MJD243 (NPN), MJD253 (PNP)

Preferred Device

Complementary Silicon Plastic Power Transistor

DPAK for Surface Mount Applications

. . . designed for low voltage, low–power, high–gain audio amplifier applications.

- Collector–Emitter Sustaining Voltage –
  $V_{CEO(sus)}$ = 100 Vdc (Min) @ I_C
  = 10 mAdc
- High DC Current Gain –
  h_{FE} = 40 (Min) @ I_C
  = 200 mAdc
  = 15 (Min) @ I_C = 1.0 Adc
- Lead Formed for Surface Mount Applications in Plastic Sleeves (No Suffix)
- Straight Lead Version in Plastic Sleeves ("–1" Suffix)
- Lead Formed Version in 16 mm Tape and Reel ("T4" Suffix)
- Low Collector–Emitter Saturation Voltage –
  $V_{CE(sat)}$ = 0.3 Vdc (Max) @ I_C
  = 500 mAdc
  = 0.6 Vdc (Max) @ I_C = 1.0 Adc
- High Current–Gain – Bandwidth Product –
  f_T = 40 MHz (Min) @ I_C
  = 100 mAdc
- Annular Construction for Low Leakage –
  I_{CBO} = 100 nAdc @ Rated V_{CB}

MAXIMUM RATINGS

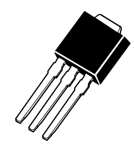
Rating	Symbol	Value	Unit
Collector–Base Voltage	V_{CB}	100	Vdc
Collector–Emitter Voltage	V_{CEO}	100	Vdc
Emitter–Base Voltage	V_{EB}	7	Vdc
Collector Current – Continuous – Peak	I_C	4 8	Adc
Base Current	I_B	1	Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	12.5 0.1	Watts W/°C
Total Device Dissipation @ T_A = 25°C (Note 1.) Derate above 25°C	P_D	1.4 0.011	Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–65 to +150	°C

1. When surface mounted on minimum pad sizes recommended.

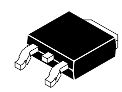
ON Semiconductor®

http://onsemi.com

4 AMPERES
100 VOLTS
12.5 WATTS
POWER TRANSISTOR

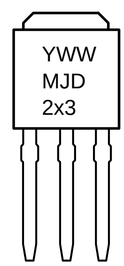


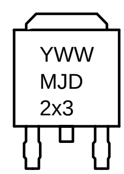
DPAK
CASE 369
STYLE 1



DPAK
CASE 369A
STYLE 1

MARKING DIAGRAMS





Y	= Year	
WW	= Work Week	
MJD2x3	= Device Code	
x	= 4 or 5	

ORDERING INFORMATION

Device	Package	Shipping
MJD243T4	DPAK	2500/Tape & Reel
MJD253–1	DPAK	75 Units/Rail
MJD253T4	DPAK	2500/Tape & Reel

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

July, 2002 – Rev. 5

Publication Order Number:
MJD243/D

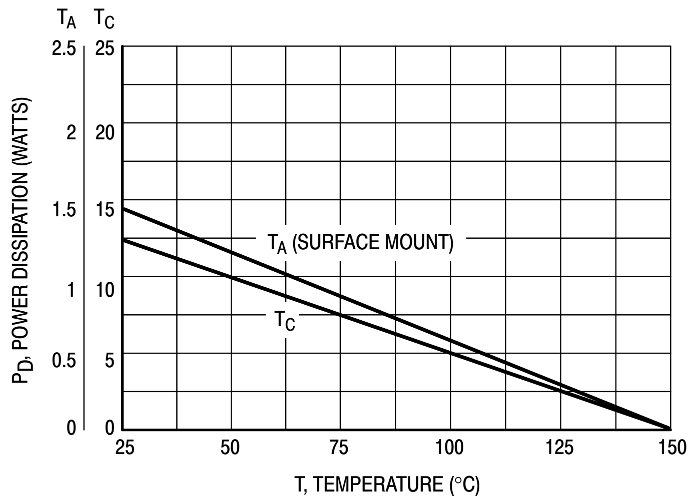


Figure 1. Power Derating

THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case Junction to Ambient (Note 1)	$R_{\theta JC}$ $R_{\theta JA}$	10 89.3	°C/W

