

# MJD243 (NPN), MJD253 (PNP)

## Complementary Silicon Plastic Power Transistor

### DPAK-3 for Surface Mount Applications

Designed for low voltage, low-power, high-gain audio amplifier applications.

#### Features

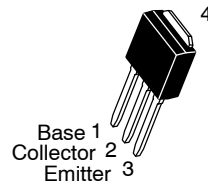
- Collector-Emitter Sustaining Voltage –  
 $V_{CE(sus)} = 100 \text{ Vdc (Min) @ } I_C$   
 $= 10 \text{ mAdc}$
- High DC Current Gain –  
 $h_{FE} = 40 \text{ (Min) @ } I_C$   
 $= 200 \text{ mAdc}$   
 $= 15 \text{ (Min) @ } I_C = 1.0 \text{ Adc}$
- Lead Formed for Surface Mount Applications in Plastic Sleeves (No Suffix)
- Straight Lead Version in Plastic Sleeves (“-1” Suffix)
- Low Collector-Emitter Saturation Voltage –  
 $V_{CE(sat)} = 0.3 \text{ Vdc (Max) @ } I_C$   
 $= 500 \text{ mAdc}$   
 $= 0.6 \text{ Vdc (Max) @ } I_C = 1.0 \text{ Adc}$
- High Current-Gain – Bandwidth Product –  
 $f_T = 40 \text{ MHz (Min) @ } I_C$   
 $= 100 \text{ mAdc}$
- Annular Construction for Low Leakage –  
 $I_{CBO} = 100 \text{ nAdc @ Rated } V_{CB}$
- Epoxy Meets UL 94 V-0 @ 0.125 in
- ESD Ratings: Human Body Model, 3B > 8000 V  
Machine Model, C > 400 V
- Pb-Free Packages are Available



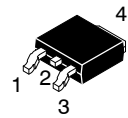
ON Semiconductor®

<http://onsemi.com>

### 4.0 A, 100 V, 12.5 W POWER TRANSISTOR

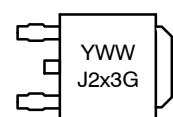
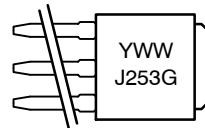


DPAK-3  
CASE 369D  
STYLE 1



DPAK-3  
CASE 369C  
STYLE 1

#### MARKING DIAGRAMS



Y = Year  
WW = Work Week  
x = 4 or 5  
G = Pb-Free Package

#### ORDERING INFORMATION

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

# MJD243 (NPN), MJD253 (PNP)

## MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Base Voltage	$V_{CB}$	100	Vdc
Collector-Emitter Voltage	$V_{CEO}$	100	Vdc
Emitter-Base Voltage	$V_{EB}$	7.0	Vdc
Collector Current -Continuous -Peak	$I_C$	4.0 8.0	Adc
Base Current	$I_B$	1.0	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	12.5 0.1	W W/ $^\circ\text{C}$
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ (Note 1) Derate above $25^\circ\text{C}$	$P_D$	1.4 0.011	W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +150	$^\circ\text{C}$

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case Junction-to-Ambient (Note 2)	$R_{\theta JC}$ $R_{\theta JA}$	10 89.3	$^\circ\text{C}/\text{W}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. When surface mounted on minimum pad sizes recommended.

## ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
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### OFF CHARACTERISTICS

Collector-Emitter Sustaining Voltage (Note 3) ( $I_C = 10$ mAdc, $I_B = 0$ )	$V_{CEO(sus)}$	100	-	Vdc
Collector Cutoff Current ( $V_{CB} = 100$ Vdc, $I_E = 0$ ) ( $V_{CB} = 100$ Vdc, $I_E = 0$ , $T_J = 125^\circ\text{C}$ )	$I_{CBO}$	- -	100 100	nAdc $\mu\text{Adc}$
Emitter Cutoff Current ( $V_{BE} = 7.0$ Vdc, $I_C = 0$ )	$I_{EBO}$	-	100	nAdc
DC Current Gain (Note 3) ( $I_C = 200$ mAdc, $V_{CE} = 1.0$ Vdc) ( $I_C = 1.0$ Adc, $V_{CE} = 1.0$ Vdc)	$h_{FE}$	40 15	180 -	-
Collector-Emitter Saturation Voltage (Note 3) ( $I_C = 500$ mAdc, $I_B = 50$ mAdc) ( $I_C = 1.0$ Adc, $I_B = 100$ mAdc)	$V_{CE(sat)}$	- -	0.3 0.6	Vdc
Base-Emitter Saturation Voltage (Note 3) ( $I_C = 2.0$ Adc, $I_B = 200$ mAdc)	$V_{BE(sat)}$	-	1.8	Vdc
Base-Emitter On Voltage (Note 3) ( $I_C = 500$ mAdc, $V_{CE} = 1.0$ Vdc)	$V_{BE(on)}$	-	1.5	Vdc

