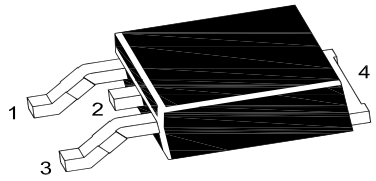
ST 2SD1817R

NPN Silicon Epitaxial Planar Transistor

Motor drivers, hammer drivers and
relay drivers applications



1. Base 2. Collector 3. Emitter 4. Collector
TO-252 Plastic Package

Absolute Maximum Ratings (T_a = 25 °C)

Parameter	Symbol	Value	Unit
Collector Base Voltage	V_{CBO}	80	V
Collector Emitter Voltage	V_{CEO}	60	V
Emitter Base Voltage	V_{EBO}	6	V
Collector Current	I_C	3	A
Collector Current (Pulse)	I_{CP}	6	A
Collector Dissipation Collector Dissipation @ T_C = 25 °C	P_C	1 15	W
Junction Temperature	T_J	150	°C
Storage Temperature Range	T_s	- 55 to + 150	°C

Characteristics at T_a = 25 °C

Parameter	Symbol	Min.	Max.	Unit
DC Current Gain at V_{CE} = 2 V, I_C = 1 A at V_{CE} = 2 V, I_C = 2 A	 h_{FE} h_{FE}	 2000 1000	 - -	 - -
Collector Base Breakdown Voltage at I_C = 1 mA	$V_{(BR)CBO}$	80	-	V
Collector Emitter Breakdown Voltage at I_C = 25 mA	$V_{(BR)CEO}$	60	-	V
Collector Cutoff Current at V_{CB} = 60 V	I_{CBO}	-	10	µA
Emitter Cutoff Current at V_{EB} = 5 V	I_{EBO}	-	2.5	mA
Collector Emitter Saturation Voltage at I_C = 2 A, I_B = 4 mA	$V_{CE(sat)}$	-	1.5	V
Base Emitter Saturation Voltage at I_C = 2 A, I_B = 4 mA	$V_{BE(sat)}$	-	2	V

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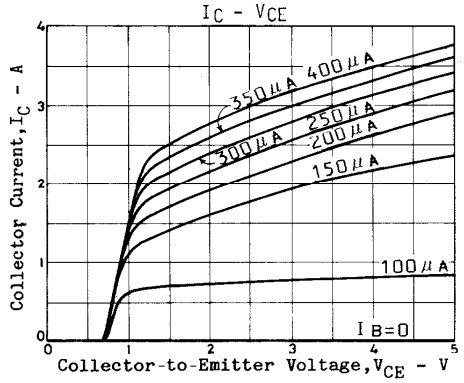
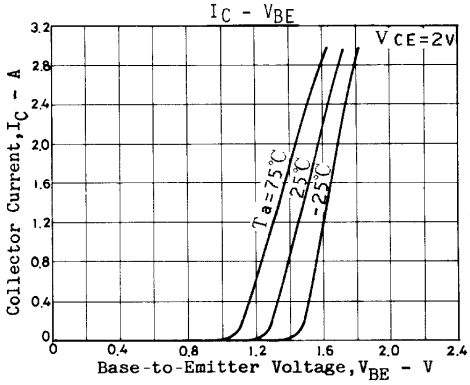
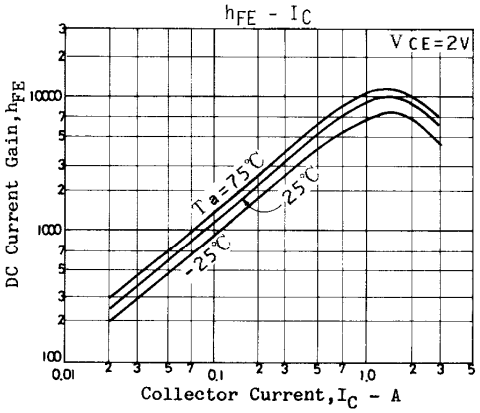
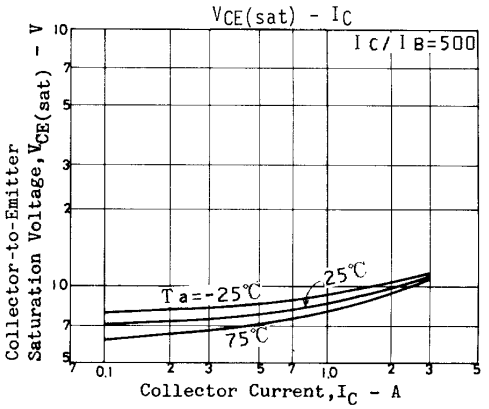
ISO/TS 16949 : 2002 Certificate No. 05103
ISO 14001:2004 Certificate No. 7116
ISO 9001:2000 Certificate No. 0506098

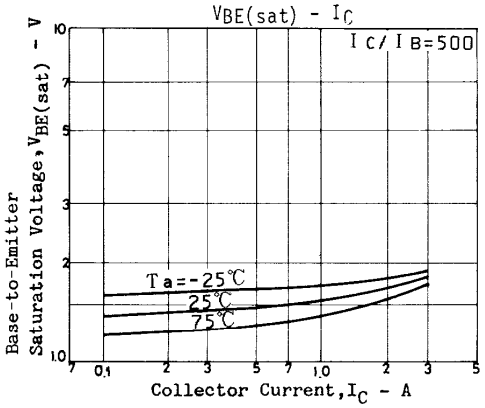
Dated : 10/08/2006

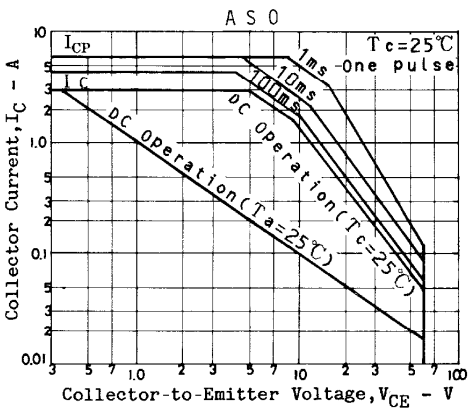

IC - VCE
Collector Current,IC - A
Collector-to-Emitter Voltage,VCE - V
400μA
350μA
300μA
250μA
200μA
150μA
100μA
IB=0

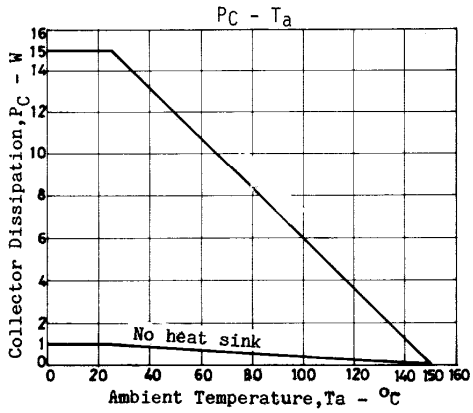

IC - VBE
VCE=2V
Collector Current,IC - A
Base-to-Emitter Voltage,VBE - V
Ta=75℃
25℃
-25℃


hFE - IC
VCE=2V
DC Current Gain,hFE
Collector Current,IC - A
Ta=75℃
25℃
-25℃

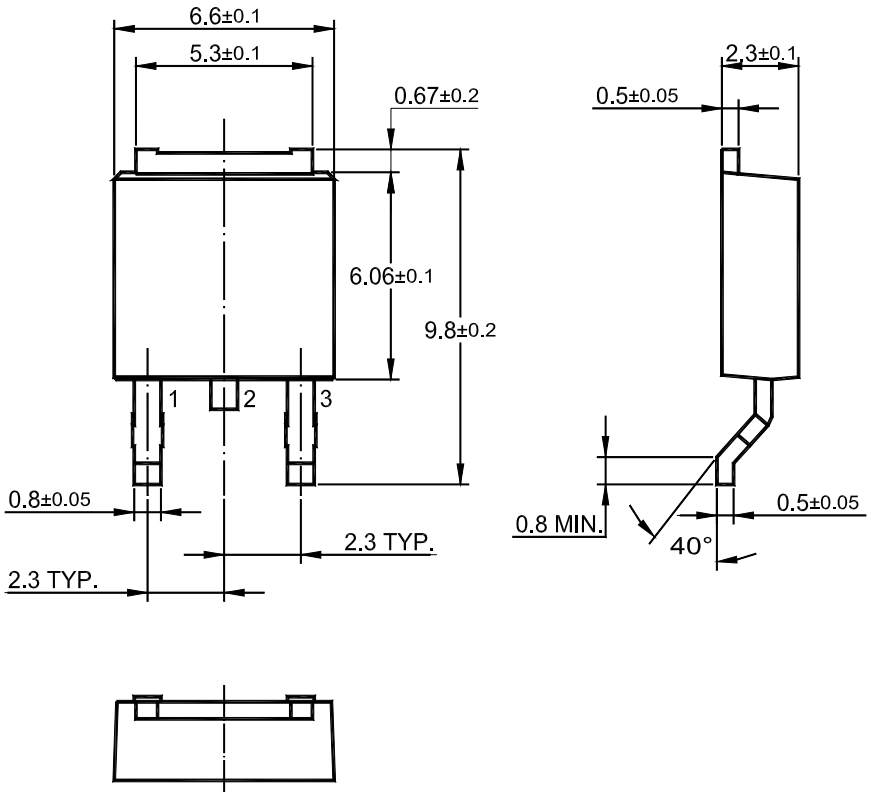

VCE(sat) - IC
IC/IB=500
Collector-to-Emitter Saturation Voltage,VCE(sat) - V
Collector Current,IC - A
Ta=-25℃
25℃
75℃


VBE(sat) - IC
IC/IB=500
Base-to-Emitter Saturation Voltage,VBE(sat) - V
Collector Current,IC - A
Ta=-25℃
25℃
75℃


A S O
ICP
IC
Tc=25℃
1ms
10ms
100ms
One pulse
DC Operation
DC Operation(Tc=25℃)
DC Operation(Ta=25℃)
Collector Current,IC - A
Collector-to-Emitter Voltage,VCE - V


PC - Ta
Collector Dissipation,PC - W
Ambient Temperature,Ta - ℃
No heat sink

TO-252 PACKAGE OUTLINE



Dimensions in mm

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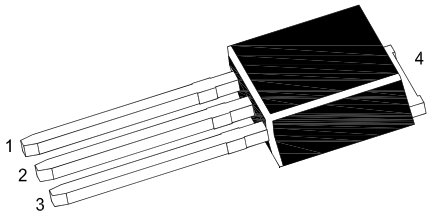
Dated : 10/08/2006

ST 2SD1817Z

NPN Silicon Epitaxial Planar Transistor

Motor drivers, hammer drivers and
relay drivers applications



1.Base 2.Collector 3.Emitter 4.Collector
TO-251 Plastic Package

Absolute Maximum Ratings (T_a = 25 °C)

Parameter	Symbol	Value	Unit
Collector Base Voltage	V_{CBO}	80	V
Collector Emitter Voltage	V_{CEO}	60	V
Emitter Base Voltage	V_{EBO}	6	V
Collector Current	I_C	3	A
Collector Current (Pulse)	I_{CP}	6	A
Collector Dissipation Collector Dissipation @ T_C = 25 °C	P_C	1 15	W
Junction Temperature	T_J	150	°C
Storage Temperature Range	T_s	- 55 to + 150	°C

Characteristics at T_a = 25 °C

Parameter	Symbol	Min.	Max.	Unit
DC Current Gain at V_{CE} = 2 V, I_C = 1 A at V_{CE} = 2 V, I_C = 2 A	 h_{FE} h_{FE}	 2000 1000	 - -	 - -
Collector Base Breakdown Voltage at I_C = 1 mA	$V_{(BR)CBO}$	80	-	V
Collector Emitter Breakdown Voltage at I_C = 25 mA	$V_{(BR)CEO}$	60	-	V
Collector Cutoff Current at V_{CB} = 60 V	I_{CBO}	-	10	µA
Emitter Cutoff Current at V_{EB} = 5 V	I_{EBO}	-	2.5	mA
Collector Emitter Saturation Voltage at I_C = 2 A, I_B = 4 mA	$V_{CE(sat)}$	-	1.5	V
Base Emitter Saturation Voltage at I_C = 2 A, I_B = 4 mA	$V_{BE(sat)}$	-	2	V

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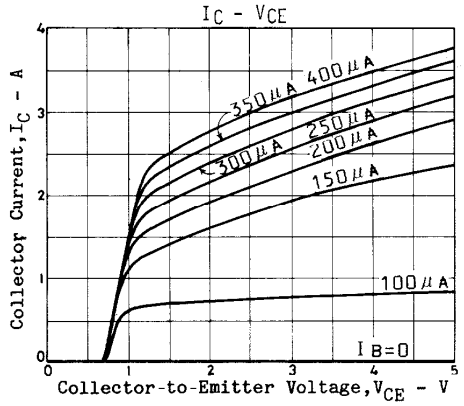
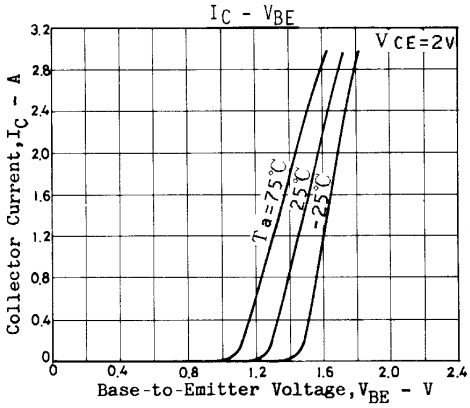
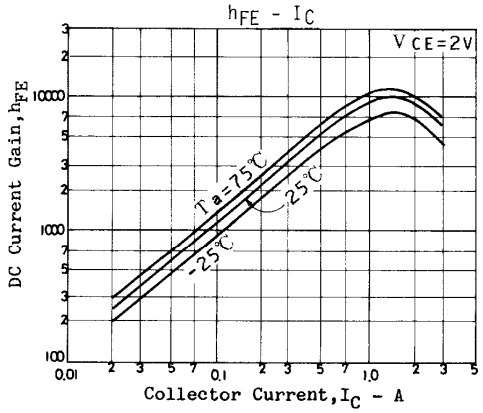
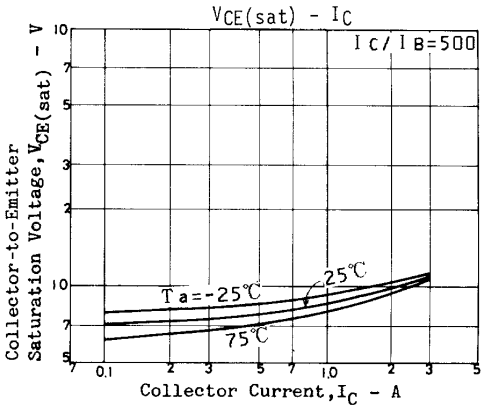
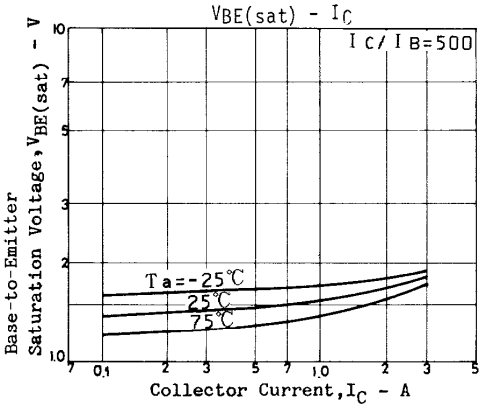
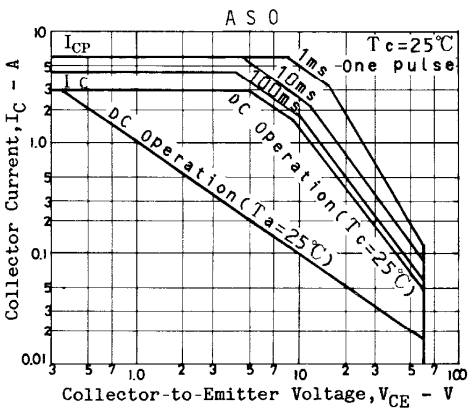

IC - VCE
Collector Current, IC - A
Collector-to-Emitter Voltage, VCE - V
350μA
400μA
300μA
250μA
200μA
150μA
100μA
IB=0

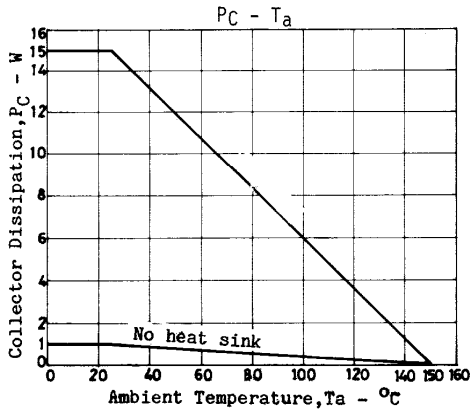

IC - VBE
VCE=2V
Collector Current, IC - A
Base-to-Emitter Voltage, VBE - V
Ta=75℃
25℃
-25℃


hFE - IC
VCE=2V
DC Current Gain, hFE
Collector Current, IC - A
Ta=75℃
25℃
-25℃

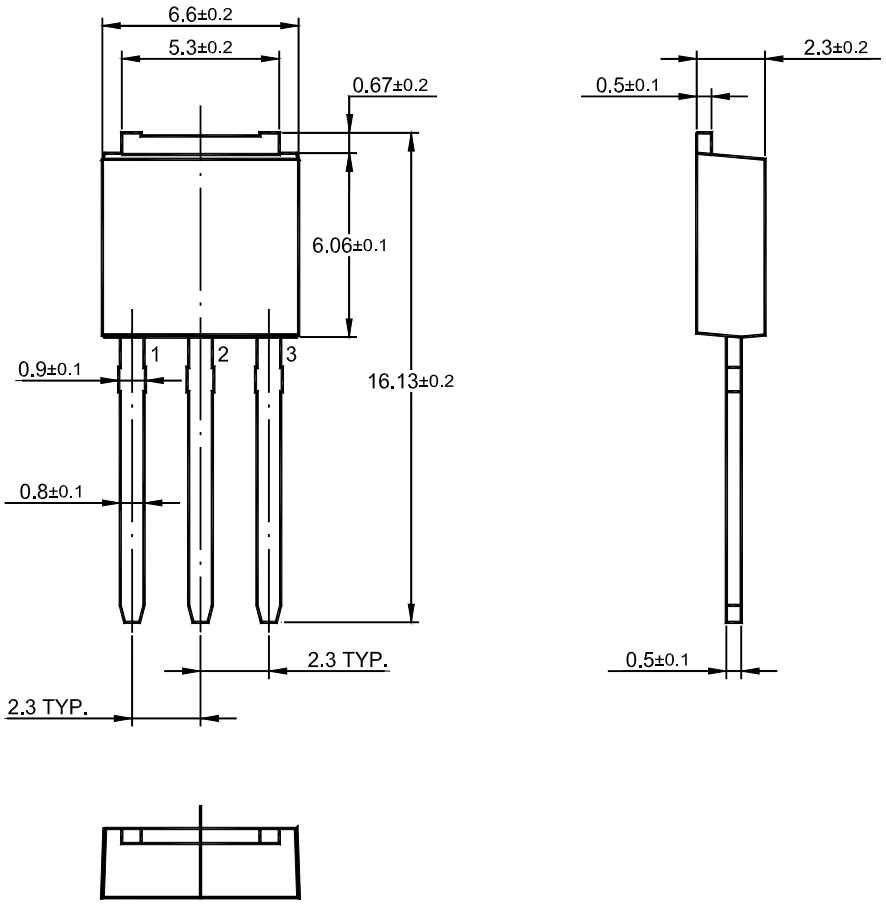

VCE(sat) - IC
IC/IB=500
Collector-to-Emitter Saturation Voltage, VCE(sat) - V
Collector Current, IC - A
Ta=-25℃
25℃
75℃


VBE(sat) - IC
IC/IB=500
Base-to-Emitter Saturation Voltage, VBE(sat) - V
Collector Current, IC - A
Ta=-25℃
25℃
75℃


A S O
ICP
IC
Tc=25℃
1ms
10ms
100ms
DC Operation
DC Operation (Tc=25℃)
DC Operation (Ta=25℃)
Collector Current, IC - A
Collector-to-Emitter Voltage, VCE - V


PC - Ta
Collector Dissipation, PC - W
Ambient Temperature, Ta - °C
No heat sink

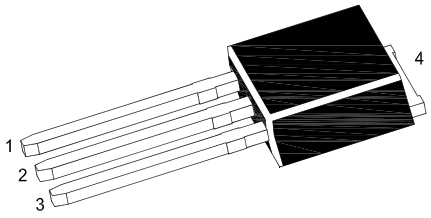
TO-251 PACKAGE OUTLINE



ST 2SD1817Z

NPN Silicon Epitaxial Planar Transistor

Motor drivers, hammer drivers and
relay drivers applications



1.Base 2.Collector 3.Emitter 4.Collector
TO-251 Plastic Package

Absolute Maximum Ratings (T_a = 25 °C)

Parameter	Symbol	Value	Unit
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Emitter Base Voltage	V_{EBO}	6	V
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Collector Current (Pulse)	I_{CP}	6	A
Collector Dissipation Collector Dissipation @ T_C = 25 °C	P_C	1 15	W
Junction Temperature	T_J	150	°C
Storage Temperature Range	T_s	- 55 to + 150	°C

Characteristics at T_a = 25 °C

Parameter	Symbol	Min.	Max.	Unit
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Collector Emitter Breakdown Voltage at I_C = 25 mA	$V_{(BR)CEO}$	60	-	V
Collector Cutoff Current at V_{CB} = 60 V	I_{CBO}	-	10	µA
Emitter Cutoff Current at V_{EB} = 5 V	I_{EBO}	-	2.5	mA
Collector Emitter Saturation Voltage at I_C = 2 A, I_B = 4 mA	$V_{CE(sat)}$	-	1.5	V
Base Emitter Saturation Voltage at I_C = 2 A, I_B = 4 mA	$V_{BE(sat)}$	-	2	V

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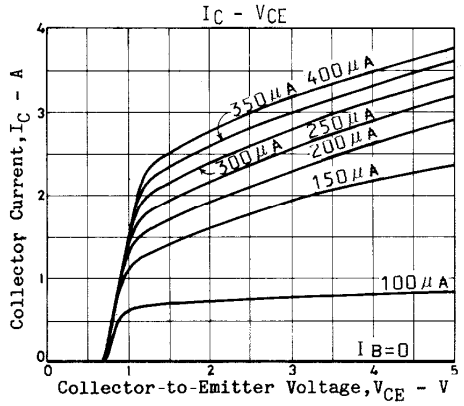
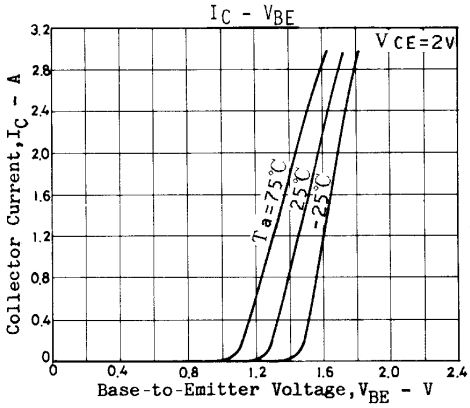
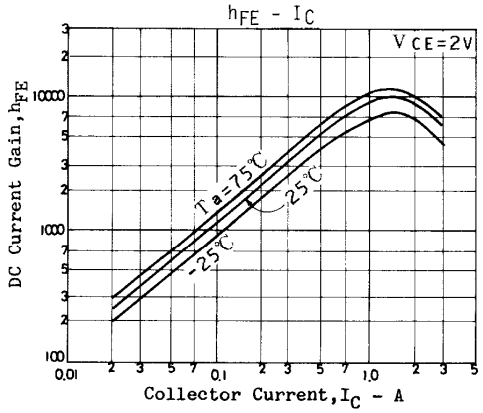
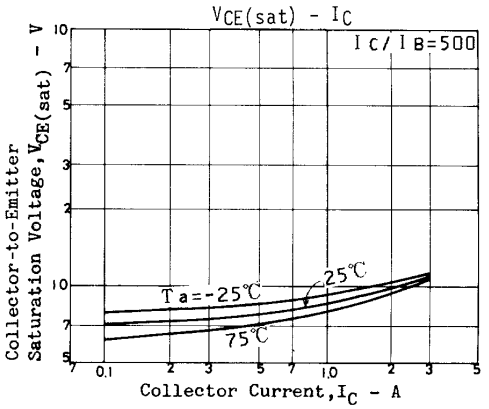
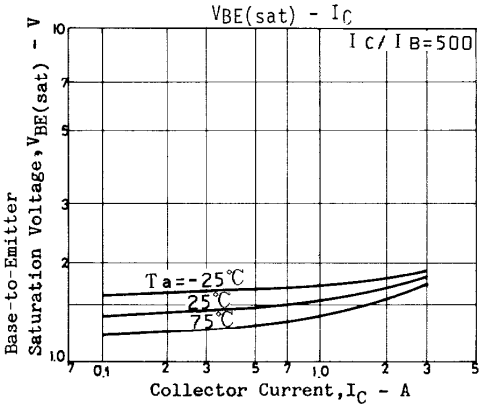
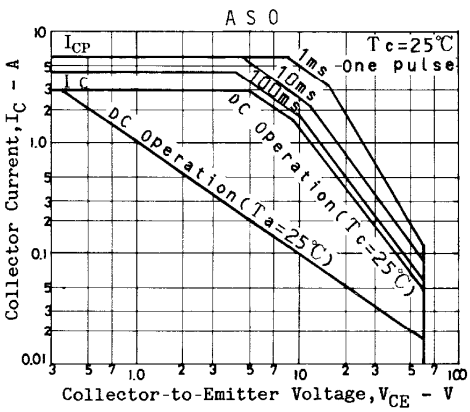

IC - VCE
Collector Current, IC - A
Collector-to-Emitter Voltage, VCE - V
350μA
400μA
300μA
250μA
200μA
150μA
100μA
IB=0

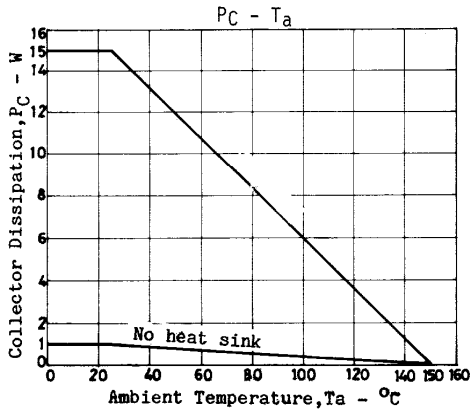

IC - VBE
VCE=2V
Collector Current, IC - A
Base-to-Emitter Voltage, VBE - V
Ta=75℃
25℃
-25℃


hFE - IC
VCE=2V
DC Current Gain, hFE
Collector Current, IC - A
Ta=75℃
25℃
-25℃

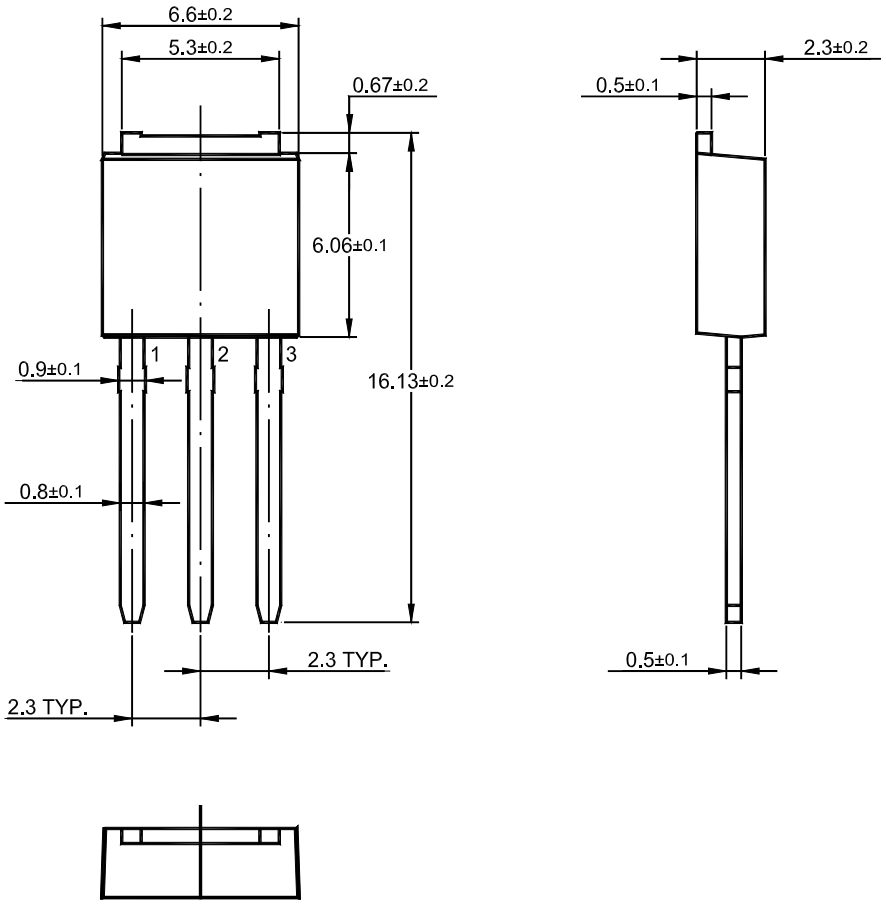

VCE(sat) - IC
IC/IB=500
Collector-to-Emitter Saturation Voltage, VCE(sat) - V
Collector Current, IC - A
Ta=-25℃
25℃
75℃


VBE(sat) - IC
IC/IB=500
Base-to-Emitter Saturation Voltage, VBE(sat) - V
Collector Current, IC - A
Ta=-25℃
25℃
75℃


A S O
ICP
IC
Tc=25℃
1ms
10ms
100ms
DC Operation
DC Operation (Tc=25℃)
DC Operation (Ta=25℃)
Collector Current, IC - A
Collector-to-Emitter Voltage, VCE - V


PC - Ta
Collector Dissipation, PC - W
Ambient Temperature, Ta - °C
No heat sink

TO-251 PACKAGE OUTLINE

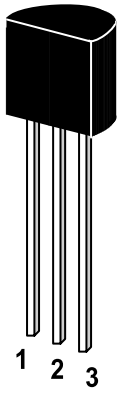


ST 2SD468

NPN Silicon Epitaxial Planar Transistor
Low Frequency Power amplifier applications.

The transistor is subdivided into two groups B and C according to its DC current gain.

On special request, these transistors can be manufactured in different pin configurations.



