

# MJD243 (NPN), MJD253 (PNP)

Preferred Device

## Complementary Silicon Plastic Power Transistor DPAK-3 for Surface Mount Applications

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

### Features

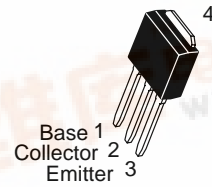
- Collector-Emitter Sustaining Voltage –  
 $V_{CE(sus)} = 100 \text{ Vdc (Min) @ } I_C = 10 \text{ mAdc}$
- High DC Current Gain –  
 $h_{FE} = 40 \text{ (Min) @ } I_C = 200 \text{ mAdc}$   
 $= 15 \text{ (Min) @ } I_C = 1.0 \text{ Adc}$
- Lead Formed for Surface Mount Applications in Plastic Sleeves (No Suffix)
- Straight Lead Version in Plastic Sleeves (“-1” Suffix)
- Lead Formed Version in 16 mm Tape and Reel (“T4” 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 Package is Available



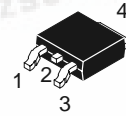
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### 4.0 A, 100 V, 12.5 W POWER TRANSISTOR

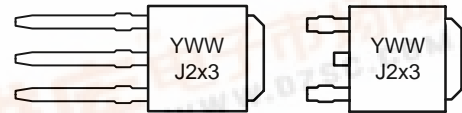


DPAK-3  
CASE 369D  
STYLE 1



DPAK-3  
CASE 369C  
STYLE 1

### MARKING DIAGRAMS



Y = Year  
 WW = Work Week  
 J2x3 = Device Code  
 x = 4 or 5

### ORDERING INFORMATION

Device	Package	Shipping†
MJD243	DPAK-3	75 Units/Rail
MJD243T4	DPAK-3	2500/Tape & Reel
MJD243T4G	DPAK-3 (Pb-Free)	2500/Tape & Reel
MJD253-1	DPAK-3	75 Units/Rail
MJD253T4	DPAK-3	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.

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



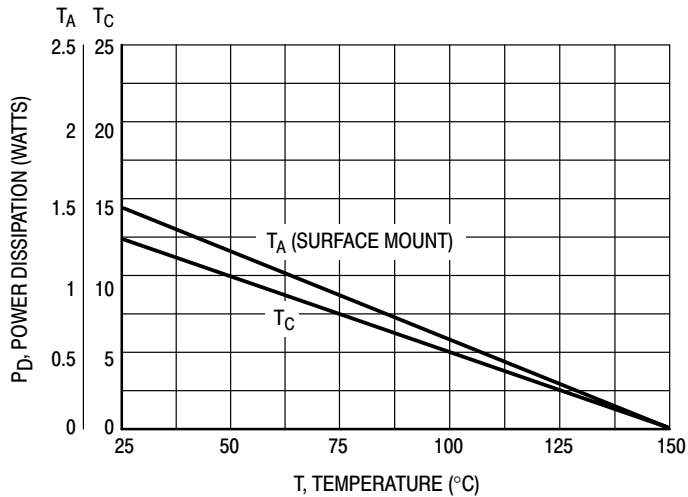
## MJD243 (NPN), MJD253 (PNP)

### 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 $\text{W}/^\circ\text{C}$
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ (Note 1) Derate above $25^\circ\text{C}$	$P_D$	1.4 0.011	W $\text{W}/^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +150	$^\circ\text{C}$

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. When surface mounted on minimum pad sizes recommended.



**Figure 1. Power Derating**

## MJD243 (NPN), MJD253 (PNP)

### THEMAL CHARACTERISTICS

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

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

### DYNAMIC CHARACTERISTICS

Current-Gain – Bandwidth Product (Note 4) ( $I_C = 100 \text{ mAdc}$ , $V_{CE} = 10 \text{ Vdc}$ , $f_{test} = 10 \text{ MHz}$ )	$f_T$	40	–	MHz
Output Capacitance ( $V_{CB} = 10 \text{ Vdc}$ , $I_E = 0$ , $f = 0.1 \text{ MHz}$ )	$C_{ob}$	–	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.  $f_T = |h_{FE}| \cdot f_{test}$ .