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Sustaining Voltage (Note 2) (I_C = 10 mAdc, I_B = 0)	$V_{CEO(sus)}$	100	–	Vdc
Collector Cutoff Current (V_{CB} = 100 Vdc, I_E = 0) (V_{CB} = 100 Vdc, I_E = 0, T_J = 125°C)	I_{CBO}	– –	100 100	nAdc μAdc
Emitter Cutoff Current (V_{BE} = 7 Vdc, I_C = 0)	I_{EBO}	–	100	nAdc
DC Current Gain (Note 2) (I_C = 200 mAdc, V_{CE} = 1 Vdc) (I_C = 1 Adc, V_{CE} = 1 Vdc)	h_{FE}	40 15	180 –	–
Collector–Emitter Saturation Voltage (Note 2) (I_C = 500 mAdc, I_B = 50 mAdc) (I_C = 1 Adc, I_B = 100 mAdc)	$V_{CE(sat)}$	 – –	 0.3 0.6	Vdc
Base–Emitter Saturation Voltage (Note 2) (I_C = 2 Adc, I_B = 200 mAdc)	$V_{BE(sat)}$	–	1.8	Vdc
Base–Emitter On Voltage (Note 2) (I_C = 500 mAdc, V_{CE} = 1 Vdc)	$V_{BE(on)}$	–	1.5	Vdc
DYNAMIC CHARACTERISTICS				
Current–Gain – Bandwidth Product (Note 3) (I_C = 100 mAdc, V_{CE} = 10 Vdc, f_{test} = 10 MHz)	f_T	40	–	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 0.1 MHz)	C_{ob}	–	50	pF

1. When surface mounted on minimum pad sizes recommended.
2. Pulse Test: Pulse Width = 300 μs, Duty Cycle ≈ 2%.
3. $f_T = |h_{FE}| \bullet f_{test}$.

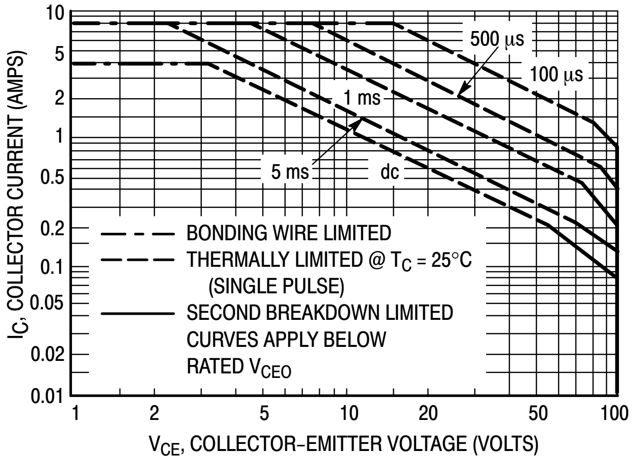


Figure 2. Active Region Maximum Safe Operating Area

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 $T_{J(pk)}$ = 150°C; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 150°C$. $T_{J(pk)}$ may be calculated from the data in Figure 3. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