### DYNAMIC CHARACTERISTICS

Current-Gain - Bandwidth Product (Note 4) ( $I_C = 100$ 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

2. When surface mounted on minimum pad sizes recommended.

3. Pulse Test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle  $\approx 2\%$ .

4.  $f_T = |h_{FE}| \cdot f_{test}$

# MJD243 (NPN), MJD253 (PNP)

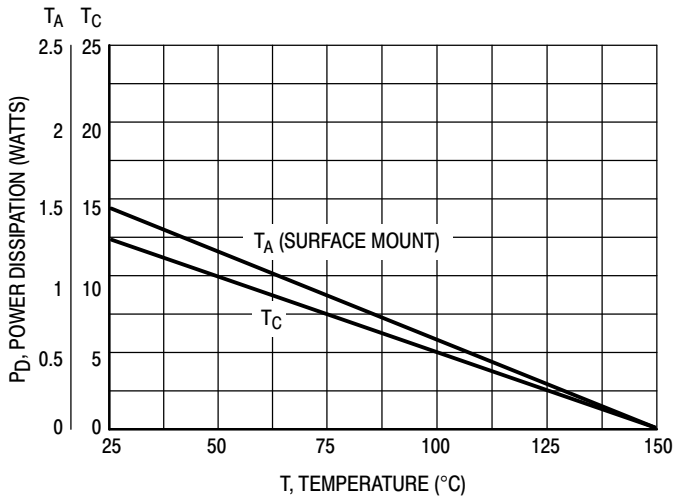


Figure 1. Power Derating

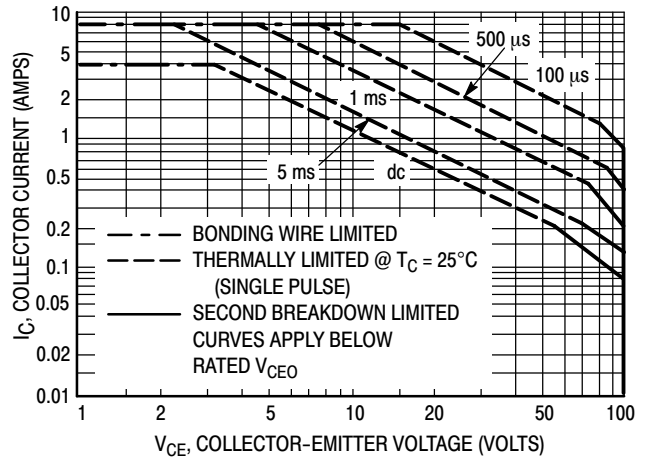


Figure 2. Active Region Maximum Safe Operating Area

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  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(pk)} \leq 150^\circ\text{C}$ .  $T_{J(pk)}$  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.