1. Emitter 2. Collector 3. Base

TO-92 Plastic Package
Weight approx. 0.19g

Absolute Maximum Ratings (Ta=25 ^{O}C)

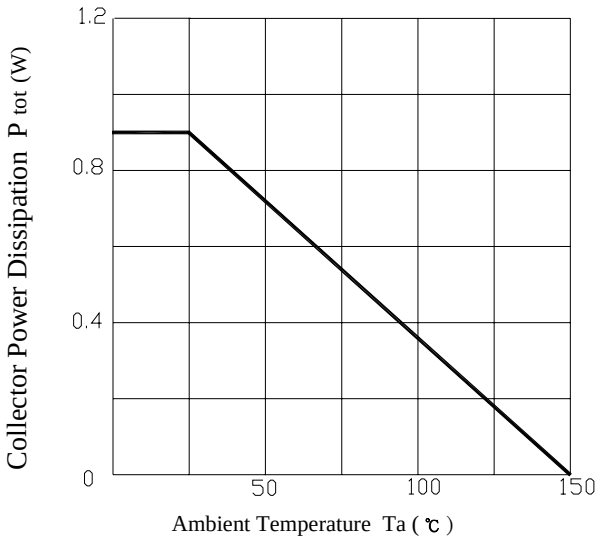
	Symbol	Value	Unit
Collector Base Voltage	V_{CBO}	25	V
Collector Emitter Voltage	V_{CEO}	20	V
Emitter Base Voltage	V_{EBO}	5	V
Collector Current	I_C	1	A
Peak Collector Current	I_{CM}	1.5	A
Power Dissipation	P_{tot}	0.9	W
Junction Temperature	T_j	150	^{O}C
Storage Temperature Range	T_S	-55 to +150	^{O}C

ST 2SD468

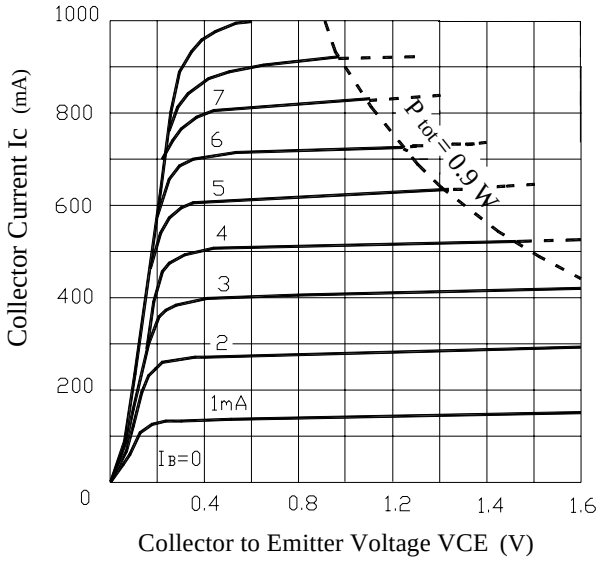
Characteristics at T_{amb}=25 ^{o}C

		Symbol	Min.	Typ.	Max.	Unit
DC Current Gain at V_{CE}=2V, I_C=0.5A Current Gain Group	B C	h_{FE} h_{FE}	85 120	- -	170 240	- -
Collector Emitter Breakdown Voltage at I_C=1mA		$V_{(BR)CEO}$	20	-	-	V
Collector Base Breakdown Voltage at I_C=10μA		$V_{(BR)CBO}$	25	-	-	V
Emitter Base Breakdown Voltage at I_E=10μA		$V_{(BR)EBO}$	5	-	-	V
Collector Cutoff Current at V_{CB}=20V		I_{CBO}	-	-	1	μA
Collector Saturation Voltage at I_C=0.8A, I_B=0.08A		$V_{CE(sat)}$	-	0.2	0.5	V
Base Emitter Voltage at V_{CE}=2V, Ic=0.5A		V_{BE}	-	0.79	1	V
Collector Output Capacitance at V_{CB}=10V, f=1MHz		C_{OB}	-	22	-	pF
Transition Frequency at V_{CE}=2V, I_C=0.5A		f_T	-	190	-	MHz

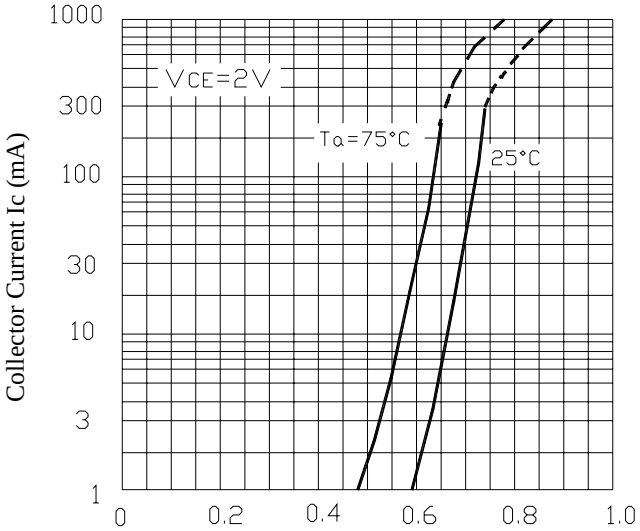
Maximum Collector Dissipation Curve



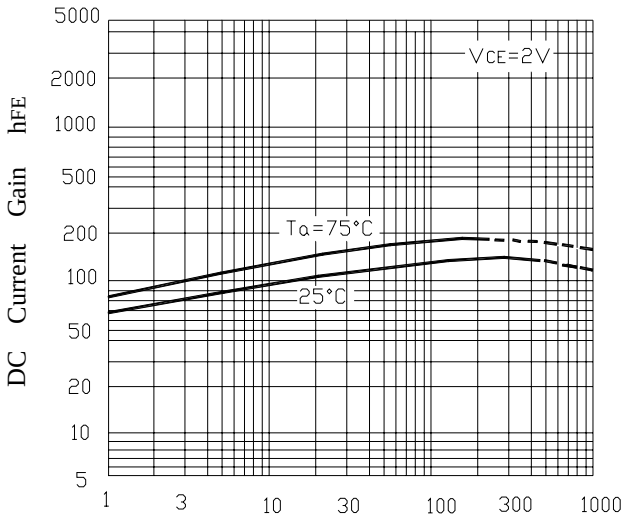
Typical Output Characteristics



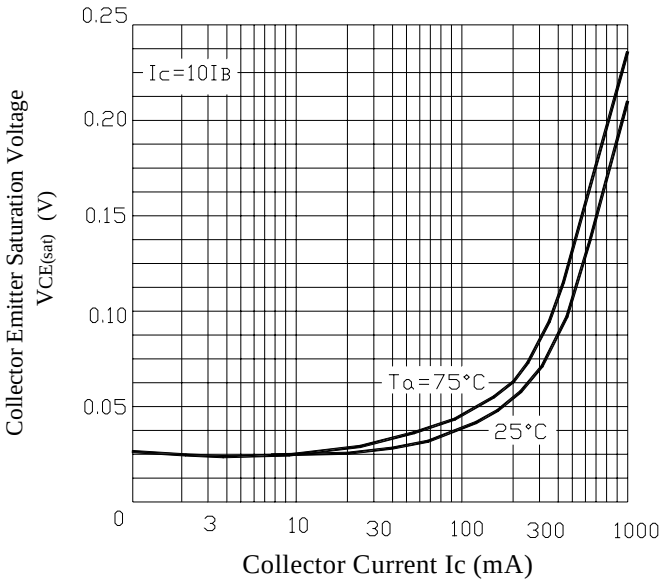
Typical Transfer Characteristics



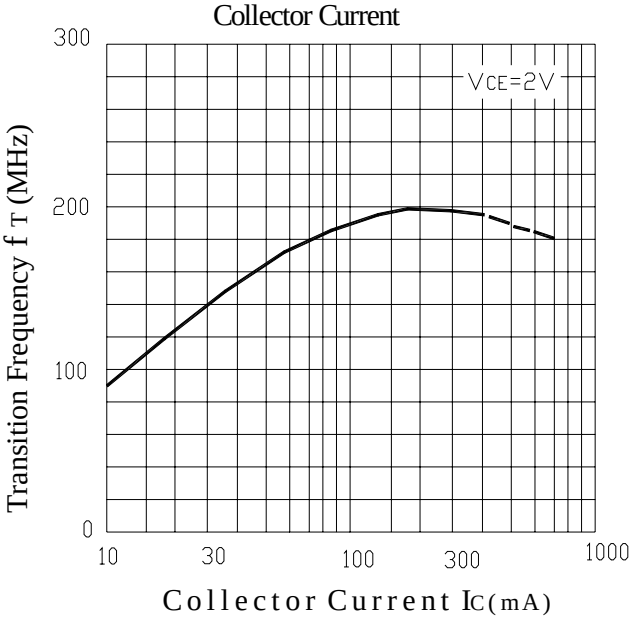
DC Current Gain vs.
Collector Current



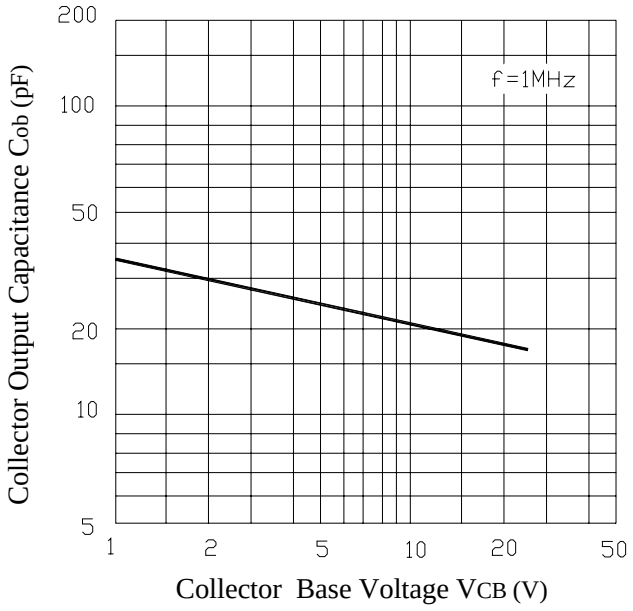
Collector Emitter Saturation Voltage vs.Collector Current



Transition Frequency v s. Collector Current



Collector Output Capacitance vs. Collector Base Voltage

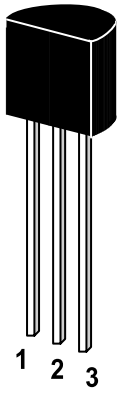


ST 2SD468

NPN Silicon Epitaxial Planar Transistor
Low Frequency Power amplifier applications.

The transistor is subdivided into two groups B and C according to its DC current gain.

On special request, these transistors can be manufactured in different pin configurations.



1. Emitter 2. Collector 3. Base

TO-92 Plastic Package
Weight approx. 0.19g

Absolute Maximum Ratings (Ta=25 ^{O}C)

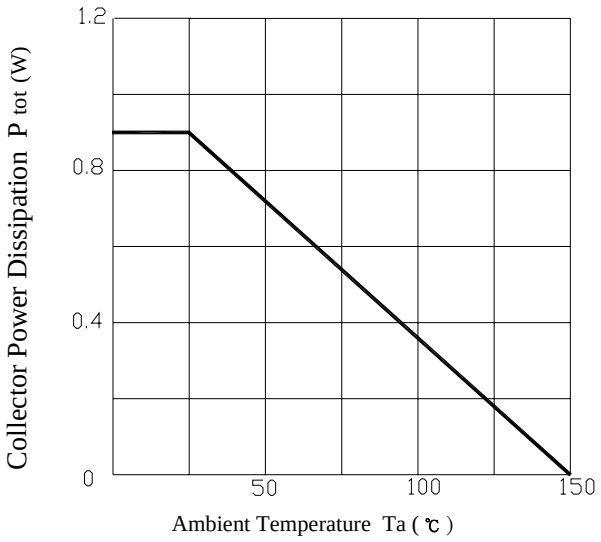
	Symbol	Value	Unit
Collector Base Voltage	V_{CBO}	25	V
Collector Emitter Voltage	V_{CEO}	20	V
Emitter Base Voltage	V_{EBO}	5	V
Collector Current	I_C	1	A
Peak Collector Current	I_{CM}	1.5	A
Power Dissipation	P_{tot}	0.9	W
Junction Temperature	T_j	150	^{O}C
Storage Temperature Range	T_S	-55 to +150	^{O}C

ST 2SD468

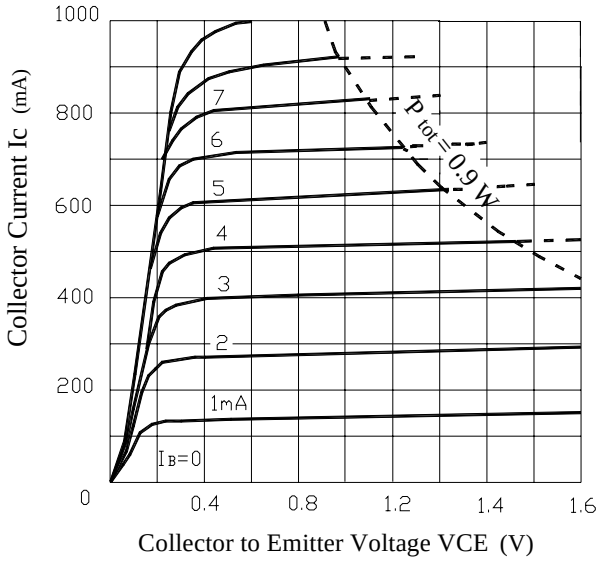
Characteristics at T_{amb}=25 ^{o}C

		Symbol	Min.	Typ.	Max.	Unit
DC Current Gain at V_{CE}=2V, I_C=0.5A Current Gain Group	B C	h_{FE} h_{FE}	85 120	- -	170 240	- -
Collector Emitter Breakdown Voltage at I_C=1mA		$V_{(BR)CEO}$	20	-	-	V
Collector Base Breakdown Voltage at I_C=10μA		$V_{(BR)CBO}$	25	-	-	V
Emitter Base Breakdown Voltage at I_E=10μA		$V_{(BR)EBO}$	5	-	-	V
Collector Cutoff Current at V_{CB}=20V		I_{CBO}	-	-	1	μA
Collector Saturation Voltage at I_C=0.8A, I_B=0.08A		$V_{CE(sat)}$	-	0.2	0.5	V
Base Emitter Voltage at V_{CE}=2V, Ic=0.5A		V_{BE}	-	0.79	1	V
Collector Output Capacitance at V_{CB}=10V, f=1MHz		C_{OB}	-	22	-	pF
Transition Frequency at V_{CE}=2V, I_C=0.5A		f_T	-	190	-	MHz

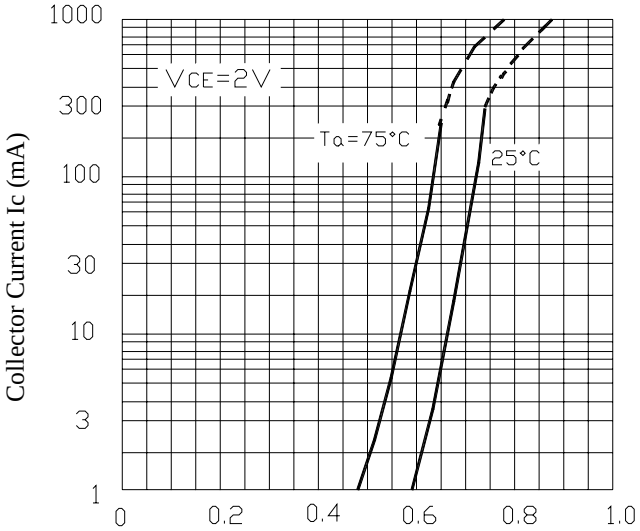
Maximum Collector Dissipation Curve



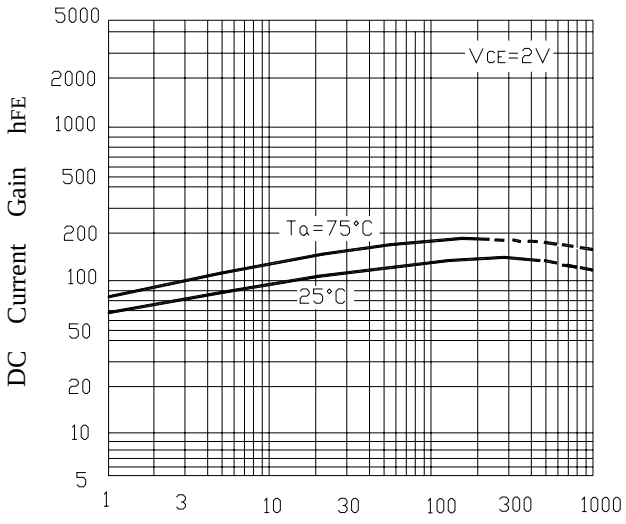
Typical Output Characteristics



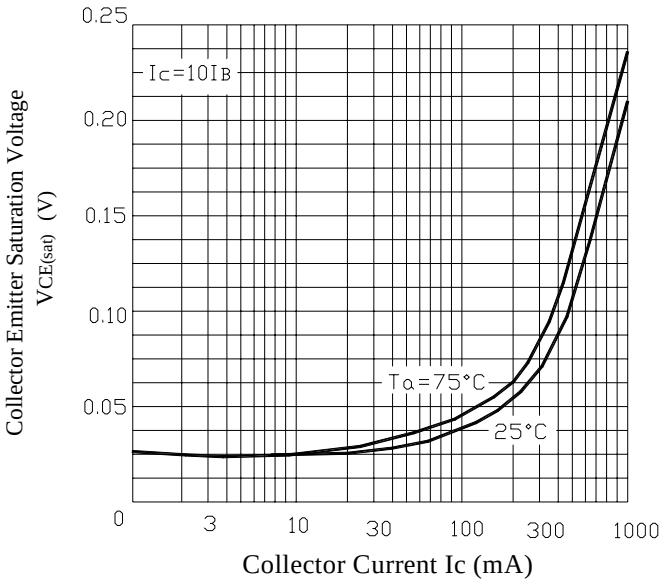
Typical Transfer Characteristics



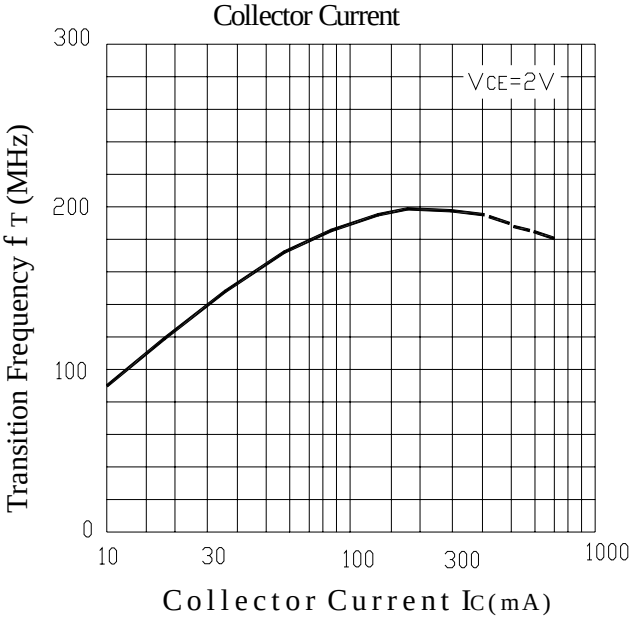
DC Current Gain vs.
Collector Current



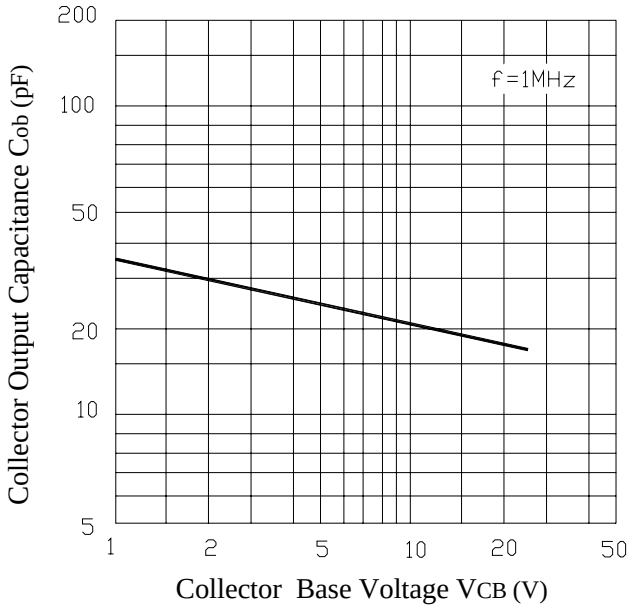
Collector Emitter Saturation Voltage vs.Collector Current



Transition Frequency v s. Collector Current



Collector Output Capacitance vs. Collector Base Voltage

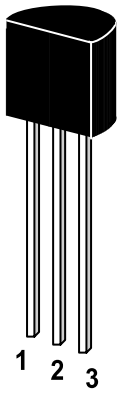


ST 2SD471

NPN Silicon Epitaxial Planar Transistor
Audio Frequency Power amplifier applications.

The transistor is subdivided into three group, O, Y and G according to its DC current gain.

On special request, these transistors can be manufactured in different pin configurations.



1. Emitter 2. Collector 3. Base

TO-92 Plastic Package
Weight approx. 0.19g

Absolute Maximum Ratings (Ta=25℃)

	Symbol	Value	Unit
Collector Base Voltage	V_{CBO}	40	V
Collector Emitter Voltage	V_{CEO}	30	V
Emitter Base Voltage	V_{EBO}	5	V
Collector Current	I_C	1	A
Power Dissipation	P_{tot}	1	W
Junction Temperature	T_j	150	^{O}C
Storage Temperature Range	T_S	-55 to +150	^{O}C

ST 2SD471

Characteristics at T_{amb}=25 ^{o}C

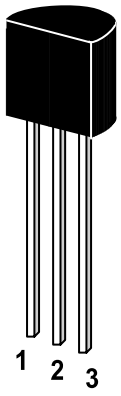
		Symbol	Min.	Typ.	Max.	Unit
DC Current Gain at V_{CE}=1V, I_C=100mA						
Current Gain Group	O	h_{FE}	70	-	140	-
	Y	h_{FE}	120	-	240	-
	G	h_{FE}	200	-	400	-
Collector Emitter Breakdown Voltage at I_C=10mA		$V_{(BR)CEO}$	30	-	-	V
Collector Base Breakdown Voltage at I_C=100μA		$V_{(BR)CBO}$	40	-	-	V
Emitter Base Breakdown Voltage at I_E=100μA		$V_{(BR)EBO}$	5	-	-	V
Collector Cutoff Current at V_{CB}=30V		I_{CBO}	-	-	0.1	μA
Collector Saturation Voltage at I_C=1.0A, I_B=100mA		$V_{CE(sat)}$	-	-	0.5	V
Base Saturation Voltage at I_C=1.0A, I_B=100mA		$V_{BE(sat)}$	-	-	1.2	V
Collector Output Capacitance at V_{CB}=6V, f=1MHz		C_{OB}	-	18	-	pF
Transition Frequency at V_{CE}=6V, I_C=10mA		f_T	-	130	-	MHz

ST 2SD471

NPN Silicon Epitaxial Planar Transistor
Audio Frequency Power amplifier applications.

The transistor is subdivided into three group, O, Y and G according to its DC current gain.

On special request, these transistors can be manufactured in different pin configurations.



1. Emitter 2. Collector 3. Base

TO-92 Plastic Package
Weight approx. 0.19g

Absolute Maximum Ratings (Ta=25℃)

	Symbol	Value	Unit
Collector Base Voltage	V_{CBO}	40	V
Collector Emitter Voltage	V_{CEO}	30	V
Emitter Base Voltage	V_{EBO}	5	V
Collector Current	I_C	1	A
Power Dissipation	P_{tot}	1	W
Junction Temperature	T_j	150	^{O}C
Storage Temperature Range	T_S	-55 to +150	^{O}C

ST 2SD471

Characteristics at T_{amb}=25 ^{o}C

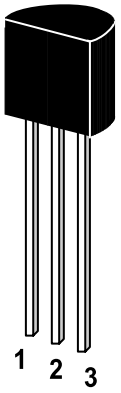
		Symbol	Min.	Typ.	Max.	Unit
DC Current Gain at V_{CE}=1V, I_C=100mA						
Current Gain Group	O	h_{FE}	70	-	140	-
	Y	h_{FE}	120	-	240	-
	G	h_{FE}	200	-	400	-
Collector Emitter Breakdown Voltage at I_C=10mA		$V_{(BR)CEO}$	30	-	-	V
Collector Base Breakdown Voltage at I_C=100μA		$V_{(BR)CBO}$	40	-	-	V
Emitter Base Breakdown Voltage at I_E=100μA		$V_{(BR)EBO}$	5	-	-	V
Collector Cutoff Current at V_{CB}=30V		I_{CBO}	-	-	0.1	μA
Collector Saturation Voltage at I_C=1.0A, I_B=100mA		$V_{CE(sat)}$	-	-	0.5	V
Base Saturation Voltage at I_C=1.0A, I_B=100mA		$V_{BE(sat)}$	-	-	1.2	V
Collector Output Capacitance at V_{CB}=6V, f=1MHz		C_{OB}	-	18	-	pF
Transition Frequency at V_{CE}=6V, I_C=10mA		f_T	-	130	-	MHz

ST 2SD655

NPN Silicon Epitaxial Planar Transistor
for switching and AF amplifier applications.

The transistor is subdivided into three groups, D, E and F, according to its DC current gain.

On special request, these transistors can be manufactured in different pin configurations.



1. Emitter 2. Collector 3. Base

TO-92 Plastic Package
Weight approx. 0.19g

Absolute Maximum Ratings (T_a = 25℃)

	Symbol	Value	Unit
Collector Base Voltage	V_{CBO}	30	V
Collector Emitter Voltage	V_{CEO}	15	V
Emitter Base Voltage	V_{EBO}	5	V
Collector Current	I_C	700	mA
Collector Peak Current	ic(peak)	1000	mA
Power Dissipation	P_{tot}	500	mW
Junction Temperature	T_j	150	^{O}C
Storage Temperature Range	T_S	-55 to +150	^{O}C

ST 2SD655

Characteristics at T_{amb}=25 ^{o}C

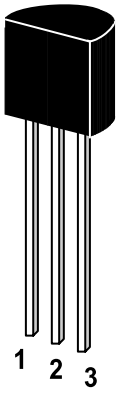
	Symbol	Min.	Typ.	Max.	Unit
DC Current Gain					
at V_{CE}=1V, I_C=150mA					
Current Gain Group D	h_{FE}	250	-	500	-
E	h_{FE}	400	-	800	-
F	h_{FE}	600	-	1200	-
Collector to Base Breakdown Voltage					
at I_C=10μA	$V_{(BR)CBO}$	30	-	-	V
Collector to Emitter Breakdown Voltage					
at I_C=1mA	$V_{(BR)CEO}$	15	-	-	V
Emitter Base Breakdown Voltage					
at I_E=10μA	$V_{(BR)EBO}$	5	-	-	V
Collector Cutoff Current					
at V_{CB}=20V	I_{CBO}	-	-	1	μA
Base Emitter Voltage					
at V_{CE}=1V, I_C=150mA	V_{BE}	-	-	1	V
Collector Emitter Saturation Voltage					
at I_C=500mA, I_B=50mA	$V_{CE(sat)}$	-	0.15	0.5	V
Gain Bandwidth Product					
at V_{CE}=1V, I_C=150mA	f_T	-	250	-	MHz

ST 2SD655

NPN Silicon Epitaxial Planar Transistor
for switching and AF amplifier applications.

The transistor is subdivided into three groups, D, E and F, according to its DC current gain.

On special request, these transistors can be manufactured in different pin configurations.



1. Emitter 2. Collector 3. Base

TO-92 Plastic Package
Weight approx. 0.19g

Absolute Maximum Ratings (T_a = 25℃)

	Symbol	Value	Unit
Collector Base Voltage	V_{CBO}	30	V
Collector Emitter Voltage	V_{CEO}	15	V
Emitter Base Voltage	V_{EBO}	5	V
Collector Current	I_C	700	mA
Collector Peak Current	ic(peak)	1000	mA
Power Dissipation	P_{tot}	500	mW
Junction Temperature	T_j	150	^{O}C
Storage Temperature Range	T_S	-55 to +150	^{O}C

ST 2SD655

Characteristics at T_{amb}=25 ^{o}C

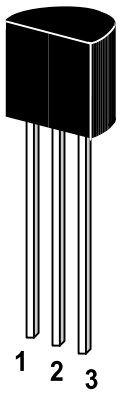
	Symbol	Min.	Typ.	Max.	Unit
DC Current Gain					
at V_{CE}=1V, I_C=150mA					
Current Gain Group D	h_{FE}	250	-	500	-
E	h_{FE}	400	-	800	-
F	h_{FE}	600	-	1200	-
Collector to Base Breakdown Voltage					
at I_C=10μA	$V_{(BR)CBO}$	30	-	-	V
Collector to Emitter Breakdown Voltage					
at I_C=1mA	$V_{(BR)CEO}$	15	-	-	V
Emitter Base Breakdown Voltage					
at I_E=10μA	$V_{(BR)EBO}$	5	-	-	V
Collector Cutoff Current					
at V_{CB}=20V	I_{CBO}	-	-	1	μA
Base Emitter Voltage					
at V_{CE}=1V, I_C=150mA	V_{BE}	-	-	1	V
Collector Emitter Saturation Voltage					
at I_C=500mA, I_B=50mA	$V_{CE(sat)}$	-	0.15	0.5	V
Gain Bandwidth Product					
at V_{CE}=1V, I_C=150mA	f_T	-	250	-	MHz

ST 2SD734

NPN Silicon Epitaxial Planar Transistor
for 1W Output, Electronic Governor, DC-DC Converter Applications.

The transistor is subdivided into four groups D, E, F and G, according to its DC current gain.

On special request, these transistors can be manufactured in different pin configurations.