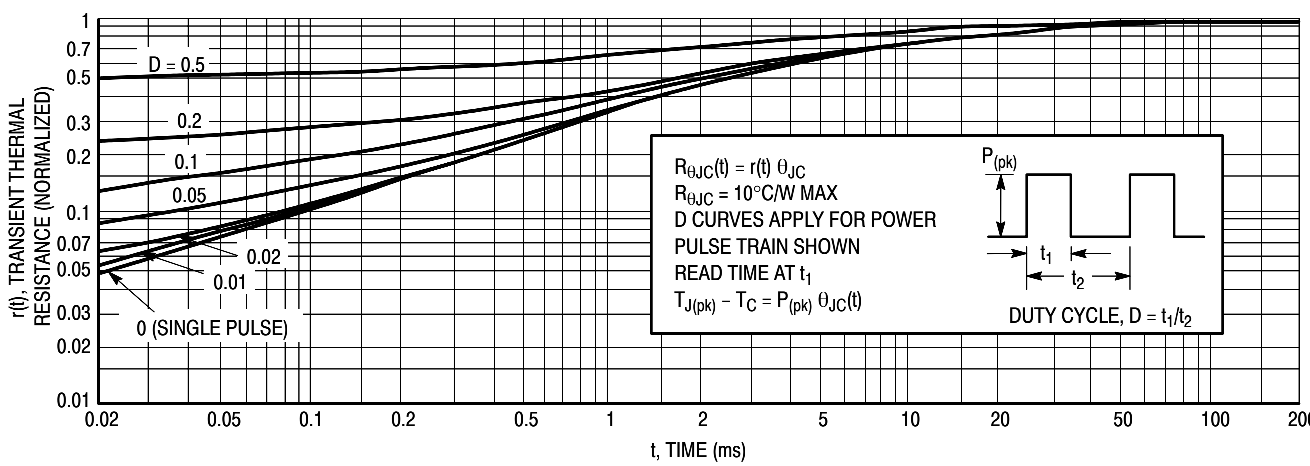


Figure 3. Thermal Response

NPN MJD243 | **PNP MJD253**

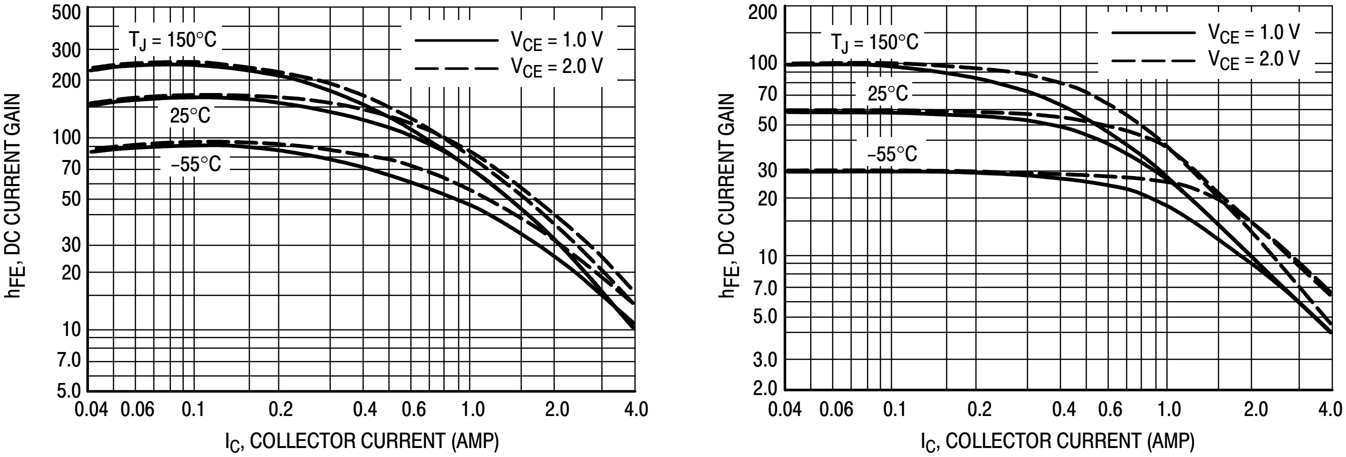


Figure 4. DC Current Gain

