MJD112 (NPN)
MJD117 (PNP)

Preferred Device

Complementary Darlington Power Transistors

DPAK For Surface Mount Applications

Designed for general purpose power and switching such as output or driver stages in applications such as switching regulators, converters, and power amplifiers.

Features

- Lead Formed for Surface Mount Applications in Plastic Sleeves (No Suffix)
- Straight Lead Version in Plastic Sleeves ("−1" Suffix)
- Electrically Similar to Popular TIP31 and TIP32 Series
- Pb−Free Packages are Available

MAXIMUM RATINGS

Rating	Symbol	Max	Unit
Collector−Emitter Voltage	V_{CEO}	100	Vdc
Collector−Base Voltage	V_{CB}	100	Vdc
Emitter−Base Voltage	V_{EB}	5	Vdc
Collector Current − Continuous − Peak	I_C	2 4	Adc
Base Current	I_B	50	mAdc
Total Power Dissipation @ T_C = 25°C Derate above 25°C	P_D	20 0.16	W W/°C
Total Power Dissipation (Note1) @ T_A = 25°C Derate above 25°C	P_D	1.75 0.014	W W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	6.25	°C/W
Thermal Resistance, Junction−to−Ambient (Note 1)	$R_{\theta JA}$	71.4	°C/W

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

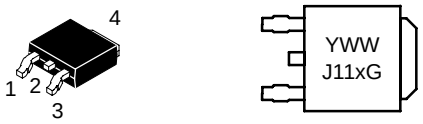
1. These ratings are applicable when surface mounted on the minimum pad sizes recommended.

ON Semiconductor®

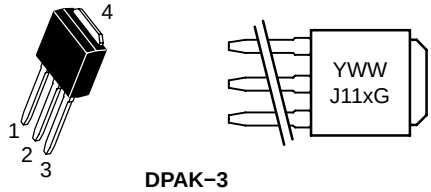
http://onsemi.com

SILICON
POWER TRANSISTORS
2 AMPERES
100 VOLTS, 20 WATTS

MARKING DIAGRAMS



DPAK
CASE 369C



DPAK−3
CASE 369D

Y = Year
WW = Work Week
x = 2 or 7
G = Pb−Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

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

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector−Emitter Sustaining Voltage (Note 2) (I_C = 30 mAdc, I_B = 0)		$V_{CEO(sus)}$	100	–	Vdc
Collector Cutoff Current (V_{CE} = 50 Vdc, I_B = 0)		I_{CEO}	–	20	μAdc
Collector Cutoff Current (V_{CB} = 100 Vdc, I_E = 0)		I_{CBO}	–	20	μAdc
Emitter Cutoff Current (V_{BE} = 5 Vdc, I_C = 0)		I_{EBO}	–	2	mAdc
Collector−Cutoff Current (V_{CB} = 80 Vdc, I_E = 0)		I_{CBO}	–	10	μAdc
Emitter−Cutoff Current (V_{BE} = 5 Vdc, I_C = 0)		I_{EBO}	–	2	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 0.5 Adc, V_{CE} = 3 Vdc) (I_C = 2 Adc, V_{CE} = 3 Vdc) (I_C = 4 Adc, V_{CE} = 3 Vdc)		h_{FE}	500 1000 200	– 12,000 –	–
Collector−Emitter Saturation Voltage (I_C = 2 Adc, I_B = 8 mAdc) (I_C = 4 Adc, I_B = 40 mAdc)		$V_{CE(sat)}$	– –	2 3	Vdc
Base−Emitter Saturation Voltage (I_C = 4 Adc, I_B = 40 mAdc)		$V_{BE(sat)}$	–	4	Vdc
Base−Emitter On Voltage (I_C = 2 Adc, V_{CE} = 3 Vdc)		$V_{BE(on)}$	–	2.8	Vdc
DYNAMIC CHARACTERISTICS					
Current−Gain − Bandwidth Product (I_C = 0.75 Adc, V_{CE} = 10 Vdc, f = 1 MHz)		f_T	25	–	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 0.1 MHz)	MJD117 MJD112	C_{ob}	– –	200 100	pF

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
*These ratings are applicable when surface mounted on the minimum pad sizes recommended.