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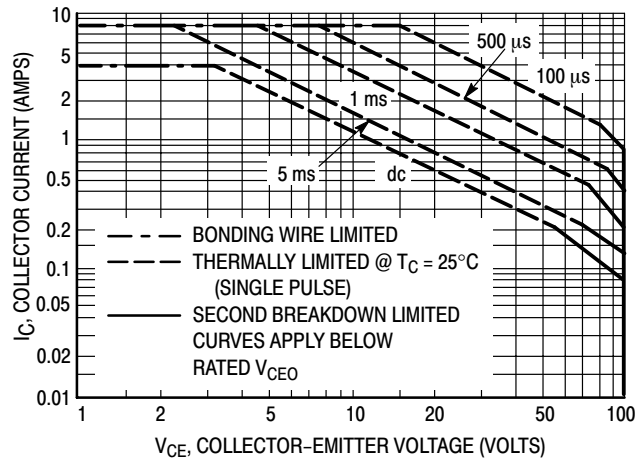


Figure 2. Active Region Maximum Safe Operating Area

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.

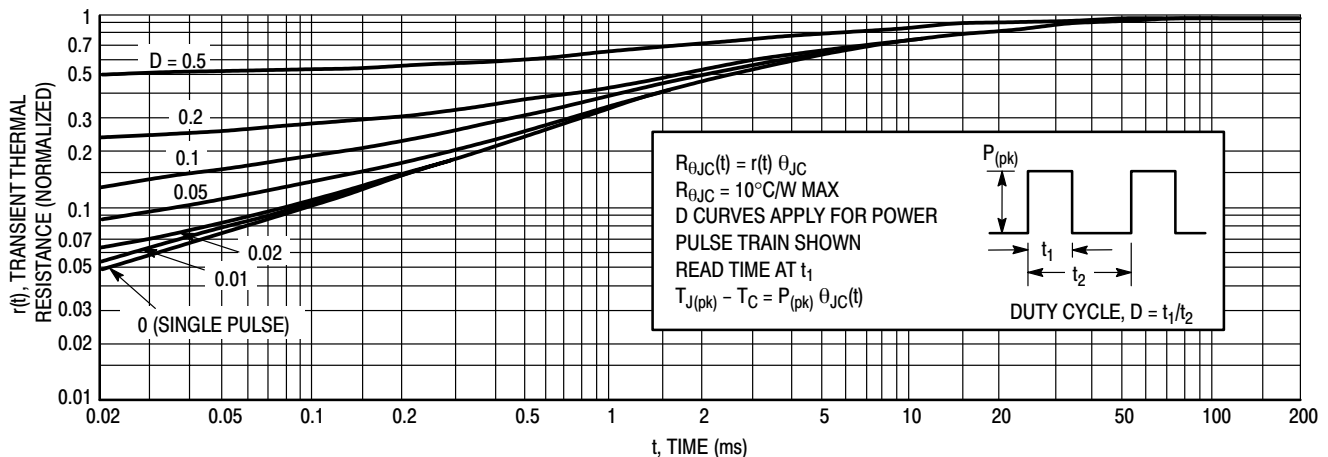


Figure 3. Thermal Response

# MJD243 (NPN), MJD253 (PNP)

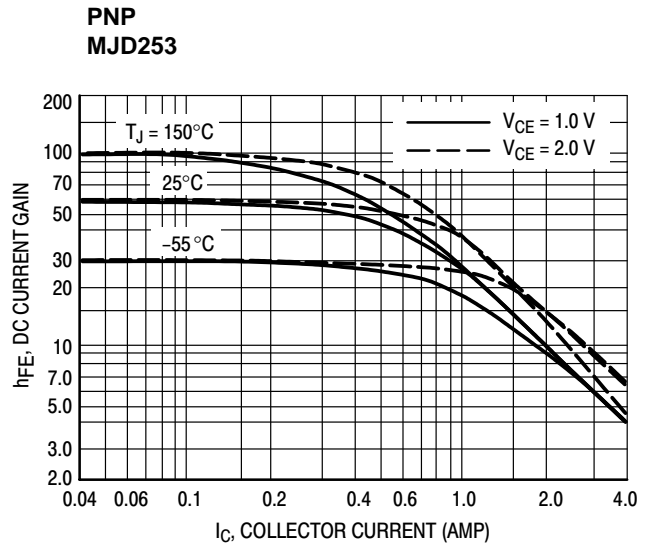
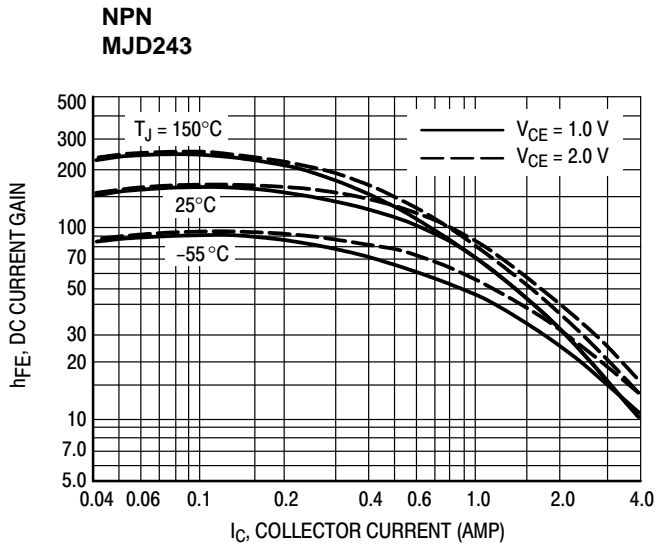