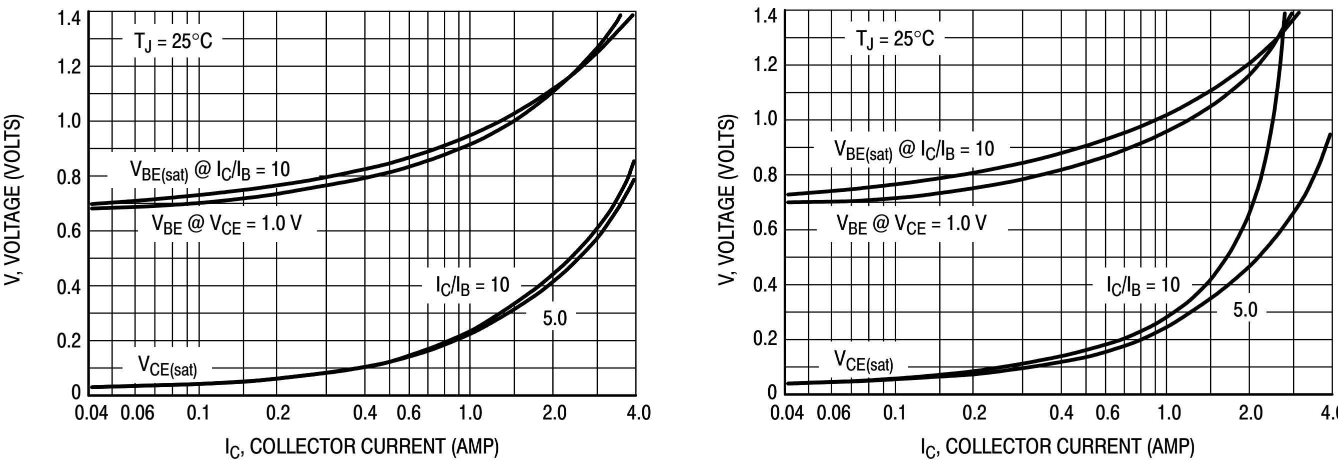


Figure 5. “On” Voltages

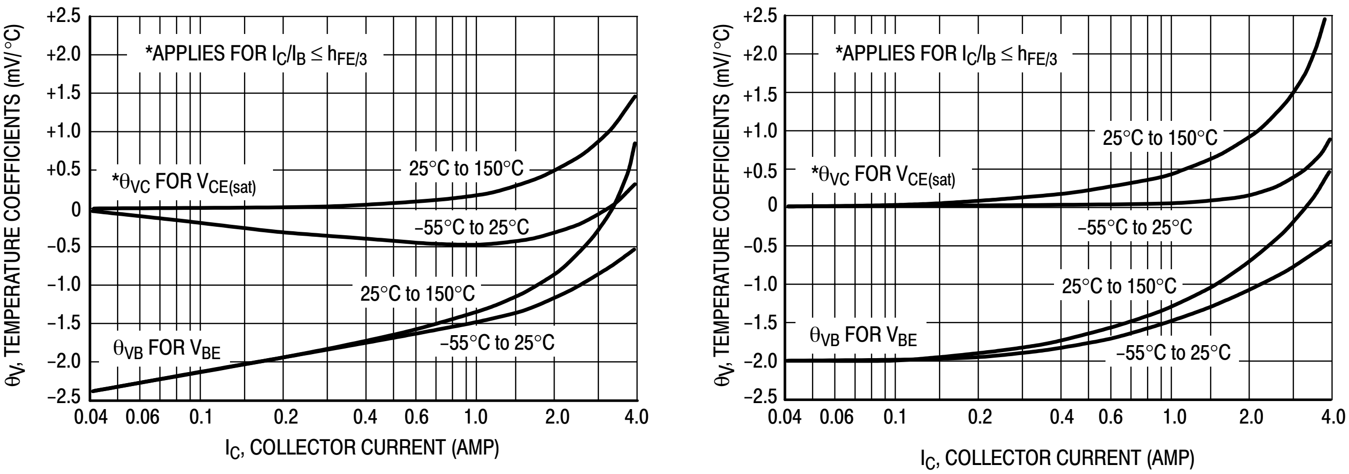
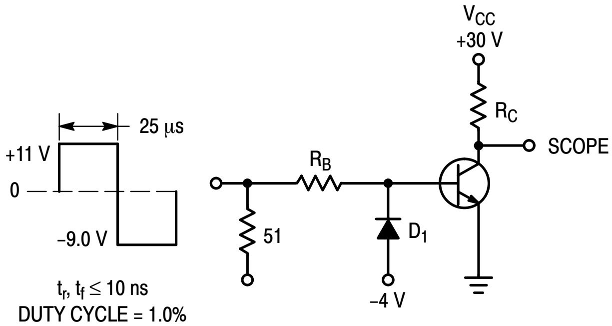


