1A Standard Positive Voltage Regulator

General Description

- The LM78xx series is three terminal standard positive voltage regulator designed for a wide range of applications that required supply current up to 1A.
- The LM78xx series is available in 10 fixed output voltage:4.7V,5V,6V,7V,8V,9V,10V, 12V,15V,18V and 24V.
- The LM78xx series provides internal current limiting, thermal shutdown protection and Safe-area operation compensation which make them virtually immune from output load, and the output current could up to 1A if adequate heat sinking provide
- The LM78xx is available in TO-220,TO-220F,DPAK (TO-252) ,D^2PAK(TO-263)packages.

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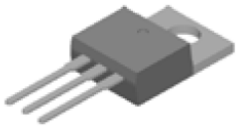
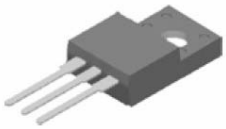


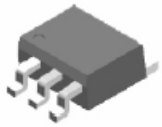
TO-220



TO-220F

DPAK
（TO-252）

D^2PAK
（TO-263-2）



D^2PAK
（TO-263-3）

Features

- Output Current up to 1A
- Maximum Input voltage up to 36V
- Output Voltage Accuracy of ±4% at 25°C
- Thermal Overload Protection
- Short Circuit Current Limiting
- Output Transistor safe operation area (SOA) Protection
- RoHS Compliance and Halogen Free

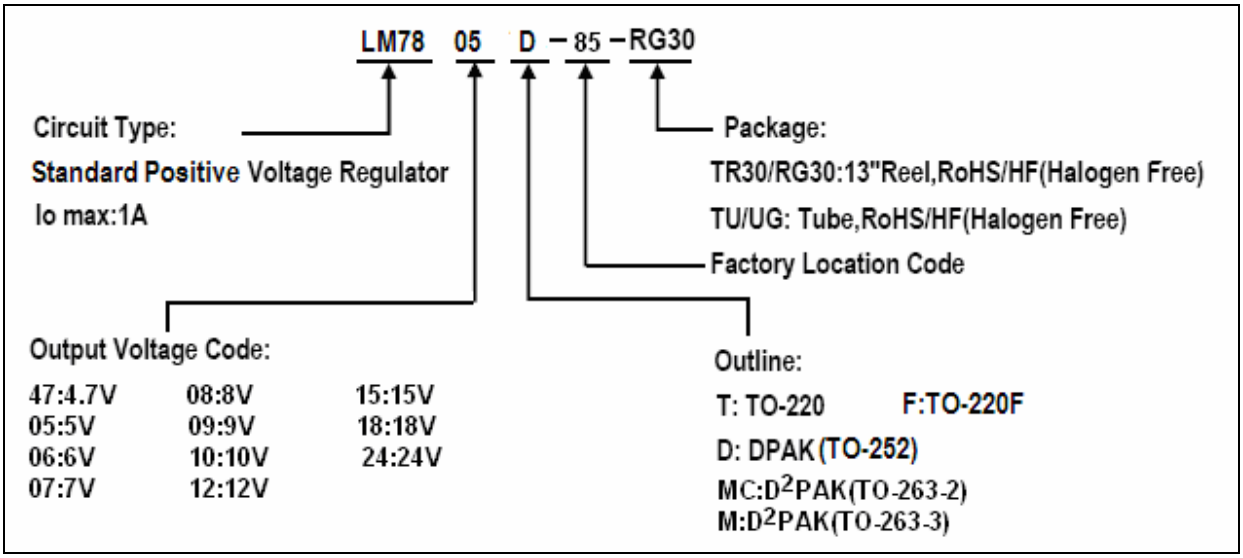
RoHS Compliant

HALOGEN FREE

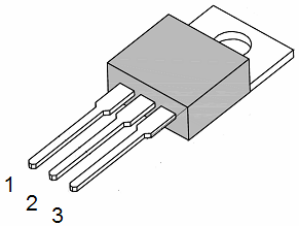
Applications

- High Efficiency Linear Regulator
- Post Regulation for Switching Supply
- Microprocessor Power Supply
- Mother Board