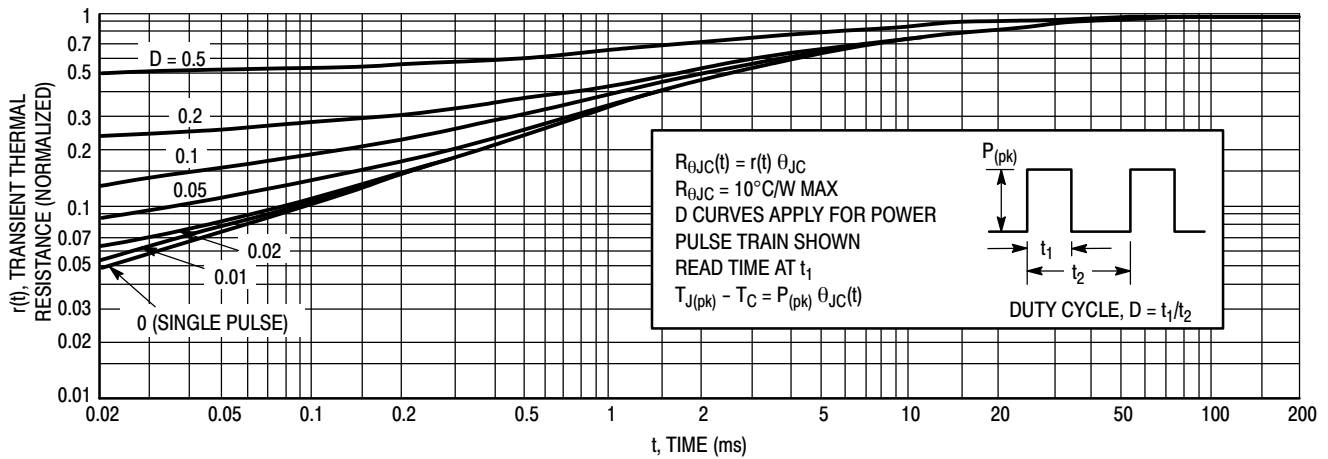
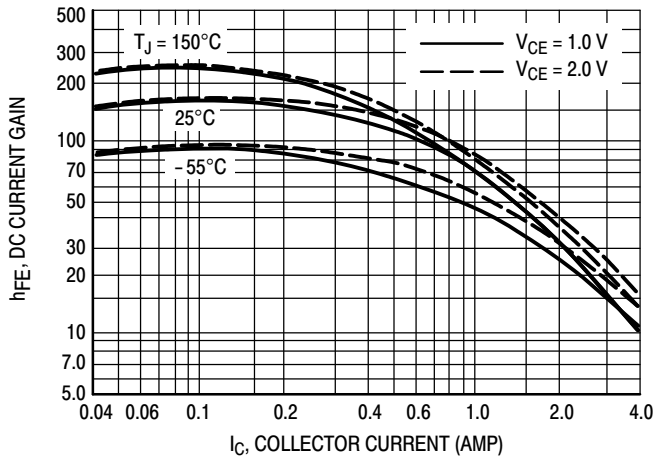


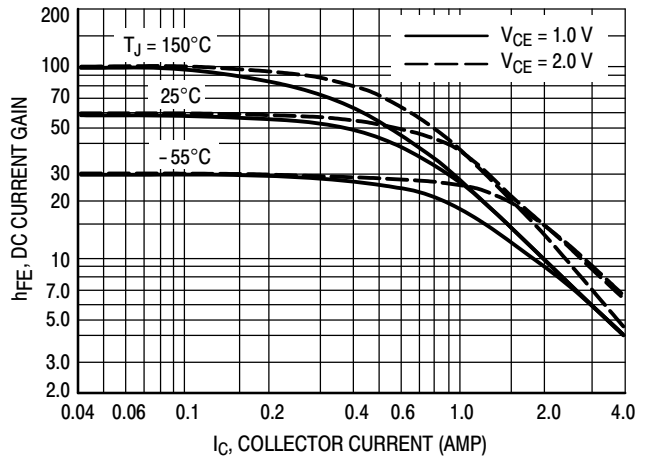
Figure 3. Thermal Response

# MJD243 (NPN), MJD253 (PNP)

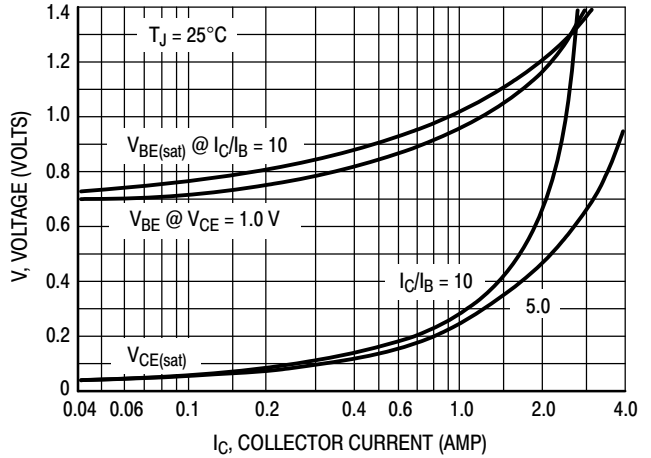
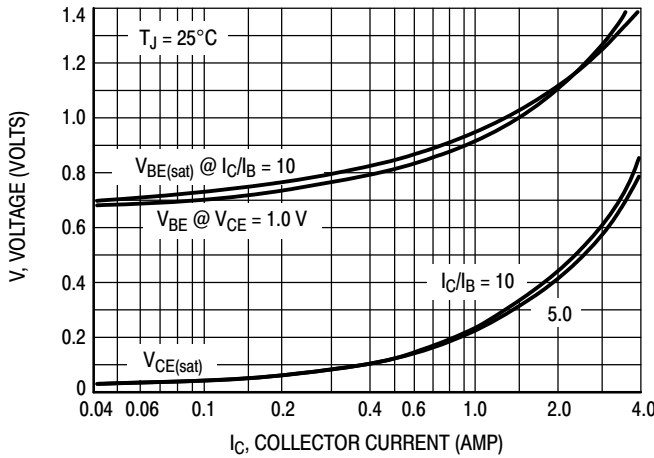
**NPN**  
**MJD243**