1. Emitter 2. Collector 3. Base

TO-92 Plastic Package
Weight approx. 0.19g

Absolute Maximum Ratings (T_a = 25°C)

	Symbol	Value	Unit
Collector Base Voltage	V_{CBO}	25	V
Collector Emitter Voltage	V_{CEO}	20	V
Emitter Base Voltage	V_{EBO}	5	V
Collector Current	I_C	700	mA
Collector Current (Pulse)	I_{CP}	1500	mA
Power Dissipation	P_{tot}	600	mW
Junction Temperature	T_j	150	°C
Storage Temperature Range	T_S	-55 to +150	°C

Characteristics at T_{amb}=25 ^{O}C

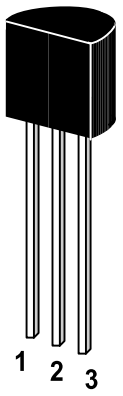
	Symbol	Min.	Typ.	Max.	Unit
DC Current Gain					
at V_{CE}=2V, I_C=50mA					
Current Gain Group D	h_{FE}	60	-	120	-
E	h_{FE}	100	-	200	-
F	h_{FE}	160	-	320	-
G	h_{FE}	280	-	560	-
at V_{CE}=2V, I_C=500mA	h_{FE}	50	-	-	-
Collector Cutoff Current					
at V_{CB}=20V	I_{CBO}	-	-	1	μA
Emitter Cutoff Current					
at V_{EB}=4V	I_{EBO}	-	-	1	μA
Gain Bandwidth Product					
at V_{CE}=10V, I_C=50mA	f_T	-	250	-	MHz
Output Capacitance					
at V_{CB}=10V,f=1MHz	C_{ob}	-	8	-	pF

ST 2SD734

NPN Silicon Epitaxial Planar Transistor
for 1W Output, Electronic Governor, DC-DC Converter Applications.

The transistor is subdivided into four groups D, E, F and G, according to its DC current gain.

On special request, these transistors can be manufactured in different pin configurations.



1. Emitter 2. Collector 3. Base

TO-92 Plastic Package
Weight approx. 0.19g

Absolute Maximum Ratings (T_a = 25°C)

	Symbol	Value	Unit
Collector Base Voltage	V_{CBO}	25	V
Collector Emitter Voltage	V_{CEO}	20	V
Emitter Base Voltage	V_{EBO}	5	V
Collector Current	I_C	700	mA
Collector Current (Pulse)	I_{CP}	1500	mA
Power Dissipation	P_{tot}	600	mW
Junction Temperature	T_j	150	°C
Storage Temperature Range	T_S	-55 to +150	°C

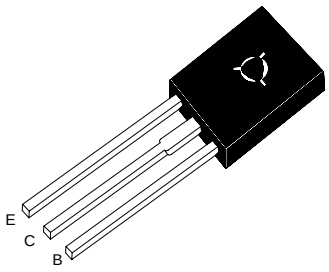
Characteristics at T_{amb}=25 ^{O}C

	Symbol	Min.	Typ.	Max.	Unit
DC Current Gain					
at V_{CE}=2V, I_C=50mA					
Current Gain Group D	h_{FE}	60	-	120	-
E	h_{FE}	100	-	200	-
F	h_{FE}	160	-	320	-
G	h_{FE}	280	-	560	-
at V_{CE}=2V, I_C=500mA	h_{FE}	50	-	-	-
Collector Cutoff Current					
at V_{CB}=20V	I_{CBO}	-	-	1	μA
Emitter Cutoff Current					
at V_{EB}=4V	I_{EBO}	-	-	1	μA
Gain Bandwidth Product					
at V_{CE}=10V, I_C=50mA	f_T	-	250	-	MHz
Output Capacitance					
at V_{CB}=10V,f=1MHz	C_{ob}	-	8	-	pF

ST 2SD882H

NPN Silicon Power Transistor

The transistor is subdivided into four groups, R, Q, P and E, according to its DC current gain.



TO-126 Plastic Package

Absolute Maximum Ratings (T_a = 25 °C)

Parameter	Symbol	Value	Unit
Collector to Base Voltage	V_{CBO}	60	V
Collector to Emitter Voltage	V_{CEO}	30	V
Emitter to Base Voltage	V_{EBO}	5	V
Collector Current	I_C	3	A
Collector Current (pulse)	I_{CP}	7	A
Total Power Dissipation(T_a = 25 °C)	P_{tot}	1	W
Total Power Dissipation(T_C = 25 °C)	P_{tot}	10	W
Junction Temperature	T_j	150	°C
Storage Temperature Range	T_S	- 55 to + 150	°C

Characteristics at T_a = 25 °C

Parameter		Symbol	Min.	Typ.	Max.	Unit
DC Current Gain						
at V_{CE} = 2 V, I_C = 1 A	Current Gain Group R	h_{FE}	60	-	120	-
	Q	h_{FE}	100	-	200	-
	P	h_{FE}	160	-	320	-
	E	h_{FE}	200	-	400	-
at V_{CE} = 2 V, I_C = 20 mA		h_{FE}	30	-	-	-
Collector Cutoff Current at V_{CB} = 60 V		I_{CBO}	-	-	1	µA
Emitter Cutoff Current at V_{EB} = 3 V		I_{EBO}	-	-	1	µA
Collector Emitter Saturation Voltage at I_C = 2 A, I_B = 0.2 A		V_{CEsat}	-	-	0.5	V
Base Emitter Saturation Voltage at I_C = 2 A, I_B = 0.2 A		V_{BEsat}	-	-	2	V
Gain Bandwidth Product at V_{CE} = 5 V, I_C = 0.1 A		f_T	-	90	-	MHz
Output Capacitance at V_{CB} = 10 V, f = 1 MHz		C_{ob}	-	45	-	pF

SEMTECH ELECTRONICS LTD.

(Subsidiary of Sino-Tech International Holdings Limited, a company listed on the Hong Kong Stock Exchange, Stock Code: 724)

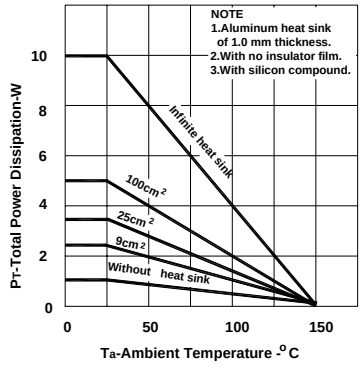
ISO/TS 16949 : 2002 Certificate No. 05103 ISO 14001:2004 Certificate No. 7116 ISO 9001:2000 Certificate No. 0506098

Dated : 13/09/2006

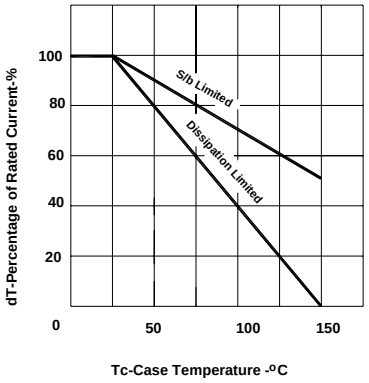
ST 2SD882H

TYPICAL CHARACTERISTICS (Ta=25°C)

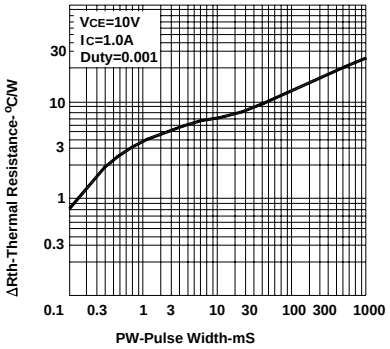
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



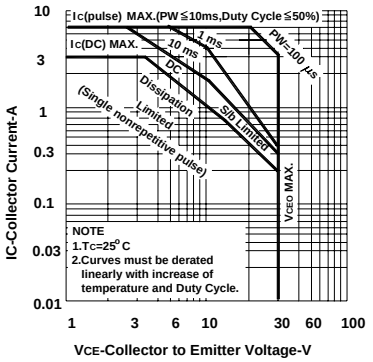
DERATING CURVES FOR ALL TYPES



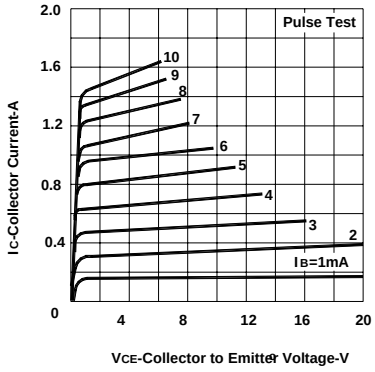
THERMAL RESISTANCE vs. PULSE WIDTH



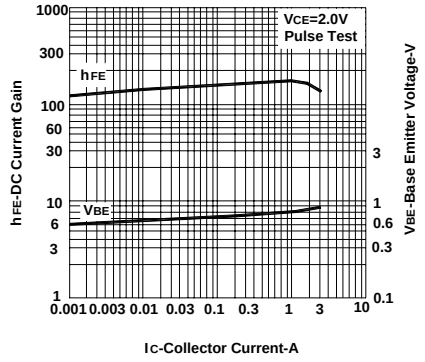
SAFE OPERATING AREAS



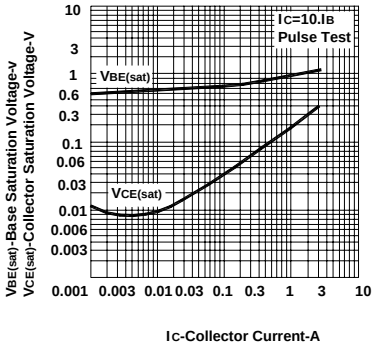
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



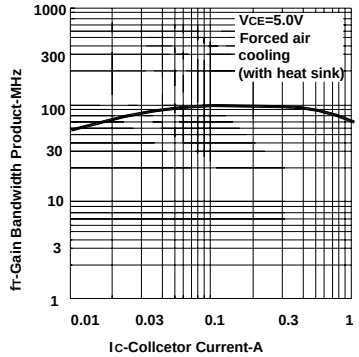
DC CURRENT GAIN, BASE TO EMITTER VOLTAGE vs. COLLECTOR CURRENT



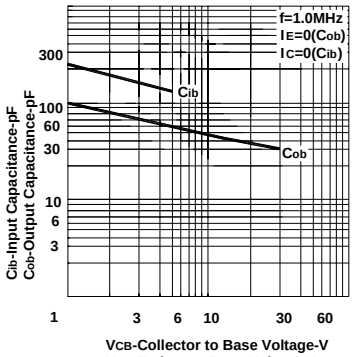
BASE AND COLLECTOR SATURATION VOLTAGE vs. COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT vs. COLLCETOR CURRENT



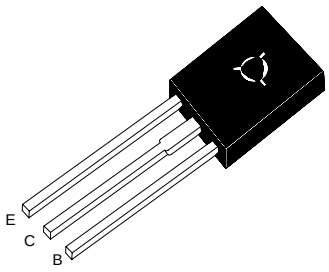
INPUT AND OUTPUT CAPACITANCE vs. REVERSE VOLTAGE



ST 2SD882H

NPN Silicon Power Transistor

The transistor is subdivided into four groups, R, Q, P and E, according to its DC current gain.



TO-126 Plastic Package

Absolute Maximum Ratings (T_a = 25 °C)

Parameter	Symbol	Value	Unit
Collector to Base Voltage	V_{CBO}	60	V
Collector to Emitter Voltage	V_{CEO}	30	V
Emitter to Base Voltage	V_{EBO}	5	V
Collector Current	I_C	3	A
Collector Current (pulse)	I_{CP}	7	A
Total Power Dissipation(T_a = 25 °C)	P_{tot}	1	W
Total Power Dissipation(T_C = 25 °C)	P_{tot}	10	W
Junction Temperature	T_j	150	°C
Storage Temperature Range	T_S	- 55 to + 150	°C

Characteristics at T_a = 25 °C

Parameter		Symbol	Min.	Typ.	Max.	Unit
DC Current Gain						
at V_{CE} = 2 V, I_C = 1 A	Current Gain Group R	h_{FE}	60	-	120	-
	Q	h_{FE}	100	-	200	-
	P	h_{FE}	160	-	320	-
	E	h_{FE}	200	-	400	-
at V_{CE} = 2 V, I_C = 20 mA		h_{FE}	30	-	-	-
Collector Cutoff Current at V_{CB} = 60 V		I_{CBO}	-	-	1	µA
Emitter Cutoff Current at V_{EB} = 3 V		I_{EBO}	-	-	1	µA
Collector Emitter Saturation Voltage at I_C = 2 A, I_B = 0.2 A		V_{CEsat}	-	-	0.5	V
Base Emitter Saturation Voltage at I_C = 2 A, I_B = 0.2 A		V_{BEsat}	-	-	2	V
Gain Bandwidth Product at V_{CE} = 5 V, I_C = 0.1 A		f_T	-	90	-	MHz
Output Capacitance at V_{CB} = 10 V, f = 1 MHz		C_{ob}	-	45	-	pF

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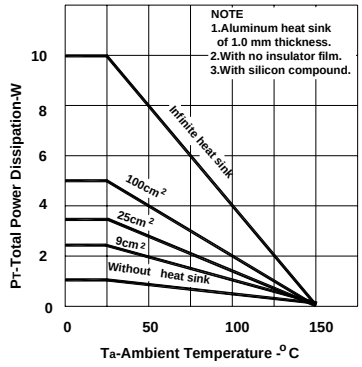
ISO/TS 16949 : 2002 Certificate No. 05103 ISO 14001:2004 Certificate No. 7116 ISO 9001:2000 Certificate No. 0506098

Dated : 13/09/2006

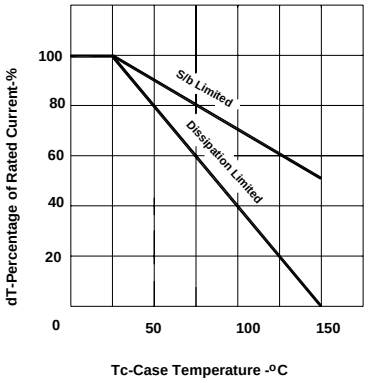
ST 2SD882H

TYPICAL CHARACTERISTICS (Ta=25°C)

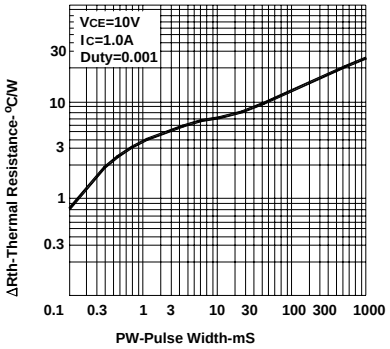
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



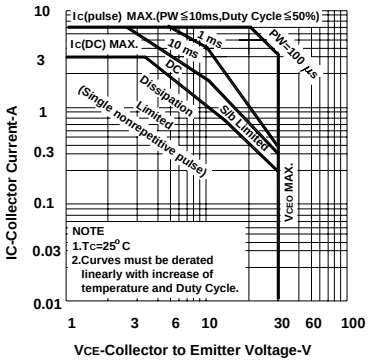
DERATING CURVES FOR ALL TYPES



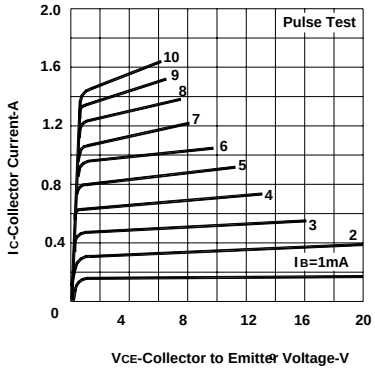
THERMAL RESISTANCE vs. PULSE WIDTH



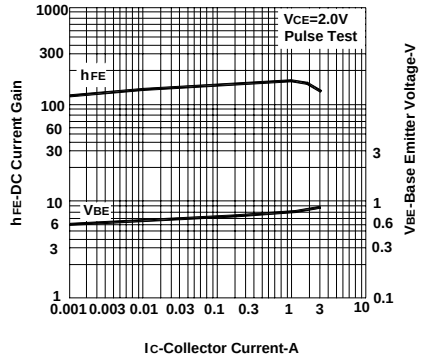
SAFE OPERATING AREAS



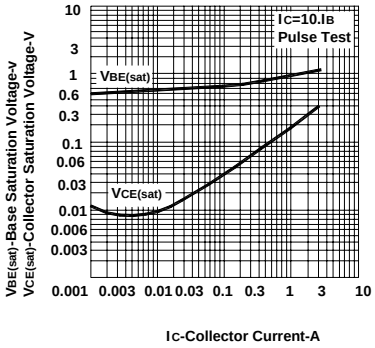
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



DC CURRENT GAIN, BASE TO EMITTER VOLTAGE vs. COLLECTOR CURRENT



BASE AND COLLECTOR SATURATION VOLTAGE vs. COLLECTOR CURRENT



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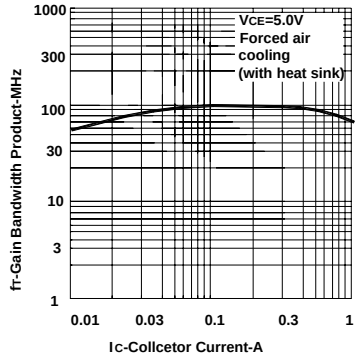
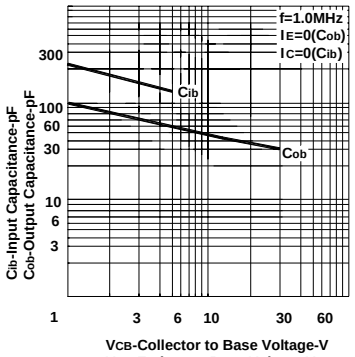


INPUT AND OUTPUT CAPACITANCE vs. REVERSE VOLTAGE

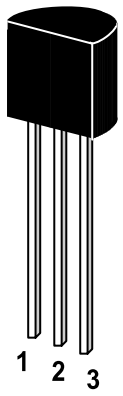


ST 2SD882S-Q/P/E

NPN Silicon Epitaxial Planar Transistor
for the output stage of 0.75W audio, voltage regulator, and relay driver.

The transistor is subdivided into three groups Q, P and E, according to its DC current gain.

On special request, these transistors can be manufactured in different pin configurations.



1. Emitter 2. Collector 3. Base

TO-92 Plastic Package
Weight approx. 0.19g

Absolute Maximum Ratings (T_a = 25^{O}C)

	Symbol	Value	Unit
Collector to Base Voltage	V_{CBO}	40	V
Collector to Emitter Voltage	V_{CEO}	30	V
Emitter to Base Voltage	V_{EBO}	5	V
Collector Current	I_C	3	A
Power Dissipation	P_{tot}	750	mW
Junction Temperature	T_j	150	^{O}C
Storage Temperature Range	T_S	-55 to +150	^{O}C

ST 2SD882S-Q/P/E

Characteristics at T_{amb}=25 ^{O}C

		Symbol	Min.	Typ.	Max.	Unit
DC Current Gain						
at V_{CE}=2V, I_C=1A	Q	h_{FE}	100	-	200	-
	P	h_{FE}	160	-	320	-
	E	h_{FE}	250	-	500	-
at V_{CE}=2V, I_C=20mA		h_{FE}	30	-	-	-
Collector Cutoff Current at V_{CB}=30V		I_{CBO}	-	-	1	uA
Emitter Cutoff Current at V_{EB}=3V		I_{EBO}	-	-	1	uA
Collector to Base Breakdown Voltage at I_C=100μA		$V_{(BR)CBO}$	40	-	-	V
Collector to Emitter Breakdown Voltage at I_C=1mA		$V_{(BR)CEO)}$	30	-	-	V
Emitter to Base Breakdown Voltage at I_E=10μA		$V_{(BR)EBO}$	5	-	-	V
Collector to Emitter Saturation Voltage at I_C=2A,I_B=200mA		$V_{CE(sat)}$	-	-	0.5	V
Base to Emitter Saturation Voltage at I_C=2A,I_B=200mA		$V_{BE(sat)}$	-	-	2	V
Transition Frequency at V_{CE}=5V, I_C=0.1A,f=100MHz		f_T	-	90	-	MHz
Collector Output Capacitance at V_{CB}=10V,f=1MHz		Cob	-	45	-	pF

ST 2SD882S-Q/P/E

NPN Silicon Epitaxial Planar Transistor
for the output stage of 0.75W audio, voltage regulator, and relay driver.

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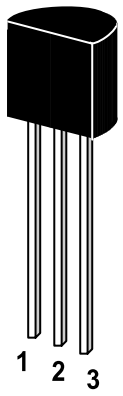


1. Emitter 2. Collector 3. Base

TO-92 Plastic Package
Weight approx. 0.19g

Absolute Maximum Ratings (T_a = 25^{O}C)

	Symbol	Value	Unit
Collector to Base Voltage	V_{CBO}	40	V
Collector to Emitter Voltage	V_{CEO}	30	V
Emitter to Base Voltage	V_{EBO}	5	V
Collector Current	I_C	3	A
Power Dissipation	P_{tot}	750	mW
Junction Temperature	T_j	150	^{O}C
Storage Temperature Range	T_S	-55 to +150	^{O}C

ST 2SD882S-Q/P/E

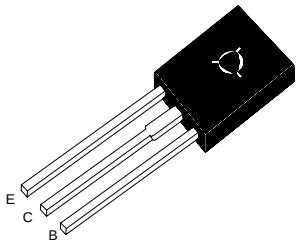
Characteristics at T_{amb}=25 ^{O}C

		Symbol	Min.	Typ.	Max.	Unit
DC Current Gain						
at V_{CE}=2V, I_C=1A	Q	h_{FE}	100	-	200	-
	P	h_{FE}	160	-	320	-
	E	h_{FE}	250	-	500	-
at V_{CE}=2V, I_C=20mA		h_{FE}	30	-	-	-
Collector Cutoff Current at V_{CB}=30V		I_{CBO}	-	-	1	uA
Emitter Cutoff Current at V_{EB}=3V		I_{EBO}	-	-	1	uA
Collector to Base Breakdown Voltage at I_C=100μA		$V_{(BR)CBO}$	40	-	-	V
Collector to Emitter Breakdown Voltage at I_C=1mA		$V_{(BR)CEO)}$	30	-	-	V
Emitter to Base Breakdown Voltage at I_E=10μA		$V_{(BR)EBO}$	5	-	-	V
Collector to Emitter Saturation Voltage at I_C=2A,I_B=200mA		$V_{CE(sat)}$	-	-	0.5	V
Base to Emitter Saturation Voltage at I_C=2A,I_B=200mA		$V_{BE(sat)}$	-	-	2	V
Transition Frequency at V_{CE}=5V, I_C=0.1A,f=100MHz		f_T	-	90	-	MHz
Collector Output Capacitance at V_{CB}=10V,f=1MHz		Cob	-	45	-	pF

ST 2SD882T

NPN Silicon Power Transistor

The transistor is subdivided into four groups, R, Q, P and E, according to its DC current gain.



TO-126 Plastic Package

Absolute Maximum Ratings (T_a = 25 °C)

Parameter	Symbol	Value	Unit
Collector to Base Voltage	V_{CBO}	40	V
Collector to Emitter Voltage	V_{CEO}	30	V
Emitter to Base Voltage	V_{EBO}	5	V
Collector Current	I_C	3	A
Collector Current (pulse)	I_C(pulse)	7	A
Total power dissipation (T_a = 25 °C)	P_{tot}	1	W
Total power dissipation (T_c = 25 °C)	P_{tot}	10	W
Junction Temperature	T_j	150	°C
Storage Temperature Range	T_S	-55 to +150	°C

Characteristics at T_a = 25 °C

Parameter		Symbol	Min.	Typ.	Max.	Unit
DC Current Gain at V_{CE} = 2 V, I_C = 1 A						
Current Gain Group	R	h_{FE}	60	-	120	-
	Q	h_{FE}	100	-	200	-
	P	h_{FE}	160	-	320	-
	E	h_{FE}	200	-	400	-
at V_{CE} = 2 V, I_C = 20 mA		h_{FE}	30	-	-	-
Collector Cutoff Current at V_{CB} = 30 V		I_{CBO}	-	-	1	µA
Emitter Cutoff Current at V_{EB} = 3 V		I_{EBO}	-	-	1	µA
Output Capacitance V_{CB} = 10 V, f = 1 MHz		Cob	-	45	-	pF
Base Emitter Saturation Voltage at I_C = 2 A, I_B = 0.2 A		$V_{BE(sat)}$	-	-	2	V
Collector Emitter Saturation Voltage at I_C = 2 A, I_B = 0.2 A		$V_{CE(sat)}$	-	-	0.5	V
Gain Bandwidth Product at V_{CE} = 5 V, I_C = 0.1 A		f_T	-	90	-	MHz

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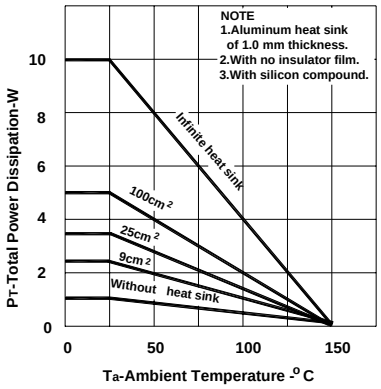
Dated : 22/03/2006

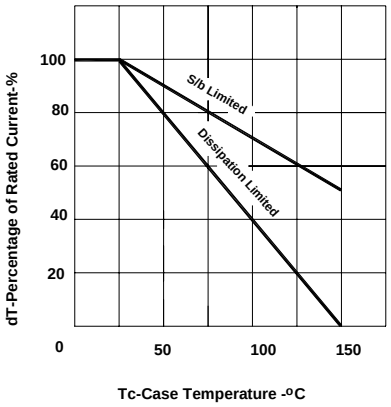
ST 2SD882T

TYPICAL CHARACTERISTICS (Ta=25°C)

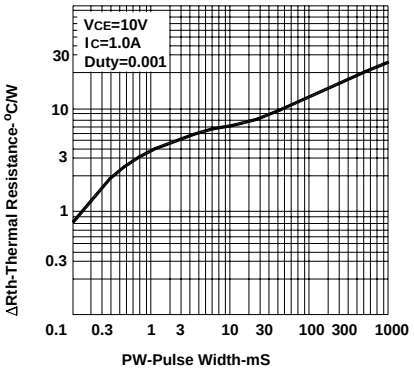
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



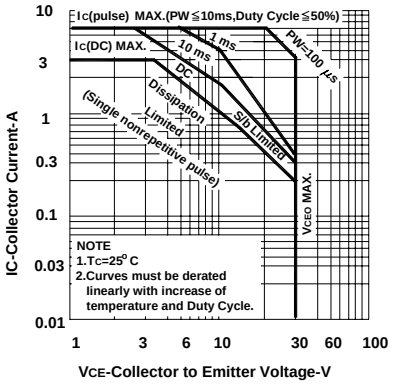
DERATING CURVES FOR ALL TYPES



THERMAL RESISTANCE vs. PULSE WIDTH



SAFE OPERATING AREAS



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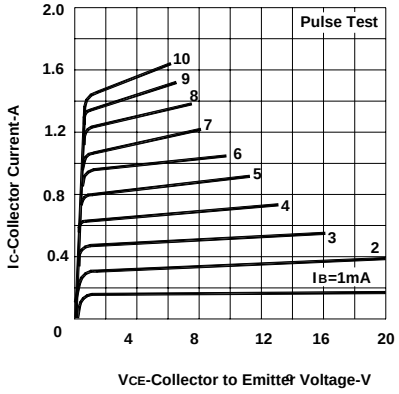
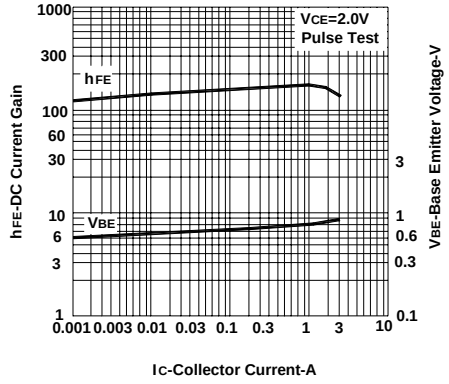


DC CURRENT GAIN, BASE TO EMITTER VOLTAGE vs. COLLECTOR CURRENT



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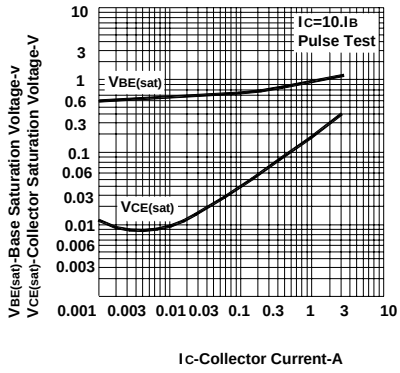
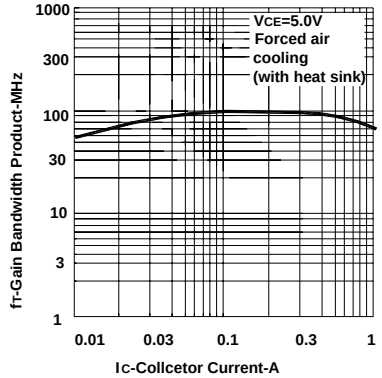
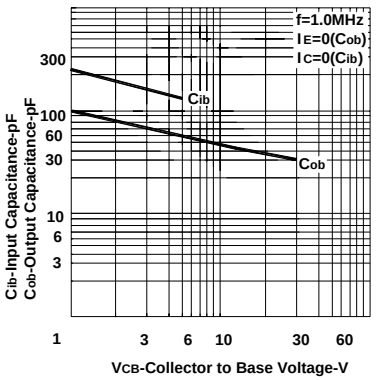


GAIN BANDWIDTH PRODUCT vs. COLLCETOR CURRENT



INPUT AND OUTPUT CAPACITANCE vs. REVERSE VOLTAGE



ST 2SD882T

NPN Silicon Power Transistor

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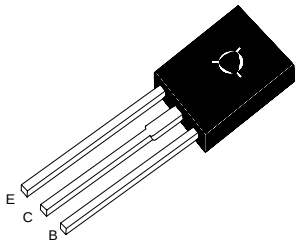

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Collector Current	I_C	3	A
Collector Current (pulse)	I_C(pulse)	7	A
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Junction Temperature	T_j	150	°C
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	Q	h_{FE}	100	-	200	-
	P	h_{FE}	160	-	320	-
	E	h_{FE}	200	-	400	-
at V_{CE} = 2 V, I_C = 20 mA		h_{FE}	30	-	-	-
Collector Cutoff Current at V_{CB} = 30 V		I_{CBO}	-	-	1	µA
Emitter Cutoff Current at V_{EB} = 3 V		I_{EBO}	-	-	1	µA
Output Capacitance V_{CB} = 10 V, f = 1 MHz		Cob	-	45	-	pF
Base Emitter Saturation Voltage at I_C = 2 A, I_B = 0.2 A		$V_{BE(sat)}$	-	-	2	V
Collector Emitter Saturation Voltage at I_C = 2 A, I_B = 0.2 A		$V_{CE(sat)}$	-	-	0.5	V
Gain Bandwidth Product at V_{CE} = 5 V, I_C = 0.1 A		f_T	-	90	-	MHz

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ST 2SD882T

TYPICAL CHARACTERISTICS (Ta=25°C)

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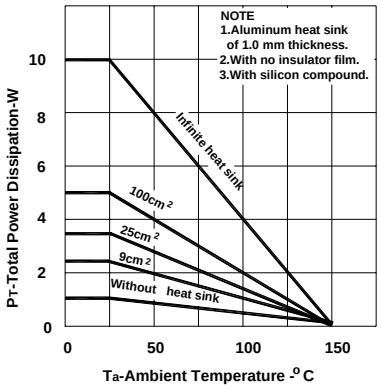

