

Plastic Power Transistor

DPAK For Surface Mount Applications

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

- Collector-Emitter Sustaining Voltage — $V_{CEO(sus)} = 100 \text{ Vdc (Min) @ } I_C = 10 \text{ mAdc}$
- 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 — $I_{CBO} = 100 \text{ nAdc @ Rated } V_{CB}$

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	I_C	4	Adc
Peak		8	
Base Current	I_B	1	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$	P_D	12.5	Watts
Derate above 25°C		0.1	W/ $^\circ\text{C}$
Total Device Dissipation @ $T_A = 25^\circ\text{C}^*$	P_D	1.4	Watts
Derate above 25°C		0.011	W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	10	$^\circ\text{C/W}$
Junction to Ambient*	$R_{\theta JA}$	89.3	

* When surface mounted on minimum pad sizes recommended.

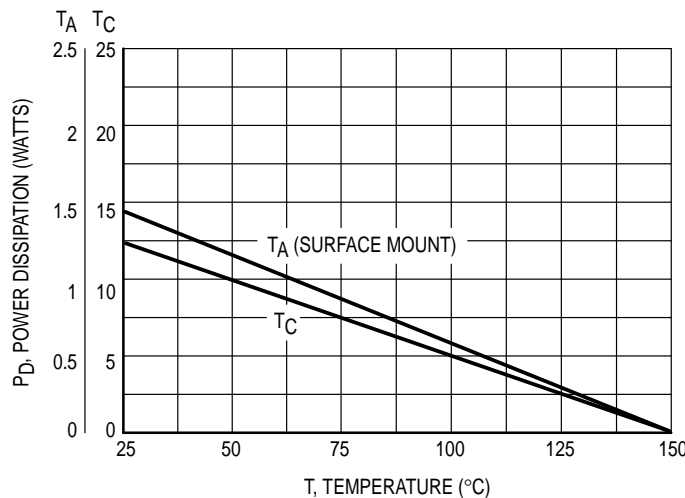


Figure 1. Power Derating

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

REV 1

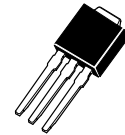
MJD243*

*Motorola Preferred Device

**NPN SILICON
POWER TRANSISTOR
4 AMPERES
100 VOLTS
12.5 WATTS**

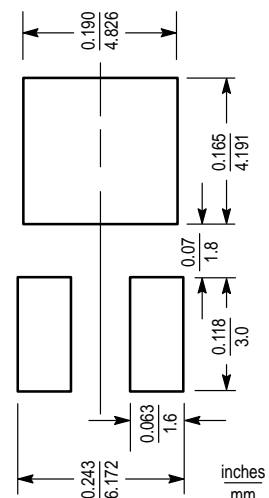


CASE 369A-13



CASE 369-07

MINIMUM PAD SIZES RECOMMENDED FOR SURFACE MOUNTED APPLICATIONS



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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Sustaining Voltage (1) ($I_C = 10\text{ mAdc}$, $I_B = 0$)	$V_{CE(sus)}$	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 μAdc
Emitter Cutoff Current ($V_{BE} = 7\text{ Vdc}$, $I_C = 0$)	I_{EBO}	—	100	nAdc
DC Current Gain (1) ($I_C = 200\text{ mAdc}$, $V_{CE} = 1\text{ Vdc}$) ($I_C = 1\text{ Adc}$, $V_{CE} = 1\text{ Vdc}$)	h_{FE}	40 15	180 —	—
Collector–Emitter Saturation Voltage (1) ($I_C = 500\text{ mAdc}$, $I_B = 50\text{ mAdc}$) ($I_C = 1\text{ Adc}$, $I_B = 100\text{ mAdc}$)	$V_{CE(sat)}$	— —	0.3 0.6	Vdc
Base–Emitter Saturation Voltage (1) ($I_C = 2\text{ Adc}$, $I_B = 200\text{ mAdc}$)	$V_{BE(sat)}$	—	1.8	Vdc
Base–Emitter On Voltage (1) ($I_C = 500\text{ mAdc}$, $V_{CE} = 1\text{ Vdc}$)	$V_{BE(on)}$	—	1.5	Vdc

DYNAMIC CHARACTERISTICS

Current–Gain — Bandwidth Product (2) ($I_C = 100\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f_{test} = 10\text{ MHz}$)	f_T	40	—	MHz
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 0.1\text{ MHz}$)	C_{ob}	—	50	pF

(1) Pulse Test: Pulse Width = 300 μs , Duty Cycle $\approx 2\%$.