Ordering Information

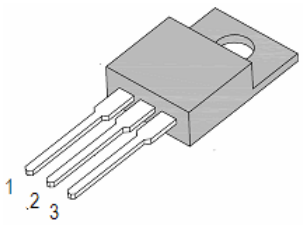


Pin Configuration



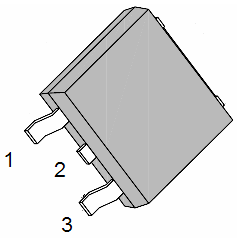
1: INPUT 2: GND 3: OUTPUT

TO-220



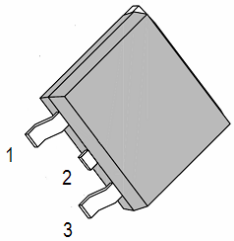
1: INPUT 2: GND 3: OUTPUT

TO-220F

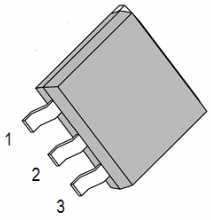


1: INPUT 2: GND 3: OUTPUT

DPAK
（TO-252）

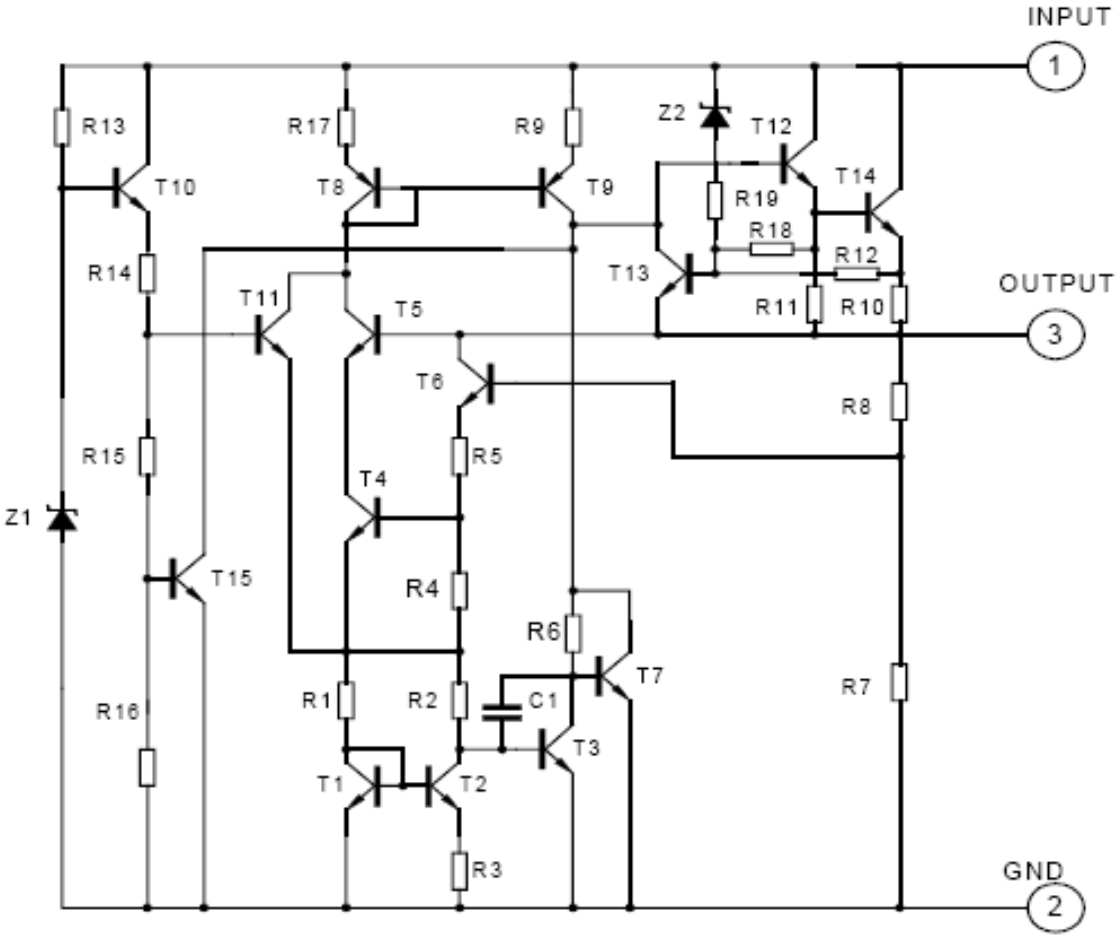


D^2PAK
（TO-263-2）



D^2PAK
（TO-263-3）

Functional Block Diagram



Absolute Maximum Ratings (Note 1)

Symbol	Description		Ratings	Unit
V_{IN}	Input Voltage	V_O=4.7~18V	35	V
		V_O=20~24V	40	
I_O	Output Current		1	A
P_D	Power Dissipation		Internally Limited	W
T_{LEAD}	Lead Temperature (Soldering 10sec)		260	°C
T_J	Operating Junction Temperature	D^2PAK	0 to 125	
		others	-20 to 150	
T_{STG}	Storage Temperature Range	D^2PAK	-40 to 150	
		others	-55 to 150	
θ_{JA}	Thermal Resistance (Junction to Ambient)	TO-220	65	°C/ W
		TO-220F		
		DPAK (TO-252)	61.54	
θ_{JC}	Thermal Resistance (Junction to Case)	TO-220	5	
		TO-220F		
		DPAK (TO-252)	7.48	

Note1: Absolute maximum ratings indicate limits beyond which damage to the device may occur. For guarantee specification and test conditions, see the Electrical Characteristics. the guarantee specification apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.

Electrical Characteristics (Io=0.5A,Tj=0~125°C, CIN=0.33μF, CO =0.1μF,unless otherwise specified,Note2)

For LM7847 (V_{IN}=9.7V, T_J = 25°C)

Symbol	Description	LM7847			Unit	Test Conditions
		Min.	Typ.	Max.		
V_O	Output Voltage	4.512	4.70	4.888	V	5mA≤ I_O≤1.0A
		4.465	-	4.935	V	7.2V≤V_{IN}≤19.7V, 5mA ≤I_O ≤1.0A
ΔV_{LOAD}	Load Regulation	-	-	47	mV	5mA ≤I_O ≤1.0A
		-	-	24	mV	0.25A≤I_O≤0.75A
ΔV_{LINE}	Line Regulation	-	-	47	mV	7.2V≤V_{IN}≤19.7V
		-	-	47	mV	7.2V≤V_{IN}≤19.7V,I_O=1.0A
V_D	Dropout Voltage	-	2.0	-	V	-
I_Q	Quiescent Current	-	-	8.0	mA	I_{OUT}≤1.0A
ΔI_Q	Quiescent Current Change	-	-	1.0	mA	7.2V≤V_{IN}≤19.7V
						5.8V≤V_{IN}≤18.3V
		-	-	0.5	mA	5mA≤ I_O≤1.0A
e_N	Output Noise Voltage	-	40	-	μV	10Hz≤f≤100KHz
$\Delta V_O/\Delta T$	Temperature coefficient of V_{OUT}	-	-0.6	-	mV/℃	I_O=5mA
PSRR	Power Supply Ripple Rejection Ratio	62	80	-	dB	7.7V≤V_{IN}≤17.7V, f=120Hz
I_{PEAK}	Peak Output Current	-	1.8	-	A	-
I_{SC}	Short-Circuit Current	-	250	-	mA	V_{IN}=35V

For LM7805 (V_{IN}=10V, T_J = 25°C)

Symbol	Description	LM7805			Unit	Test Conditions
		Min.	Typ.	Max.		
V_O	Output Voltage	4.80	5.0	5.20	V	5mA ≤I_O≤1.0A
		4.75	-	5.25	V	7.5V≤V_{IN}≤20V, 5mA ≤I_O≤1.0A
ΔV_{LOAD}	Load Regulation	-	-	50	mV	5mA ≤I_O≤1.0A
		-	-	25	mV	0.25A≤ I_O ≤0.75A
ΔV_{LINE}	Line Regulation	-	-	50	mV	7.0V≤V_{IN}≤25V
		-	-	50	mV	7.5V≤V_{IN}≤20V,I_O=1.0A
V_D	Dropout Voltage	-	2.0	-	V	-
I_Q	Quiescent Current	-	-	8.0	mA	I_O≤1.0A
ΔI_Q	Quiescent Current Change	-	-	1.0	mA	7.5V≤V_{IN}≤20V
		-	-	0.5	mA	5mA ≤I_O≤1.0A
e_N	Output Noise Voltage	-	40	-	μV	10Hz≤f≤100KHz
$\Delta V_O/\Delta T$	Temperature coefficient of V_{OUT}	-	-0.6	-	mV/℃	I_{OUT}=5mA

PSRR	Power Supply Ripple Rejection Ratio	62	80	-	dB	8V≤V_{IN}≤18V, f=120Hz
I_{PEAK}	Peak Output Current	-	1.8	-	A	-
I_{SC}	Short-Circuit Current	-	250	-	mA	V_{IN}=35V

For LM7806 (V_{IN}=11V, T_J = 25°C)