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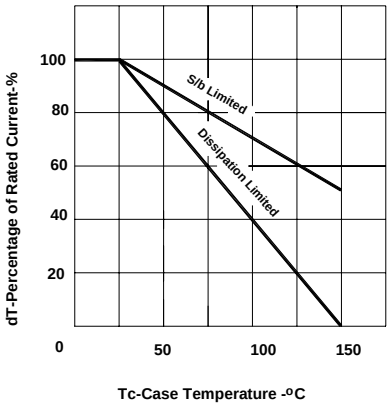

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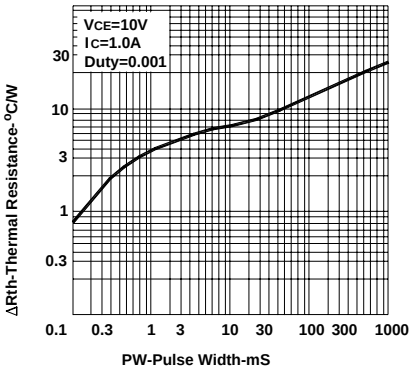
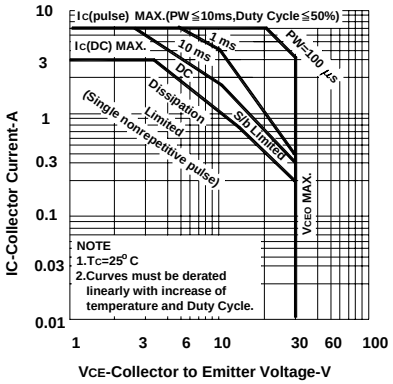
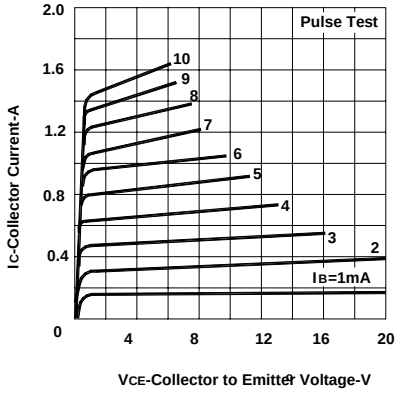


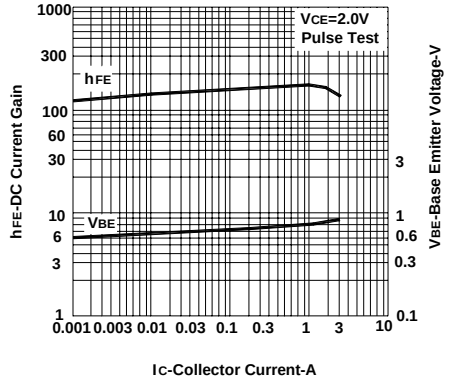
SAFE OPERATING AREAS



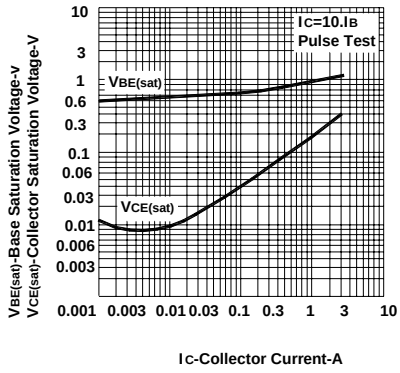
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



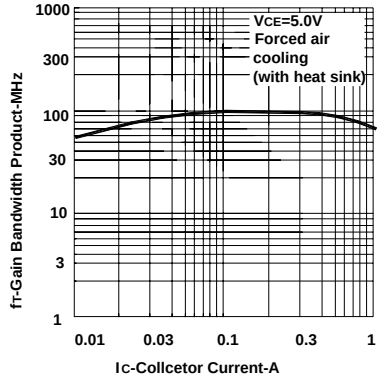
DC CURRENT GAIN, BASE TO EMITTER VOLTAGE vs. COLLECTOR CURRENT



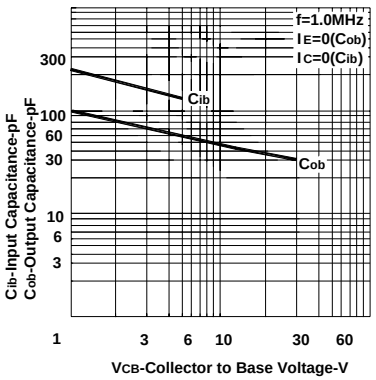
BASE AND COLLECTOR SATURATION VOLTAGE vs. COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT vs. COLLCETOR CURRENT



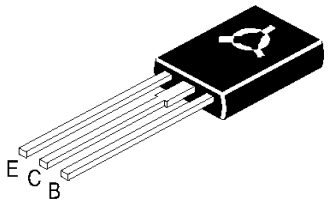
INPUT AND OUTPUT CAPACITANCE vs. REVERSE VOLTAGE



ST 2SD882U-P

NPN SILICON EPITAXIAL POWER TRANSISTOR

These devices are intended for use in medium power linear and switching applications



TO-126 Plastic Package

Absolute Maximum Ratings (T_a = 25 °C)

Parameter	Symbol	Value	Unit
Collector Base Voltage	V_{CBO}	120	V
Collector Emitter Voltage	V_{CES}	100	V
Collector Emitter Voltage	V_{CEO}	100	V
Emitter Base Voltage	V_{EBO}	6	V
Collector Current	I_C	4	A
Collector Peak Current	I_{CM}	7	A
Base Current	I_B	1	A
Power Dissipation at T_A = 25 °C	P_D	1.25	mW
Power Dissipation at T_C = 25 °C	P_D	36	mW
Operating and Storage Temperature Range	T_S	- 65 to + 150	°C

Characteristics at T_a = 25 °C

Parameter	Symbol	Min.	Max.	Unit
DC Current Gain at V_{CE} = 1 V, I_C = 500 mA at V_{CE} = 1 V, I_C = 2 A at V_{CE} = 2 V, I_C = 1 A at V_{CE} = 5 V, I_C = 10 mA	 h_{FE} h_{FE} h_{FE} h_{FE}	 100 15 100 15	 260 - 260 -	 - - - -
Collector Base Cutoff Current at V_{CB} = 120 V	I_{CBO}	-	100	µA
Collector Emitter Cutoff Current at V_{CE} = 100 V	I_{CES}	-	100	µA
Emitter Base Cutoff Current at V_{EB} = 5 V	I_{EBO}	-	1	mA
Collector Emitter Breakdown Voltage at I_C = 1 mA	$V_{(BR)CEO}$	100	-	V
Collector Emitter Saturation Voltage at I_C = 2 A, I_B = 200 mA	$V_{CE(sat)}$	-	0.8	V
Base Emitter On Voltage at V_{CE} = 1 V, I_C = 2 A	$V_{BE(on)}$	-	1.5	V
Transition Frequency at V_{CE} = 1 V, I_C = 250 mA	f_T	3	-	MHz

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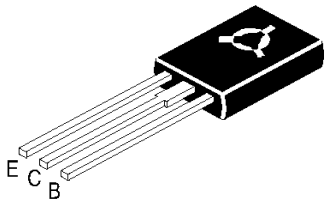

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Collector Current	I_C	4	A
Collector Peak Current	I_{CM}	7	A
Base Current	I_B	1	A
Power Dissipation at T_A = 25 °C	P_D	1.25	mW
Power Dissipation at T_C = 25 °C	P_D	36	mW
Operating and Storage Temperature Range	T_S	- 65 to + 150	°C

Characteristics at T_a = 25 °C

Parameter	Symbol	Min.	Max.	Unit
DC Current Gain at V_{CE} = 1 V, I_C = 500 mA at V_{CE} = 1 V, I_C = 2 A at V_{CE} = 2 V, I_C = 1 A at V_{CE} = 5 V, I_C = 10 mA	 h_{FE} h_{FE} h_{FE} h_{FE}	 100 15 100 15	 260 - 260 -	 - - - -
Collector Base Cutoff Current at V_{CB} = 120 V	I_{CBO}	-	100	µA
Collector Emitter Cutoff Current at V_{CE} = 100 V	I_{CES}	-	100	µA
Emitter Base Cutoff Current at V_{EB} = 5 V	I_{EBO}	-	1	mA
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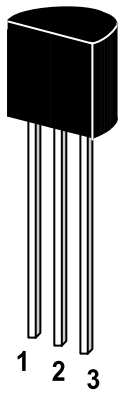


1. Emitter 2. Collector 3. Base

TO-92 Plastic Package

Weight approx. 0.19g

Features

- Low collector-emitter saturation voltage
- Satisfactory operation performances at high efficiency with the low voltage power supply

Absolute Maximum Ratings (Ta=25^{o}C)

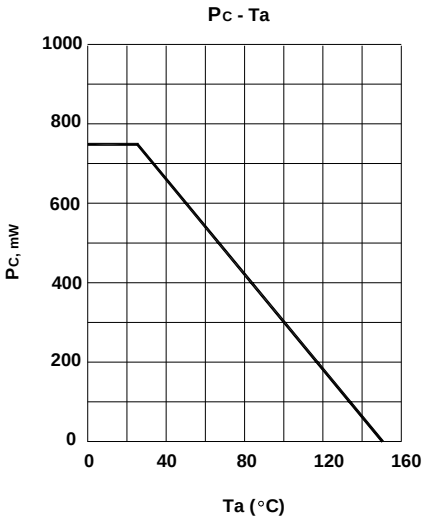
	Symbol	Value	Unit
Collector Base Voltage	V_{CBO}	40	V
Collector Emitter Voltage	V_{CEO}	20	V
Emitter Base Voltage	V_{EBO}	7	V
Peak Collector Current	I_{CP}	8	A
Collector Current	I_C	5	A
Power Dissipation	P_{tot}	750	mW
Junction Temperature	T_j	150	^{O}C
Storage Temperature Range	T_S	-55 to +150	^{O}C

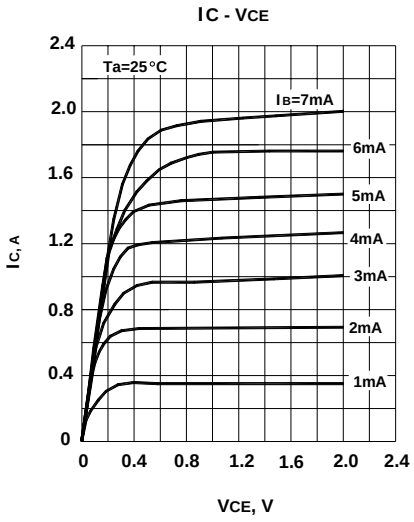
ST 2SD965

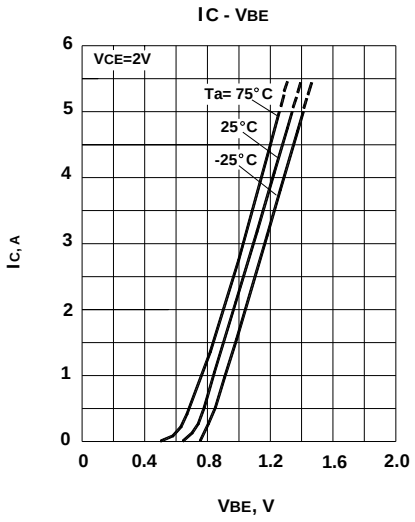
Characteristics at T_{amb}=25 °C

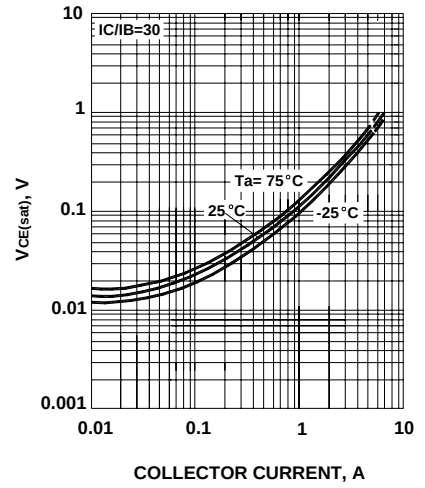
		Symbol	Min.	Typ.	Max.	Unit
DC Current Gain						
at V_{CE}=2V, I_C=0.5A	P	h_{FE}	120	-	250	-
	Q	h_{FE}	230	-	380	-
	R	h_{FE}	340	-	600	-
at V_{CE}=2V, I_C=1A		h_{FE}	150	-	-	-
Collector Cutoff Current at V_{CB}=10V		I_{CBO}	-	-	0.1	μA
Collector Cutoff Current at V_{CE}=10V		I_{CEO}	-	-	1.0	μA
Emitter Cutoff Current at V_{EB}=7V		I_{EBO}	-	-	0.1	μA
Collector Output Capacitance at V_{CB}=20V, f=1MHz (Common base, input open circuited)		Cob	-	26	50	pF
Collector to Emitter Voltage at I_C=1mA		V_{CEO}	20	-	-	V
Emitter to Base Voltage at I_E=10μA		V_{EBO}	7	-	-	V
Collector to Emitter Saturation Voltage at I_C=3A, I_B=0.1A		$V_{CE(sat)}$	-	0.28	1	V
Current Gain Bandwidth Product at V_{CB}=6V, I_E= -50mA, f=200MHz		f_T	-	150	-	MHz

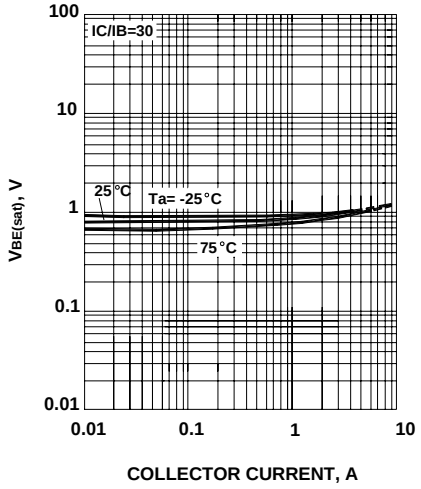
ST 2SD965

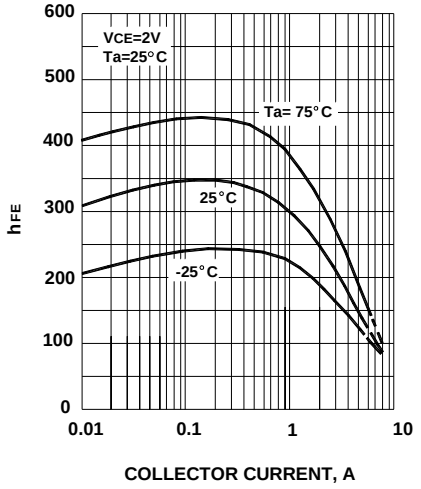


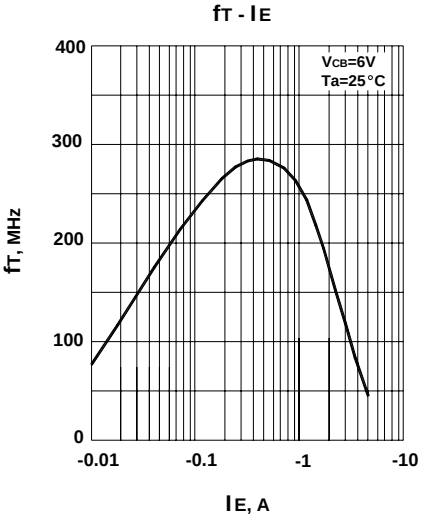


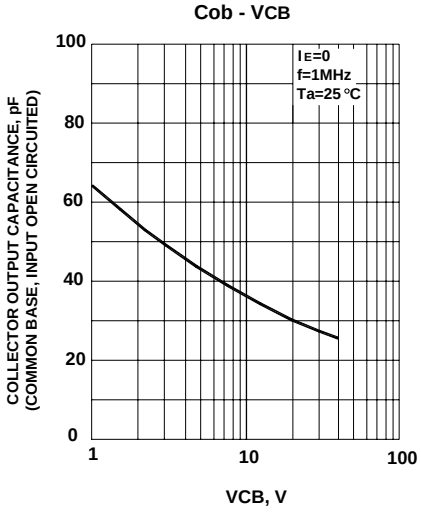


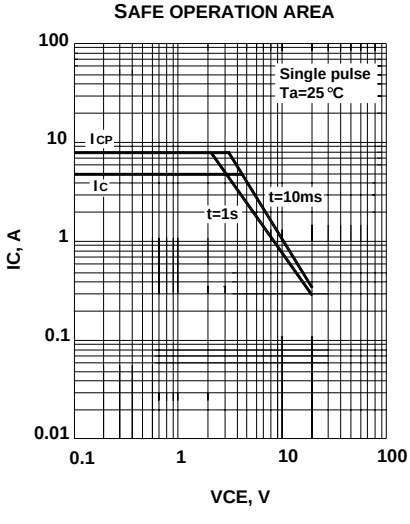












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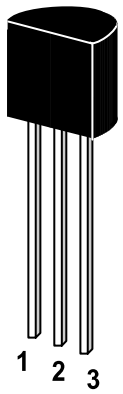

1. Emitter 2. Collector 3. Base

TO-92 Plastic Package

Weight approx. 0.19g

Features

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	Symbol	Value	Unit
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Peak Collector Current	I_{CP}	8	A
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Power Dissipation	P_{tot}	750	mW
Junction Temperature	T_j	150	^{O}C
Storage Temperature Range	T_S	-55 to +150	^{O}C

ST 2SD965

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		Symbol	Min.	Typ.	Max.	Unit
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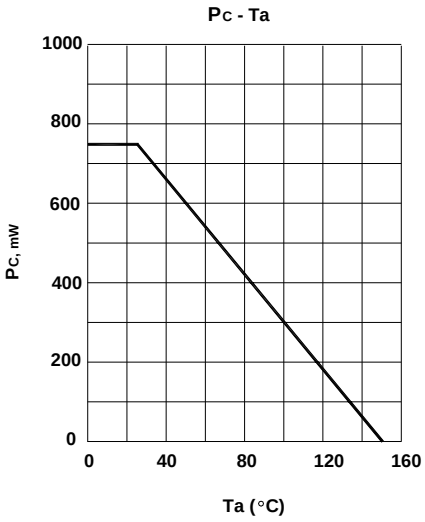
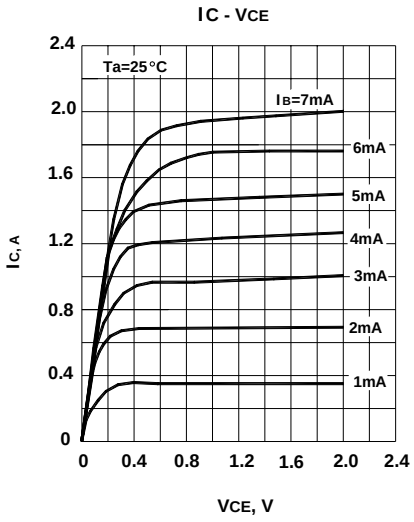
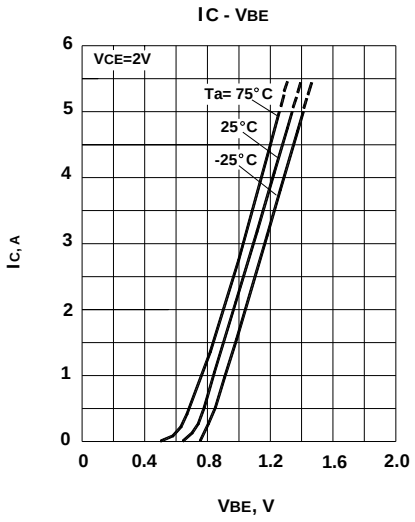
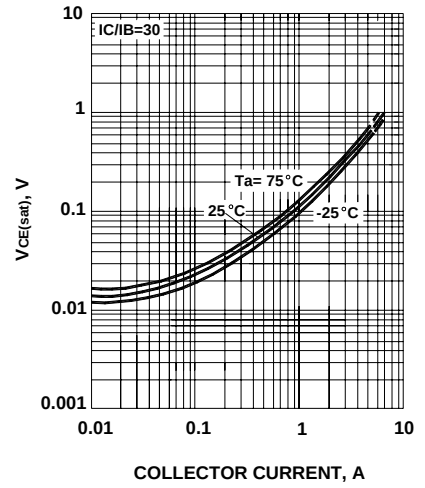
at V_{CE}=2V, I_C=0.5A	P	h_{FE}	120	-	250	-
	Q	h_{FE}	230	-	380	-
	R	h_{FE}	340	-	600	-
at V_{CE}=2V, I_C=1A		h_{FE}	150	-	-	-
Collector Cutoff Current at V_{CB}=10V		I_{CBO}	-	-	0.1	μA
Collector Cutoff Current at V_{CE}=10V		I_{CEO}	-	-	1.0	μA
Emitter Cutoff Current at V_{EB}=7V		I_{EBO}	-	-	0.1	μA
Collector Output Capacitance at V_{CB}=20V, f=1MHz (Common base, input open circuited)		Cob	-	26	50	pF
Collector to Emitter Voltage at I_C=1mA		V_{CEO}	20	-	-	V
Emitter to Base Voltage at I_E=10μA		V_{EBO}	7	-	-	V
Collector to Emitter Saturation Voltage at I_C=3A, I_B=0.1A		$V_{CE(sat)}$	-	0.28	1	V
Current Gain Bandwidth Product at V_{CB}=6V, I_E= -50mA, f=200MHz		f_T	-	150	-	MHz

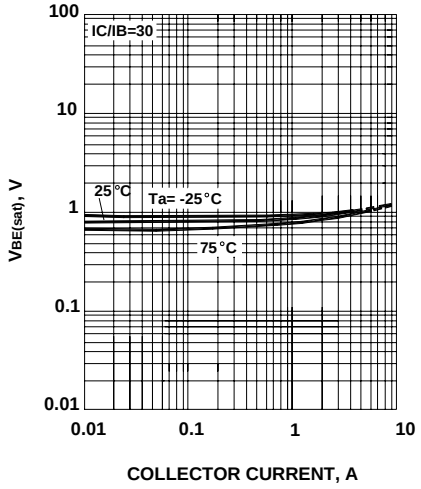
ST 2SD965

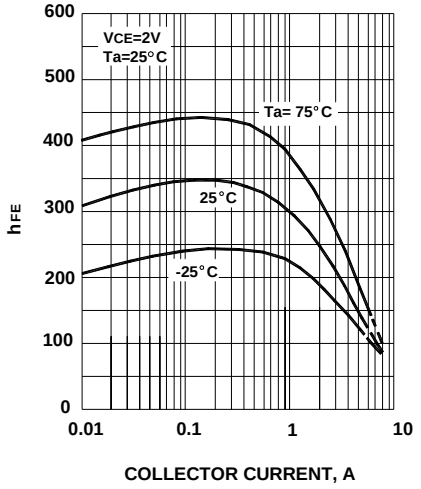


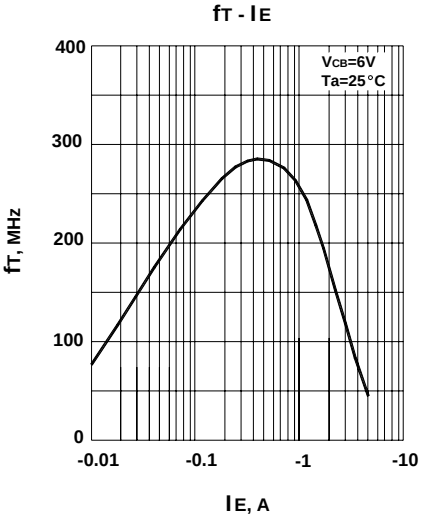


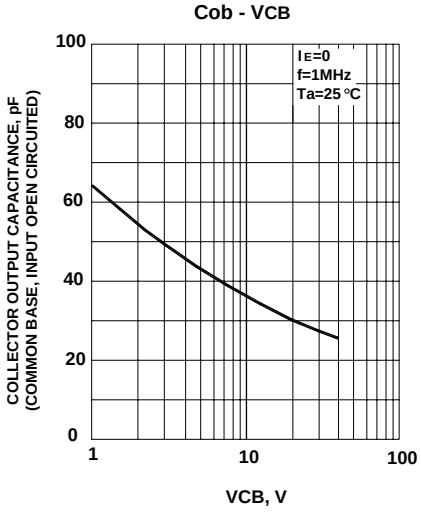


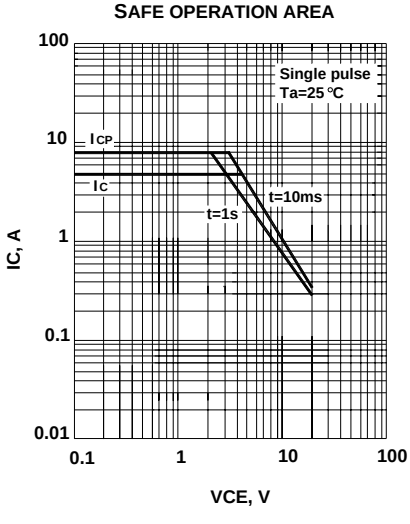












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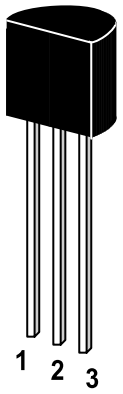

1. Emitter 2. Collector 3. Base

TO-92 Plastic Package
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	Symbol	Value	Unit
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Emitter to Base Voltage	V_{EBO}	7	V
Peak Collector Current	I_{CP}	8	A
Collector Current	I_C	5	A
Collector Power Dissipation	Pc	1	W
Junction Temperature	T_j	150	^{O}C
Storage Temperature Range	T_S	-55 to +150	^{O}C

ST 2SD966

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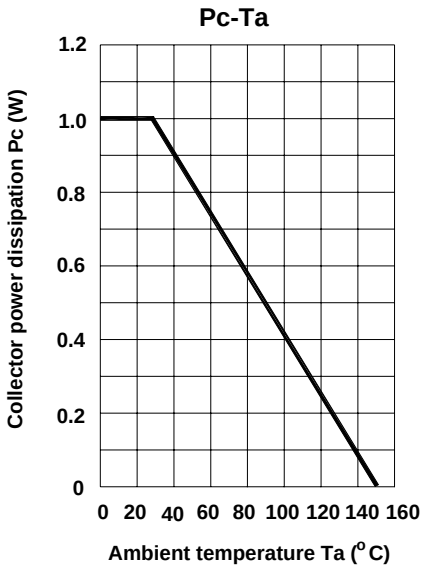
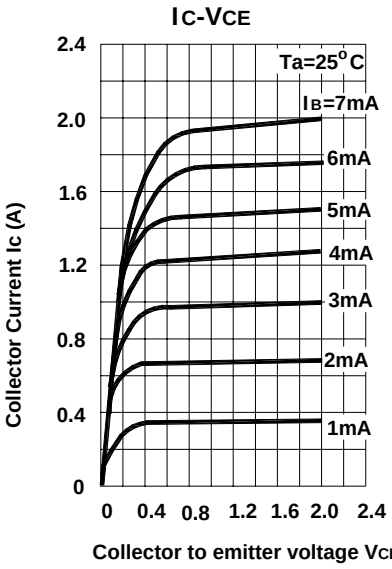
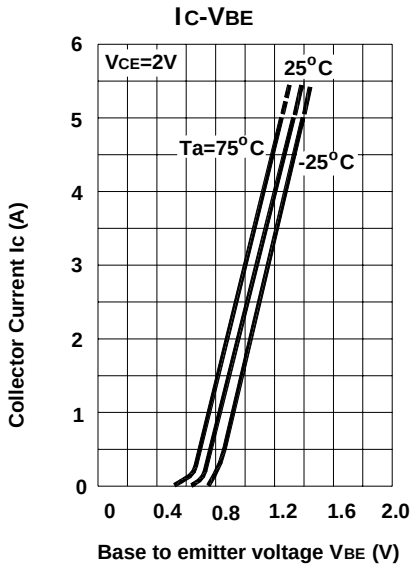
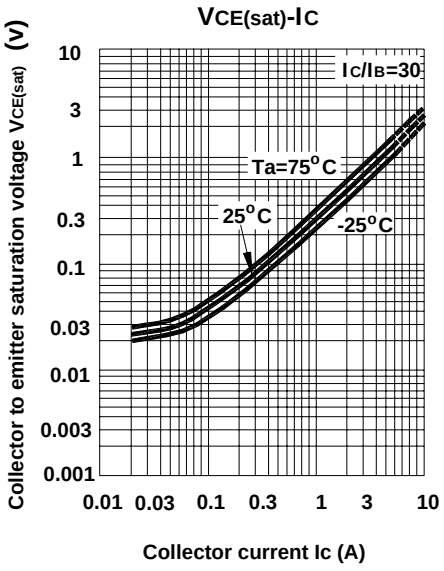
Collector Cutoff Current at V_{CB}=10V		I_{CBO}	-	-	0.1	μA
Emitter Cutoff Current at V_{EB}=7V		I_{EBO}	-	-	0.1	μA
Collector Output Capacitance at V_{CB}=20V,f=1.0MHz		Cob	-	-	50	pF
Collector to Emitter Voltage at I_C=1mA		V_{CEO}	20	-	-	V
Emitter to Base Voltage at I_E=10μA		V_{EBO}	7	-	-	V
Collector to Emitter Saturation Voltage at I_C=3A,I_B=0.1A		$V_{CE(sat)}$	-	-	1	V
Transition Frequency at V_{CB}=6V, I_E=-50mA,f=200MHz		f_T	-	150	-	MHz

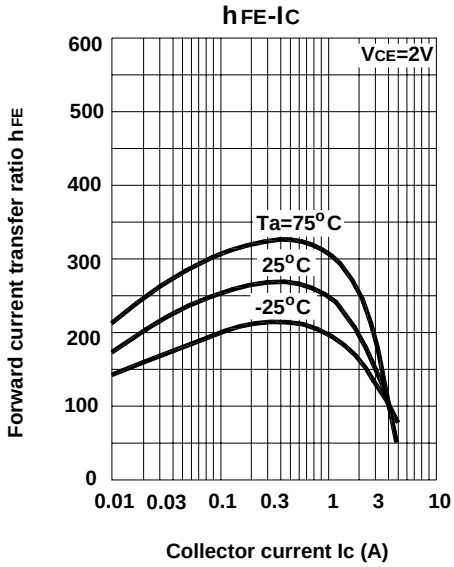
ST 2SD966

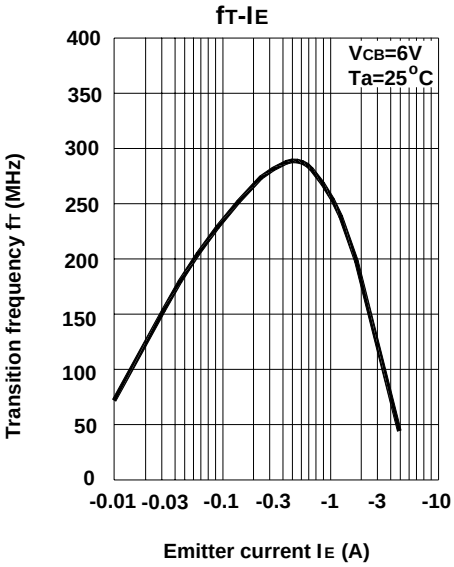

Pc-Ta
Collector power dissipation Pc (W)
1.2
1.0
0.8
0.6
0.4
0.2
0
0 20 40 60 80 100 120 140 160
Ambient temperature Ta (°C)

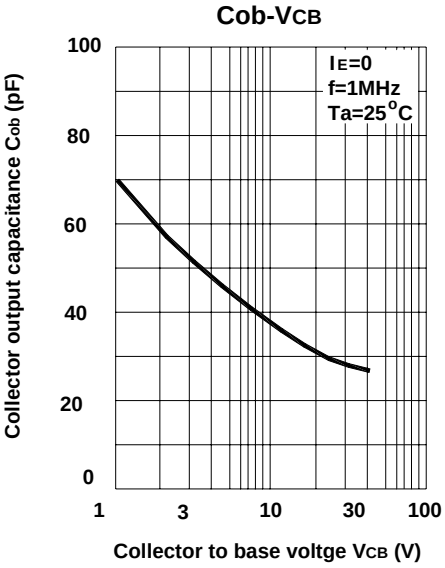

IC-VCE
Ta=25°C
IB=7mA
6mA
5mA
4mA
3mA
2mA
1mA
Collector Current Ic (A)
2.4
2.0
1.6
1.2
0.8
0.4
0
0 0.4 0.8 1.2 1.6 2.0 2.4
Collector to emitter voltage VCE (V)


IC-VBE
VCE=2V
25°C
Ta=75°C
-25°C
Collector Current Ic (A)
6
5
4
3
2
1
0
0 0.4 0.8 1.2 1.6 2.0
Base to emitter voltage VBE (V)


VCE(sat)-IC
Collector to emitter saturation voltage VCE(sat) (V)
IC/IB=30
Ta=75°C
25°C
-25°C
10
3
1
0.3
0.1
0.03
0.01
0.003
0.001
0.01 0.03 0.1 0.3 1 3 10
Collector current Ic (A)


hFE-IC
VCE=2V
Ta=75°C
25°C
-25°C
Forward current transfer ratio hFE
600
500
400
300
200
100
0
0.01 0.03 0.1 0.3 1 3 10
Collector current Ic (A)


fT-IE
VCB=6V
Ta=25°C
Transition frequency fT (MHz)
400
350
300
250
200
150
100
50
0
-0.01 -0.03 -0.1 -0.3 -1 -3 -10
Emitter current IE (A)

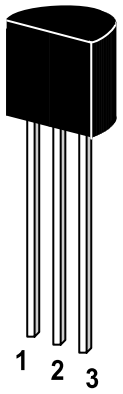

Cob-VCB
IE=0
f=1MHz
Ta=25°C
Collector output capacitance Cob (pF)
100
80
60
40
20
0
1 3 10 30 100
Collector to base voltge VCB (V)

ST 2SD966

NPN Silicon Epitaxial Planar Transistor
for low-frequency power amplification and stroboscope.