(2) $f_T = |h_{FE}| \cdot f_{test}$.

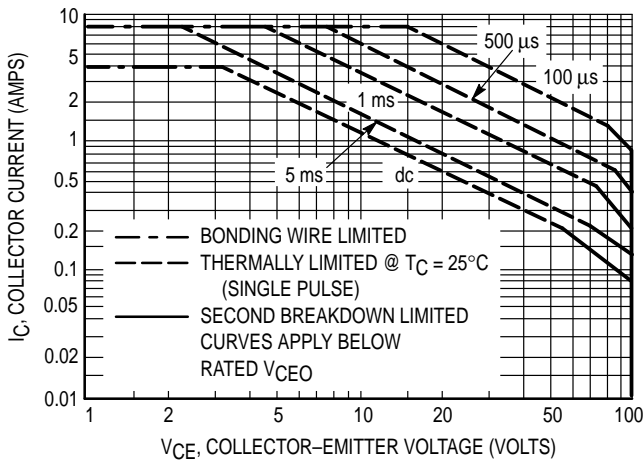


Figure 2. Active Region Maximum Safe Operating Area

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 $T_{J(pk)} = 150^\circ\text{C}$; 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.

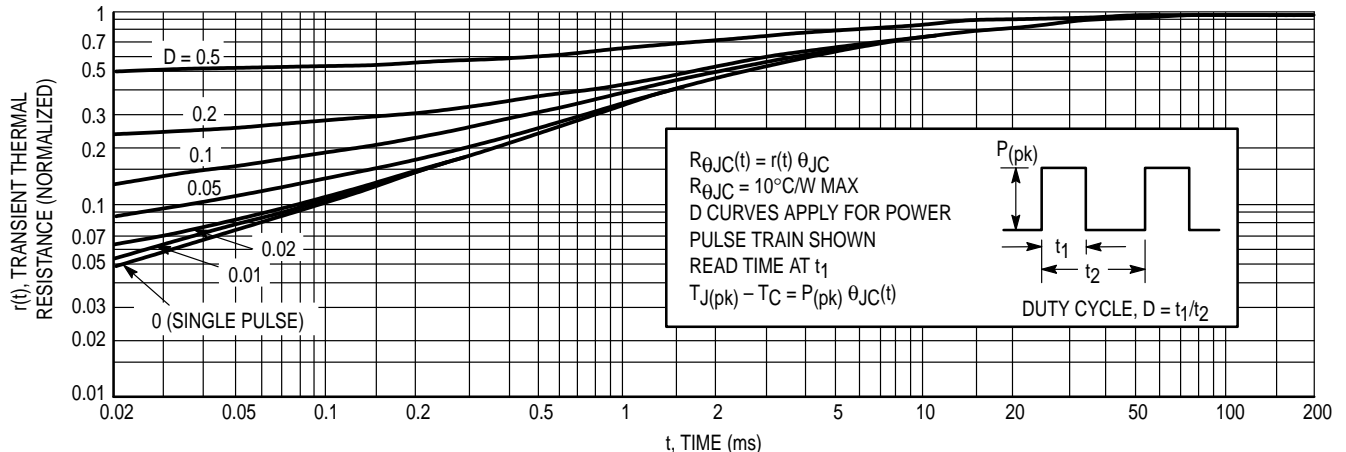


Figure 3. Thermal Response

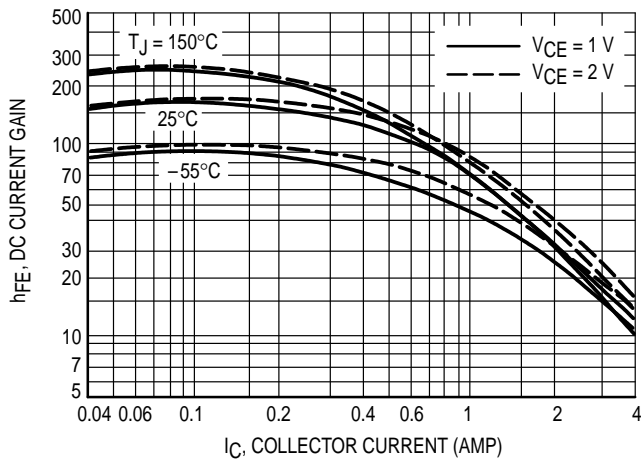


Figure 4. DC Current Gain