Figure 6. Temperature Coefficients



RB and RC VARIED TO OBTAIN DESIRED CURRENT LEVELS
D1 MUST BE FAST RECOVERY TYPE, e.g.:
1N5825 USED ABOVE IB ≈ 100 mA
MSD6100 USED BELOW IB ≈ 100 mA
FOR PNP TEST CIRCUIT, REVERSE ALL POLARITIES

Figure 7. Switching Time Test Circuit

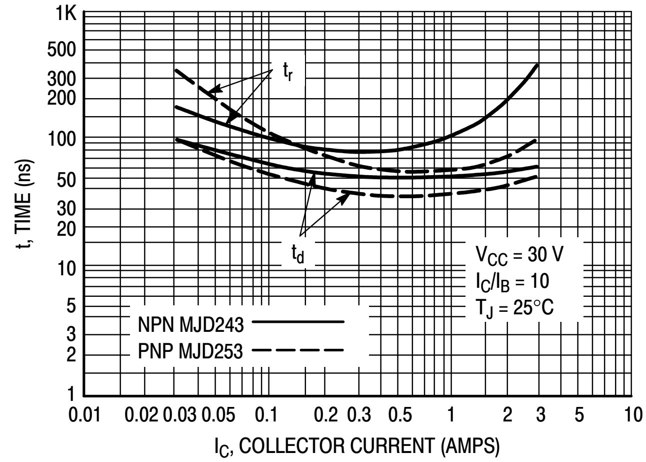


Figure 8. Turn−On Time

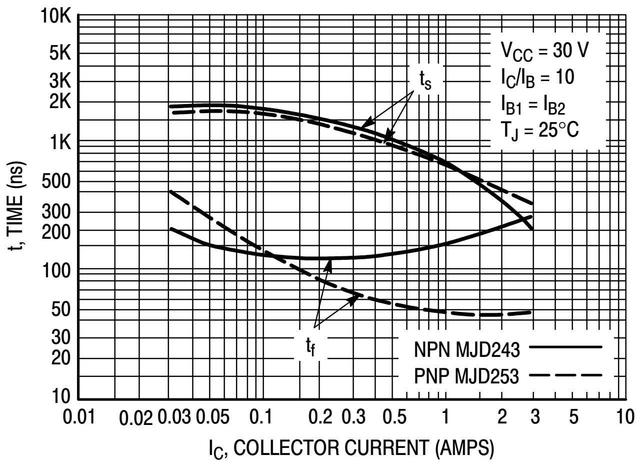


Figure 9. Turn−Off Time

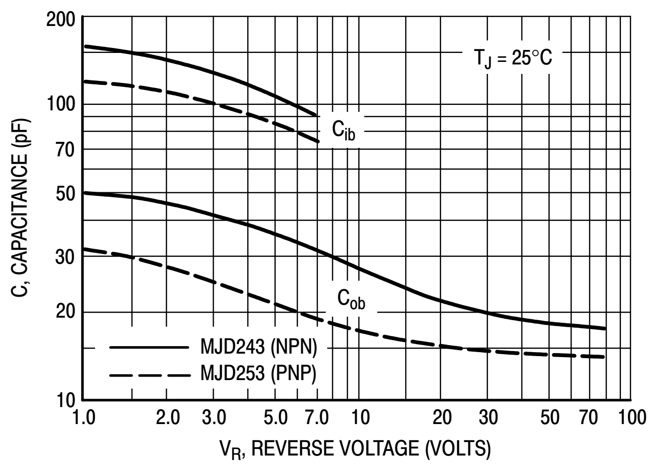


Figure 10. Capacitance

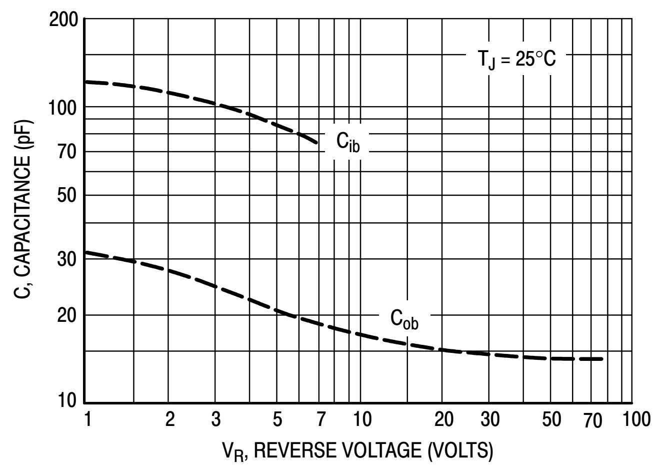


Figure 11. Capacitance

TYPICAL SOLDER HEATING PROFILE

For any given circuit board, there will be a group of control settings that will give the desired heat pattern. The operator must set temperatures for several heating zones, and a figure for belt speed. Taken together, these control settings make up a heating "profile" for that particular circuit board. On machines controlled by a computer, the computer remembers these profiles from one operating session to the next. Figure 12 shows a typical heating profile for use when soldering a surface mount device to a printed circuit board. This profile will vary among soldering systems but it is a good starting