The transistor is subdivided into three groups P, Q and R, according to its DC current gain.

On special request, these transistors can be manufactured in different pin configurations.



1. Emitter 2. Collector 3. Base

TO-92 Plastic Package
Weight approx. 0.19g

Absolute Maximum Ratings (T_a = 25^{O}C)

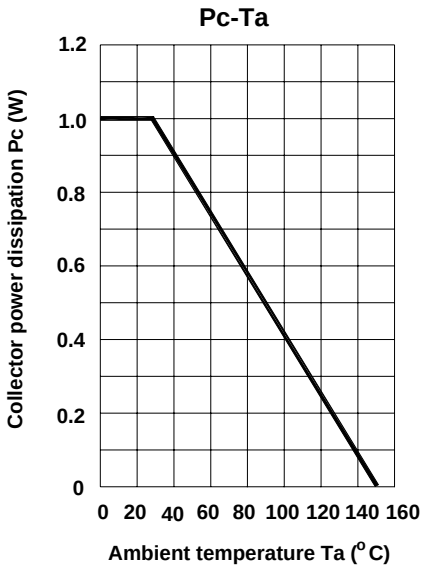
	Symbol	Value	Unit
Collector to Base Voltage	V_{CBO}	40	V
Collector to Emitter Voltage	V_{CEO}	20	V
Emitter to Base Voltage	V_{EBO}	7	V
Peak Collector Current	I_{CP}	8	A
Collector Current	I_C	5	A
Collector Power Dissipation	Pc	1	W
Junction Temperature	T_j	150	^{O}C
Storage Temperature Range	T_S	-55 to +150	^{O}C

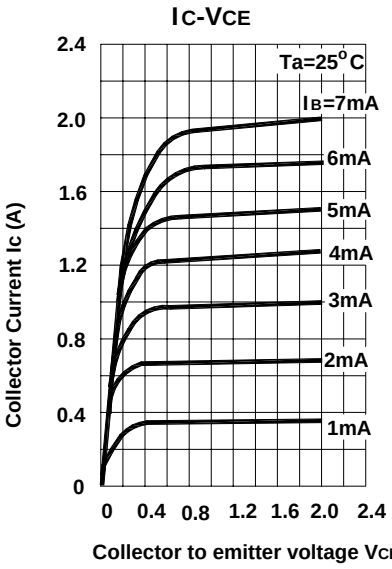
ST 2SD966

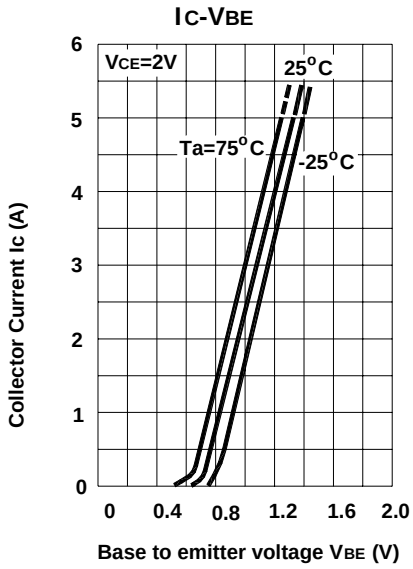
Characteristics at T_{amb}=25 ^{O}C

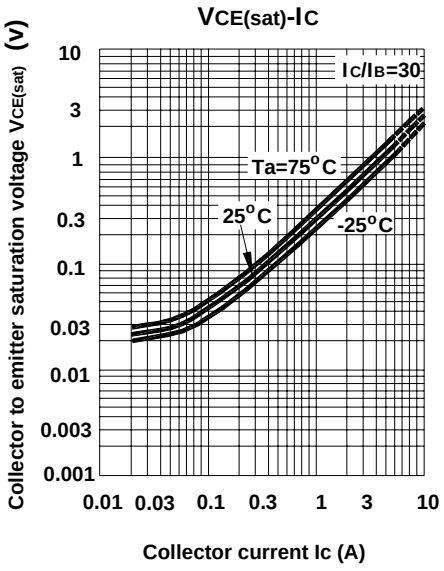
		Symbol	Min.	Typ.	Max.	Unit
DC Current Gain						
at V_{CE}=2V, I_C=0.5A	P	h_{FE}	120	-	250	-
	Q	h_{FE}	230	-	380	-
	R	h_{FE}	340	-	600	-
at V_{CE}=2V, I_C=2A		h_{FE}	150	-	-	-
Collector Cutoff Current at V_{CB}=10V		I_{CBO}	-	-	0.1	μA
Emitter Cutoff Current at V_{EB}=7V		I_{EBO}	-	-	0.1	μA
Collector Output Capacitance at V_{CB}=20V,f=1.0MHz		Cob	-	-	50	pF
Collector to Emitter Voltage at I_C=1mA		V_{CEO}	20	-	-	V
Emitter to Base Voltage at I_E=10μA		V_{EBO}	7	-	-	V
Collector to Emitter Saturation Voltage at I_C=3A,I_B=0.1A		$V_{CE(sat)}$	-	-	1	V
Transition Frequency at V_{CB}=6V, I_E=-50mA,f=200MHz		f_T	-	150	-	MHz

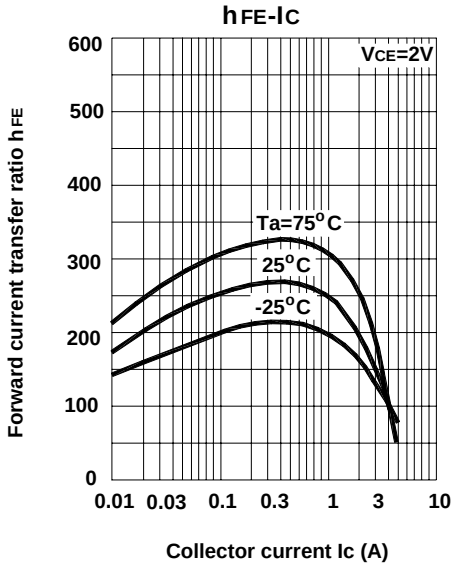
ST 2SD966

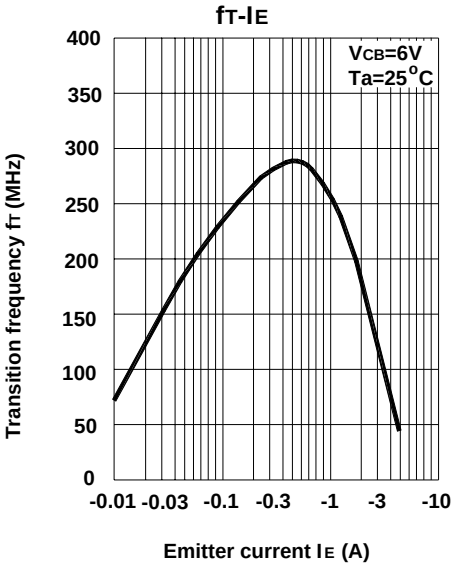

Pc-Ta
Collector power dissipation Pc (W)
1.2
1.0
0.8
0.6
0.4
0.2
0
0 20 40 60 80 100 120 140 160
Ambient temperature Ta (°C)

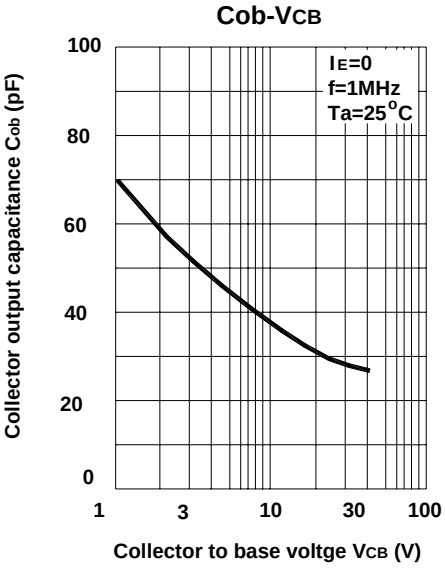

IC-VCE
Ta=25°C
IB=7mA
6mA
5mA
4mA
3mA
2mA
1mA
Collector Current Ic (A)
2.4
2.0
1.6
1.2
0.8
0.4
0
0 0.4 0.8 1.2 1.6 2.0 2.4
Collector to emitter voltage VCE (V)


IC-VBE
VCE=2V
25°C
Ta=75°C
-25°C
Collector Current Ic (A)
6
5
4
3
2
1
0
0 0.4 0.8 1.2 1.6 2.0
Base to emitter voltage VBE (V)


VCE(sat)-IC
Collector to emitter saturation voltage VCE(sat) (V)
IC/IB=30
Ta=75°C
25°C
-25°C
10
3
1
0.3
0.1
0.03
0.01
0.003
0.001
0.01 0.03 0.1 0.3 1 3 10
Collector current Ic (A)


hFE-IC
VCE=2V
Ta=75°C
25°C
-25°C
Forward current transfer ratio hFE
600
500
400
300
200
100
0
0.01 0.03 0.1 0.3 1 3 10
Collector current Ic (A)


fT-IE
VCB=6V
Ta=25°C
Transition frequency fT (MHz)
400
350
300
250
200
150
100
50
0
-0.01 -0.03 -0.1 -0.3 -1 -3 -10
Emitter current IE (A)


Cob-VCB
IE=0
f=1MHz
Ta=25°C
Collector output capacitance Cob (pF)
100
80
60
40
20
0
1 3 10 30 100
Collector to base voltge VCB (V)

GP1A038RBK/GP1A038RBKL/ GP1A038RCK/GP1A038RCKL

OPIC Photointerrupter with Encoder Function

■ Features

1. Linear encoder for reading linear scale
2. Since the multi-divided photodiode system is adopted, high-precision reading is possible even if the angle is deviated between the scale and encoder.
3. High resolution:
   Resolution 150LPI **(GP1A038RBK/GP1A038RBKL)**
   Resolution 180LPI **(GP1A038RCK/GP1A038RCKL)**

■ Applications

1. Printers

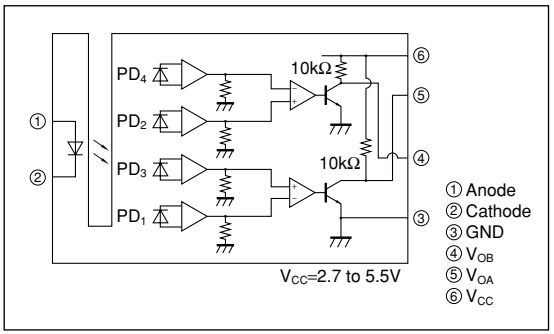
■ Absolute Maximum Ratings

(T_a=25°C)

Parameter		Symbol	Rating	Unit
Input	*1 Forward current	I_F	50	mA
	Reverse voltage	V_R	4	V
Output	Supply voltage	V_{CC}	7	V
	Low level output current	I_{OL}	8	mA
	*1 Power dissipation	P_O	150	mW
Operating temperature		T_{opr}	−10 to +70	°C
Storage temperature		T_{stg}	−40 to +80	°C
*2 Soldering temperature		T_{sol}	260	°C

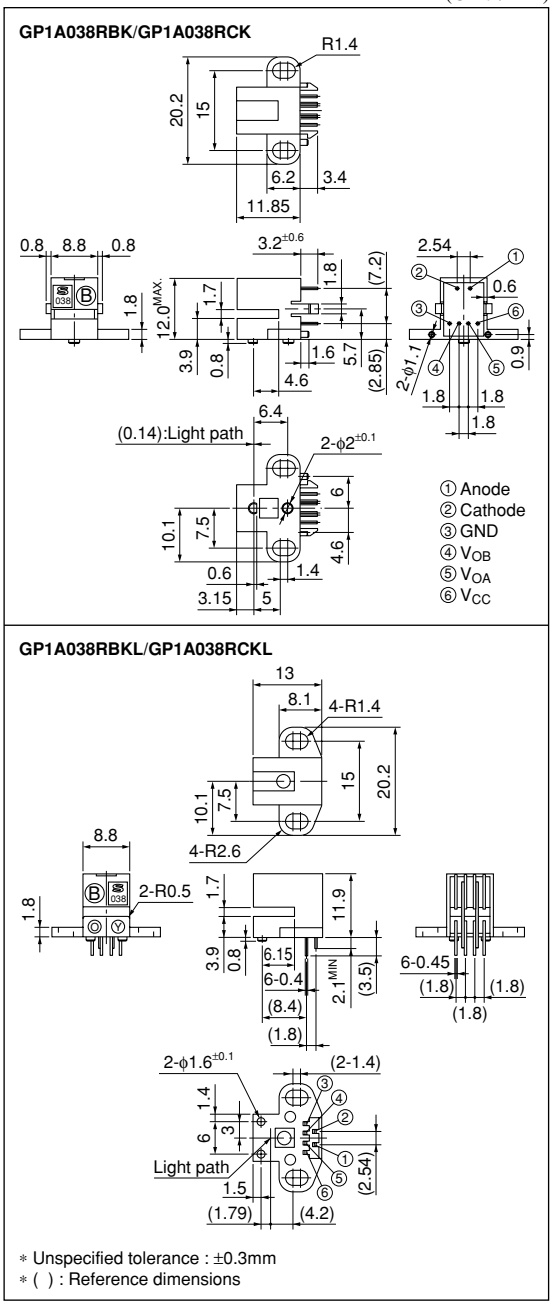
*1 The derating factors of absolute maximum ratings due to ambient temperature are shown in Fig.2 to 3
*2 For 5s

■ Internal connection diagram



■ Outline Dimensions

(Unit : mm)



■ Electro-optical Characteristics

(T_a=25°C)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input	Forward voltage	V_F	I_F=11mA	–	1.3	1.5	V
	Reverse current	I_R	V_R=1V	–	–	100	μA
Output	Operating supply voltage	V_{CC}	–	2.7	5.0	5.5	V
	Low level output voltage	V_{OL}	V_{CC}=2.7 to 5.5V, I_F=11mA, I_{OL}=8mA	–	–	0.4	V
	High level output voltage	V_{OH}	V_{CC}=2.7 to 5.5V, I_F=11mA	V_{CC}–0.3	–	–	V
	Supply current	I_{CC}	V_{CC}=2.7 to 5.5V, I_F=11mA, A and B low level	–	–	5	mA
*1 Transfer characteristics	Duty ratio	D_A D_B	V_{CC}=2.7 to 5.5V, I_F=11mA, f=10kHz, Z=$0.3^{+0.7}_{-0.2}$mm	35	50	65	%
	Phase difference	$\theta_{AB1\ to\ 4}$		45	90	135	°
	Response time	t_r		–	1.0	2.0	μs
		t_f		–	1.0	2.0	μs
	Response frequency	fmax	V_{CC}=2.7 to 5.5V, I_F=11mA, Z=$0.3^{+0.7}_{-0.2}$mm	–	–	20	kHz

*1 Refer to the measuring condition. The values of transfer characteristics do not include an error of linear scale. Z is the distance between scale face and holder on the detector side.

Fig.1 Output Waveforms

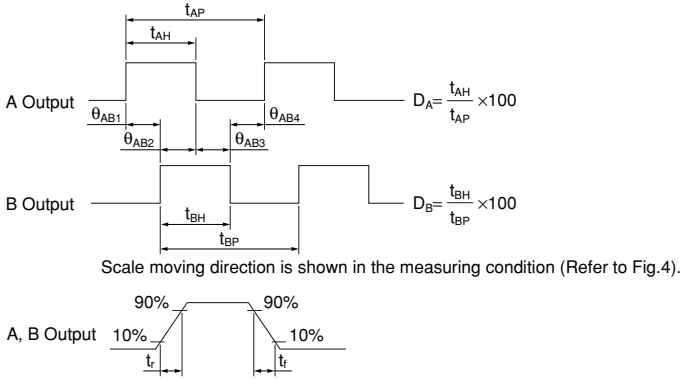


Fig.2 Forward Current vs. Ambient Temperature

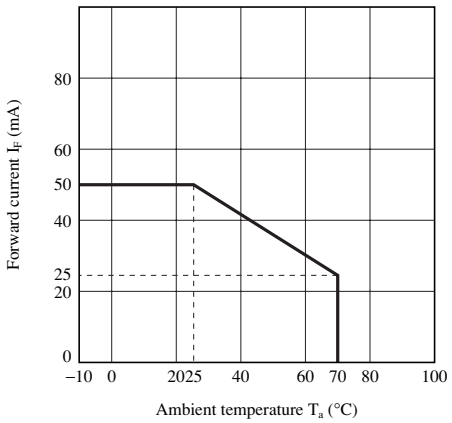


Fig.3 Output Power Dissipation vs. Ambient Temperature

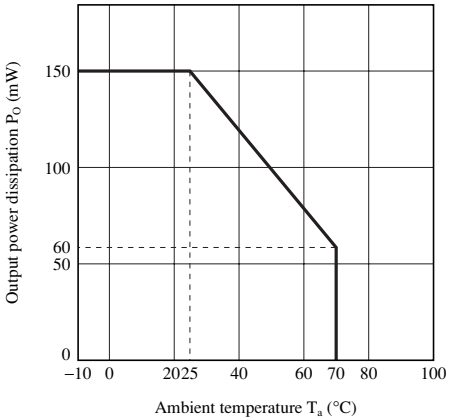
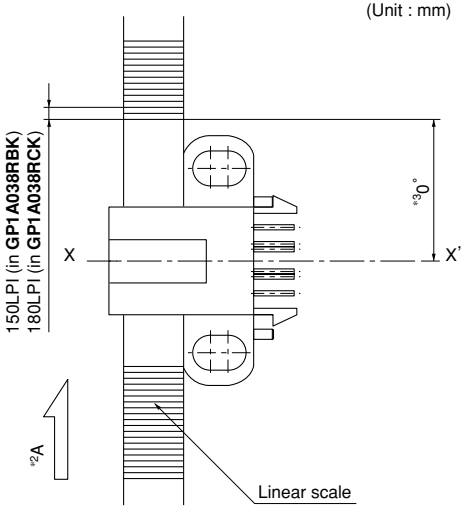
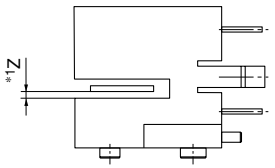
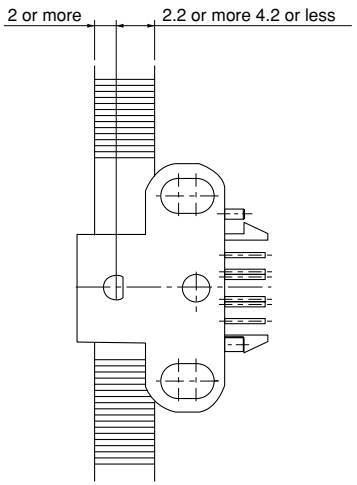


Fig.4 Measuring Condition

(Unit : mm)







*1 Distance between scale face and holder on the detector side

*2 Scale moving direction

*3 X-X' is the line which is through the center of holder positioning pin, and it is parallel to the scale slit.

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- Observe the following points when using any devices in this publication. SHARP takes no responsibility for damage caused by improper use of the devices which does not meet the conditions and absolute maximum ratings to be used specified in the relevant specification sheet nor meet the following conditions:

  (i) The devices in this publication are designed for use in general electronic equipment designs such as:
  --- Personal computers
  --- Office automation equipment
  --- Telecommunication equipment [terminal]
  --- Test and measurement equipment
  --- Industrial control
  --- Audio visual equipment
  --- Consumer electronics

  (ii) Measures such as fail-safe function and redundant design should be taken to ensure reliability and safety when SHARP devices are used for or in connection with equipment that requires higher reliability such as:
  --- Transportation control and safety equipment (i.e., aircraft, trains, automobiles, etc.)
  --- Traffic signals
  --- Gas leakage sensor breakers
  --- Alarm equipment
  --- Various safety devices, etc.

  (iii) SHARP devices shall not be used for or in connection with equipment that requires an extremely high level of reliability and safety such as:
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  --- Telecommunication equipment [trunk lines]
  --- Nuclear power control equipment
  --- Medical and other life support equipment (e.g., scuba).

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-
- Contact and consult with a SHARP representative if there are any questions about the contents of this publication.

DESCRIPTION

7314 is a four-channel input digital audio processor utilizing CMOS Technology. Volume, Bass, Treble and Balance are incorporated into a single chip. Loudness Function and Selectable Input Gain are also provided to build a highly effective electronic audio processor having the highest performance and reliability with the least external components. All functions are programmable using the I^2C Bus. The pin assignments and application circuit are optimized for easy PCB layout and cost saving advantage for audio application.

FEATURES

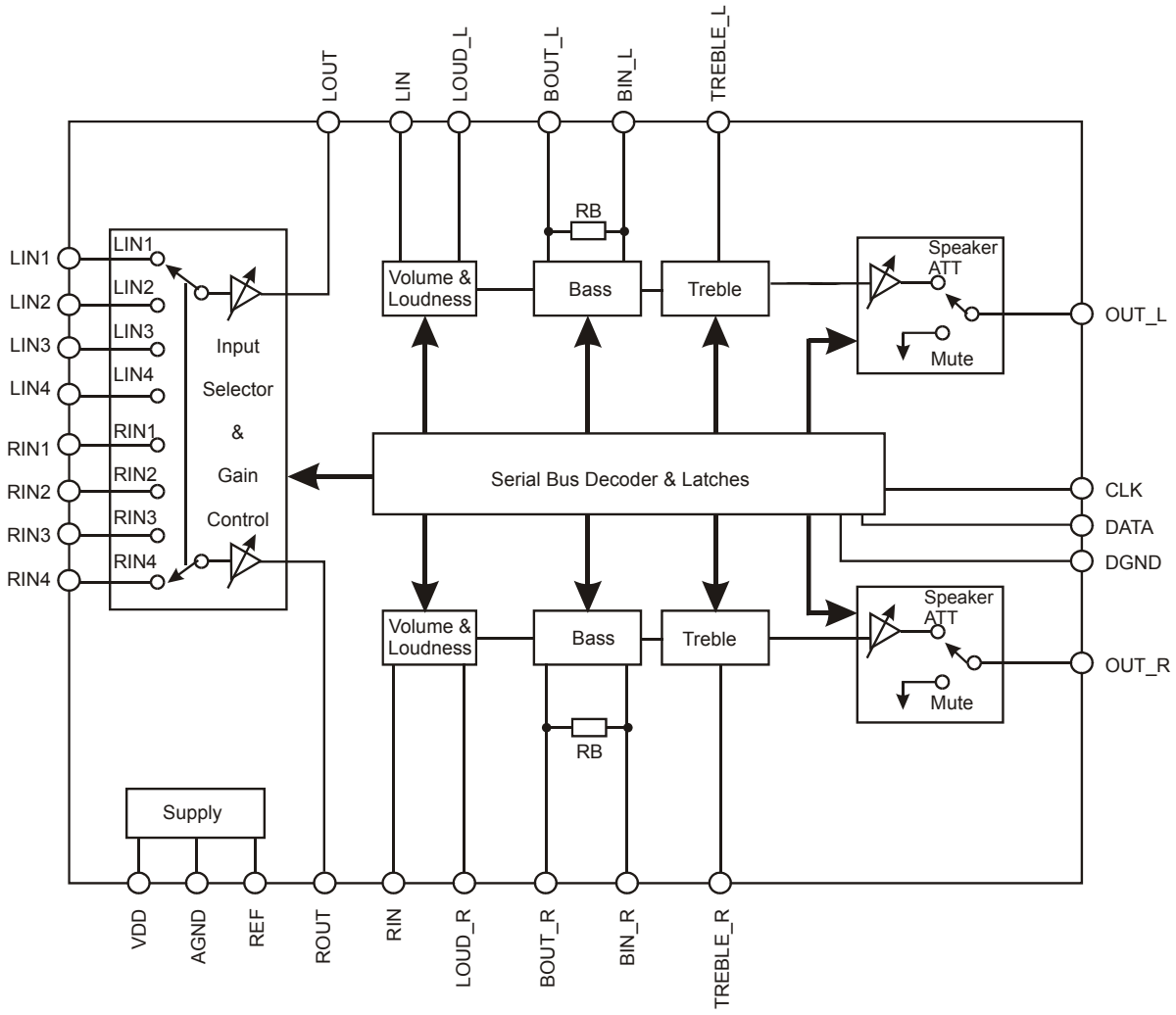
- CMOS technology
- Least external components
- Treble and bass control
- Loudness function
- 4 stereo inputs with selectable input gain
- Input/output for external noise reduction system/equalizer
- 2 independent speaker controls for balance control
- Independent mute function
- Volume control in 1.25 dB/step
- Low distortion
- Low noise and DC stepping
- Controlled by I^2C bus micro-processor interface
- Available in 28 Pins, DIP or SOP

APPLICATIONS

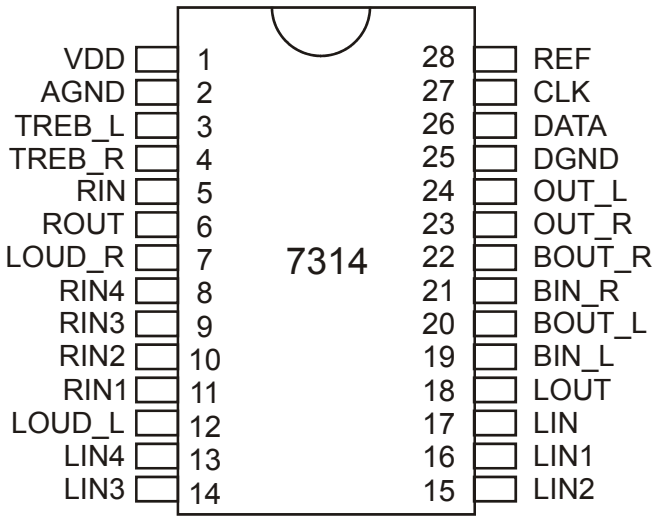
- Car stereo (Audio)
- Hi-Fi audio system

Note: Purchase of I^2C Component of Princeton Technology Corporation (PTC) conveys a license under Philips I^2C Patent Right to use these components in any I^2C System, provided that the system conforms to the I^2C Standard Specification defined by Philips

BLOCK DIAGRAM



PIN CONFIGURATION



PIN DESCRIPTION

Pin Name	I/O	Description	Pin No.
VDD	-	Supply Input Voltage	1
AGND	-	Analog Ground	2
TREB_L	I	Left Channel Input for Treble Controller	3
TREB_R	I	Right Channel Input for Treble Control	4
RIN	I	Audio Processor Right Channel Input	5
ROUT	O	Gain Output and Input Selector for Right Channel	6
LOUD_R	I	Right Channel Loudness Input	7
RIN4	I	Right Channel Input 4	8
RIN3	I	Right Channel Input 3	9
RIN2	I	Right Channel Input 2	10
RIN1	I	Right Channel Input 1	11
LOUD_L	I	Left Channel Loudness Input	12
LIN4	I	Left Channel Input 4	13
LIN3	I	Left Channel Input 3	14
LIN2	I	Left Channel Input 2	15
LIN1	I	Left Channel Input 1	16
LIN	I	Audio Processor Left Channel Input	17
LOUT	O	Gain Output and Input Selector for Left Channel	18
BIN_L	I	Left Channel Input for Bass Controller	19
BOUT_L	O	Left Bass Controller Output Channel	20
BIN_R	I	Right Channel Input for Bass Controller	21
BOUT_R	O	Right Channel Output for Bass Controller	22
OUT_R	O	Right Speaker Output	23
OUT_L	O	Left Speaker Output	24
DGND	-	Digital Ground	25
DATA	I	Control Data Input	26
CLK	I	Clock Input for Serial Data Transmission	27
REF	-	Analog Reference Voltage (1/2 VDD)	28

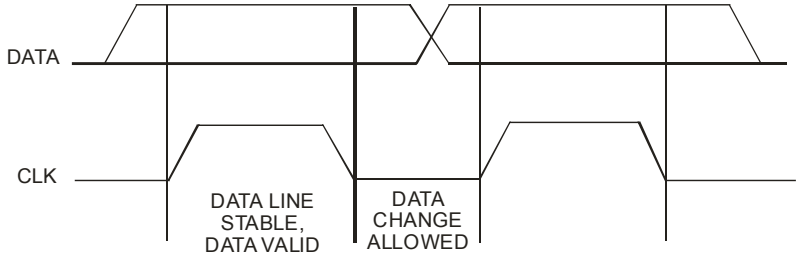
FUNCTIONAL DESCRIPTION

BUS INTERFACE

Data are transmitted to and from the microprocessor to the 7314 via the DATA and CLK. The DATA and CLK make up the BUS Interface. It should be noted that the pull-up resistors must be connected to the positive supply voltage.