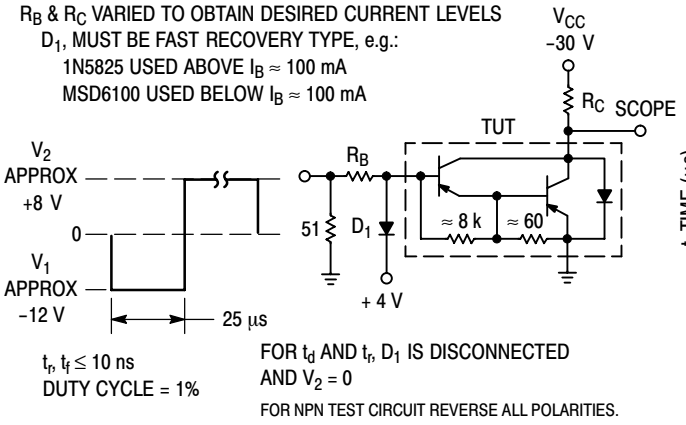


Figure 1. Switching Times Test Circuit

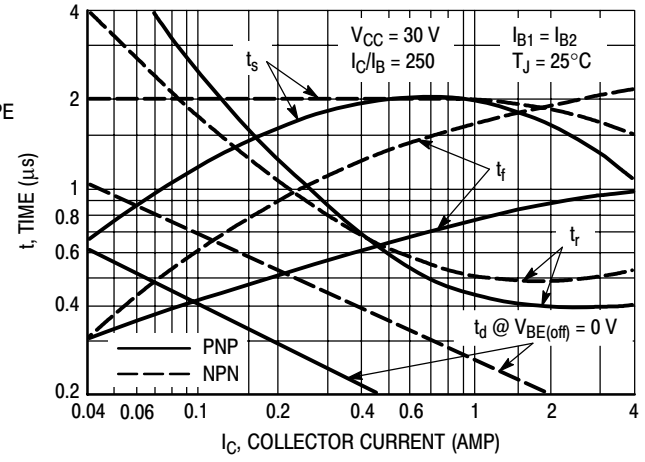


Figure 2. Switching Times

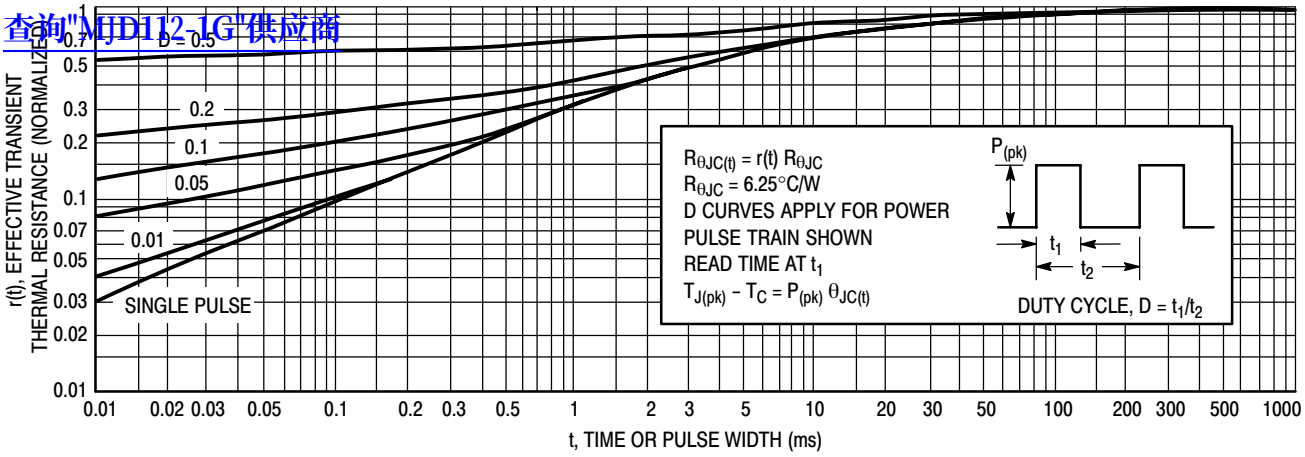


Figure 3. Thermal Response

ACTIVE−REGION SAFE−OPERATING AREA

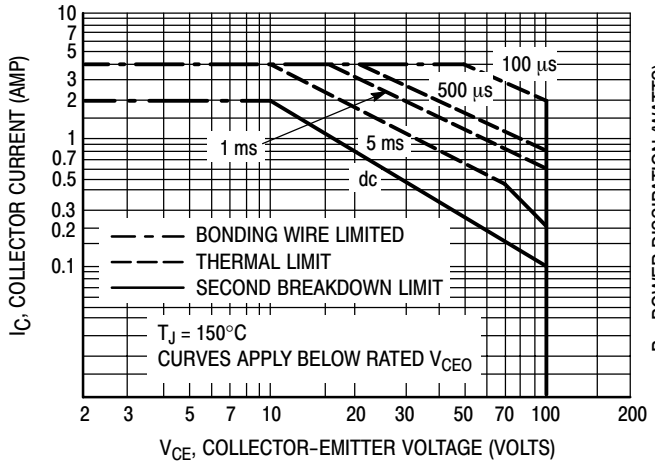


Figure 4. Maximum Rated Forward Biased Safe Operating Area