Symbol	Description	LM7806			Unit	Test Conditions
		Min.	Typ.	Max.		
V_O	Output Voltage	5.76	6.0	6.24	V	5mA ≤I_O≤1.0A
		5.7	-	6.3	V	8.5V≤V_{IN}≤21V, 5mA ≤I_O≤1.0A
ΔV_{LOAD}	Load Regulation	-	-	60	mV	5mA ≤I_O≤1.0A
		-	-	30	mV	0.25A≤ I_O ≤0.75A
ΔV_{LINE}	Line Regulation	-	-	60	mV	8.0V≤V_{IN}≤25V
		-	-	60	mV	8.5V≤V_{IN}≤21V,I_O=1.0A
I_Q	Quiescent Current	-	-	8.0	mA	I_{OUT}≤1.0A
ΔI_Q	Quiescent Current Change	-	-	1.0	mA	7.5V≤V_{IN}≤20V
		-	-	0.5	mA	I_O=5mA-1.0A
eN	Output Noise Voltage	-	40	-	μV	10Hz≤f≤100KHz
$\Delta V_O/\Delta T$	Temperature coefficient of V_{OUT}	-	-0.7	-	mV/℃	I_O=5mA
PSRR	Power Supply Ripple Rejection Ratio	62	80	-	dB	9V≤V_{IN}≤19V, f=120Hz
I_{PEAK}	Peak Output Current	-	1.8	-	A	-
I_{SC}	Short-Circuit Current	-	250	-	mA	V_{IN}=35V
V_D	Dropout Voltage	-	2.0	-	V	-

For LM7807 (V_{IN}=13V, T_J = 25°C)

Symbol	Description	LM7807			Unit	Test Conditions
		Min.	Typ.	Max.		
V_O	Output Voltage	6.72	7.0	7.28	V	5mA ≤I_O≤1.0A
		6.65	-	7.35	V	9.5V≤V_{IN}≤22V, 5mA ≤I_O≤1.0A
ΔV_{LOAD}	Load Regulation	-	-	70	mV	5mA ≤I_O≤1.0A
		-	-	35	mV	0.25A≤ I_O ≤0.75A
ΔV_{LINE}	Line Regulation	-	-	70	mV	9.0V≤V_{IN}≤25V
		-	-	70	mV	9.5V≤V_{IN}≤22V,I_O=1.0A
V_D	Dropout Voltage	-	2.0	-	V	-
I_Q	Quiescent Current	-	-	8.0	mA	I_O≤1.0A
ΔI_Q	Quiescent Current Change	-	-	1.0	mA	9.5V≤V_{IN}≤22V
		-	-	0.5	mA	I_O=5mA-1.0A
eN	Output Noise Voltage	-	50	-	μV	10Hz≤f≤100KHz
$\Delta V_O/\Delta T$	Temperature coefficient of V_{OUT}	-	-0.8	-	mV/℃	I_O=5mA

PSRR	Power Supply Ripple Rejection Ratio	59	75	-	dB	9V≤V_{IN}≤19V, f=120Hz
I_{PEAK}	Peak Output Current	-	1.8	-	A	-
I_{SC}	Short-Circuit Current	-	250	-	mA	V_{IN}=35V

For LM7808 (V_{IN}=14V, T_J = 25°C)

Symbol	Description	LM7808			Unit	Test Conditions
		Min.	Typ.	Max.		
V_O	Output Voltage	7.68	8.0	8.32	V	5mA ≤I_O≤1.0A
		7.6	-	8.4	V	10.5V≤V_{IN}≤23V, 5mA ≤I_O≤1.0A
ΔV_{LOAD}	Load Regulation	-	-	80	mV	5mA ≤I_O≤1.0A
		-	-	40	mV	0.25A≤ I_O ≤0.75A
ΔV_{LINE}	Line Regulation	-	-	80	mV	10.5V≤V_{IN}≤25V
		-	-	80	mV	10.5V≤V_{IN}≤23V,I_O=1.0A
V_D	Dropout Voltage	-	2.0	-	V	-
I_Q	Quiescent Current	-	-	8.0	mA	I_O≤1.0A
ΔI_Q	Quiescent Current Change	-	-	1.0	mA	9.5V≤V_{IN}≤22V
		-	-	0.5	mA	5mA ≤I_O≤1.0A
eN	Output Noise Voltage	-	58	-	μV	10Hz≤f≤100KHz
$\Delta V_O/\Delta T$	Temperature coefficient of V_{OUT}	-	-0.9	-	mV/℃	I_O=5mA
PSRR	Power Supply Ripple Rejection Ratio	56	72	-	dB	11.5V≤V_{IN}≤21.5V, f=120Hz
I_{PEAK}	Peak Output Current	-	1.8	-	A	-
I_{SC}	Short-Circuit Current	-	250	-	mA	V_{IN}=35V

For LM7809 (V_{IN}=15V, T_J = 25°C)

Symbol	Description	LM7809			Unit	Test Conditions
		Min.	Typ.	Max.		
V_O	Output Voltage	8.64	9.0	9.36	V	5mA ≤I_O≤1.0A
		8.55	-	9.45	V	10.5V≤V_{IN}≤23V, 5mA ≤I_O≤1.0A
ΔV_{LOAD}	Load Regulation	-	-	90	mV	5mA ≤I_O≤1.0A
		-	-	45	mV	0.25A≤ I_O ≤0.75A
ΔV_{LINE}	Line Regulation	-	-	90	mV	11.5V≤V_{IN}≤25V
		-	-	90	mV	11.5V≤V_{IN}≤24V,I_O=1.0A
V_D	Dropout Voltage	-	2.0	-	V	-
I_Q	Quiescent Current	-	-	8.0	mA	I_O≤1.0A
ΔI_Q	Quiescent Current Change	-	-	1.0	mA	11.5V≤V_{IN}≤24V
		-	-	0.5	mA	5mA ≤I_O≤1.0A
eN	Output Noise Voltage	-	58	-	μV	10Hz≤f≤100KHz
$\Delta V_O/\Delta T$	Temperature coefficient of V_{OUT}	-	-1.1	-	mV/℃	I_O=5mA

PSRR	Power Supply Ripple Rejection Ratio	56	72	-	dB	12.5V≤V_{IN}≤22.5V, f=120Hz
I_{PEAK}	Peak Output Current	-	1.8	-	A	-
I_{SC}	Short-Circuit Current	-	250	-	mA	V_{IN}=35V

For LM7810 (V_{IN}=16V, T_J = 25°C)