Figure 4. DC Current Gain

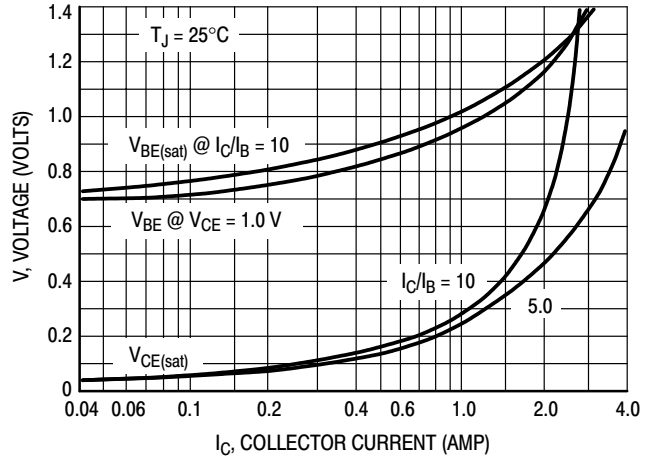
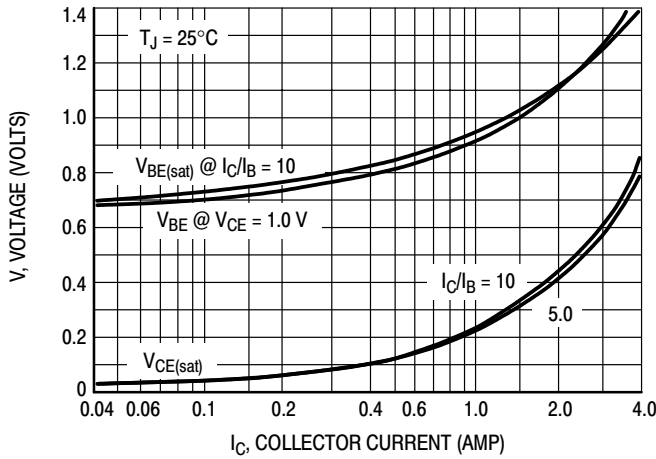


Figure 5. "On" Voltages

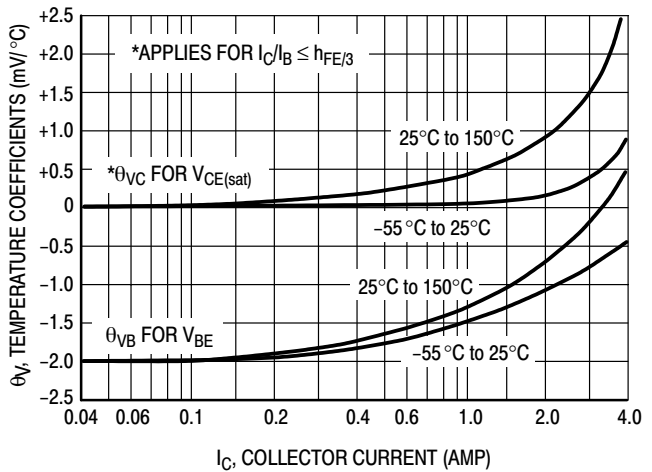
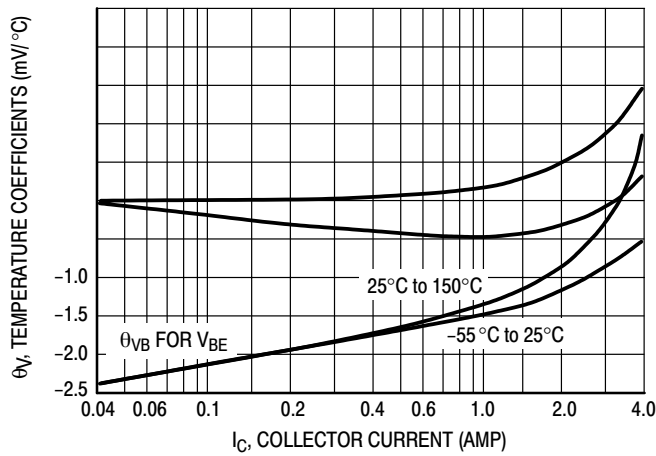
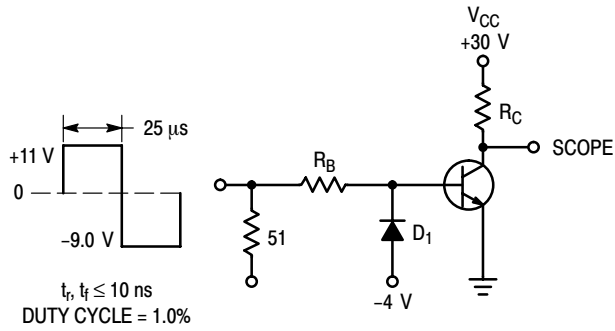