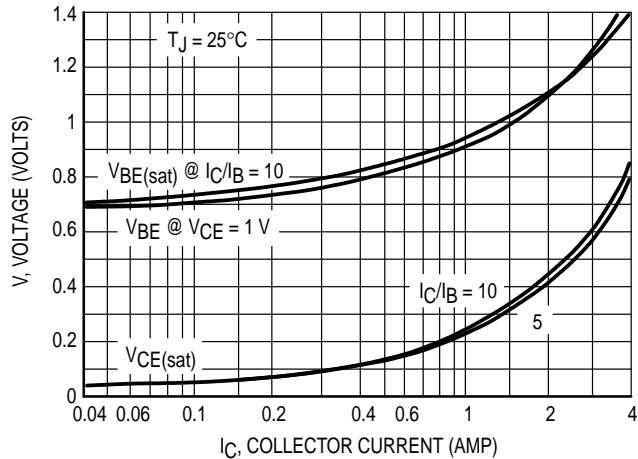


Figure 5. "On" Voltages

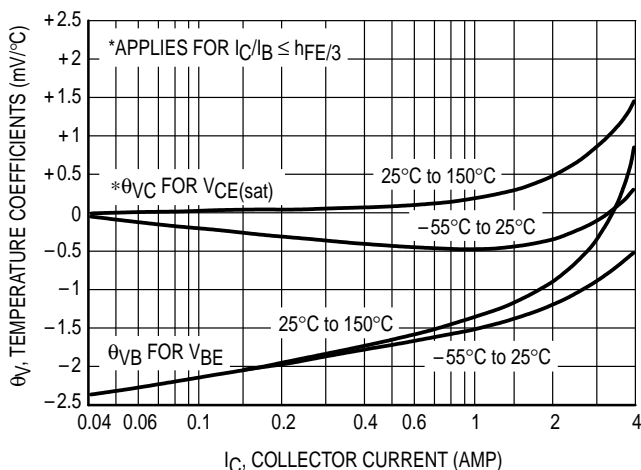
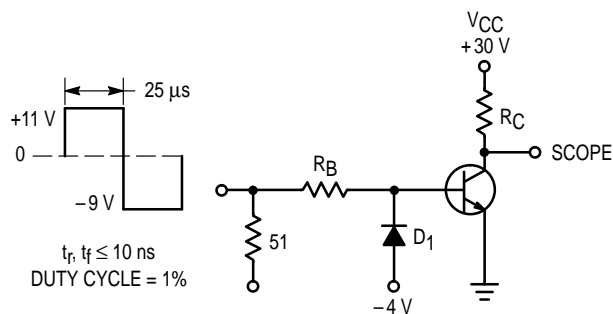


Figure 6. Temperature Coefficients



R_B and R_C VARIED TO OBTAIN DESIRED CURRENT LEVELS
 D₁ MUST BE FAST RECOVERY TYPE, e.g.:
 1N5825 USED ABOVE $I_B \approx 100$ mA FOR PNP TEST CIRCUIT,
 MSD6100 USED BELOW $I_B \approx 100$ mA REVERSE ALL POLARITIES