Symbol	Description	LM7810			Unit	Test Conditions
		Min.	Typ.	Max.		
V_O	Output Voltage	9.60	10.0	10.40	V	5mA ≤I_O≤1.0A
		9.5	-	10.5	V	12.5V≤V_{IN}≤25V, I_O=5mA-1.0A
ΔV_{LOAD}	Load Regulation	-	-	100	mV	5mA ≤I_O≤1.0A
		-	-	50	mV	0.25A≤ I_O ≤0.75A
ΔV_{LINE}	Line Regulation	-	-	100	mV	13V≤V_{IN}≤25V
		-	-	100	mV	13V≤V_{IN}≤25V,I_O=1.0A
I_Q	Quiescent Current	-	-	8.0	mA	I_O≤1.0A
ΔI_Q	Quiescent Current Change	-	-	1.0	mA	12.6V≤V_{IN}≤25V
		-	-	0.5	mA	5mA ≤I_O≤1.0A
eN	Output Noise Voltage	-	58	-	μV	10Hz≤f≤100KHz
$\Delta V_O/\Delta T$	Temperature coefficient of V_{OUT}	-	-1.1	-	mV/℃	I_O=5mA
PSRR	Power Supply Ripple Rejection Ratio	56	72	-	dB	12.5V≤V_{IN}≤22.5V, f=120Hz
I_{PEAK}	Peak Output Current	-	1.8	-	A	-
I_{SC}	Short-Circuit Current	-	250	-	mA	V_{IN}=35V
V_D	Dropout Voltage	-	2.0	-	V	-

For LM7812 (V_{IN}=19V, T_J = 25°C)

Symbol	Description	LM7812			Unit	Test Conditions
		Min.	Typ.	Max.		
V_O	Output Voltage	11.52	12.0	12.48	V	5mA ≤I_O≤1.0A
		11.4	-	12.6	V	14.5V≤V_{IN}≤27V, 5mA ≤I_O≤1.0A
ΔV_{LOAD}	Load Regulation	-	-	120	mV	5mA ≤I_O≤1.0A
		-	-	60	mV	0.25A≤ I_O ≤0.75A
ΔV_{LINE}	Line Regulation	-	-	120	mV	14.5V≤V_{IN}≤30V
		-	-	120	mV	14.5V≤V_{IN}≤27V,I_O=1.0A
V_D	Dropout Voltage	-	2.0	-	V	-
I_Q	Quiescent Current	-	-	8.0	mA	I_O≤1.0A
ΔI_Q	Quiescent Current Change	-	-	1.0	mA	14.5V≤V_{IN}≤30V
		-	-	0.5	mA	5mA ≤I_O≤1.0A

eN	Output Noise Voltage	-	75	-	μV	10Hz≤f≤100KHz
ΔVo/ΔT	Temperature coefficient of V_{OUT}	-	-1.5	-	mV/℃	I_O=5mA
PSRR	Power Supply Ripple Rejection Ratio	56	72	-	dB	15V≤V_{IN}≤25V, f=120Hz
I_{PEAK}	Peak Output Current	-	1.8	-	A	-
I_{SC}	Short-Circuit Current	-	250	-	mA	V_{IN}=35V

For LM7815 (V_{IN}=23V, T_J= 25°C)

Symbol	Description	LM7815			Unit	Test Conditions
		Min.	Typ.	Max.		
V_O	Output Voltage	14.40	15.0	15.60	V	5mA ≤I_O≤1.0A
		14.25	-	15.75	V	17.5V≤V_{IN}≤30V, 5mA ≤I_O≤1.0A
ΔVLOAD	Load Regulation	-	-	150	mV	5mA ≤I_O≤1.0A
		-	-	75	mV	0.25A≤ I_O ≤0.75A
ΔVLINE	Line Regulation	-	-	150	mV	18.5V≤V_{IN}≤30V
		-	-	150	mV	17.8V≤V_{IN}≤30V,I_O=1.0A
V_D	Dropout Voltage	-	2.0	-	V	-
I_Q	Quiescent Current	-	-	8.0	mA	I_O≤1.0A
ΔIQ	Quiescent Current Change	-	-	1.0	mA	17.5V≤V_{IN}≤30V
		-	-	0.5	mA	5mA ≤I_O≤1.0A
eN	Output Noise Voltage	-	90	-	μV	10Hz≤f≤100KHz
ΔVo/ΔT	Temperature coefficient of V_{OUT}	-	-1.8	-	mV/℃	I_O=5mA
PSRR	Power Supply Ripple Rejection Ratio	54	70	-	dB	15V≤V_{IN}≤25V, f=120Hz
I_{PEAK}	Peak Output Current	-	1.8	-	A	-
I_{SC}	Short-Circuit Current	-	250	-	mA	V_{IN}=35V

For LM7818 (V_{IN}=27V, T_J= 25°C)

Symbol	Description	LM7818			Unit	Test Conditions
		Min.	Typ.	Max.		
V_O	Output Voltage	17.28	18.0	18.72	V	5mA ≤I_O≤1.0A
		17.1	-	18.9	V	21V≤V_{IN}≤33V, 5mA ≤I_O≤1.0A
ΔVLOAD	Load Regulation	-	-	180	mV	5mA ≤I_O≤1.0A
		-	-	90	mV	0.25A≤ I_O ≤0.75A
ΔVLINE	Line Regulation	-	-	180	mV	21V≤V_{IN}≤33V
		-	-	180	mV	21V≤V_{IN}≤33V,I_O=1.0A
V_D	Dropout Voltage	-	2.0	-	V	-
I_Q	Quiescent Current	-	-	8.0	mA	I_O≤1.0A
ΔIQ	Quiescent Current Change	-	-	1.0	mA	21.5V≤V_{IN}≤33V
		-	-	0.5	mA	5mA ≤I_O≤1.0A

eN	Output Noise Voltage	-	110	-	μV	10Hz≤f≤100KHz
ΔVo/ΔT	Temperature coefficient of V_{OUT}	-	-2.2	-	mV/℃	I_O=5mA
PSRR	Power Supply Ripple Rejection Ratio	53	69	-	dB	22V≤V_{IN}≤32V, f=120Hz
I_{PEAK}	Peak Output Current	-	1.8	-	A	-
Isc	Short-Circuit Current	-	250	-	mA	V_{IN}=35V

For LM7824 (V_{IN}=33V, Tj= 25°C)

Symbol	Description	LM7824			Unit	Test Conditions
		Min.	Typ.	Max.		
Vo	Output Voltage	23.04	24.0	24.96	V	5mA ≤I_O≤1.0A
		22.80	-	25.20	V	27V≤V_{IN}≤38V, 5mA ≤I_O≤1.0A
ΔV_{LOAD}	Load Regulation	-	-	240	mV	5mA ≤I_O≤1.0A
		-	-	120	mV	0.25A≤ I_O ≤0.75A
ΔV_{LINE}	Line Regulation	-	-	240	mV	21V≤V_{IN}≤33V
		-	-	240	mV	27V≤V_{IN}≤38V,I_O=1.0A
V_D	Dropout Voltage	-	2.0	-	V	-
I_Q	Quiescent Current	-	-	8.0	mA	I_O≤1.0A
ΔIQ	Quiescent Current Change	-	-	1.0	mA	28V≤V_{IN}≤38V
		-	-	0.5	mA	5mA ≤I_O≤1.0A
eN	Output Noise Voltage	-	170	-	μV	10Hz≤f≤100KHz
ΔVo/ΔT	Temperature coefficient of V_{OUT}	-	-2.8	-	mV/℃	I_O=5mA
PSRR	Power Supply Ripple Rejection Ratio	50	66	-	dB	28V≤V_{IN}≤38V, f=120Hz
I_{PEAK}	Peak Output Current	-	1.8	-	A	-
Isc	Short-Circuit Current	-	250	-	mA	V_{IN}=35V

Note2: The Maximum steady state usable output current are dependent on the input voltage, heat sinking, lead length of the package and the copper pattern of the PCB. The data above represents pulse test conditions with junction temperature specified at the initiation of test.

