MOTOROLA
SEMICONDUCTOR TECHNICAL DATA

Order this document
by MJ11028/D

NPN
MJ11028
MJ11030
MJ11032*
PNP
MJ11029
MJ11031
MJ11033*

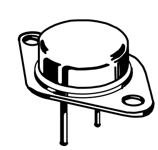
*Motorola Preferred Device

High-Current Complementary Silicon Transistors

. . . for use as output devices in complementary general purpose amplifier applications.

- High DC Current Gain — h_{FE} = 1000 (Min) @ I_C = 25 Adc
  h_{FE} = 400 (Min) @ I_C = 50 Adc
- Curves to 100 A (Pulsed)
- Diode Protection to Rated I_C
- Monolithic Construction with Built–In Base–Emitter Shunt Resistor
- Junction Temperature to +200°C

50 AMPERE COMPLEMENTARY SILICON DARLINGTON POWER TRANSISTORS 60–120 VOLTS 300 WATTS



CASE 197A–05
TO–204AE (TO–3)

MAXIMUM RATINGS

Rating	Symbol	MJ11028 MJ11029	MJ11030 MJ11031	MJ11032 MJ11033	Unit
Collector–Emitter Voltage	V_{CEO}	60	90	120	Vdc
Collector–Base Voltage	V_{CB}	60	90	120	Vdc
Emitter–Base Voltage	V_{EB}	5			Vdc
Collector Current — Continuous Peak	I_C I_{CM}	50 100			Adc
Base Current — Continuous	I_B	2			Adc
Total Power Dissipation @ T_C = 25°C Derate above 25°C @ T_C = 100°C	P_D	300 1.71			Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–55 to +200			°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Maximum Lead Temperature for Soldering Purposes for ≤ 10 seconds	T_L	275	°C
Thermal Resistance Junction to Case	$R_{\theta JC}$	0.584	°C

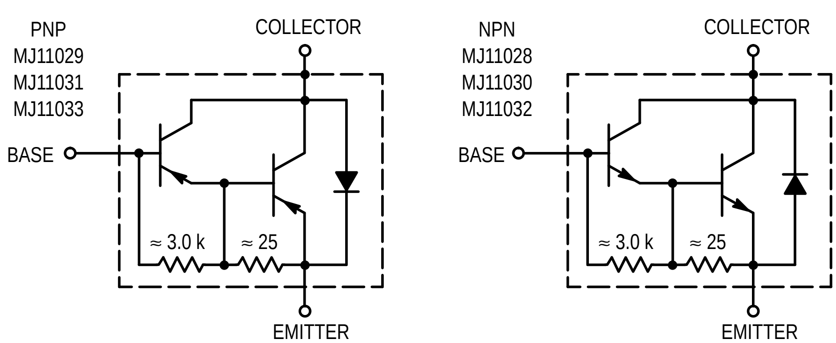


Figure 1. Darlington Circuit Schematic

Preferred devices are Motorola recommended choices for future use and best overall value.

MOTOROLA

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Breakdown Voltage (1) (I_C = 1 00 mAdc, I_B = 0)	MJ11028, MJ11029 MJ11030, MJ11031 MJ11032, MJ11033	$V_{(BR)CEO}$	60 90 120	— — —	Vdc
Collector–Emitter Leakage Current (V_{CE} = 60 Vdc, R_{BE} = 1 k ohm) (V_{CE} = 90 Vdc, R_{BE} = 1 k ohm) (V_{CE} = 120 Vdc, R_{BE} = 1 k ohm) (V_{CE} = 60 Vdc, R_{BE} = 1 k ohm, T_C = 150°C) (V_{CE} = 90 Vdc, R_{BE} = 1 k ohm, T_C = 150°C) (V_{CE} = 120 Vdc, R_{BE} = 1 k ohm, T_C = 150°C)	 MJ11028, MJ11029 MJ11030, MJ11031 MJ11032, MJ11033 MJ11028, MJ11029 MJ11030, MJ11031 MJ11032, MJ11033	I_{CER}	 — — — — — —	 2 2 2 10 10 10	mAdc
Emitter Cutoff Current (V_{BE} = 5 Vdc, I_C = 0)		I_{EBO}	—	5	mAdc
Collector–Emitter Leakage Current (V_{CE} = 50 Vdc, I_B = 0)		I_{CEO}	—	2	mAdc
ON CHARACTERISTICS (1)					
DC Current Gain (I_C = 25 Adc, V_{CE} = 5 Vdc) (I_C = 50 Adc, V_{CE} = 5 Vdc)		h_{FE}	 1 k 400	 18 k —	—
Collector–Emitter Saturation Voltage (I_C = 25 Adc, I_B = 250 mAdc) (I_C = 50 Adc, I_B = 500 mAdc)		$V_{CE(sat)}$	 — —	 2.5 3.5	Vdc
Base–Emitter Saturation Voltage (I_C = 25 Adc, I_B = 200 mAdc) (I_C = 50 Adc, I_B = 300 mAdc)		$V_{BE(sat)}$	 — —	 3.0 4.5	Vdc