point. Factors that can affect the profile include the type of soldering system in use, density and types of components on the board, type of solder used, and the type of board or substrate material being used. This profile shows temperature versus time. The line on the graph shows the actual temperature that might be experienced on the surface of a test board at or near a central solder joint. The two profiles are based on a high density and a low density board. The Vitronics SMD310 convection/infrared reflow soldering system was used to generate this profile. The type of solder used was 62/36/2 Tin Lead Silver with a melting point between 177–189°C. When this type of furnace is used for solder reflow work, the circuit boards and solder joints tend to heat first. The components on the board are then heated by conduction. The circuit board, because it has a large surface area, absorbs the thermal energy more efficiently, then distributes this energy to the components. Because of this effect, the main body of a component may be up to 30 degrees cooler than the adjacent solder joints.

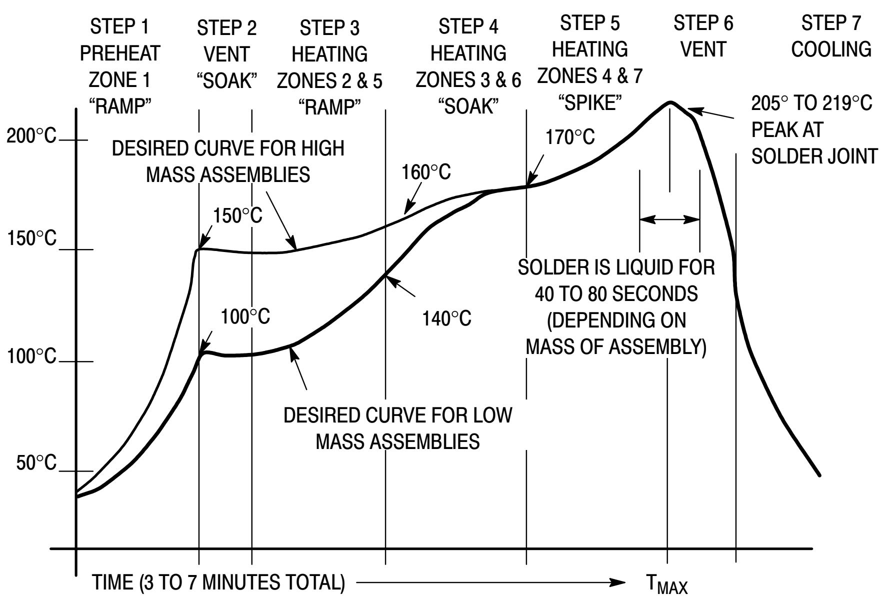
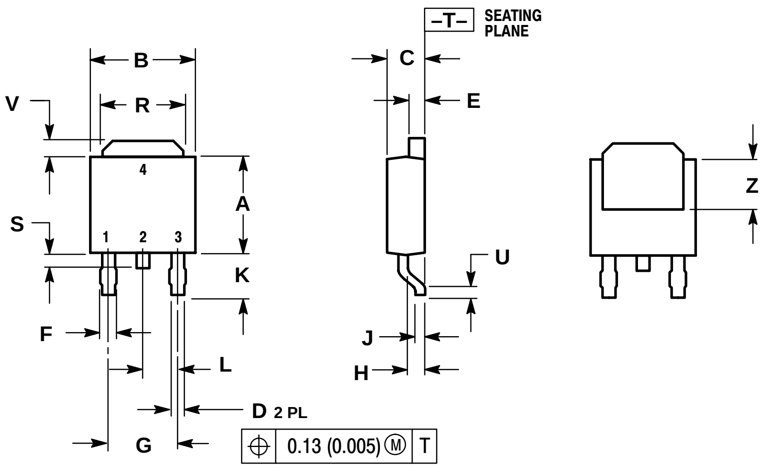


