MJD47, MJD50

Preferred Device

High Voltage Power Transistors

DPAK For Surface Mount Applications

Designed for line operated audio output amplifier, SWITCHMODE™ power supply drivers and other switching applications.

Features

- Pb−Free Packages are Available
- Lead Formed for Surface Mount Applications in Plastic Sleeves (No Suffix)
- Lead Formed Version in 16 mm Tape and Reel (“T4” Suffix)
- Electrically Similar to Popular TIP47, and TIP50
- 250 and 400 V (Min) − $V_{CEO(sus)}$
- 1 A Rated Collector Current
- Epoxy Meets UL 94, V−0 @ 0.125 in
- ESD Ratings: Human Body Model, 3B > 8000 V
  Machine Model, C > 400 V

MAXIMUM RATINGS

Rating	Symbol	Max	Unit
Collector−Emitter Voltage	V_{CEO}		Vdc
MJD47		250	
MJD50		400	
Collector−Base Voltage	V_{CB}		Vdc
MJD47		350	
MJD50		500	
Emitter−Base Voltage	V_{EB}	5	Vdc
Collector Current − Continuous Peak	I_C	1 2	Adc
Base Current	I_B	0.6	mAdc
Total Power Dissipation @ T_C = 25°C Derate above 25°C	P_D	15 0.12	W W/°C
Total Power Dissipation* @ T_A = 25°C Derate above 25°C	P_D	1.56 0.0125	W W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +150	°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.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	8.33	°C/W
Thermal Resistance, Junction−to−Ambient*	$R_{\theta JA}$	80	°C/W
Lead Temperature for Soldering Purpose	T_L	260	°C

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

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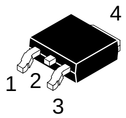
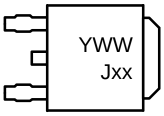
NPN SILICON
POWER TRANSISTORS
1 AMPERE
250, 400 VOLTS
15 WATTS

MARKING DIAGRAM



DPAK
CASE 369C
STYLE 1



Y = Year
WW = Work Week
xx = 47 or 50

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

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

December, 2004 − Rev. 6

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector−Emitter Sustaining Voltage (Note 1) (I_C = 30 mAdc, I_B = 0)	MJD47 MJD50	$V_{CEO(sus)}$	250 400	− −	Vdc
Collector Cutoff Current (V_{CE} = 150 Vdc, I_B = 0) (V_{CE} = 300 Vdc, I_B = 0)	MJD47 MJD50	I_{CEO}	− −	0.2 0.2	mAdc
Collector Cutoff Current (V_{CE} = 350 Vdc, V_{BE} = 0) (V_{CE} = 500 Vdc, V_{BE} = 0)	MJD47 MJD50	I_{CES}	− −	0.1 0.1	mAdc
Emitter Cutoff Current (V_{BE} = 5 Vdc, I_C = 0)		I_{EBO}	−	1	mAdc
ON CHARACTERISTICS (Note 1)					
DC Current Gain (I_C = 0.3 Adc, V_{CE} = 10 Vdc) (I_C = 1 Adc, V_{CE} = 10 Vdc)		h_{FE}	30 10	150 −	−
Collector−Emitter Saturation Voltage (I_C = 1 Adc, I_B = 0.2 Adc)		$V_{CE(sat)}$	−	1	Vdc
Base−Emitter On Voltage (I_C = 1 Adc, V_{CE} = 10 Vdc)		$V_{BE(on)}$	−	1.5	Vdc
DYNAMIC CHARACTERISTICS					
Current Gain — Bandwidth Product (I_C = 0.2 Adc, V_{CE} = 10 Vdc, f = 2 MHz)		f_T	10	−	MHz
Small−Signal Current Gain (I_C = 0.2 Adc, V_{CE} = 10 Vdc, f = 1 kHz)		h_{fe}	25	−	−

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

ORDERING INFORMATION

Device	Package	Shipping†
MJD47	369C	75 Units / Rail
MJD47T4	369C	2500 Tape & Reel
MJD47T4G	369C (Pb−Free)	2500 Tape & Reel
MJD50	369C	75 Units / Rail
MJD50T4	369C	2500 Tape & Reel
MJD50T4G	369C (Pb−Free)	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.