Figure 7. Switching Time Test Circuit

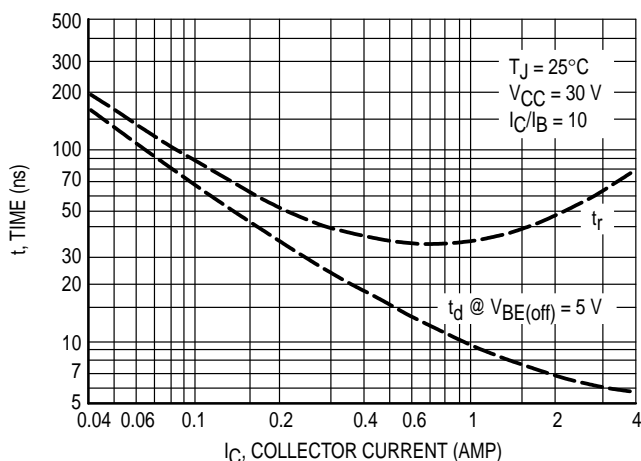


Figure 8. Turn-On Time

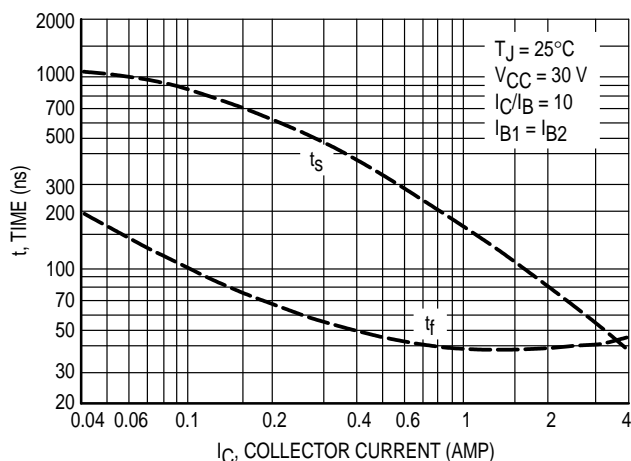


Figure 9. Turn-Off Time

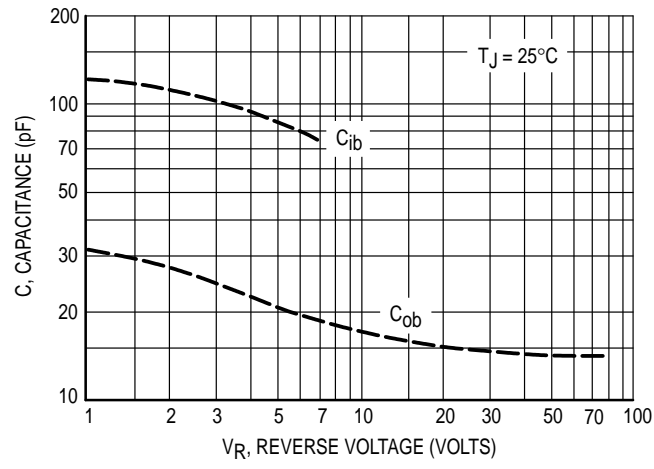
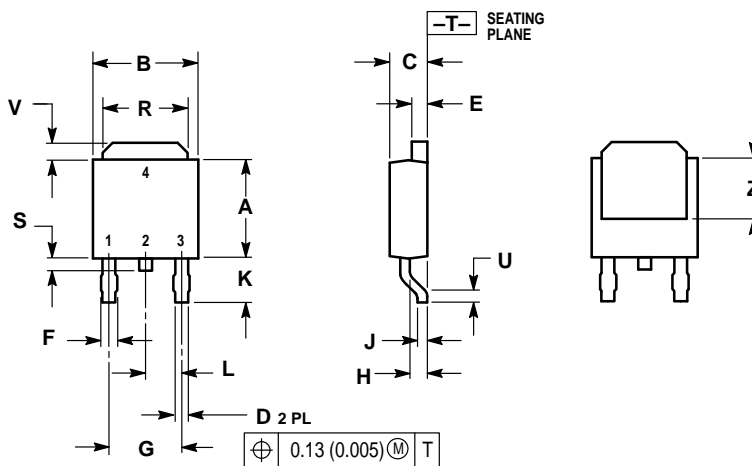


Figure 10. Capacitance

PACKAGE DIMENSIONS

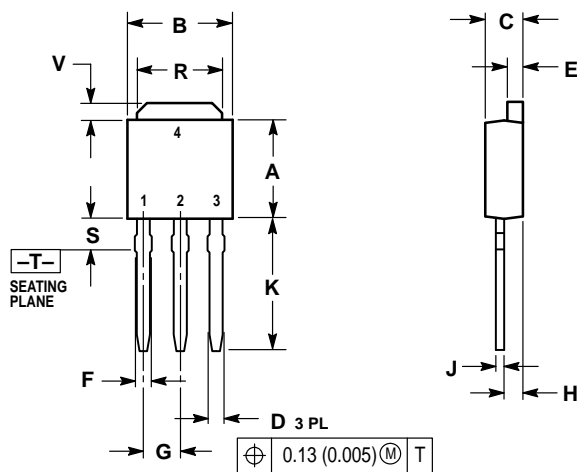


- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.235	0.250	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

CASE 369A-13
 ISSUE W




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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

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CASE 369-07
 ISSUE K

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