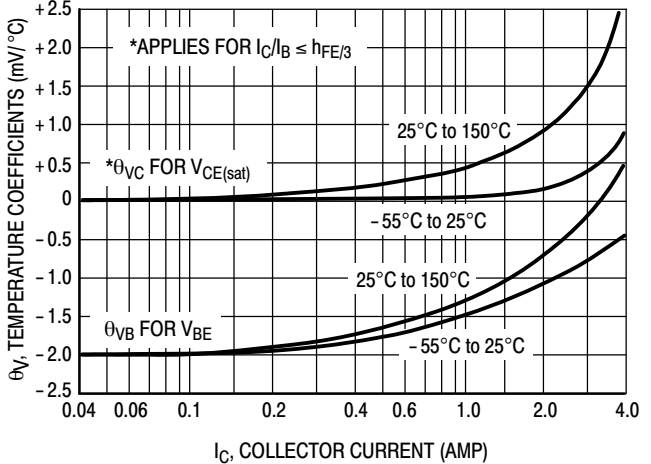
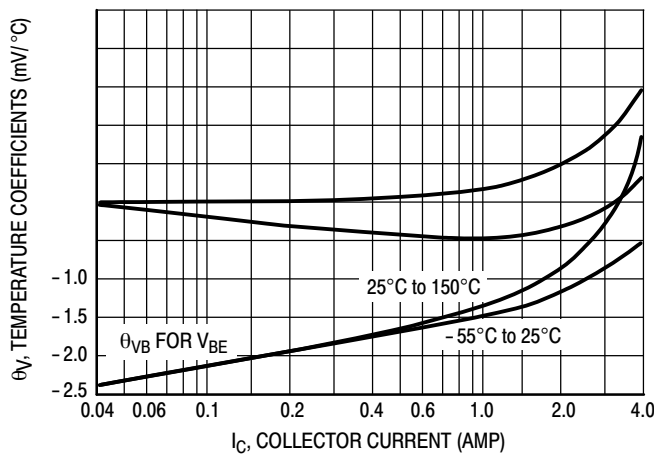
**PNP**  
**MJD253**