TYPICAL CHARACTERISTICS

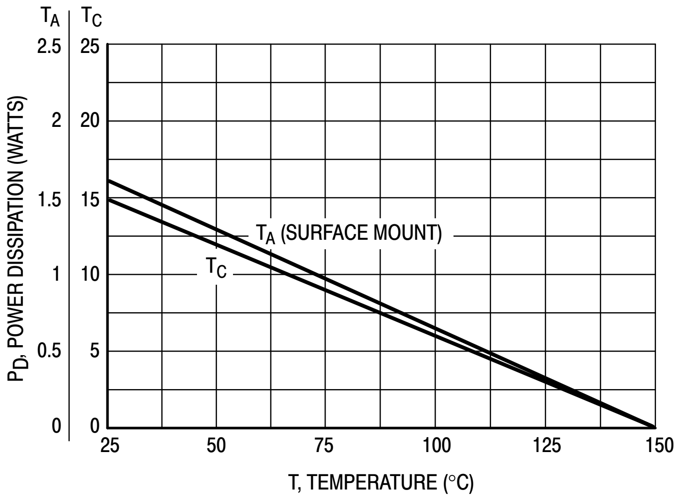


Figure 1. Power Derating

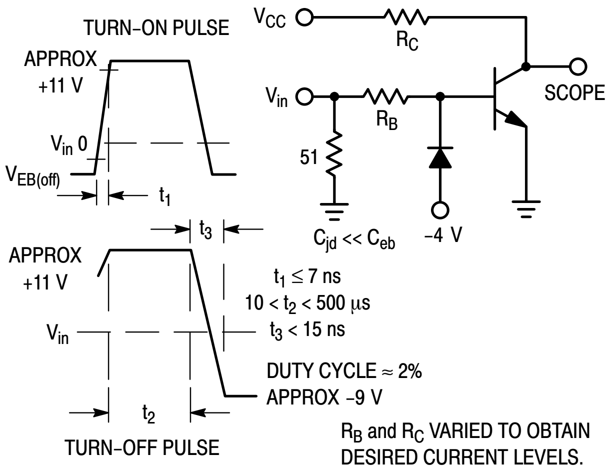


Figure 2. Switching Time Equivalent Circuit

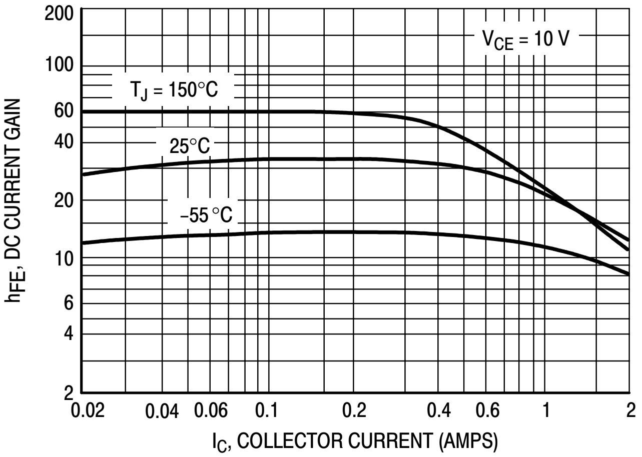


Figure 3. DC Current Gain

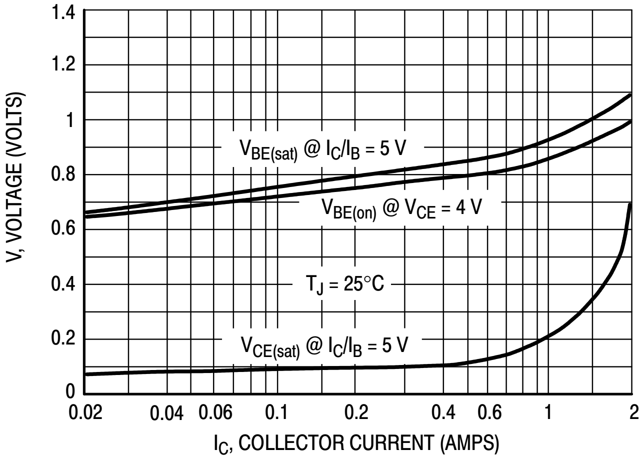


Figure 4. “On” Voltages

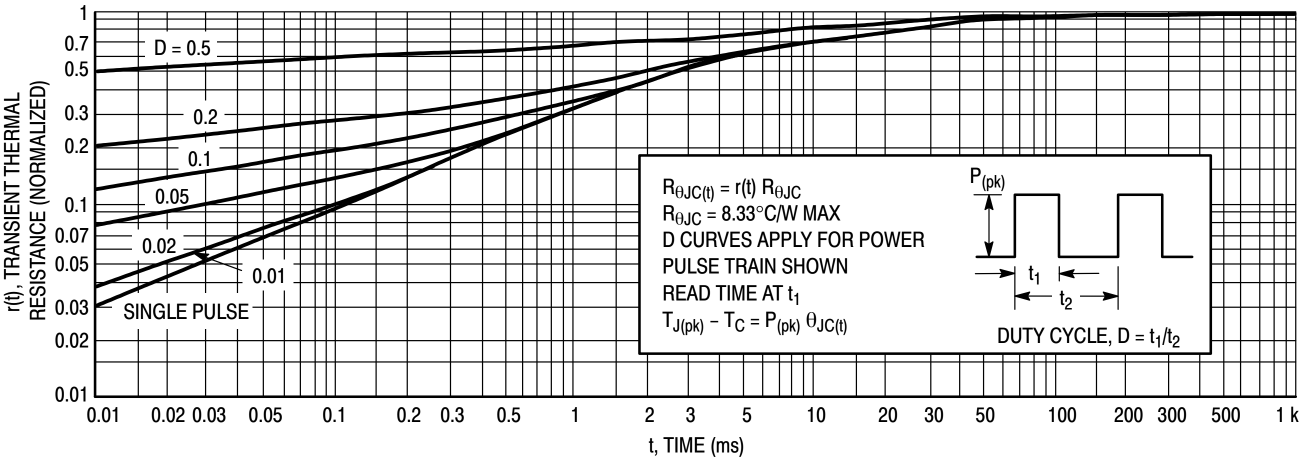


Figure 5. Thermal Response

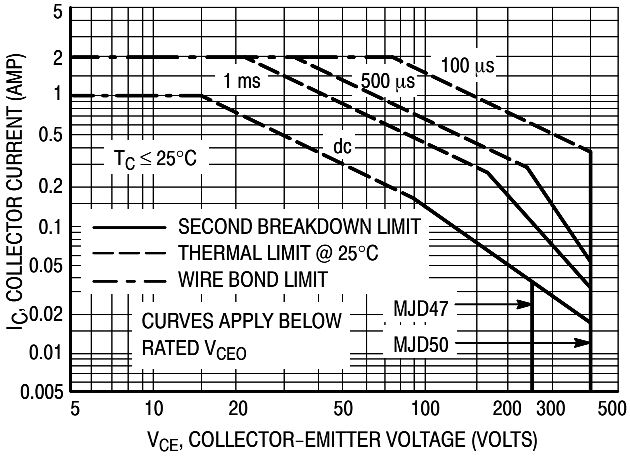


Figure 6. Active Region Safe Operating Area

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 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 $T_{J(pk)} \le 150°C$. $T_{J(pk)}$ may be calculated from the data in Figure 5. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