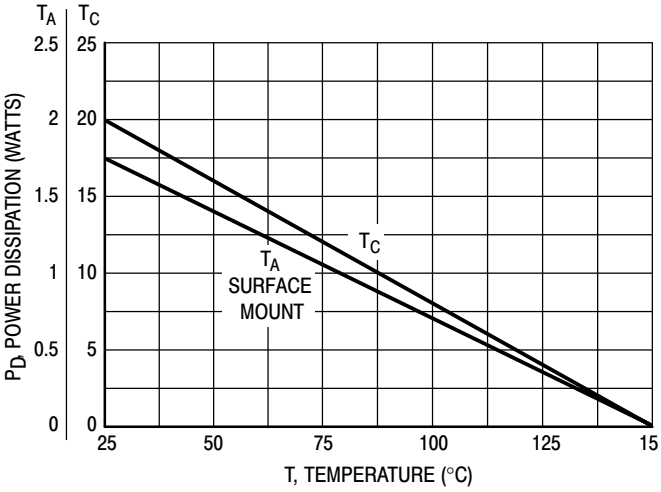


Figure 5. Power Derating

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 Figures 5 and 6 is based on $T_{J(pk)} = 150°C$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} < 150°C$. $T_{J(pk)}$ may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

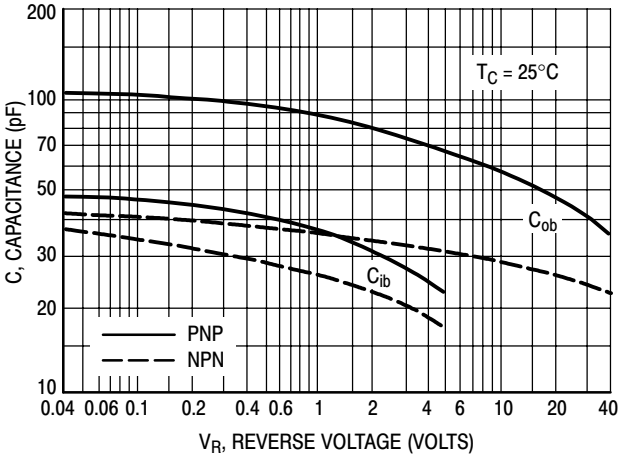
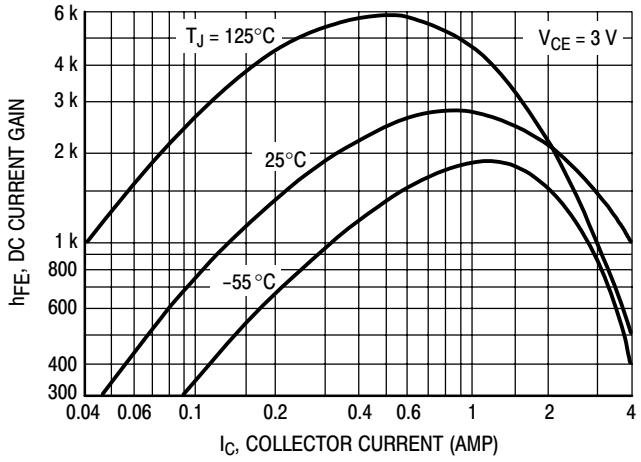