Figure 12. Typical Solder Heating Profile

PACKAGE DIMENSIONS

DPAK
CASE 369A–13
ISSUE AB

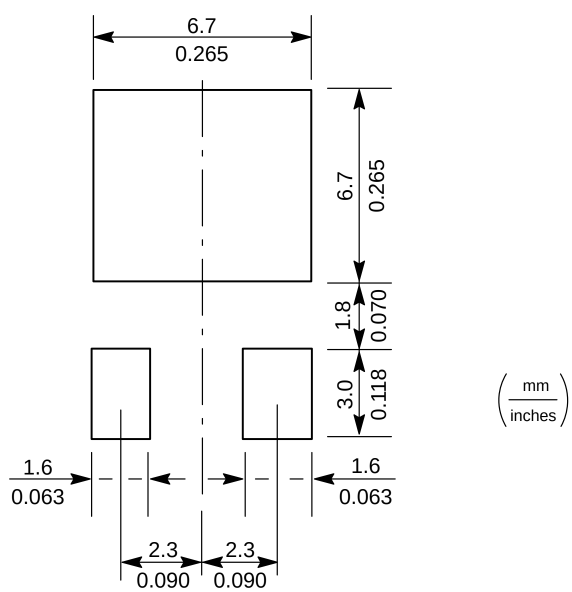


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	0.235	0.250	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	0.033	0.040	0.84	1.01
F	0.037	0.047	0.94	1.19
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	0.175	0.215	4.45	5.46
S	0.020	0.050	0.51	1.27
U	0.020	---	0.51	---
V	0.030	0.050	0.77	1.27
Z	0.138	---	3.51	---

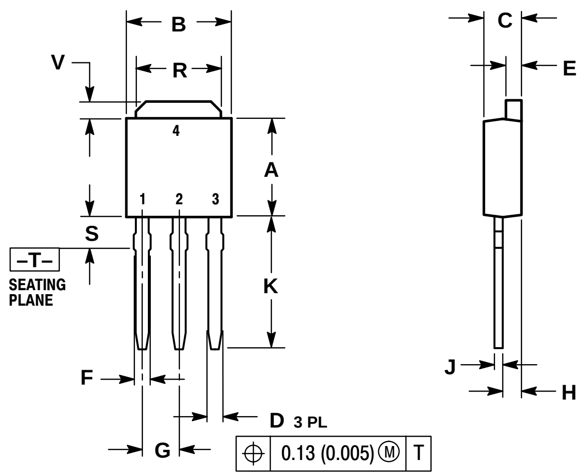
STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

Minimum Pad Sizes Recommended for Surface Mounted Applications



PACKAGE DIMENSIONS

DPAK STRAIGHT LEADS
CASE 369–07
ISSUE M



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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.250	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	0.033	0.040	0.84	1.01
F	0.037	0.047	0.94	1.19
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	0.175	0.215	4.45	5.46
S	0.050	0.090	1.27	2.28
V	0.030	0.050	0.77	1.27

STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

PUBLICATION ORDERING INFORMATION

Literature Fulfillment:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303–675–2175 or 800–344–3860 Toll Free USA/Canada
Fax: 303–675–2176 or 800–344–3867 Toll Free USA/Canada
Email: ONlit@hibbertco.com

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

JAPAN: ON Semiconductor, Japan Customer Focus Center
4–32–1 Nishi–Gotanda, Shinagawa–ku, Tokyo, Japan 141–0031
Phone: 81–3–5740–2700
Email: r14525@onsemi.com

ON Semiconductor Website: http://onsemi.com

For additional information, please contact your local Sales Representative.