**Figure 4. DC Current Gain**



**Figure 5. "On" Voltages**



**Figure 6. Temperature Coefficients**

# MJD243 (NPN), MJD253 (PNP)

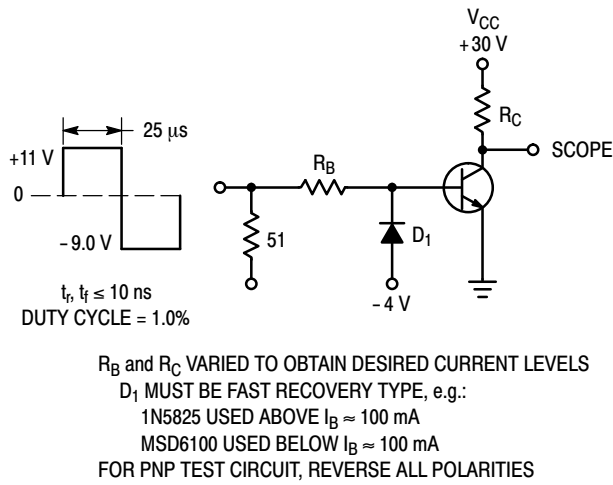


Figure 7. Switching Time Test Circuit

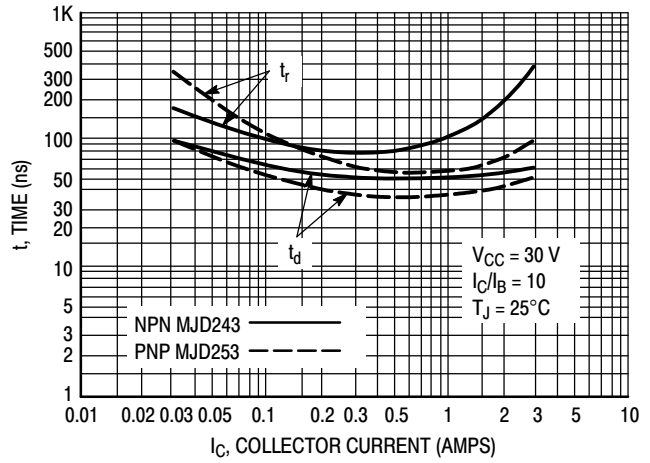


Figure 8. Turn-On Time

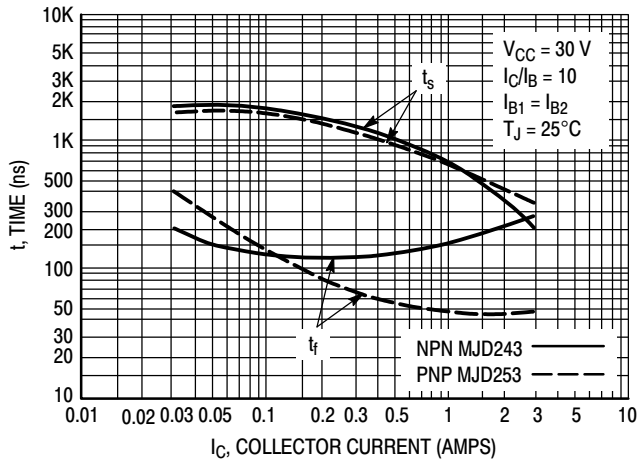


Figure 9. Turn-Off Time

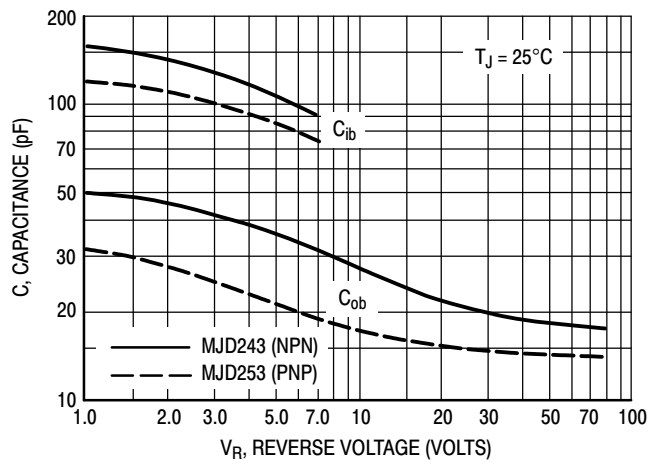


Figure 10. Capacitance

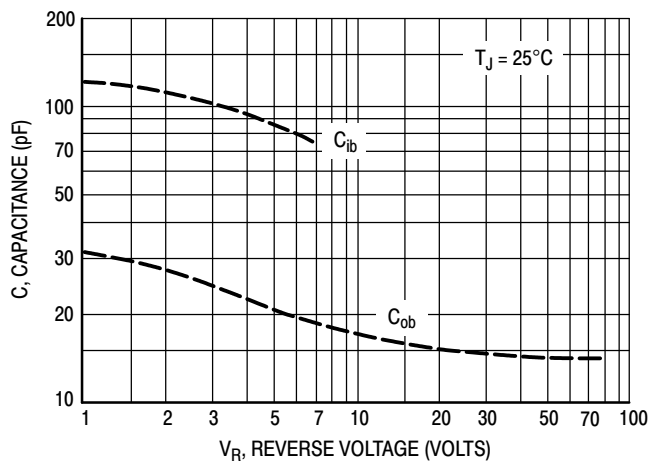


Figure 11. Capacitance

## MJD243 (NPN), MJD253 (PNP)

### ORDERING INFORMATION

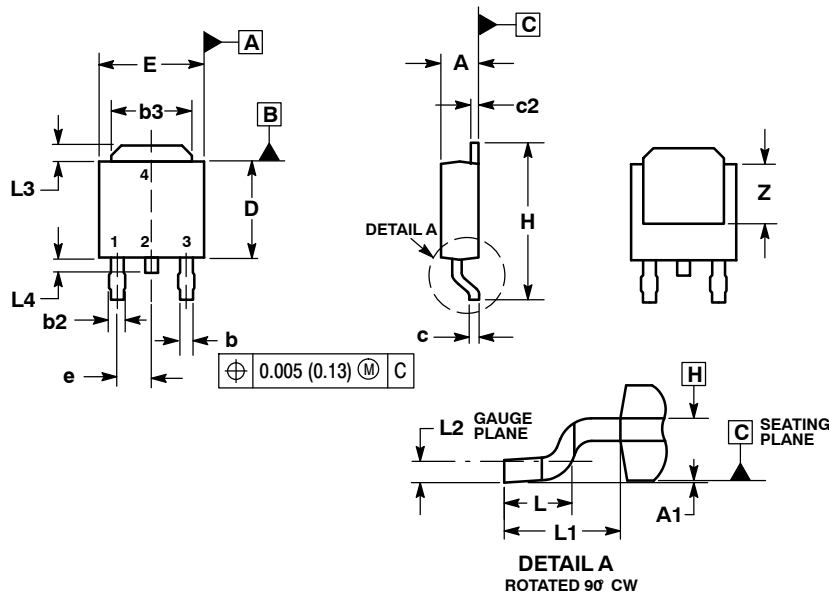
Device	Package Type	Package	Shipping†
MJD243	DPAK-3	369C	75 Units / Rail
MJD243G	DPAK-3 (Pb-Free)	369C	75 Units / Rail
MJD243T4	DPAK-3	369C	2500 / Tape & Reel
MJD243T4G	DPAK-3 (Pb-Free)	369C	2500 / Tape & Reel
MJD253-1	DPAK-3	369D	75 Units / Rail
MJD253-1G	DPAK-3 (Pb-Free)	369D	75 Units / Rail
MJD253T4	DPAK-3	369C	2500 / Tape & Reel
MJD253T4G	DPAK-3 (Pb-Free)	369C	2500 / Tape & Reel

†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.

# MJD243 (NPN), MJD253 (PNP)

## PACKAGE DIMENSIONS

**DKPAK-3**  
 CASE 369C-01  
 ISSUE D