Typical Characteristics Curves

Fig.1- Dropout Voltage vs. Junction Temperature

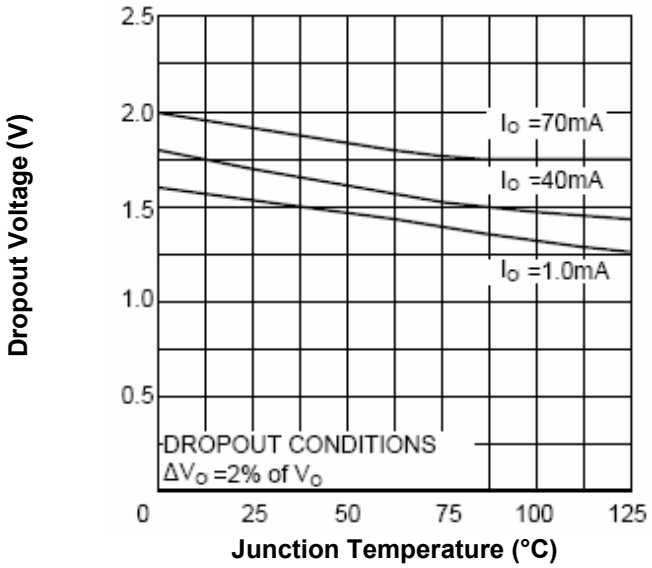


Fig.2- Output Voltage vs. Junction Temperature

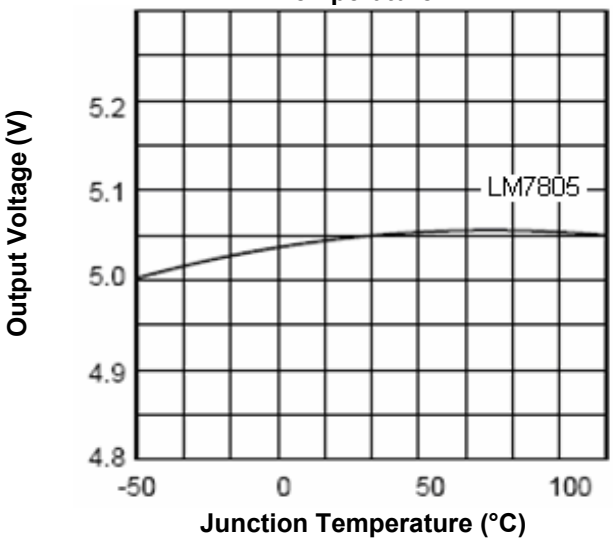


Fig.3- Power Dissipation vs. Junction Temperature

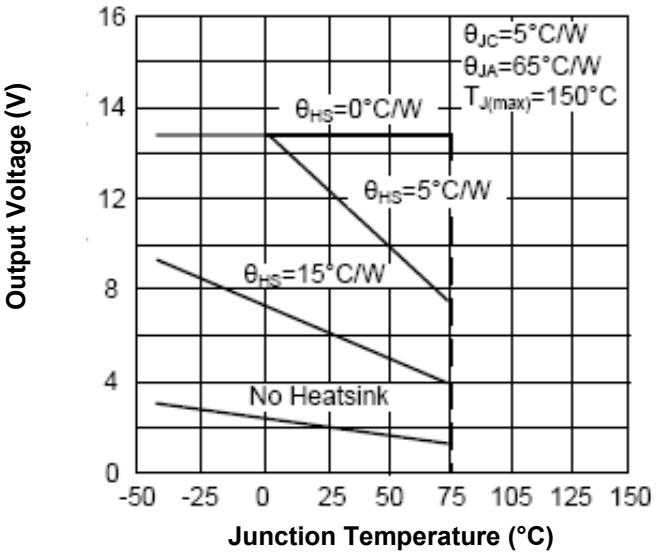
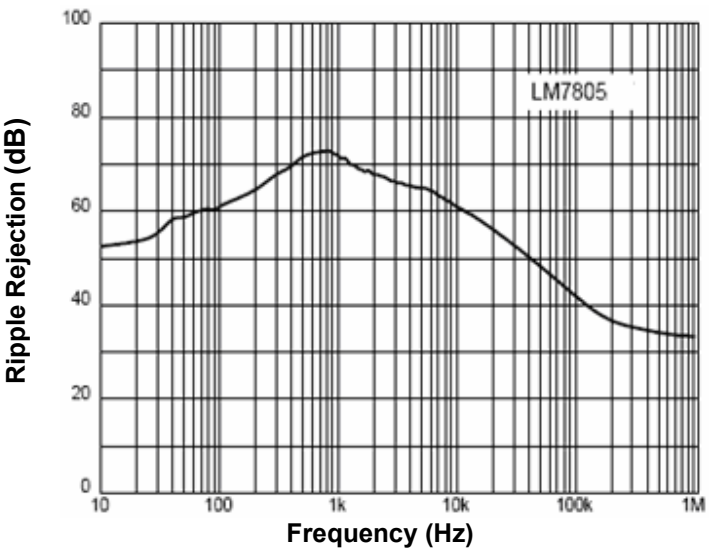


Fig.4- Ripple Rejection vs. Frequency



Typical Characteristics Curves (Continued)

Fig.5- Line Transient
(Conditions: Io=500mA, Co=0.1μF)