DATA VALIDITY

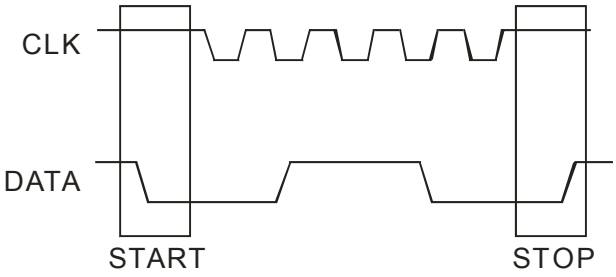
A data on the DATA Line is considered valid and stable only when the CLK Signal is in HIGH State. The HIGH and LOW State of the DATA Line can only change when the CLK signal is LOW. Please refer to the figure below.



START AND STOP CONDITIONS

A Start Condition is activated when
1) the CLK is set to HIGH and
2) DATA shifts from HIGH to LOW State.

The Stop Condition is activated when
1) CLK is set to HIGH and
2) DATA shifts from LOW to HIGH State. Please refer to the timing diagram below.

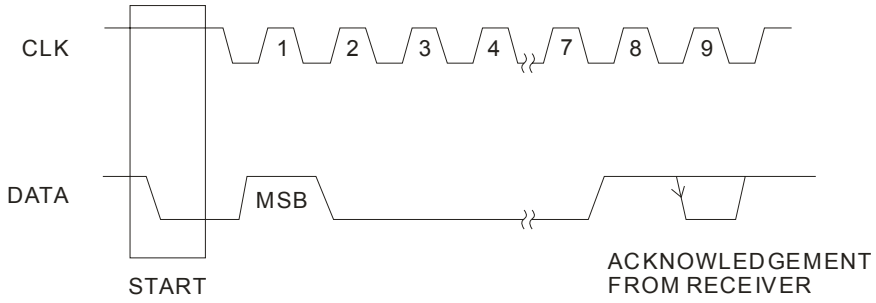


BYTE FORMAT

Every byte transmitted to the DATA Line consist of 8 bits. Each byte must be followed by an Acknowledge Bit. The MSB is transmitted first.

ACKNOWLEDGE

During the Acknowledge Clock Pulse, the master (μP) puts a resistive HIGH level on the DATA Line. The peripheral (audio processor) that acknowledges has to pull-down (LOW) the DATA line during the Acknowledge Clock Pulse so that the DATA Line is in a Stable Low State during this Clock Pulse. Please refer to the diagram below.



The audio processor that has been addressed has to generate an acknowledge after receiving each byte, otherwise, the DATA Line will remain at the High Level during the ninth (9th) Clock Pulse. In this case, the master transmitter can generate the STOP Information in order to abort the transfer.

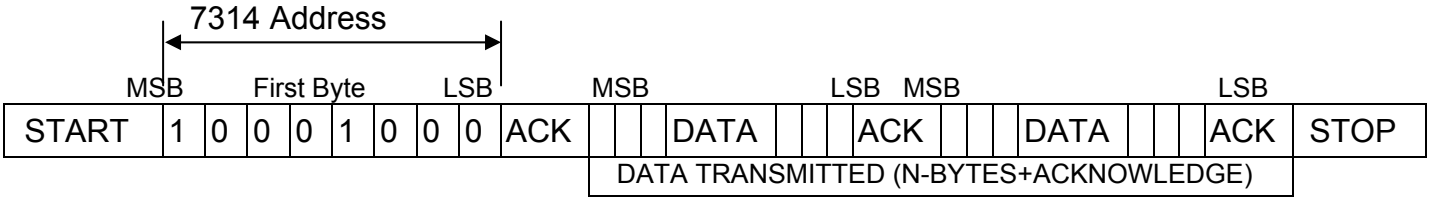
TRANSMISSION WITHOUT ACKNOWLEDGE

If you want to avoid the acknowledge detection of the audio processor, a simpler μP transmission may be used. Wait one clock and do not check the slave acknowledge of this same clock then send the new data. If you use this approach, there are greater chances of faulty operation as well as decrease in noise immunity.

INTERFACE PROTOCOL

The interface protocol consists of the following (see diagram below):

- A Start Condition
- A Chip Address Byte including the 7314 address. The 8th Bit of the Byte must be “0”. 7314 must always acknowledge the end of each transmitted byte.
- A Data Sequence (N-Bytes + Acknowledge)
- A Stop Condition



Note:
ACK = ACKNOWLEDGE
MAX. CLOCK SPEED = 100KBITS/S

SOFTWARE SPECIFICATION

7314 ADDRESS

7314 Address is shown below.

1 MSB	0	0	0	1	0	0	0 LSB

DATA BYTES

MSB							LSB	Function
0	0	B2	B1	B0	A2	A1	A0	Volume Control
1	1	0	B1	B0	A2	A1	A0	Speaker ATT L
1	1	1	B1	B0	A2	A1	A0	Speaker ATT R
0	1	0	G1	G0	S2	S1	S0	Audio Switch
0	1	1	0	C3	C2	C1	C0	Bass Control
0	1	1	1	C3	C2	C1	C0	Treble Control

where Ax = 1.25 dB steps; Bx = 10 dB steps; Cx = 2 dB steps; Gx = 3.75 dB/steps

VOLUME

The table below gives a detailed description of the Volume Data Bytes. For example, a volume of -37.5 dB is given by 0 0 0 1 1 1 1 0.

MSB							LSB	Function
0	0	B2	B1	B0	A2	A1	A0	Volume 1.25 dB steps
					0	0	0	0
					0	0	1	-1.25
					0	1	0	-2.5
					0	1	1	-3.75
					1	0	0	-5
					1	0	1	-6.25
					1	1	0	-7.5
					1	1	1	-8.75
0	0	B2	B1	B0	A2	A1	A0	Volume 10dB steps
		0	0	0				0
		0	0	1				-10
		0	1	0				-20
		0	1	1				-30
		1	0	0				-40
		1	0	1				-50
		1	1	0				-60
		1	1	1				-70

SPEAKER ATTENUATORS

The table below gives a detailed description of the speaker attenuators data bytes. For example, an attenuation of 30dB on the Speaker R (Right) is given by: 1 1 1 1 1 0 0 0.

MSB							LSB	Function
1	1	0	B1	B0	A2	A1	A0	Speaker L
1	1	1	B1	B0	A2	A1	A0	Speaker R
					0	0	0	0
					0	0	1	-1.25
					0	1	0	-2.5
					0	1	1	-3.75
					1	0	0	-5
					1	0	1	-6.25
					1	1	0	-7.5
					1	1	1	-8.75
			0	0				0
			0	1				-10
			1	0				-20
			1	1				-30
			1	1	1	1	1	Mute

AUDIO SWITCH DATA BYTE

The following table shows the detailed description of the Audio Switch Data Bytes. For example, a Stereo 1 Input with Gain of +11.25 dB Loudness ON is given by: 0 1 0 0 0 0 0 0.

MSB							LSB	Function
0	1	0	G1	G0	S2	S1	S0	Audio Switch
						0	0	Stereo 1
						0	1	Stereo 2
						1	0	Stereo 3
						1	1	Stereo 4
					0			Loudness ON
					1			Loudness OFF
			0	0				+11.25dB
			0	1				+7.5dB
			1	0				+3.75dB
			1	1				0dB

BASS AND TREBLE DATA BYTES

The following table shows a detailed description of the Bass and Treble Data Byte. For example a Treble at -12dB is given by: 0 1 1 1 0 0 0 1.

MSB							LSB	Function
0	1	1	0	C3	C2	C1	C0	Bass
0	1	1	1	C3	C2	C1	C0	Treble
				0	0	0	0	-14
				0	0	0	1	-12
				0	0	1	0	-10
				0	0	1	1	-8
				0	1	0	0	-6
				0	1	0	1	-4
				0	1	1	0	-2
				0	1	1	1	0
				1	1	1	1	0
				1	1	1	0	2
				1	1	0	1	4
				1	1	0	0	6
				1	0	1	1	8
				1	0	1	0	10
				1	0	0	1	12
				1	0	0	0	14

Unit: dB

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating	Unit
Operating supply voltage	Vs	10.5	V
Operating temperature	Topr	-40 to +85	℃
Storage temperature	Tstg	-65 to +150	℃

QUICK REFERENCE DATA

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	Vs	6	9	10	V
Max. input signal handling	VCL	2	2.5		Vrms
Total harmonic distortion (V=1Vrms, f=1KHz)	THD		0.07	0.15	%
Signal to noise ratio	S/N		95		dB
Channel separation (f=1KHz)	Sc		85		dB
Volume control 1.25dB step		-75		0	dB
Bass & treble control 2dB step		-14		+14	dB
Balance control 1.25dB step		-37.5		0	dB
Input gain 3.75dB step		0		11.25	dB
Mute attenuation			85		dB

ELECTRICAL CHARACTERISTICS

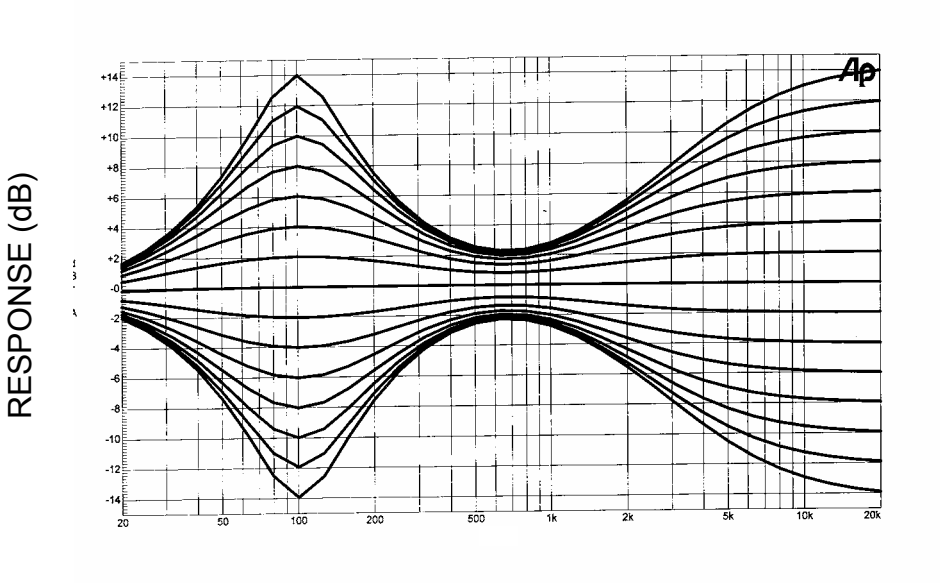
(Unless specified: Ta=25℃, Vc=9V, RL=10KΩ, Rg = 600Ω, all controls flat (G=0), f=1KHz)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Supply						
Supply voltage	Vcc		6	9	10	V
Supply current	Is			30	40	mA
Input Selectors						
Input resistance	R_{II}	Input 1,2,3	80	100	120	KΩ
Clipping level	V_{CL}	Av=-8.75 dB ; d=0.3%	2	2.5		Vrms
Input separation (2)	S_{IN}		80	100		dB
Min. input gain	G_{INmin}		-1	0	1	dB
Max. input gain	G_{INmax}			11.25		dB
Volume Control						
Input resistance	R_{IV}		30	40	50	KΩ
Control range	C_{RANGE}		65	70	75	dB
Min. attenuation	A_{VMIN}		-1	0	1	dB
Max. attenuation	A_{VMAX}		65	70	75	dB
Step resolution	A_{STEP}		0.5	1.25	1.75	dB
Attenuation set error	E_A	AV=0 to -20dB AV=-20 to –60dB	-1.25 -3.0	0	1.25 2	dB dB
Speaker Attenuators						
Control range	C_{RANGE}		35	37.5	40	dB
Step resolution	S_{STEP}		0.5	1.25	1.75	dB
Attenuation set error	E_A				1.5	dB
Output mute attenuation	A_{MUTE}		75	85		dB
Bass Control (1)						
Control range	Gb	Max. Boost/Cut	±12	±14	±16	dB
Step resolution	B_{STEP}		1	2	3	dB
Internal feedback resistance	R_B		34	44	58	KΩ
Treble Control (1)						
Control range	Gt	Max. Boost/Cut	±13	±14	±15	dB
Step resolution	T_{STEP}		1	2	3	dB

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Audio Outputs						
Clipping level	V_{OCL}	d=0.3%	2	2.5		Vrms
Output resistance	R_{OUT}		1.7	1.9	2.1	Ω
DC voltage level	V_{OUT}		4.2	4.5	4.8	V
General						
Output noise	e_{NO}	BW=20-20KHz, flat		-97		dB
		Output Muted All gains=0dB		-92		dB
		A Curve All Gains=0dB		-100		dB
Signal to noise ratio	S/N	All Gains=0dB Vo=1Vrms		95		dB
Distortion	d	AV=0, VIN=1Vrms		0.1	0.3	%
		AV=-8.75dB, VIN=1Vrms		0.07	0.15	%
		AV=-8.75dB, VIN=0.3Vrms		0.03	0.1	%
Channel separation left/right	Sc		80	90		dB
Bus Inputs						
Input low voltage	V_{IL}				1	V
Input high voltage	V_{IH}		3			V
Input current	I_{IN}		-5		+5	μA
Output voltage SDA acknowledge	Vo	Io=1.6mA			0.4	V

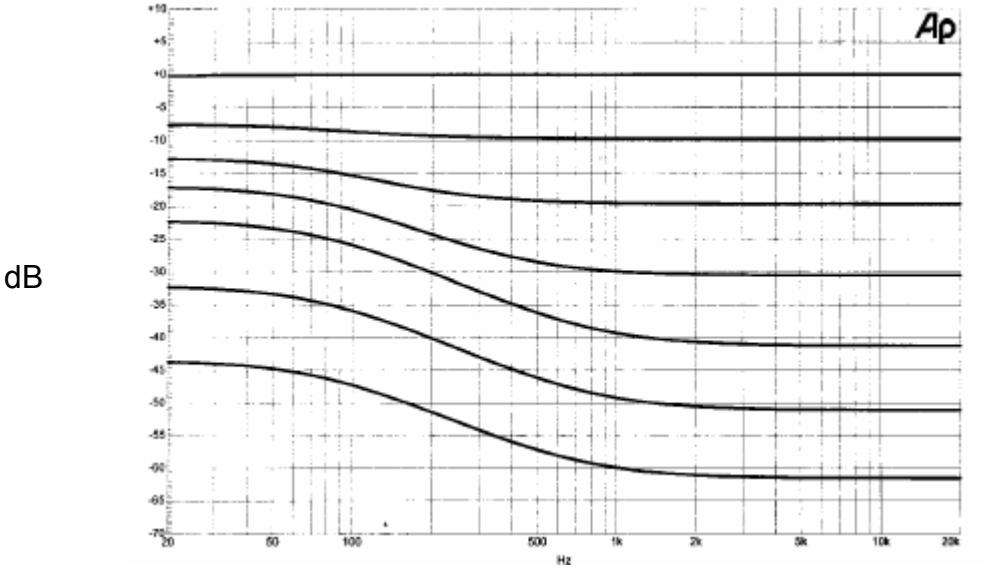
Notes:

1. For the Bass and Treble Response, please, refer to the diagram below. The center frequency and quality of the resonance behavior can be selected by the external circuitry. A standard first order bass response can realized by a standard feedback network.
2. The selected input is grounded thru the 2.2μF capacitor.



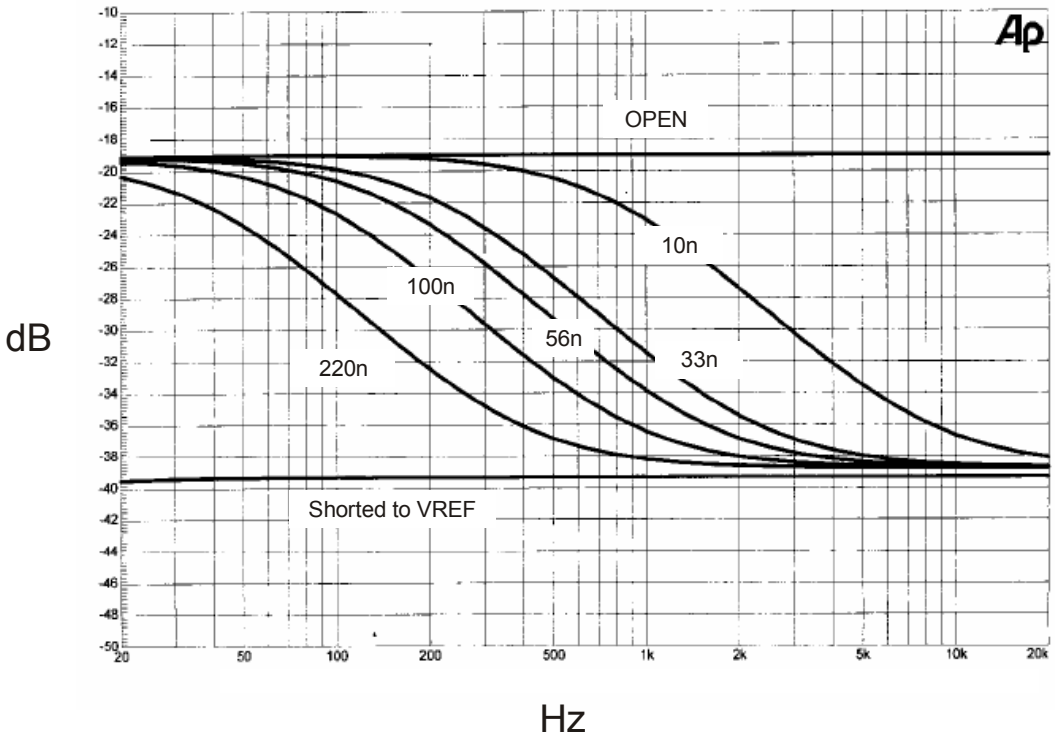
FREQUENCY (HZ)

Typical Tone Response (with the ext. Components indicated in the test circuit)



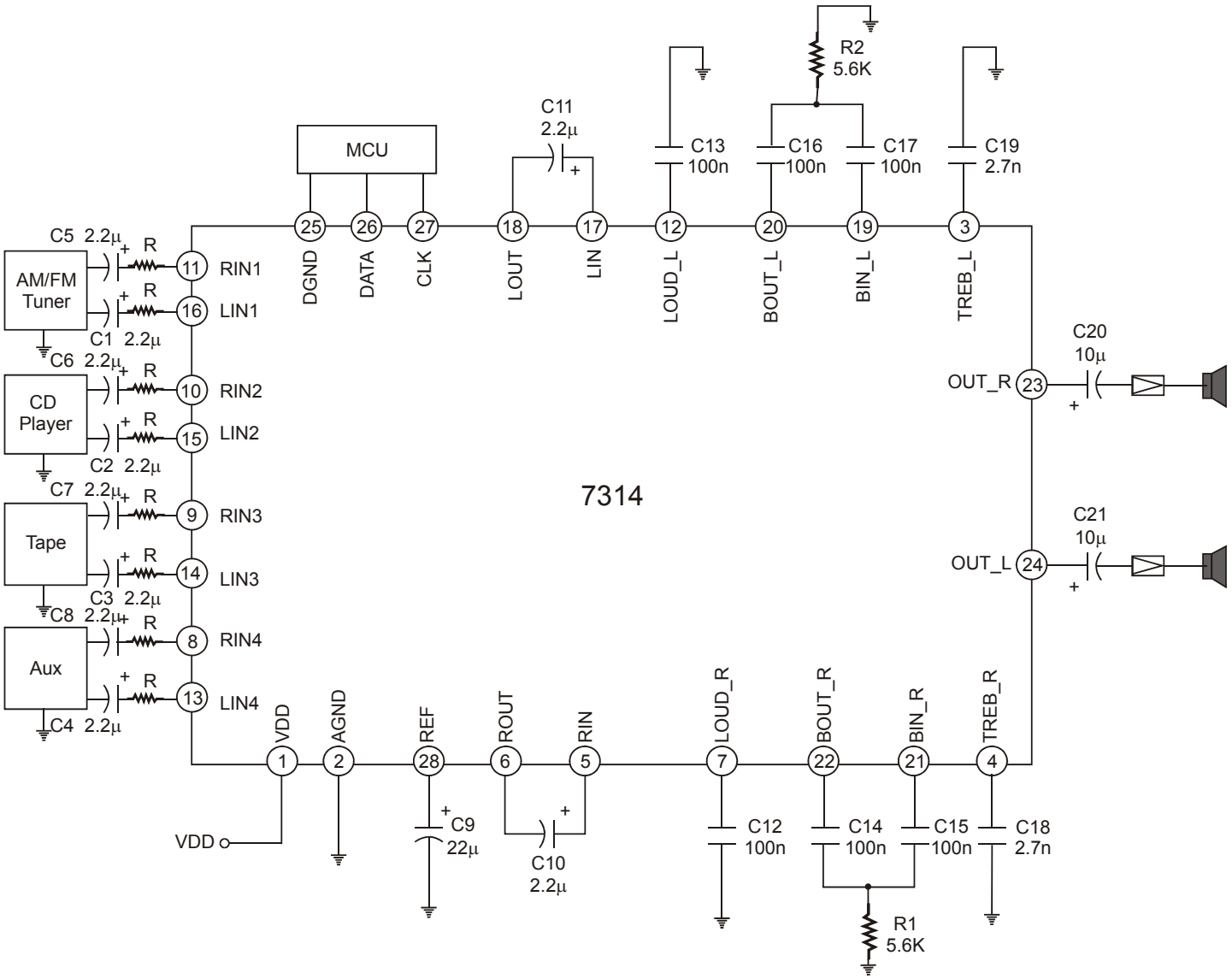
Hz

Loudness vs Volume Attenuation Frequency Response (C_{12}=C_{13}=100nF)



C12, C13 vs Loudness Frequency Response
(Volume=-40dB, All other controls are flat)

APPLICATION CIRCUIT



Notes:

1. It is suggested that you use Mylar Capacitor for capacitors, C12 ~ C19.
2. Resistor (R) Range = 2.0KΩ to 3.6KΩ
3. Recommended Value of Resistor (R) = 2.4KΩ

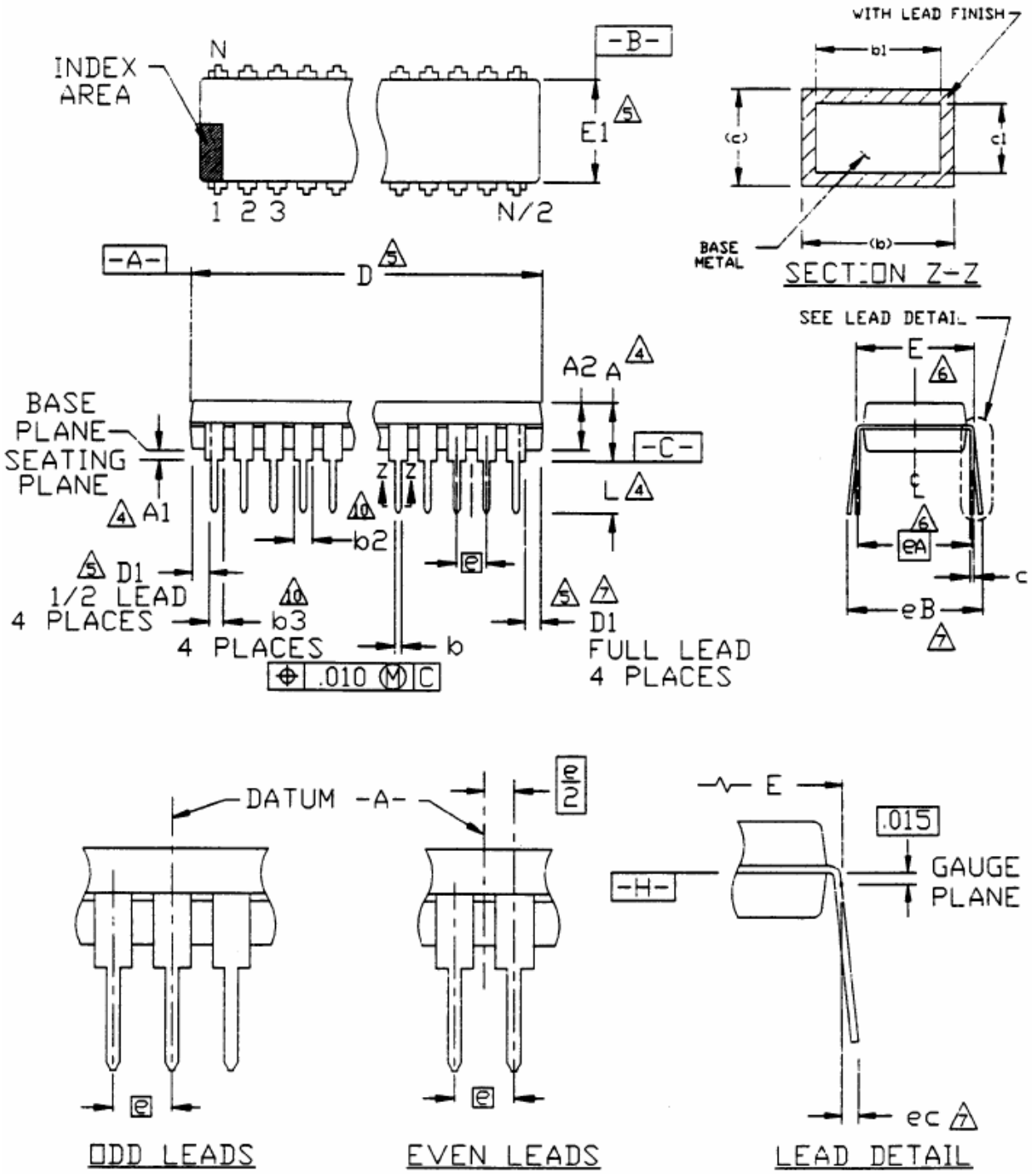
ORDER INFORMATION

Valid Part Number	Package Type	Top Code
7314-D (L)	28 Pins, DIP, 300mil	7314-D
7314 (L)	28 Pins, SOP, 300mil	7314

Notes:
1. (L), (C) or (S) = Lead Free
2. The Lead Free mark is put in front of the date code.

PACKAGE INFORMATION

28 PINS, DIP, 300 MIL



Symbol	Min.	Nom.	Max.
A	-	-	0.210
A1	0.015	-	-
A2	0.115	0.130	0.195
b	0.014	0.018	0.022
b1	0.014	0.018	0.020
b2	0.045	0.060	0.070
b3	0.030	0.039	0.045
c	0.008	0.010	0.014
c1	0.008	0.010	0.011
D	1.345	1.365	1.400
D1	0.005	-	-
E	0.300	0.310	0.325
E1	0.240	0.250	0.280
e	0.100 BSC		
eA	0.300 BSC		
eB	-	-	0.430
eC	0.000	-	0.060
L	0.115	0.130	0.150

Notes:
1. All dimensions are in INCHES.
2. Dimensioning and tolerancing per ANSI Y14.5M-1982.
3. Dimension A, A1 and L are measured with the package seated in JEDEC Seating Plane Gauge GS-3.
4. D, D1, and E1 dimensions do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010 inch.
5. E and eA measured with the leads constrained to be perpendicular to datum -C-.
6. eB and eC are measured at the lead tips with the leads constrained. N is the number of terminal positions (N=28)
7. Pointed or rounded lead tips are preferred to ease insertion.
8. b2 and b3 maximum dimensions do not include dambar protrusions. Dambar protrusions shall not exceed 0.010” (0.25mm).
9. This variation is a ½ lead package.
10. Distance between leads including dambar protrusions to be 0.005 inch minimum.
11. Datum plane -H- coincident with the bottom of lead where lead exits body.
12. Refer to JEDEC MS-001 Variation BF.