Figure 6. Capacitance

TYPICAL ELECTRICAL CHARACTERISTICS

NPN MJD112



PNP MJD117

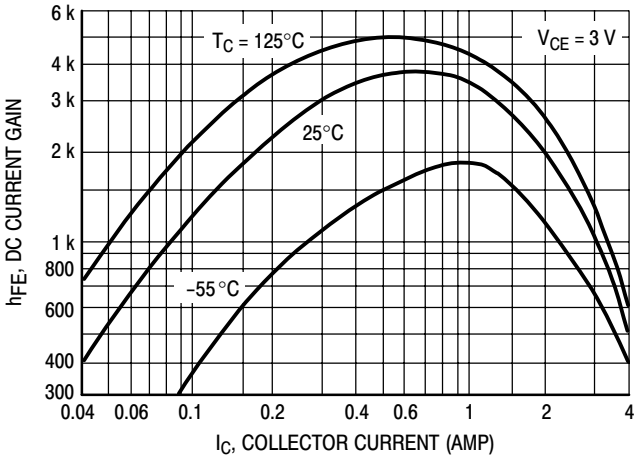
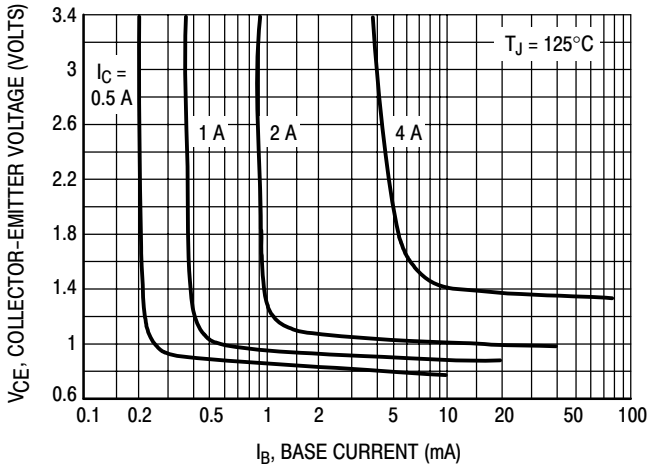


Figure 7. DC Current Gain



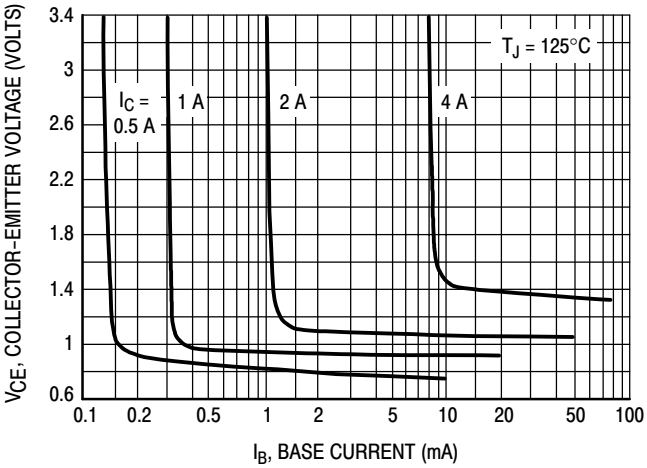
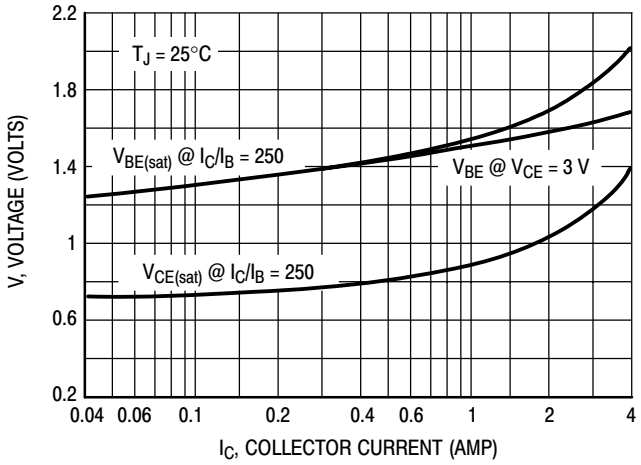