Figure 6. Temperature Coefficients

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$R_B$  and  $R_C$  VARIED TO OBTAIN DESIRED CURRENT LEVELS  
 $D_1$  MUST BE FAST RECOVERY TYPE, e.g.:  
 1N5825 USED ABOVE  $I_B \approx 100 \text{ mA}$   
 MSD6100 USED BELOW  $I_B \approx 100 \text{ mA}$   
 FOR PNP TEST CIRCUIT, REVERSE ALL POLARITIES

Figure 7. Switching Time Test Circuit

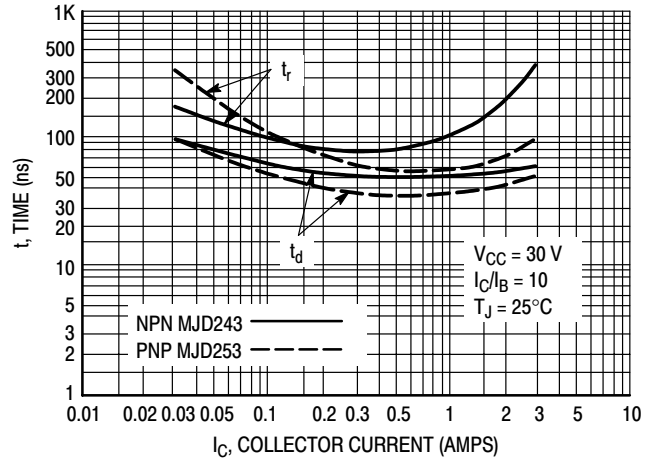


Figure 8. Turn-On Time

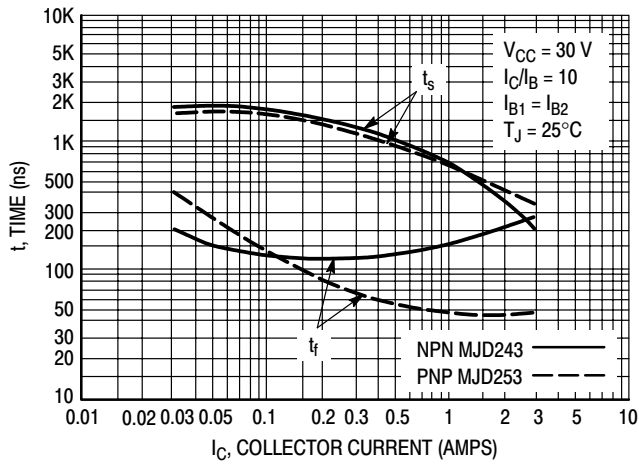


Figure 9. Turn-Off Time

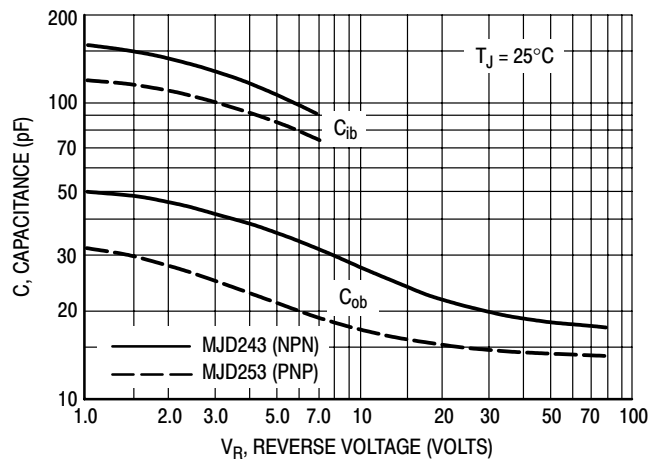


Figure 10. Capacitance

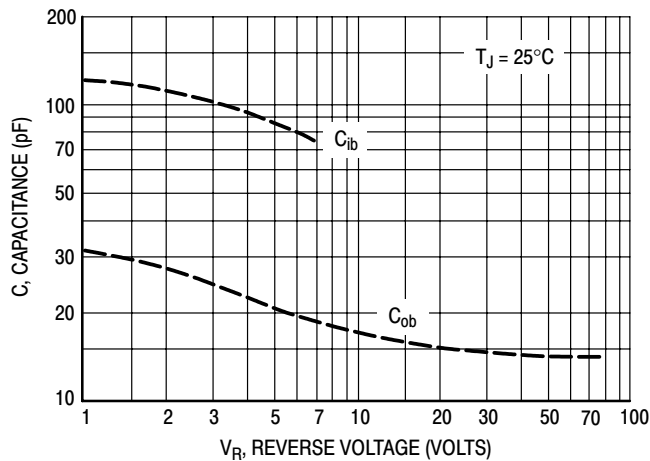
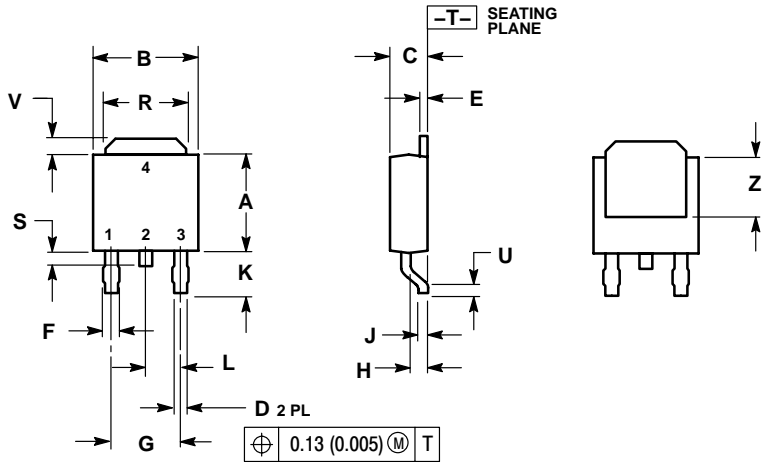


Figure 11. Capacitance