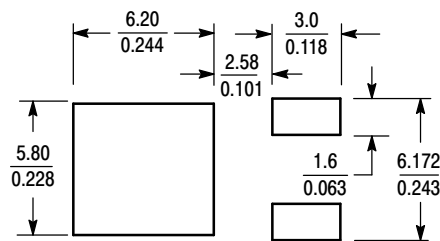


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.086	0.094	2.18	2.38
A1	0.000	0.005	0.00	0.13
b	0.025	0.035	0.63	0.89
b2	0.030	0.045	0.76	1.14
b3	0.180	0.215	4.57	5.46
c	0.018	0.024	0.46	0.61
c2	0.018	0.024	0.46	0.61
D	0.235	0.245	5.97	6.22
E	0.250	0.265	6.35	6.73
e	0.090 BSC		2.29 BSC	
H	0.370	0.410	9.40	10.41
L	0.055	0.070	1.40	1.78
L1	0.108 REF		2.74 REF	
L2	0.020 BSC		0.51 BSC	
L3	0.035	0.050	0.89	1.27
L4	---		---	
Z	0.155	---	3.93	---

### SOLDERING FOOTPRINT\*



SCALE 3:1 (mm / inches)

**STYLE 1:**

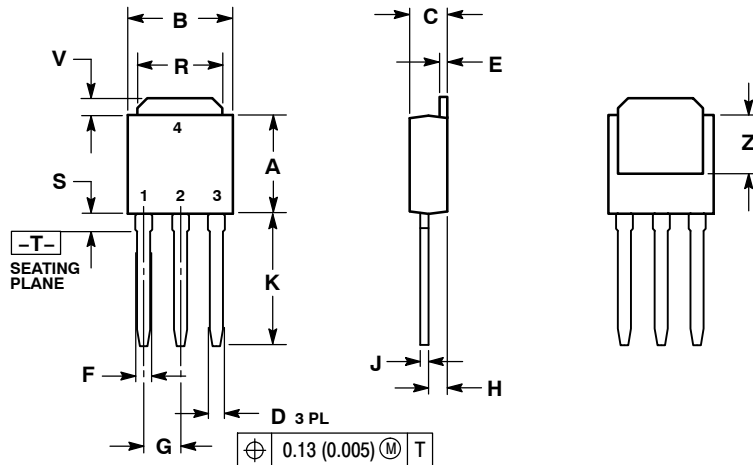
- PIN 1. BASE
- 2. COLLECTOR
- 3. EMITTER
- 4. COLLECTOR

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

# MJD243 (NPN), MJD253 (PNP)

## PACKAGE DIMENSIONS

### DPAK-3 (SINGLE GAUGE) CASE 369D-01 ISSUE B



NOTES:

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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.245	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	---

STYLE 1:

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

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