Figure 8. Collector Saturation Region



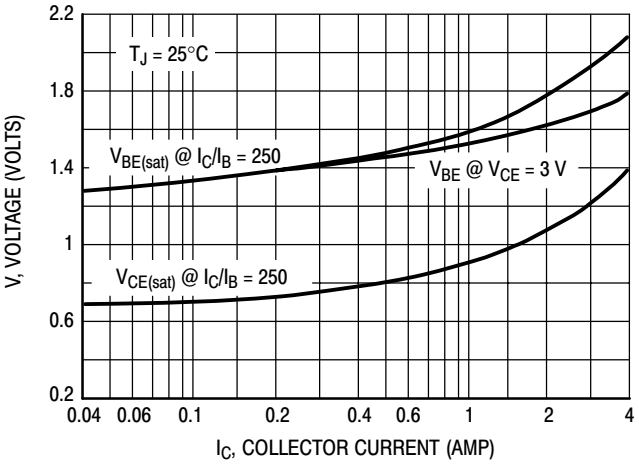


Figure 9. “On Voltages

NPN MJD112 PNP MJD117

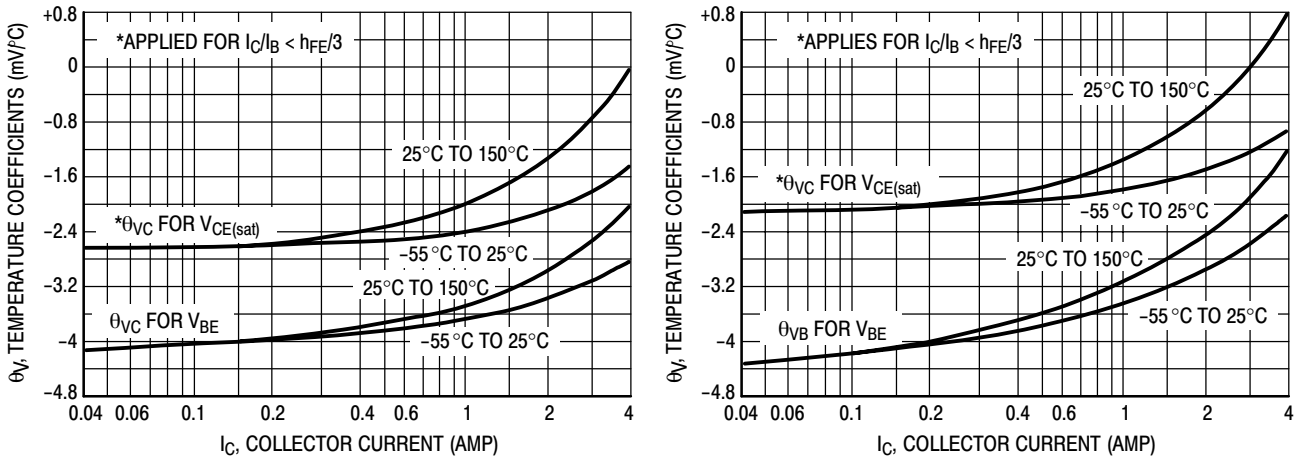


Figure 10. Temperature Coefficients

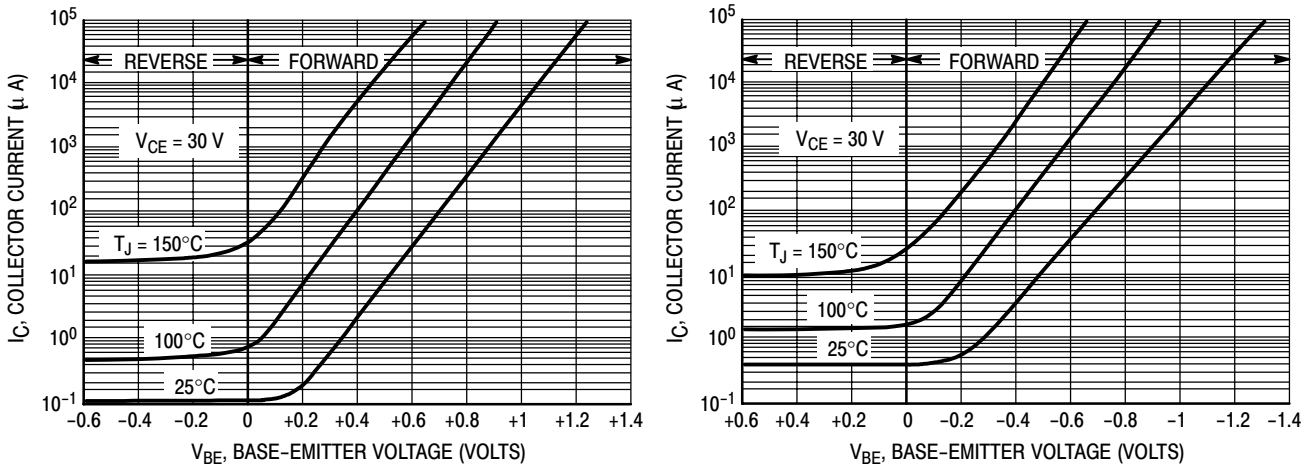


Figure 11. Collector Cut−Off Region

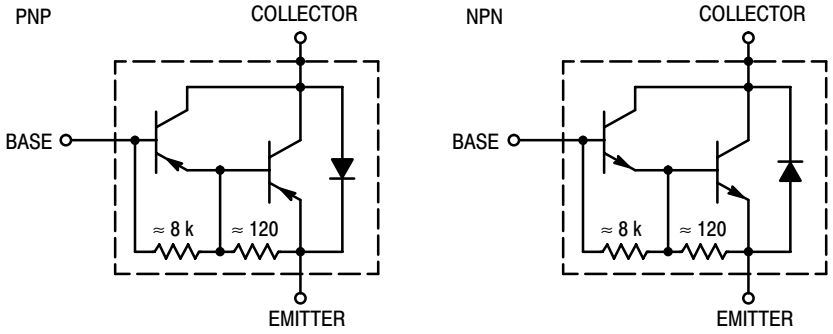


Figure 12. Darlington Schematic

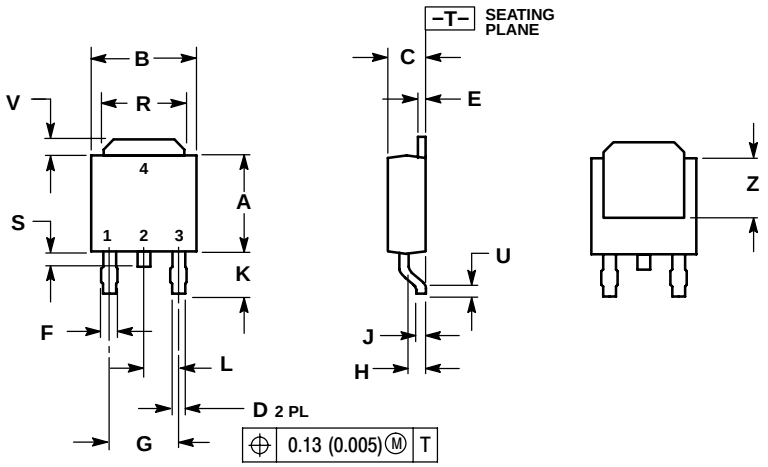
ORDERING INFORMATION

Device	Package Type	Package	Shipping†
MJD112	DPAK	369C	75 Units / Rail
MJD112G	DPAK (Pb−Free)		
MJD112−001	DPAK−3	369D	
MJD112−1G	DPAK−3 (Pb−Free)		
MJD112RL	DPAK	369C	1800 Tape & Reel
MJD112RLG	DPAK (Pb−Free)		
MJD112T4	DPAK		2500 Tape & Reel
MJD112T4G	DPAK (Pb−Free)		
MJD117	DPAK		75 Units / Rail
MJD117G	DPAK (Pb−Free)		
MJD117−001	DPAK−3	369D	
MJD117−1G	DPAK−3 (Pb−Free)		