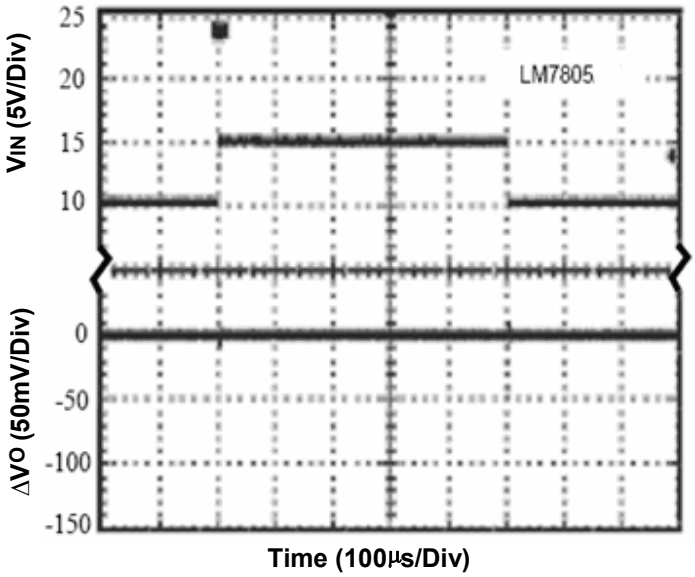
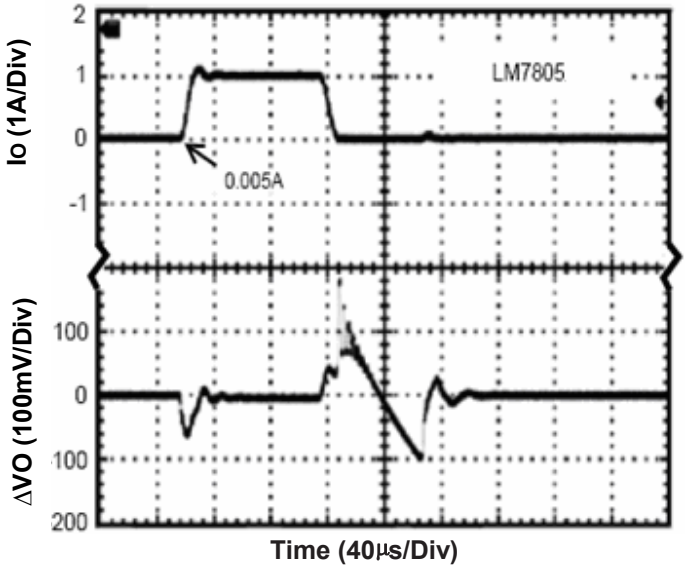
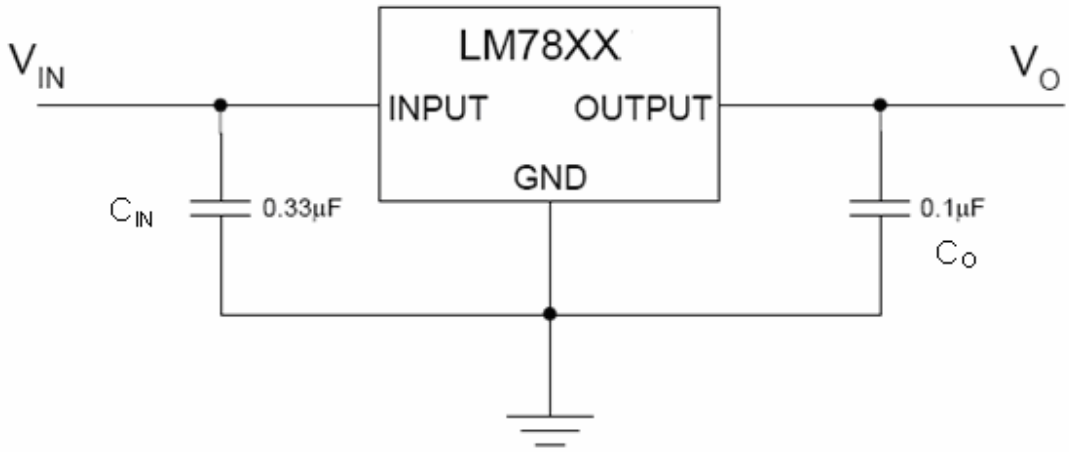


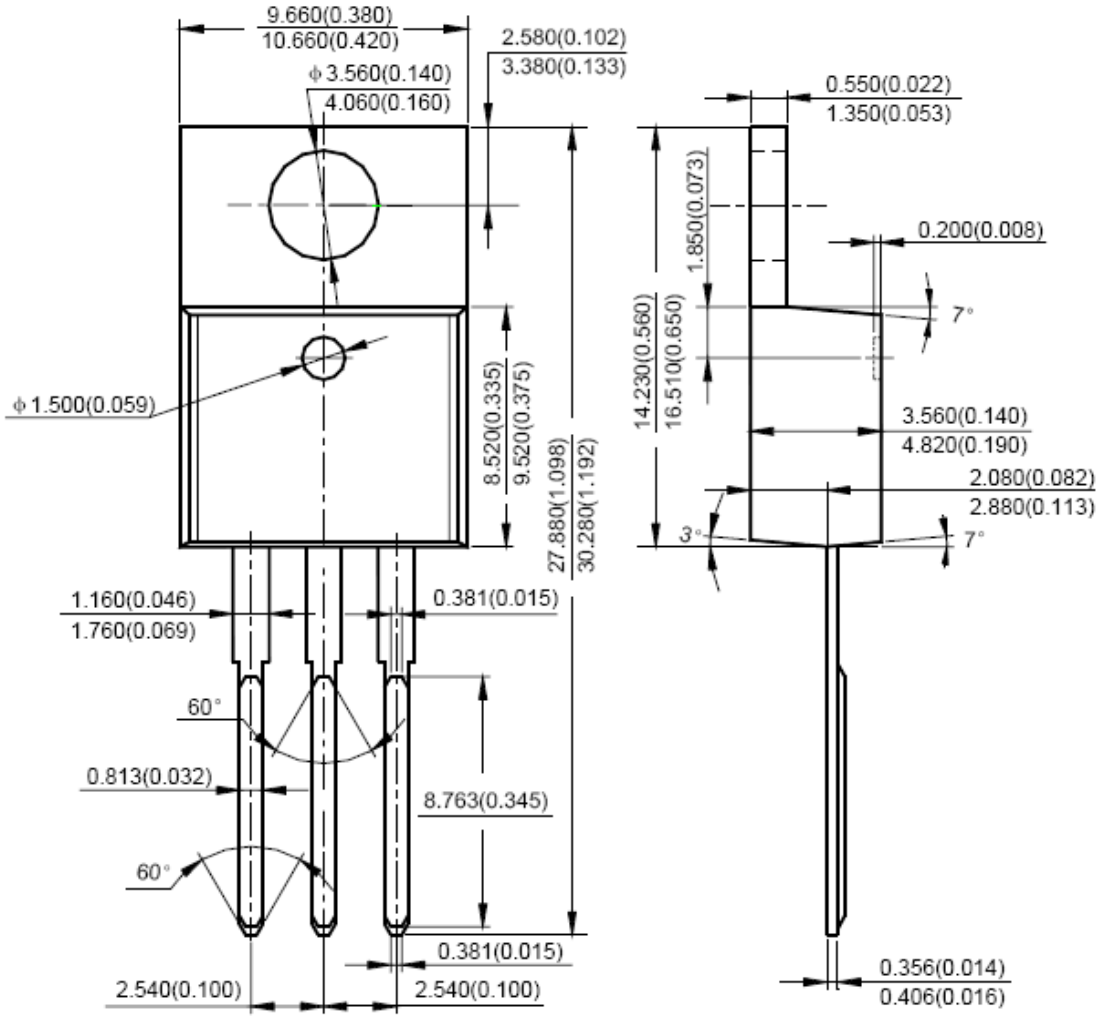
Fig.6- Load Transient
(Conditions: VIN=10V, CIN=0.33μF, Co=0.1μF)