# MJD243 (NPN), MJD253 (PNP)

## PACKAGE DIMENSIONS

**DPAK-3**  
CASE 369C-01  
ISSUE O

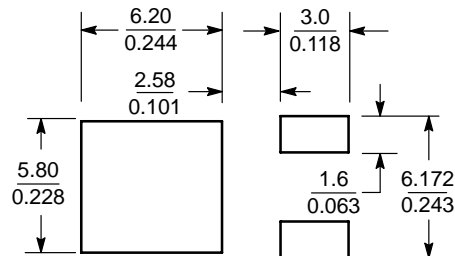


- NOTES:  
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.22
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	---

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

### SOLDERING FOOTPRINT\*



SCALE 3:1  $\left(\frac{\text{mm}}{\text{inches}}\right)$

### DPAK-3

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

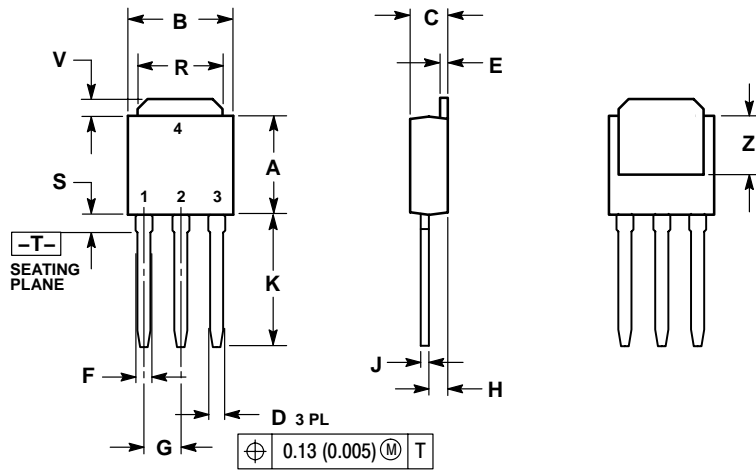
# MJD243 (NPN), MJD253 (PNP)

## 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: BASE  
 2. COLLECTOR  
 3. EMITTER  
 4. COLLECTOR

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