MJD117T4	DPAK	369C	2500 Tape & Reel
MJD117T4G	DPAK (Pb−Free)		

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

PACKAGE DIMENSIONS

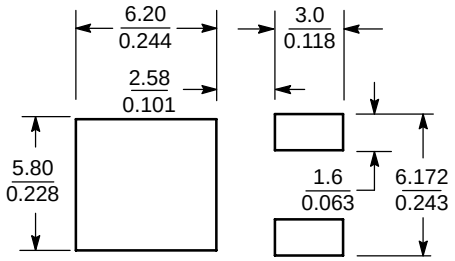
DPAK
CASE 369C
ISSUE O



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

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.22
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
G	0.180 BSC		4.58 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.102	0.114	2.60	2.89
L	0.090 BSC		2.29 BSC	
R	0.180	0.215	4.57	5.45
S	0.025	0.040	0.63	1.01
U	0.020	−−−	0.51	−−−
V	0.035	0.050	0.89	1.27
Z	0.155	−−−	3.93	−−−

SOLDERING FOOTPRINT*

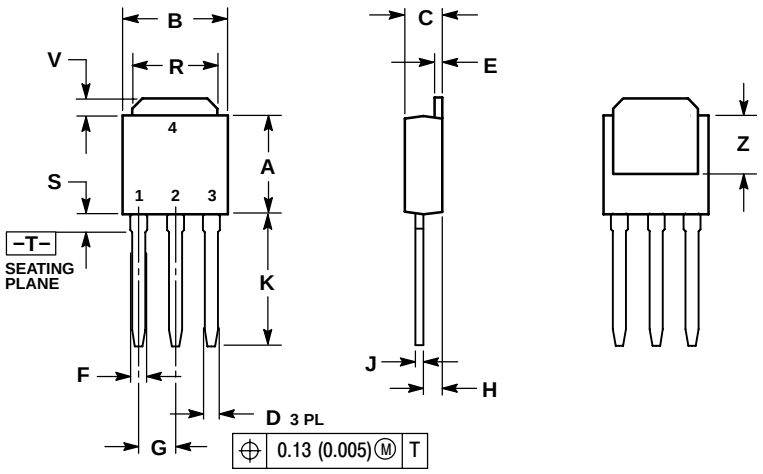


SCALE 3:1 (mm / inches)

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

DPAK−3
CASE 369D−01
ISSUE B



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

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.35
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
G	0.090 BSC		2.29 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.350	0.380	8.89	9.65
R	0.180	0.215	4.45	5.45
S	0.025	0.040	0.63	1.01
V	0.035	0.050	0.89	1.27
Z	0.155	−−−	3.93	−−−

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 61312, Phoenix, Arizona 85082−1312 USA
Phone: 480−829−7710 or 800−344−3860 Toll Free USA/Canada
Fax: 480−829−7709 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada

Japan: ON Semiconductor, Japan Customer Focus Center
2−9−1 Kamimeguro, Meguro−ku, Tokyo, Japan 153−0051
Phone: 81−3−5773−3850

ON Semiconductor Website: http://onsemi.com

Order Literature: http://www.onsemi.com/litorder

For additional information, please contact your local Sales Representative.

MJD112/D