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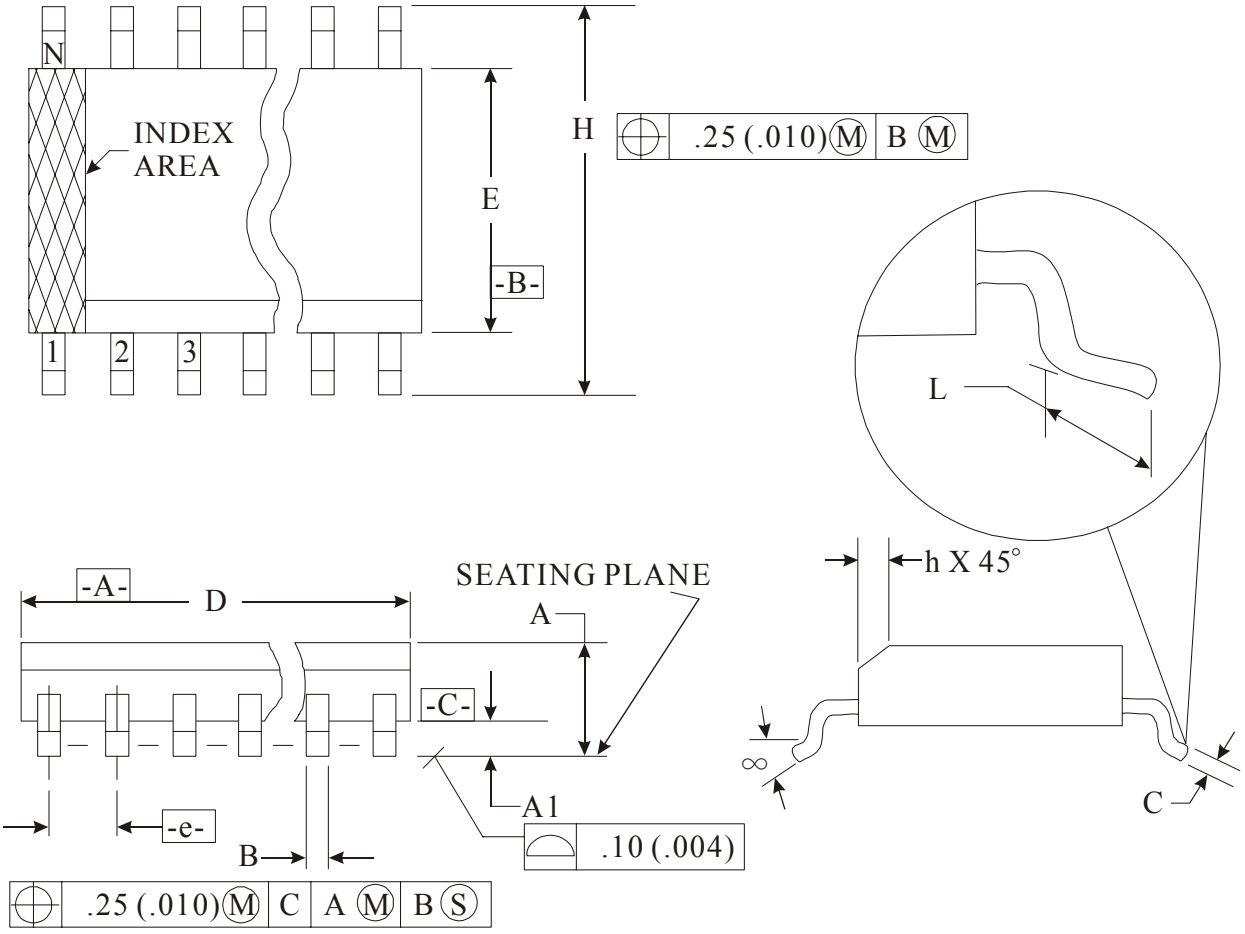
28 PINS, SOP, 300 MIL



Symbol	Min.	Nom.	Max.
A	2.35	-	2.65
A1	0.10	-	0.30
B	0.33	-	0.51
C	0.23	-	0.32
D	17.70	-	18.10
E	7.40	-	7.60
e	1.27 bsc.		
H	10.00	-	10.65
h	0.25	-	0.75
L	0.40	-	1.27
α	0°	-	8°

Notes:
1. Dimensioning and tolerancing per ANSI Y14.5M-1982.
2. Dimension “D” does not include mold flash, protrusions or gate burrs. Mold Flash, protrusion or gate burrs shall not exceed 0.15 mm (0.006 in) per side.
3. Dimension “E” does not include interlead flash or protrusions. Interlead flash or protrusions shall not exceed 0.25 mm (0.010 in) per side.
4. The chamfer on the body is optional. It is not present, a visual index feature must be located within the crosshatched area.
5. “L” is the length of the terminal for soldering to a substrate.
6. N is the number of the terminal positions (N=28)
7. The lead width “B” as measured 0.36 mm (0.014 in) or greater above the seating plane, shall not exceed a maximum value of 0.61 mm (0.24 in).
8. Controlling dimension：MILLIMETER.
9. Refer to JEDEC MS-013, Variation AE.

JEDEC is the trademark of JEDEC SOLID STATE TECHNOLOGY ASSOCIATION.

概述

HC3001 是一款高效率，2X3W 双通道立体声 D 类音频功率放大器。是一个低噪声，无滤波器的架构，无需进行过滤，只需很少的外部元件，以节省电路板空间和成本。

HC3001 只需 5V 电源工作电压，在 5V 供电和输入负载 3Ω 的条件下，每个通道最大可达 3.2W 输出功率。

HC3001 有关闭和静音控制功能。高的 PSRR 和差分结构提供更强的抗干扰性，噪声和 RF 自校准功能。

HC3001提供SOP-16无铅封装。

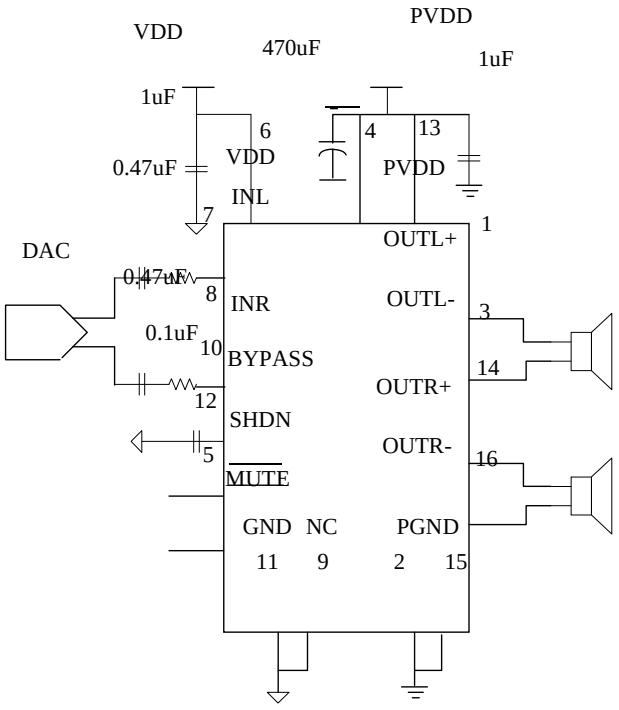
特性

- 低的EMI 辐射
- FM 无干扰
- 无虑波的 Class-D 架构
- 输出功率
  - 3.2W/ch into 3Ω at 5V
  - 1.7W/ch into 8Ω at 5V
- 工作电压:2.2V 到 5.0V
- 低 THD+N 和低噪声
- 高于 85%的转换效率
- 短路自动恢复和热保护
- 少的外围元器件，节省空间和成本

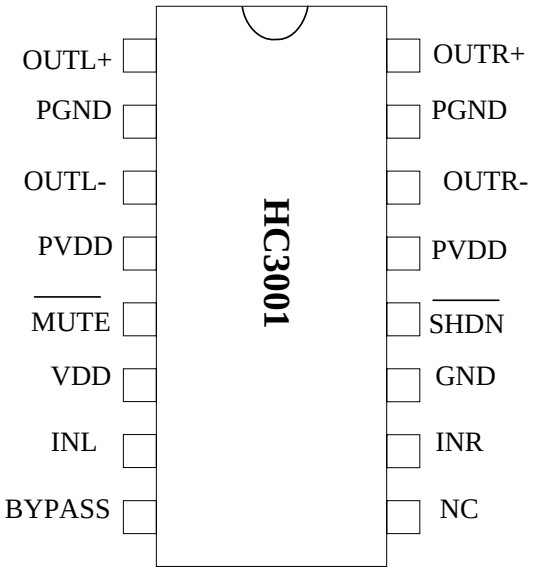
应用领域

- 便携DVD播放机
- 笔记本,台式机
- USB 耳麦, 便携麦克
- LCD TV/LCD显示器

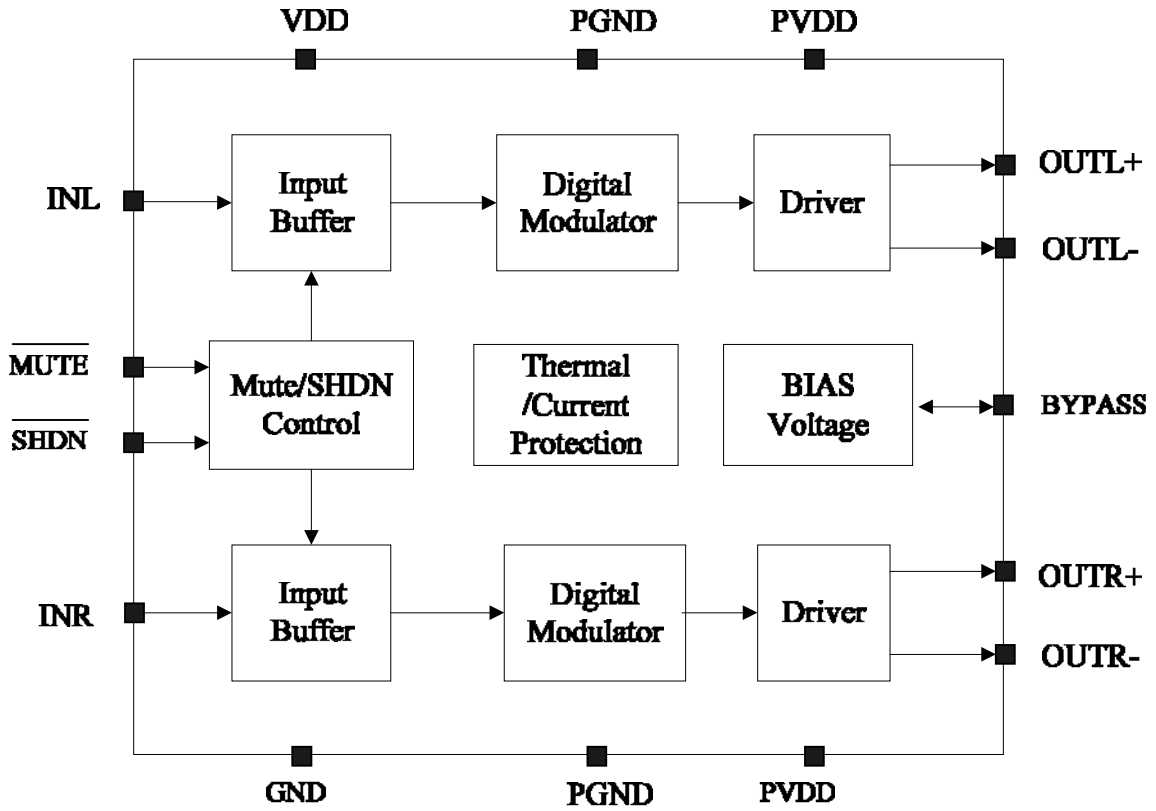
典型应用电路:



管脚图



功能框图



管脚描述

名称	Pin No.	I/O	管脚描述
1	OUTL+	O	左声道音频正输出
2,15	PGND		电源地
3	OUTL-	O	左声道音频负输出
4,13	PVDD		供应低压终端的功率级
5	MUTE	I	静音控制输入引脚（低电平有效）
6	VDD		模拟电源电压
7	INL	I	左声道输入引脚
8	BYPASS	I	内部midsupply用于发电机电压的模拟参考
9	NC		无连接
10	INR	I	右声道输入引脚
11	GND		模拟电源地
12	SHDN	I	关断控制输入引脚（低电平有效）
14	OUTR-	O	右声道音频负输出
16	OUTR+	O	右声道音频正输出

订购信息

订单号	封装类型	标记	封装
HC3001	SOP-16	HC3001 XXXXXXX	盘式包装 管子

绝对最大额定值（在操作自由空气的温度，除非另有说明）

Vss	电源电压	-0.3V to 5.5V
V_I	输入电压	-0.3V to V_{DD}+0.3V
T_A	操作自由空气温度范围	-40°C to 85°C
T_J	操作自由空气结温	-40°C to 125°C
T_{STG}	存储温度范围	-65°C to 150°C
T_{SLD}	焊接温度	300°C, 5sec

推荐工作条件

			最小	最大	单位
V_{SS}	电源电压	AVDD, PVDD	2.2	5.0	V
V_{IH}	使能输入高电压	V_{DD}=5.0V	1.3		V
V_{IL}	启用输入低电压	V_{DD}=5.0V		0.4	
V_{IH}	静音输入高电压	V_{DD}=5.0V	1.3		V
V_{IL}	静音输入低电压	V_{DD}=5.0V		0.4	

热信息

参数	符号	封装	最大	单位
热阻（结到环境）	θ_{JA}	SOP-16	110	°C/W
热阻（结到管壳）	θ_{JC}	SOP-16	23	°C/W

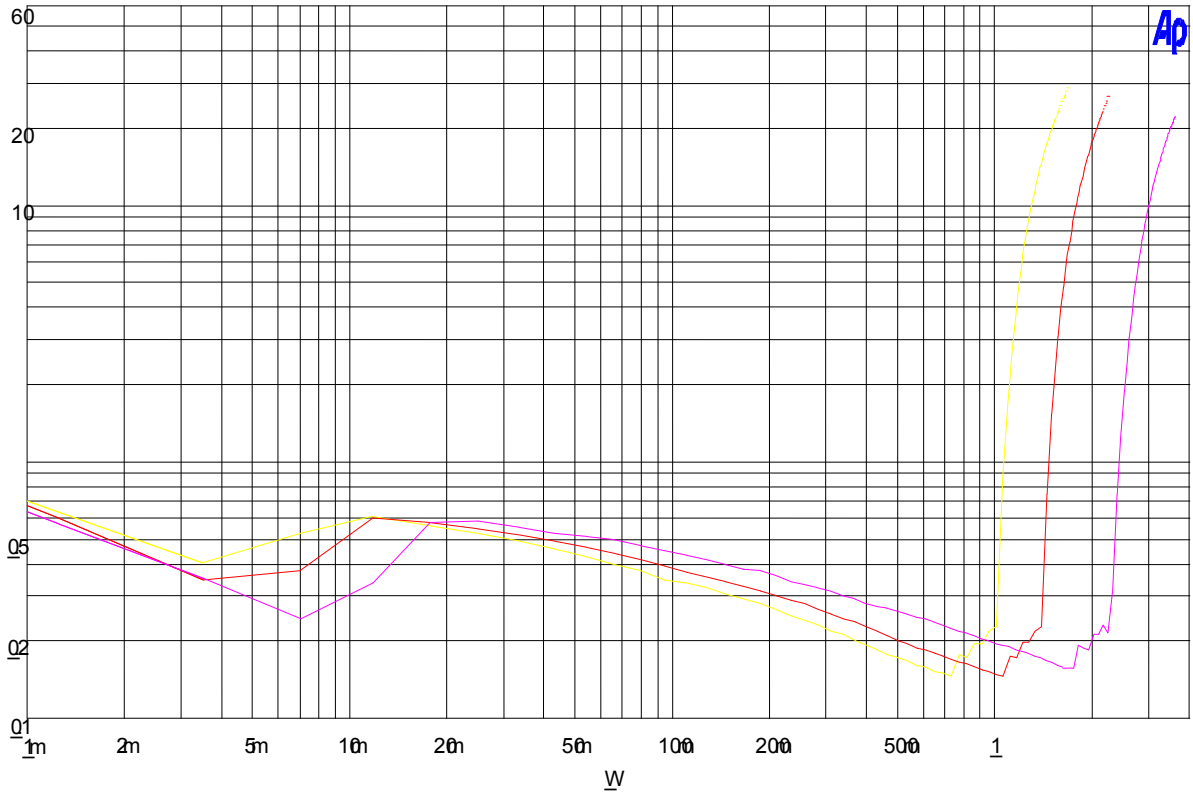
电气特性(VDD =5V, Gain=25dB, R =8Ω, T =25°C, 除非另有说明.)

符号	参数	测试条件		最小	典型值	最大	单位
V_{IN}	供电			2.2		5.0	V
P_O	输出功率	THD+N=10%,f=1KHZ,R_L=4Ω	V_{DD}=5.0V		2.8		W
			V_{DD}=3.6V		1.3		
		THD+N=1%,f=1KHZ,R_L=4Ω	V_{DD}=5.0V		2.1		W
			V_{DD}=3.6V		1		
		THD+N=10%,f=1KHZ,R_L=8Ω	V_{DD}=5.0V		1.7		W
			V_{DD}=3.6V		0.8		
		THD+N=1%,f=1KHZ,R_L=8Ω	V_{DD}=5.0V		1.20		W
			V_{DD}=3.6V		0.6		
THD+N	总谐波 失真加噪声	V_{DD}=5.0V, P_O=0.5W, R_L=8Ω	f=1KHz		0.15		%
		V_{DD}=3.6V, P_O=0.5W, R_L=8Ω			0.14		
		V_{DD}=5.0V, P_O=1W, R_L=4Ω	f=1KHz		0.18		%
		V_{DD}=3.6V, P_O=1W, R_L=4Ω			0.16		

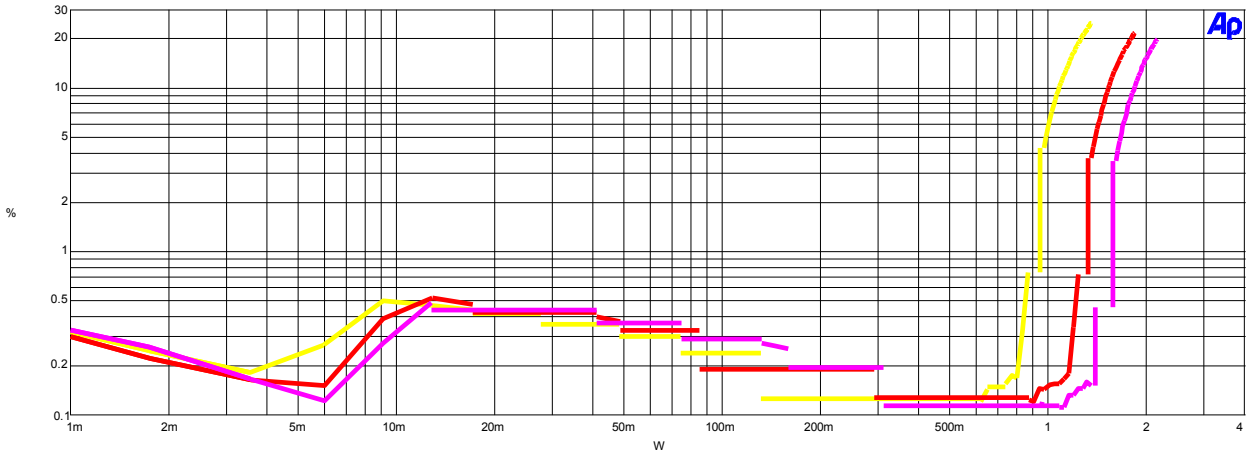
Continued

符号	参数	测试条件		最小	典型值	最大	单位
G_V	增益				25		dB
PSRR	电源纹波拒绝	VDD=5.0V, Inputs ac-grounded with CIN=0.47μF	f=1KHz		-55		dB
C_S	相声	V_{DD}=5.0V,P_O=0.5W, R_L=8Ω, G_V=25dB	f=1KHz		-85		dB
SNR	讯噪比	V_{DD}=5.0V,Vorms=1V, G_V=25dB	f=1KHz		82		dB
Vn	输出噪声	V_{DD}=5.0V,Inputs floating with C_{IN}=0.47μF	A-weighting		87		μV
			No A-weighting		136		
Dyn	动态范围	V_{DD}=5.0V,THD=1%	f=1KHz		90		dB
η	效率	R_L=8Ω,THD=10%	f=1KHz		85		%
		R_L=4Ω,THD=10%			80		
I_Q	静态电流	V_{DD}=5.0V	No Load		5		mA
		V_{DD}=3.0V			3.6		
I_{MUTE}	当前静音	V_{DD}=5.0V	V_{MUTE}=0.3V		3.5		mA
I_{SD}	关断电流	V_{DD}=2.5V to 5.5V	V_{SD}=0.3V			1	μA
Vos	输出失调电压	V_{IN}=0V, V_{DD}=5V			10		mV
OTP	保护过温	无负载，结温度	V_{DD}=5.0V		135		°C
OTH	过温磁滞				20		

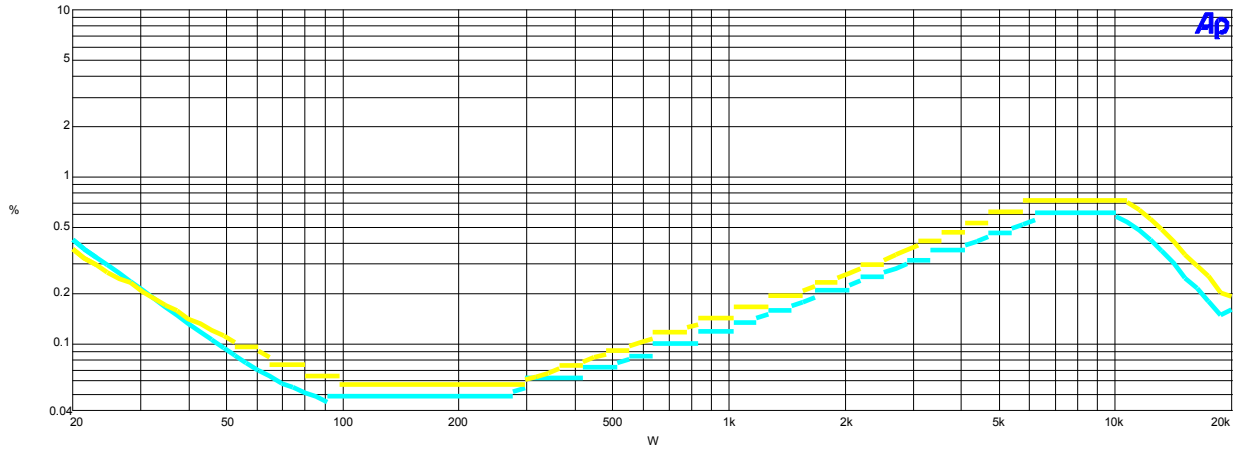
典型工作特性 (T =25°C)



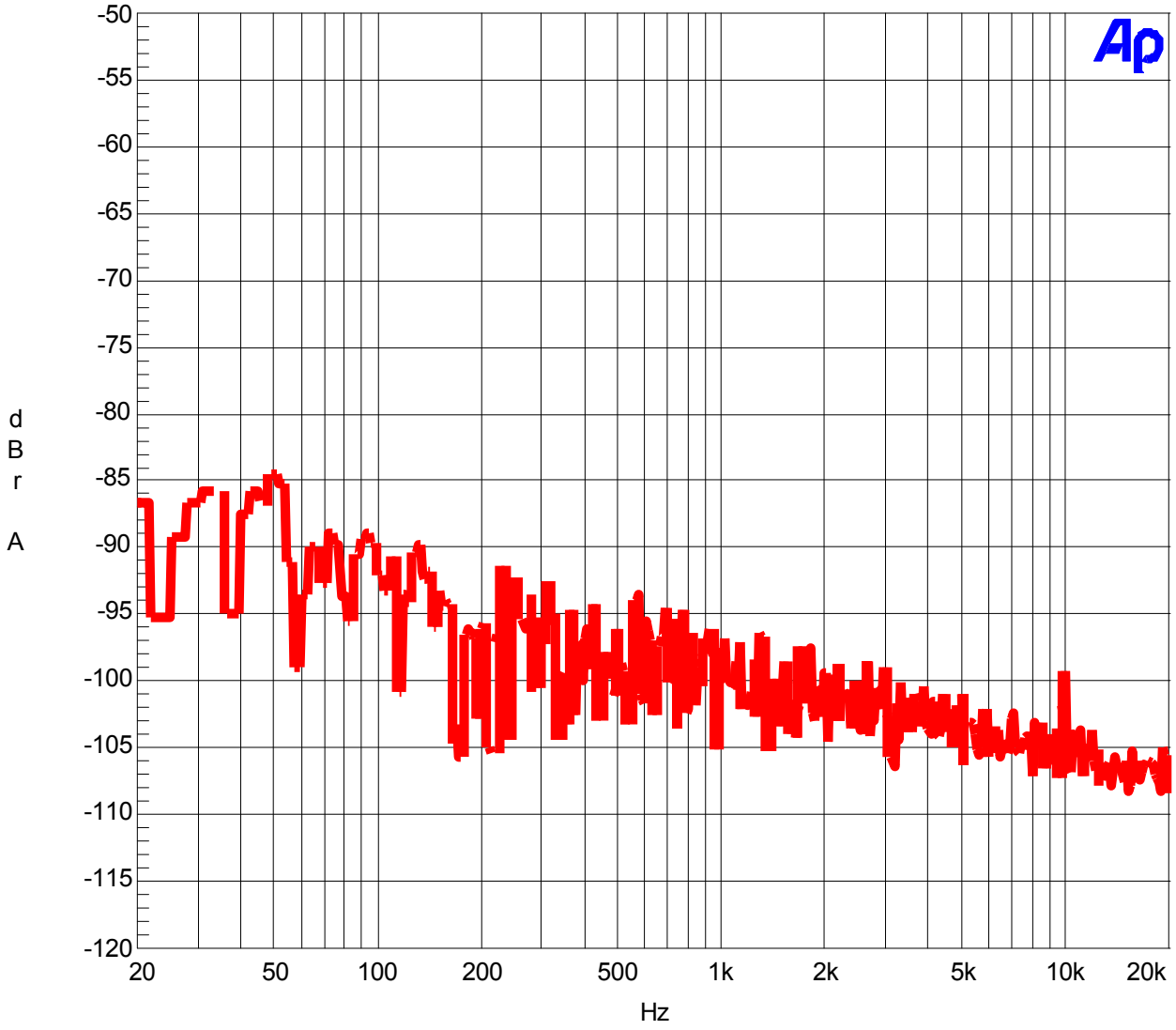
THD+N VS OUT POWER (RL=4ohm Gain=25dB,f=1kHz)



THD+N VS OUT POWER (RL=8ohm Gain=25dB,f=1kHz)



THD+N VS FREQUENCY(PO=1W,RL=8Ω Gain=25dB)



NOISE FLOOR FFT（VDD=5V,RL=8Ω Gain=25dB）

应用说明

静音操作

静音引脚是用于控制 HC3001 的输入输出状态。该引脚上的逻辑高是引脚上的输出，逻辑低禁止输出。当在不同的音频源渠道不断变化时，终端可以用作一个快速禁用/启用的输出.。由于内部上拉，静音引脚可以悬空。

关机操作

该 HC3001 采用停机模式的运作过程目的是将与未使用时段进行节能电源电流减至最低水平。当放大器使用时 SHDN 输入端子在正常操作期间应提升。SHDN 脚由于内部上拉可以悬空。

欠压锁定（UVLO）功能

HC3001 采用的电路设计，低电压检测。当电源电压下降到 1.8V 或以下，HC3001 输出被禁用，当 VDD ≧2.0V 时设备输出这种状态，并开始正常功能。

短路保护

HC3001 在输出端具有保护电路，防止输出到 GND 和输出到接地发生损坏设备。当输出端检测到短路时，立即禁用驱动器的一部分。这是虚掩的错。恢复正常操作时，故障排除。

热保护

芯片的内部温度超过 135 ° C,HC3001 热保护防止损坏设备。此点上有一个从设备到设备的± 20 ° C 的公差。当管芯温度超过设定值，器件进入关断状态并且输出被禁止。这不是一个 latchedfault。故障被清除后的温度降低到 30 ° C。设备在没有外部系统的介入点时开始正常工作。

最大增益

该 HC3001 有两个内部放大器阶段。第一阶段的增益是外部配置，而第二阶段的是内部固定。该 IC 的差动增益

$$A = 20*\log [2*((R_f / (R_i + R_e))]$$

其中 Re 是外部电阻，HC3001 射频 =180kΩ， RI =20kΩ，因此，最大封闭增益为 25dB 的（没有外部电阻）。

去耦电容（CS）

该 HC3001 是一款高性能 D 类音频放大器，需要足够的电源去耦，以确保效率高，总谐波失真（THD）低。对于较高频率的瞬态尖峰，或在在线数字散列良好的低等效串联电阻（ESR）的陶瓷电容器，一般 1μF 的， 尽量靠近器件 PVDD 使其工作最好。去耦电容放置接近 HC3001 对 D 类放大器的效率很重要，因为任何阻力或电感在器件和电容之间的跟踪会导致效率的损失。用于过滤低频率的噪音信号，一个 4.7μF 的或更大的电容放在靠近音频功率 放大器也将有所帮助。

输入电容（Ci）

如果设计使用差分源是从 0.5V 的偏置到 VDD - 0.8V 的, HC3001 不需要输入耦合电容.如果输入信号没有在推荐的共模输入范围有偏差，如果高通滤波是需要的，或者，如果使用单端信号源，输入耦合电容是必需的。输入电容和输入电阻从高通滤波器的转角频率 在下面的确定方程

$$f_C = \frac{1}{2\pi R_i C_i}$$

输入电容的值是重要的考虑因素，因为它直接影响到低音（低频）电路的性能。无线手机音箱通常不能很好地应对低频率，使频率可以角落设置以阻止本应用低频。不使用输入电容可以增加抵消。以下公式用于解决输入耦合电容。

$$C_I = \frac{1}{(2\pi R_I f_C)}$$

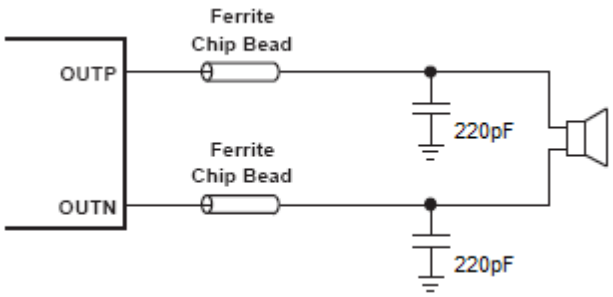
如果是拐角频率波段内的音频，电容器应为± 10％或更高宽容，因为任何不匹配的电容
在转角频率及以下的阻抗不匹配.