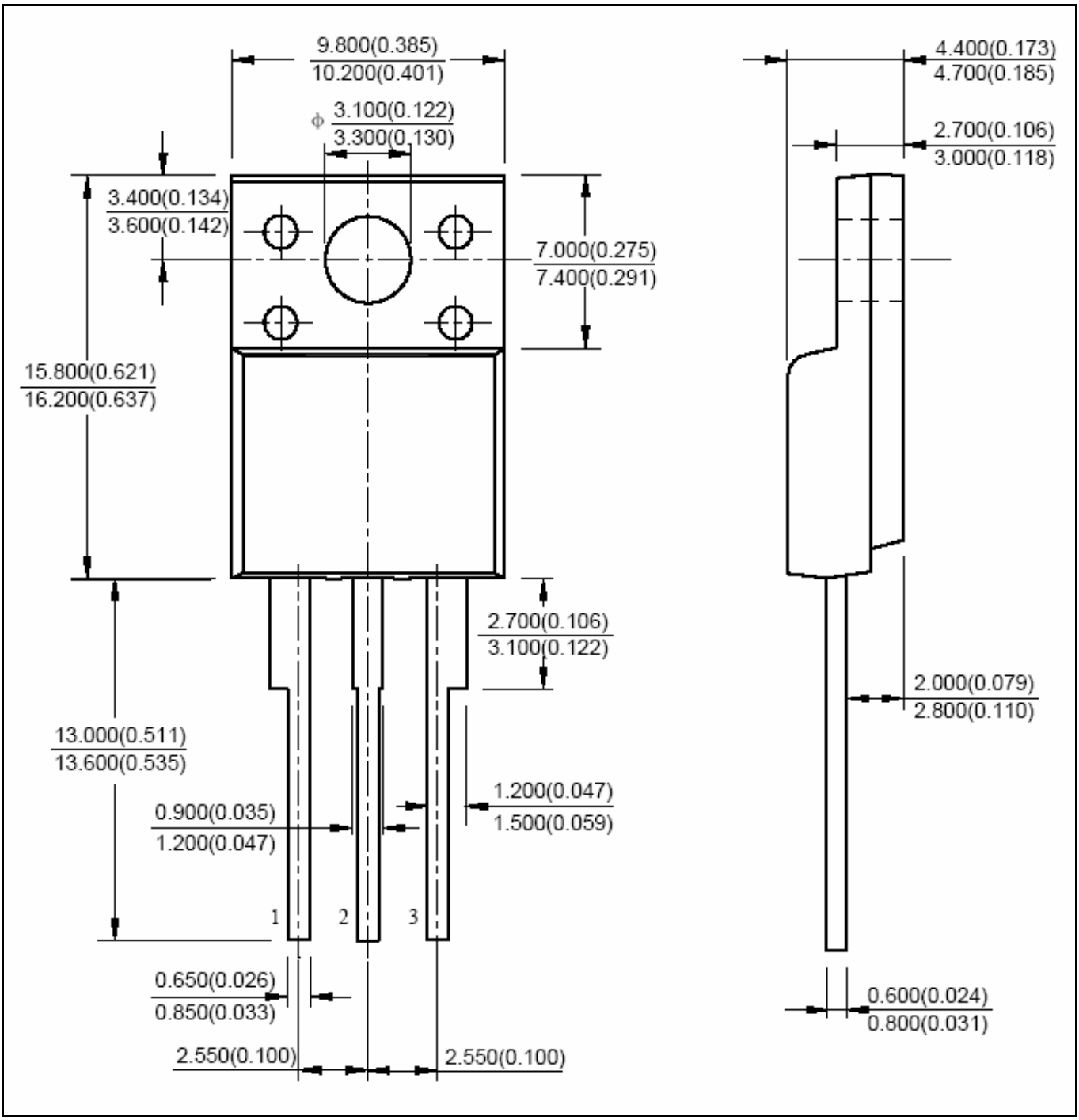
Typical Application



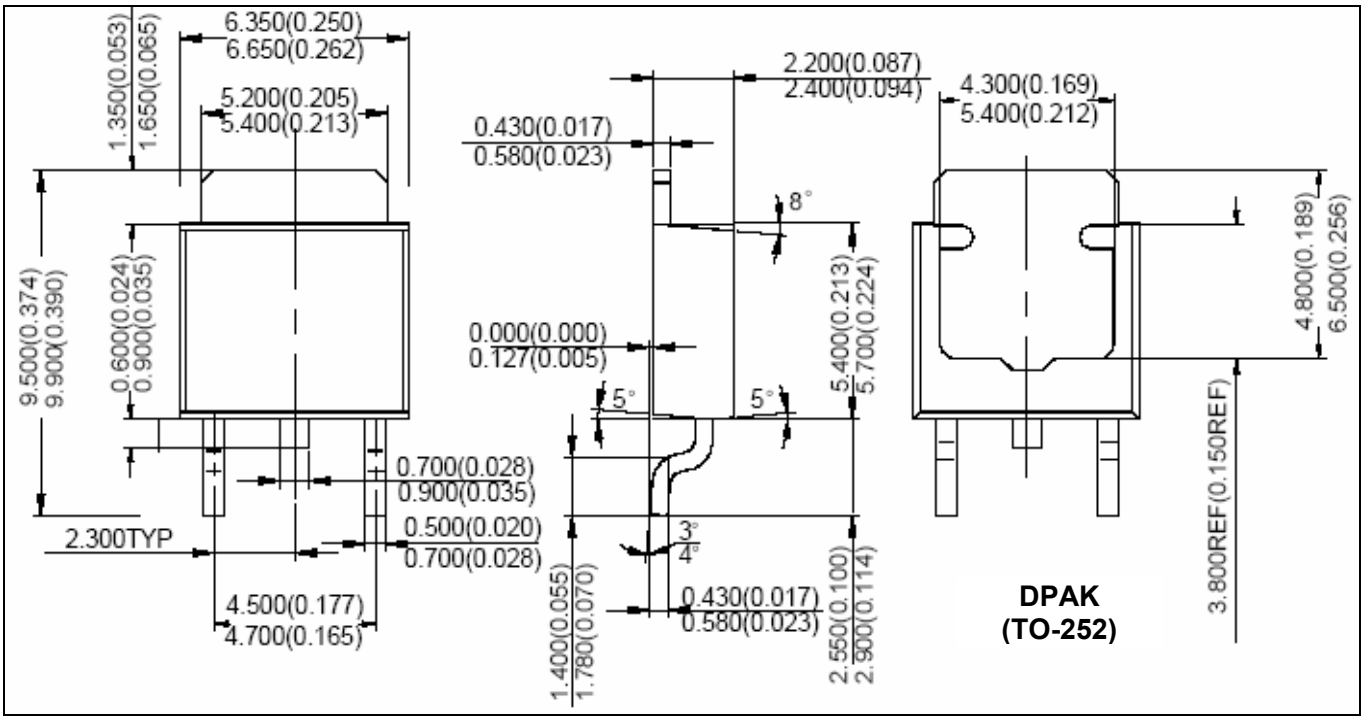
Dimensions in mm (inches)