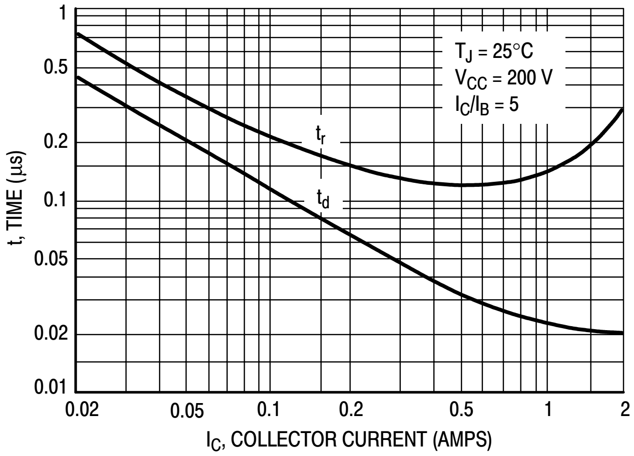


Figure 7. Turn−On Time

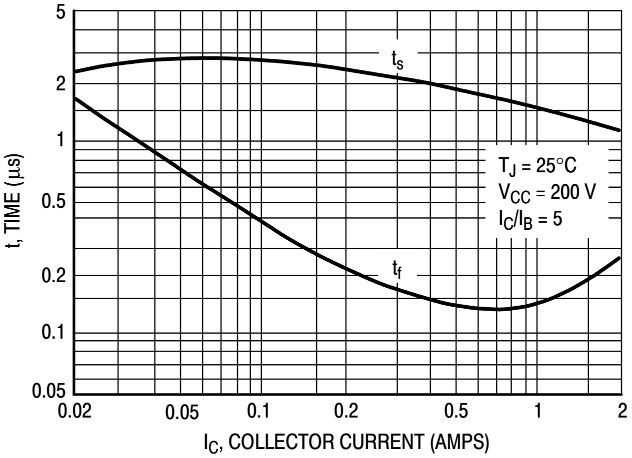
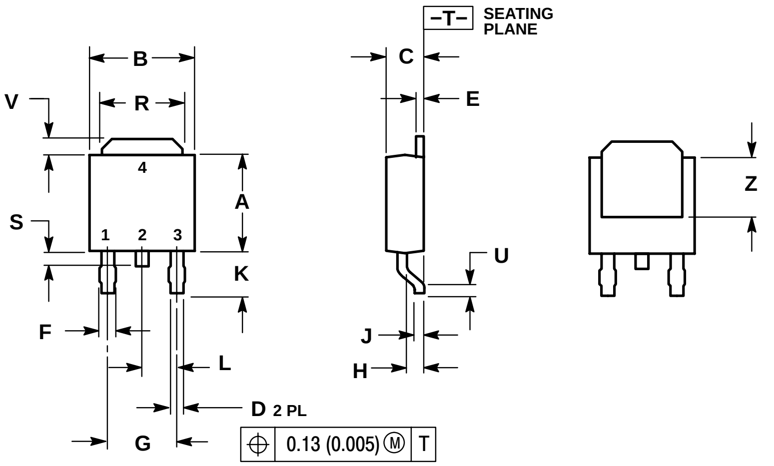


Figure 8. Turn-Off Time

PACKAGE DIMENSIONS

DPAK

CASE 369C−01
ISSUE O

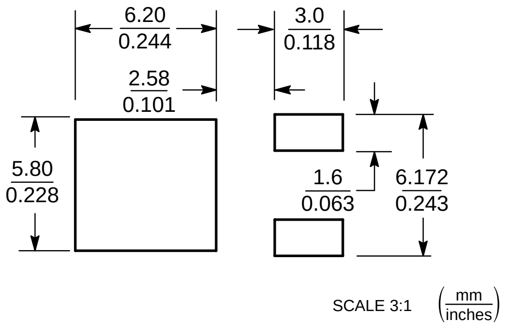


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

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*



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

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