模拟参考旁路电容（CBYP）

模拟参考旁路电容（CBYP）是最关键的电容并且具有许多重要性能。在启动或从关断模式恢复时，ç 决定放大器启动的速度。第二个功能是减少到输出驱动信号电源耦合造成的噪音。这种噪声从内部模拟参考放大器，显示为退化的 PSRR 和 THD +N。
1.0μF 到 0.47μF 的陶瓷旁路电容（CBYP）是最佳推荐 。总谐波失真和噪声性能。增加旁路电容以减少点击和弹出的电源噪声开/关和进出关断。

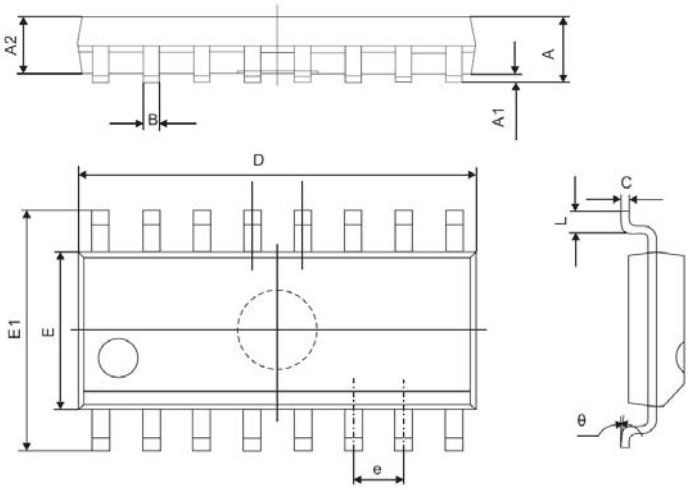
过滤器的自由运行和铁氧体磁珠过滤器

如果设计失败，没有一个 LC 滤波器和频率敏感电路大于辐射 1MHz 的，铁氧体磁珠滤波器通常可以使用。井电路，只需要通过 FCC 和 CE，因为 FCC 和 CE 只测试大于 30MHz 的辐射的过滤器的功能。当选择一个铁氧体磁珠，在高频下选择高阻抗率，在低频率选择低阻抗。另外，选择具有足够的额定电流铁氧体磁珠，以防止输出信号失真。
如果有低频 “（<1MHZ）电磁干扰敏感电路和/或有较长的引线从功放到扬声器，使用 LC 输出滤波器。



铁氧体磁珠滤波器，以减少电磁干

封装信息图：SOP-16



Symbol	Dimensions Millimeters	
	Min	Max
A	1.350	1.750
A1	0.100	0.250
A2	1.350	1.550
B	0.330	0.510
C	0.190	0.250
D	9.800	10.000
E	3.800	4.000
E1	5.800	6.300
e	1.270(TYP)	
L	0.400	1.270
θ	0°	8°

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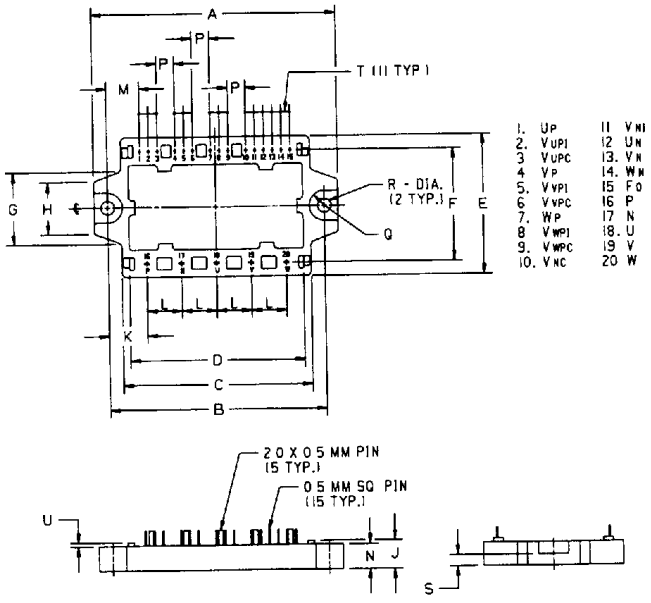
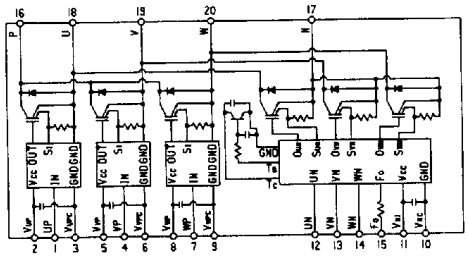
Intellimod™-3 Modules

Three Phase
IGBT Inverter Output
20 Amperes/110-230 Volt Line

OUTLINE DRAWING



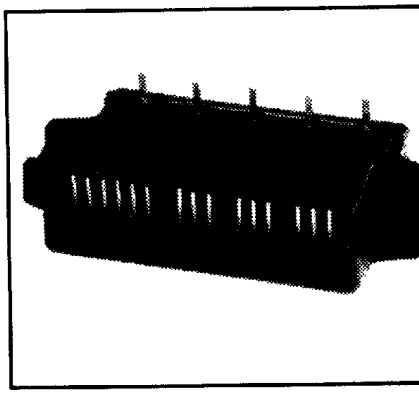
CONNECTION DIAGRAM



110-230 Volt Line, PM20CHA060 Outline Drawing

Dimensions	Inches	Millimeters
A	3.86±0.04	98.0±1.0
B	3.42±0.02	87.0±0.5
C	2.99	76.0
D	2.76	70.0
E	2.20±0.04	56.0±1.0
F	1.77	45.0
G	1.14	29.0
H	0.83	21.0
J	0.63	16.0
K	0.61	15.5

Dimensions	Inches	Millimeters
L	0.55	14.0
M	0.521	13.24
N	0.39	10.0
P	0.28	7.12
Q	0.24R	6.0R
R	0.22 Dia.	5.5 Dia
S	0.20	5.0
T	0.14	3.56
U	0.06	1.5V



Description

Powerex Intellimod-3 Modules
designed for applications requi
a high frequency (20kHz) outpu
switching inverter. The module
isolated from the baseplate, co
sisting of complete drive, contr
and protection circuitry for the
inverter.

Features:

- ☐ Complete Output Power Cir
- ☐ Gate Drive Circuit
- ☐ Protection Logic
  - Short Circuit
  - Over-Current
  - Over Temperature
  - Under Voltage

Applications:

- ☐ Inverters
- ☐ Small UPS
- ☐ Motion/Servo Control
- ☐ AC Motor Control

Ordering Information

PM20CHA060

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PM20CHA060
Intellimod-3 Modules
Three Phase IGBT Inverter Output
20 Amperes/110-230 Volt Line

Absolute Maximum Ratings, T_j = 25 °C unless otherwise specified

Characteristics	Symbol	PM20CHA060	Units
Power Device Junction Temperature	T_j	-20 to +150	°C
Storage Temperature	T_{STG}	-40 to +125	°C
Case Operating Temperature	T_C	-20 to +100	°C
Mounting Torque, M5 Mounting Screws	—	17	Kg-c
Module Weight (Typical)	—	90	Gram
Supply Voltage Protected by OC and SC (V_D = 13.5 - 16.5 V, Inverter Part)	$V_{CC\ (prot.)}$	400	Volts
Isolation Voltage AC 1 minute, 60Hz	V_{RMS}	2500	Volts
Control Sector			
Supply Voltage Applied Between (V_{UP1} - V_{UPC}, V_{VP1} - V_{VPC}, V_{WP1} - V_{WPC}, V_{N1} - V_{NC})	V_D	20	Volts
Input Current Applied Between (U_P, V_P, W_P, U_N, V_N, W_N)	I_{CIN}	20	mA
Input Voltage Applied Between (U_P, V_P, W_P, U_N, V_N, W_N)	V_{CIN}	20	Volts
Fault Output Supply Voltage	V_{FO}	20	Volts
Fault Output Current	I_{FO}	20	mA
IGBT Inverter Sector			
Collector-Emitter Voltage Fig. 1	V_{CES}	600	Volts
Collector Current ±	I_C	20	Amper
Peak Collector Current ±	I_{CP}	40	Amper
Supply Voltage (Applied between P - N)	V_{CC}	400	Volts
Supply Voltage (Surge) Applied between P - N	$V_{CC\ (surge)}$	500	Volts
Collector Dissipation	P_C	62	Watts

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Electrical Characteristics, T_j = 25 °C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Control Sector						
Overcurrent Trip Level Inverter Part	OC	-20°C ≤ T ≤ +125°C	28	38	–	Ampere
Short Circuit Trip Level Inverter Part	SC	-20°C ≤ T ≤ +125°C	–	57	–	Ampere
Overcurrent Delay Time	$t_{off(OC)}$	V_D = 15V Fig. 7	–	10	–	µS
Over Temperature Protection	OT	Trip Level	100	110	120	°C
Over Temperature Protection	OT_R	Reset Level	–	90	–	°C
Supply Circuit Under Voltage Protection	UV	Trip Level	11.5	12.0	12.5	Volts
Supply Circuit Under Voltage Protection	UV_R	Reset Level	–	12.5	–	Volts
Supply Voltage	V_D	Applied between V_{UP1} - V_{UPC}, V_{VP1} - V_{PC}, V_{WP1} - V_{WPC}, V_{N1} - V_{NC}	13.5	15	16.5	Volts
Circuit Current	I_D	V_D = 15V, I_{CIN} = 1mA, V_{N1} - V_{NC}	–	25	40	mA
	I_D	V_D = 15V, I_{CIN} = 1mA, V_{XP1} - V_{XPC}	–	7	12	mA
Input Bias On Current	$I_{CIN(on)}$	Sink Current at U_P, V_P, W_P, U_N, V_N, W_N	0.1	0.22	0.5	mA
Input Bias Off Current	$I_{CIN(off)}$	Sink current at U_P, V_P, W_P, U_N, V_N, W_N	0.1	0.22	0.5	mA
PWM Input Frequency	f_{PWM}	3-Ø Sinusoidal	–	15	20	kHz
Dead Time	t_{DEAD}	For each Input Pulse	2.0	–	–	µS
		Using example Interface Circuit*	5.0	–	–	µS
Fault Output Current	$I_{FO(H)}$	V_D = 15V, V_{FO} = 15V	–	–	0.01	mA
	$I_{FO(L)}$	V_D = 15V, V_{FO} = 15V	–	10	15	mA
Minimum Fault Output Pulse Width	t_{FO}	V_D = 15V	20	40	60	µS
		Using example Interface Circuit* V_D = 15V	25	100	–	µS

*See Intellimod-3 Applications Data Section 4.3.

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Intellimod-3 Modules
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20 Amperes/110-230 Volt Line

Electrical Characteristics, T_j = 25 °C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
IGBT Inverter Sector						
Collector Cutoff Current	I_{CEX}	$V_{CE} = V_{CEX}$, T_j = 25 °C, Fig. 6	–	–	1	mA
Collector Cutoff Current	I_{CEX}	$V_{CE} = V_{CEX}$, T_j = 125 °C, Fig. 6	–	–	10	mA
Diode Forward Voltage	V_{FM}	$-I_C$ = 20A, V_D = 15V, I_{CIN} = 1mA, Fig. 3	–	1.9	2.5	Volts
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	V_D = 15V, I_{CIN} = 0mA, I_C = 20A, Fig. 2	–	2.6	3.5	Volts
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	V_D = 15V, I_{CIN} = 0mA, I_C = 20A, T_j = 125 °C, Fig. 2	–	2.5	3.4	Volts
Inductive Load Switching Times	t_{on}	V_D = 15V, I_{CIN} = 0mA, V_{CC} = 300V, I_C = 20A, T_j = 125 °C, Fig. 4, Fig. 5	0.5	0.9	1.5	µS
	t_{rr}		–	0.15	0.4	µS
	$t_{C(on)}$		–	0.3	1.0	µS
	t_{off}		–	2.0	2.5	µS
	$t_{C(off)}$		–	0.5	1.5	µS

Thermal Characteristics

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistances	$R_{th(j-c)Q}$	Inverter IGBT Part	–	–	2.0	°C/W
	$R_{th(j-c)F}$	Inverter FWD	–	–	4.5	°C/W
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin, Thermal Grease Applied	–	–	0.4	°C/W

Recommended Operating Conditions

Characteristics	Symbol	Test Conditions	Value	Units
Supply Voltage	V_{CC}	Applied across P-N Terminals	0 ~ 400	Volts
	V_D	Applied between V_{UP1} - V_{UPC}, V_{N1} - V_{NC}, V_{VP1} - V_{VPC}, V_{WP1} - V_{WPC}	15 ± 1.5	Volts
Input On Current	$I_{CIN(on)}$	Applied between U_P, V_P, W_P, U_N, V_N, W_N	0 ~ 0.5	mA
Input Off Current	$I_{CIN(off)}$		0.5 ~ 2	mA
PWM Input Frequency	f_{PWM}	Using example Interface Circuit*	5 ~ 20	kHz
Minimum Dead Time	t_{DEAD}	Using example Interface Circuit*	5.0	µS

*See Intellimod-3 Applications Data Section 4.3.

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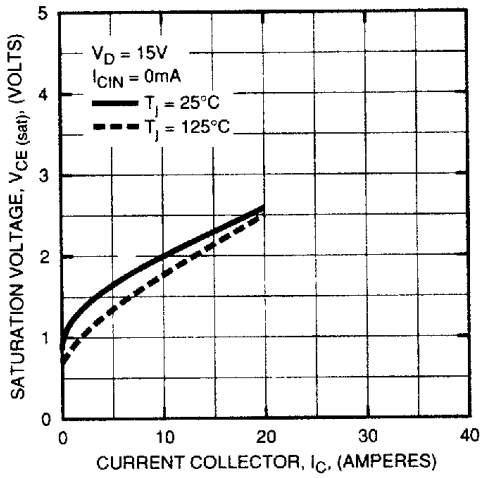
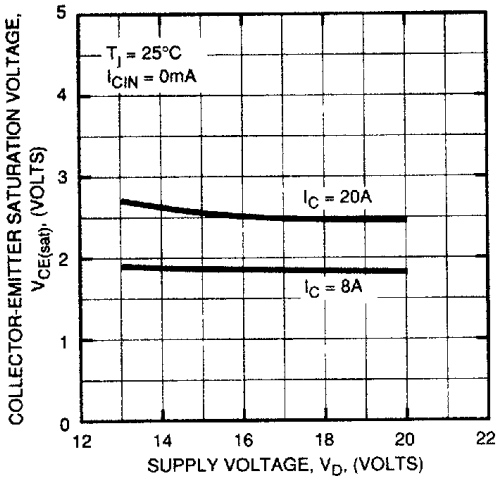
20Amperes/110-230 Volt Line

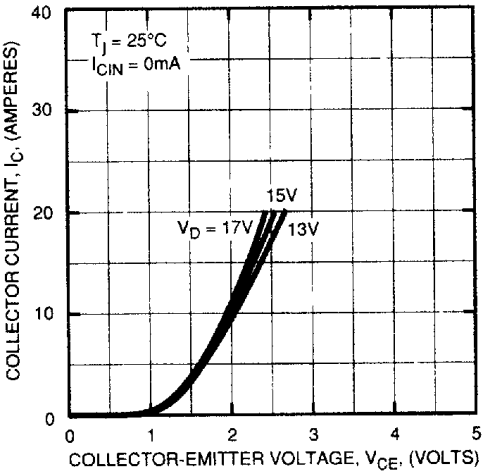
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



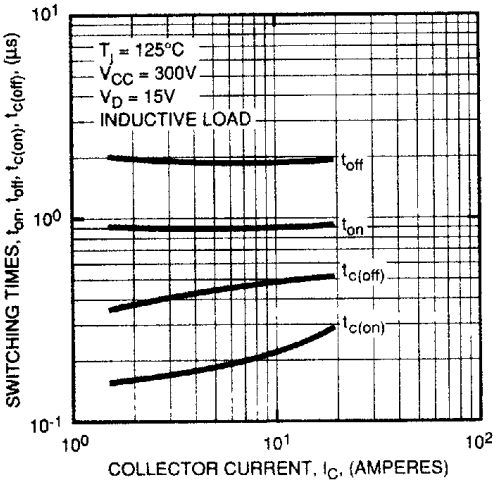
COLLECTOR-EMITTER SATURATION VOLTAGE (TYPICAL)



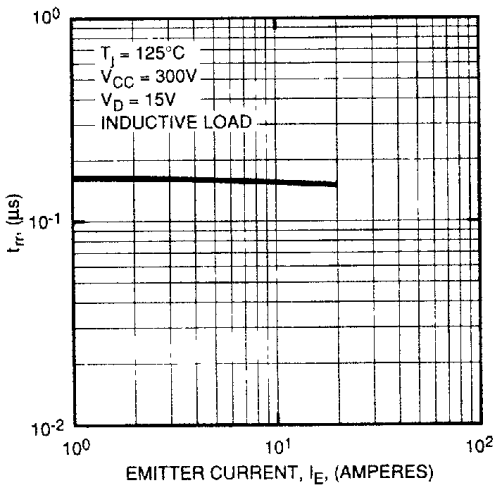
OUTPUT CHARACTERISTICS (TYPICAL)



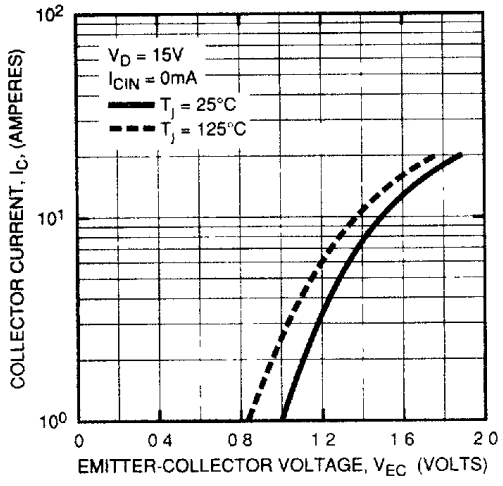
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



REVERSE COLLECTOR CURRENT VS. EMITTER-COLLECTOR VOLTAGE (DIODE FORWARD CHARACTERISTICS) (TYPICAL)



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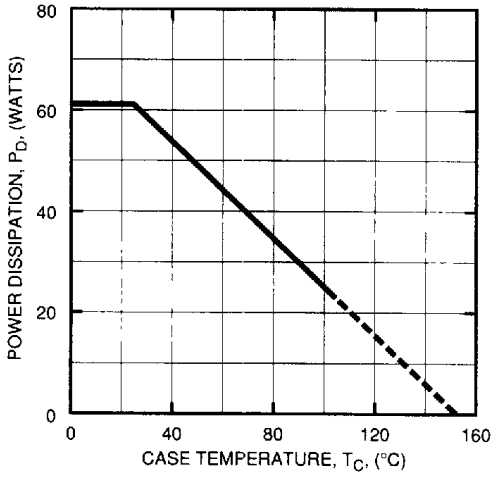
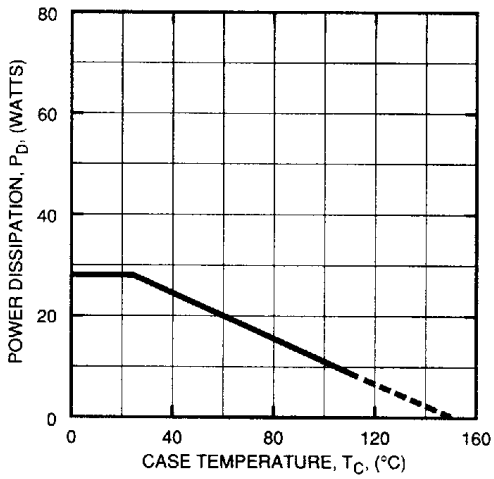
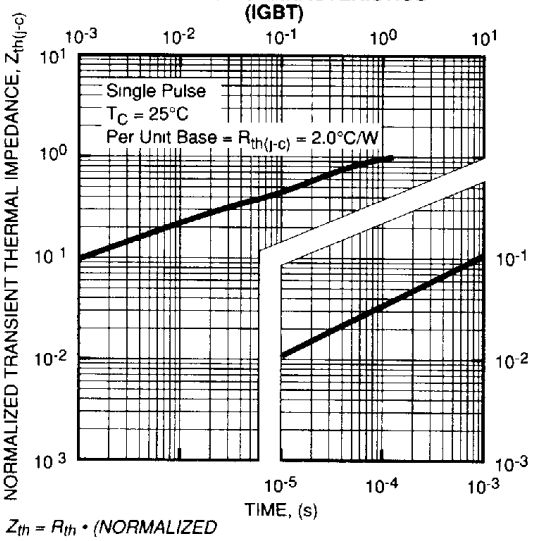
POWER DISSIPATION DERATING CURVE (PER IGBT ELEMENT)



POWER DISSIPATION DERATING CURVE (PER FWDi ELEMENT)

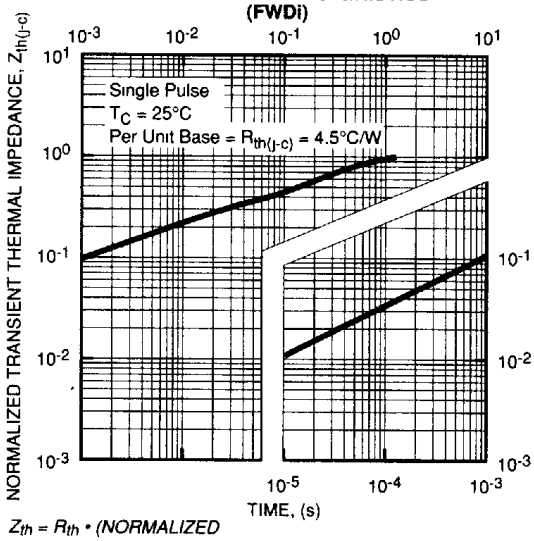


TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)



$Z_{th} = R_{th} \cdot$ *(NORMALIZED VALUE)*

TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDi)



$Z_{th} = R_{th} \cdot$ *(NORMALIZED VALUE)*

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Three Phase IGBT Inverter Output
20 Amperes/110-230 Volt Line

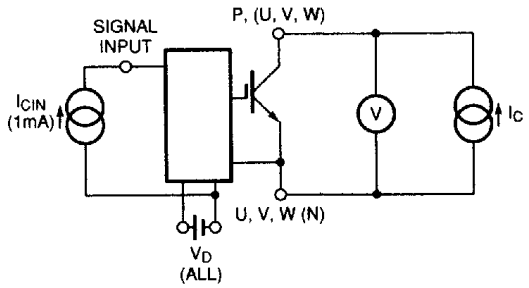


Figure 1 V_{CES} Test

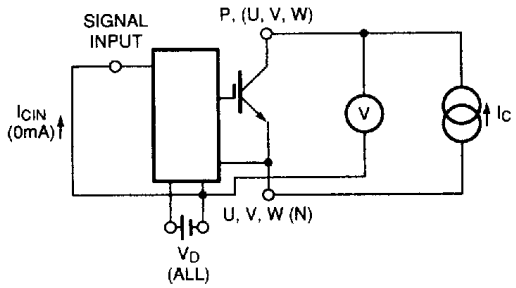


Figure 2 $V_{CE(SAT)}$ Test

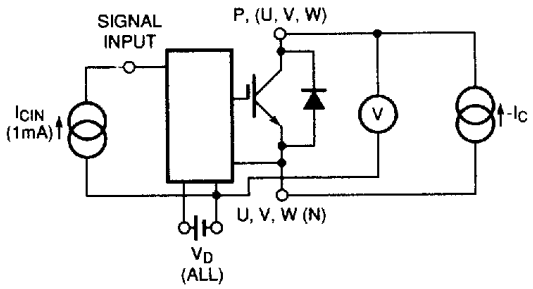


Figure 3 V_{EC} Test

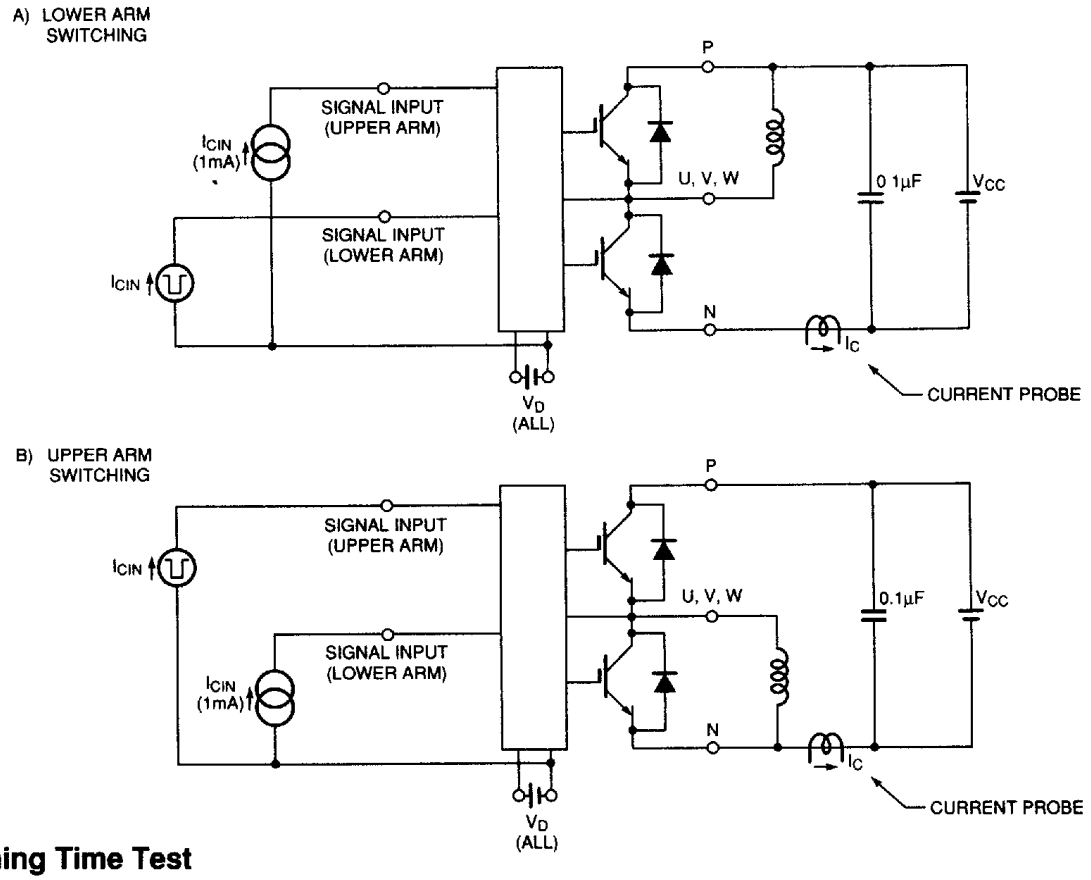


Figure 4 Switching Time Test

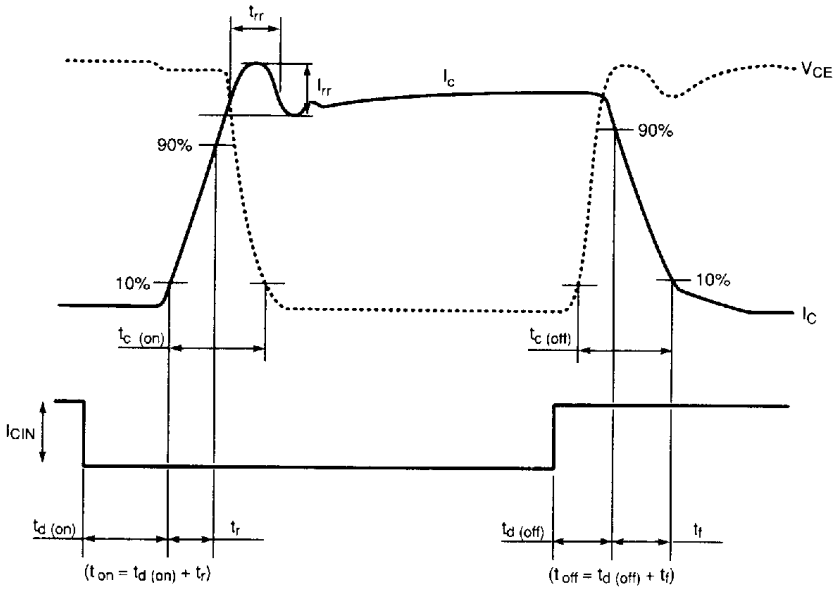


Figure 5 Switching Test Waveform

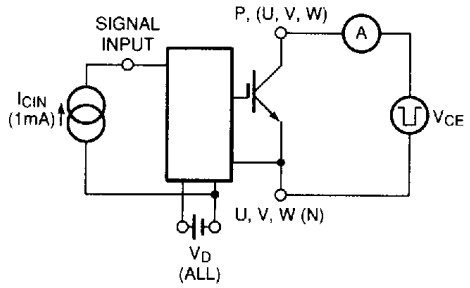


Figure 6 I_{CES} Test

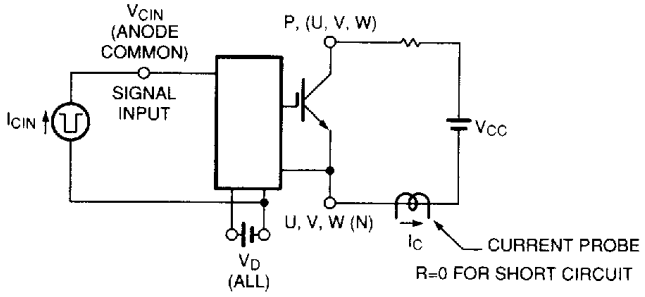


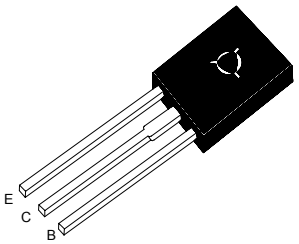
Figure 7 Over Current and Short Circuit Test

ST 2SD1691T

NPN Silicon Epitaxial Power Transistor

For Low-Frequencey Power Amplifiers and Mid-Speed Switching

The transistor is subdivided into three groups, M, L and K, according to its DC-DC current gain.



TO-126 Plastic Package

Absolute Maximum Ratings (T_a = 25 °C)

Parameter	Symbol	Value	Unit
Collector to Base Voltage	V_{CBO}	60	V
Collector to Emitter Voltage	V_{CEO}	60	V
Emitter to Base Voltage	V_{EBO}	7	V
Collector Current	$I_{C(DC)}$	5	A
Base Current	$I_{B(DC)}$	1	A
Collector Current (pulse) [1)]	$I_{C(pulse)}$	8	A
Total power dissipation (T_a = 25 °C)	P_{tot}	1.3	W
Total power dissipation (T_c = 25 °C)	P_{tot}	20	W
Junction Temperature	T_j	150	°C
Storage Temperature Range	T_S	-55 to +150	°C

[1)] PW ≦ 10ms, duty cycle ≦ 50%.

Characteristics at T_a = 25 °C

Parameter		Symbol	Min.	Max.	Unit
DC Current Gain at V_{CE} = 1 V, I_C = 2 A					
Current Gain Group	M	h_{FE}	100	200	-
	L	h_{FE}	160	320	-
	K	h_{FE}	200	400	-
at V_{CE} = 1 V, I_C = 0.1 A		h_{FE}	60	-	-
at V_{CE} = 1 V, I_C = 5 A		h_{FE}	50	-	-
Collector Cutoff Current at V_{CB} = 50 V		I_{CBO}	-	10	µA
Emitter Cutoff Current at V_{EB} = 7 V		I_{EBO}	-	10	µA
Base Saturation Voltage at I_C = 2 A, I_B = 0.2 A		$V_{BE(sat)}$	-	1.2	V
Collector Saturation Voltage at I_C = 2 A, I_B = 0.2 A		$V_{CE(sat)}$	-	0.3	V
Turn-on time	at I_C = 2 A, I_{B1} = -I_{B2} = 0.2 A, R_L = 5 Ω, V_{CC} = 10 V	T_{on}	-	1	µs
Storage time		T_{stg}	-	2.5	µs
Fall time		t_f	-	1	µs

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Dated : 22/03/2006

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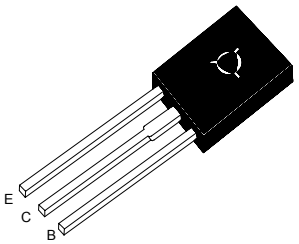

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Storage time		T_{stg}	-	2.5	µs
Fall time		t_f	-	1	µs

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