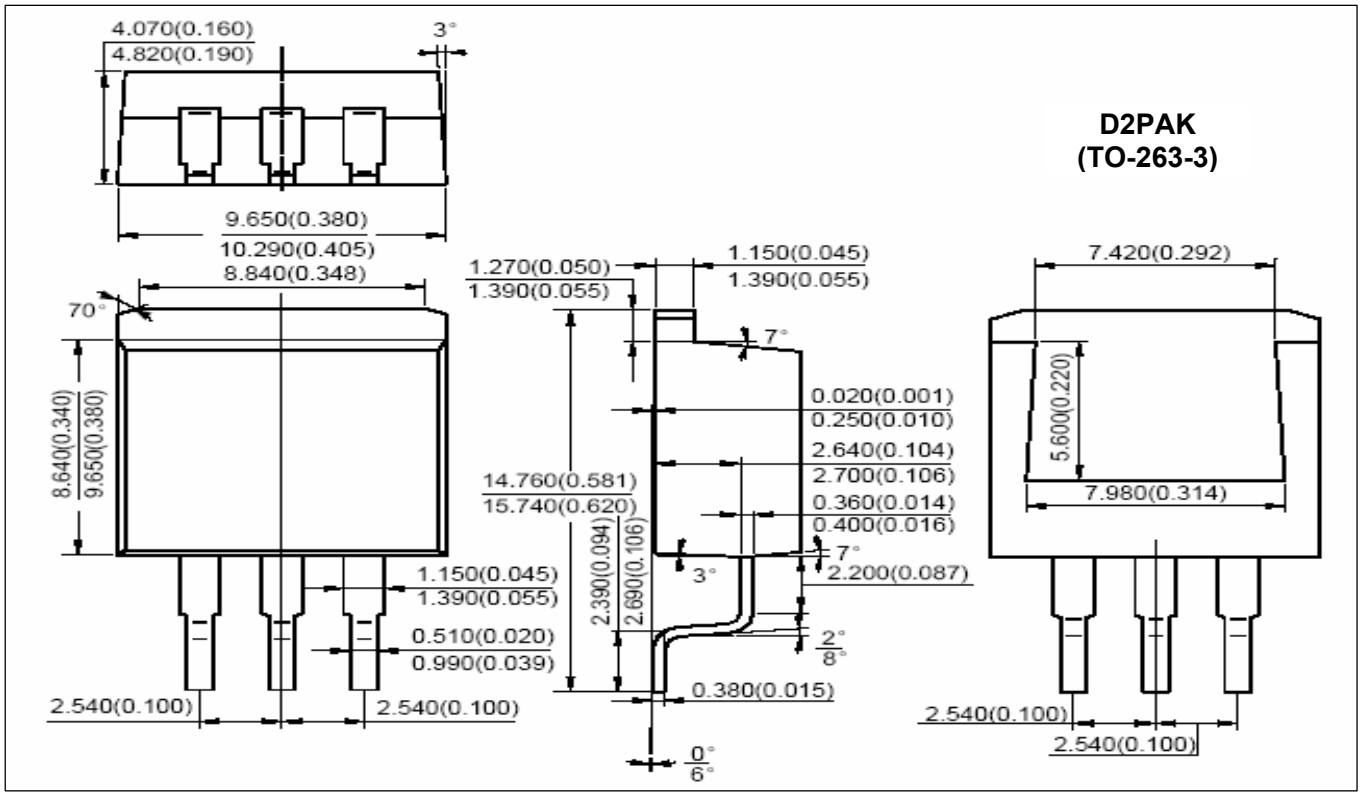


TO-220


9.800(0.385)
10.200(0.401)
ϕ 3.100(0.122)
3.300(0.130)
3.400(0.134)
3.600(0.142)
7.000(0.275)
7.400(0.291)
15.800(0.621)
16.200(0.637)
2.700(0.106)
3.100(0.122)
13.000(0.511)
13.600(0.535)
0.900(0.035)
1.200(0.047)
1.200(0.047)
1.500(0.059)
1
2
3
0.650(0.026)
0.850(0.033)
2.550(0.100)
2.550(0.100)
4.400(0.173)
4.700(0.185)
2.700(0.106)
3.000(0.118)
2.000(0.079)
2.800(0.110)
0.600(0.024)
0.800(0.031)

TO-220F


6.350(0.250)
6.650(0.262)
1.350(0.053)
1.650(0.065)
5.200(0.205)
5.400(0.213)
9.500(0.374)
9.900(0.390)
0.600(0.024)
0.900(0.035)
2.300TYP
0.700(0.028)
0.900(0.035)
0.500(0.020)
0.700(0.028)
4.500(0.177)
4.700(0.165)
2.200(0.087)
2.400(0.094)
0.430(0.017)
0.580(0.023)
8°
0.000(0.000)
0.127(0.005)
5°
5°
5.400(0.213)
5.700(0.224)
3°
4°
1.400(0.055)
1.780(0.070)
0.430(0.017)
0.580(0.023)
2.550(0.100)
2.900(0.114)
4.300(0.169)
5.400(0.212)
4.800(0.189)
6.500(0.256)
3.800REF(0.150REF)
DPAK
(TO-252)


4.070(0.160)
4.820(0.190)
3°
9.650(0.380)
10.290(0.405)
8.840(0.348)
70°
8.640(0.340)
9.650(0.380)
1.150(0.045)
1.390(0.055)
0.510(0.020)
0.990(0.039)
2.540(0.100)
2.540(0.100)
1.270(0.050)
1.390(0.055)
1.150(0.045)
1.390(0.055)
7°
0.020(0.001)
0.250(0.010)
2.640(0.104)
2.700(0.106)
14.760(0.581)
15.740(0.620)
0.360(0.014)
0.400(0.016)
7°
3°
2.200(0.087)
2.390(0.094)
2.690(0.106)
2°
8°
0.380(0.015)
0°
6°
D2PAK
(TO-263-3)
7.420(0.292)
5.600(0.220)
7.980(0.314)
2.540(0.100)
2.540(0.100)

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