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

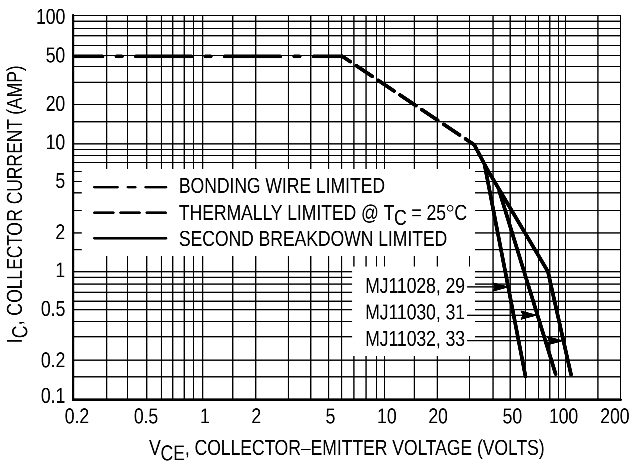


Figure 2. DC Safe Operating Area

There are two limitations on the power–handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate I_C – V_{CE} limits of the transistor that must be observed for reliable operation, i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 2 is based on $T_{J(pk)}$ = 200°C; T_C is variable depending on conditions. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

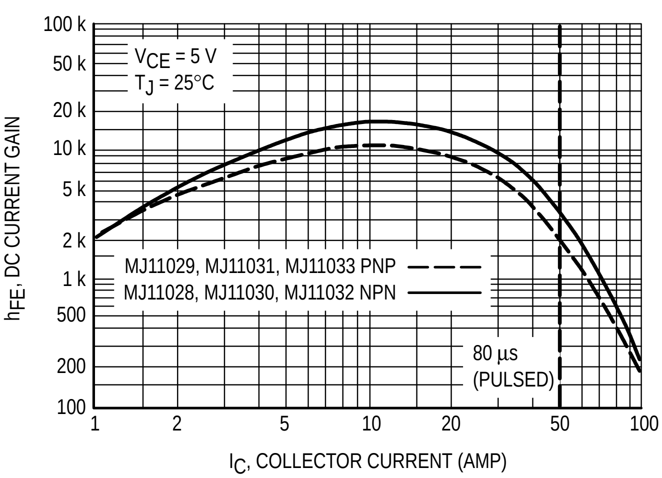


Figure 3. DC Current Gain

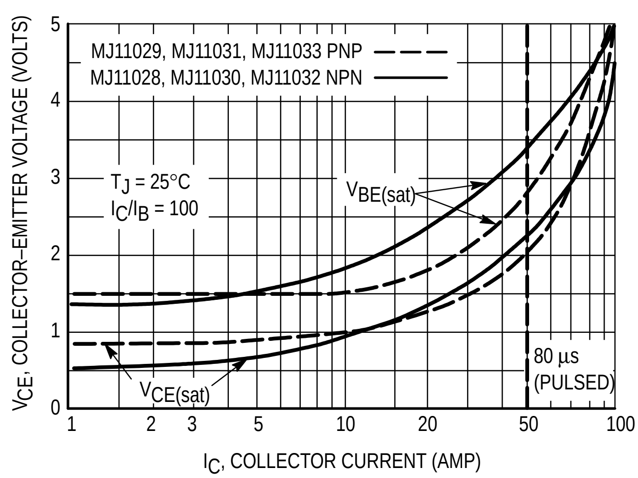
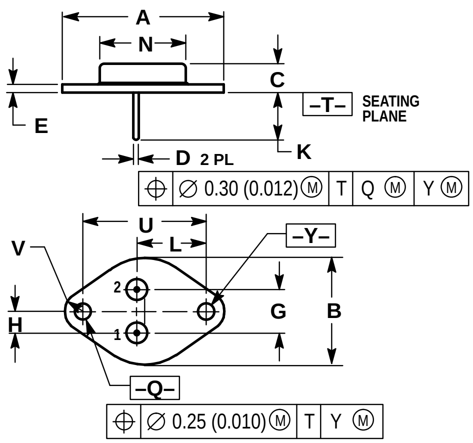


Figure 4. “On” Voltage

PACKAGE DIMENSIONS



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.530 REF		38.86 REF	
B	0.990	1.050	25.15	26.67
C	0.250	0.335	6.35	8.51
D	0.057	0.063	1.45	1.60
E	0.060	0.070	1.53	1.77
G	0.430 BSC		10.92 BSC	
H	0.215 BSC		5.46 BSC	
K	0.440	0.480	11.18	12.19
L	0.665 BSC		16.89 BSC	
N	0.760	0.830	19.31	21.08
Q	0.151	0.165	3.84	4.19
U	1.187 BSC		30.15 BSC	
V	0.131	0.188	3.33	4.77

STYLE 1:
PIN 1. BASE
2. EMITTER
CASE: COLLECTOR

CASE 197A–05
TO–204AE (TO–3)
ISSUE J

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