

High Voltage Power Transistors

DPAK For Surface Mount Applications

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

- 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)
- Electrically Similar to Popular TIP47, and TIP50
- 250 and 400 V (Min) — $V_{CEO(sus)}$
- 1 A Rated Collector Current

MAXIMUM RATINGS

Rating	Symbol	MJD47	MJD50	Unit
Collector–Emitter Voltage	V_{CEO}	250	400	Vdc
Collector–Base Voltage	V_{CB}	350	500	Vdc
Emitter–Base Voltage	V_{EB}	5		Vdc
Collector Current — Continuous Peak	I_C	1 2		Adc
Base Current	I_B	0.6		Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	15 0.12		Watts W/ $^\circ\text{C}$
Total Power Dissipation* @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	1.56 0.0125		Watts 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	$R_{\theta JC}$	8.33	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient*	$R_{\theta JA}$	80	$^\circ\text{C/W}$
Lead Temperature for Soldering Purpose	T_L	260	$^\circ\text{C}$

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

Characteristic	Symbol	Min	Max	Unit
Collector–Emitter Sustaining Voltage (1) ($I_C = 30\text{ mAdc}, I_B = 0$)	$V_{CEO(sus)}$	250 400	— —	Vdc
Collector Cutoff Current ($V_{CE} = 150\text{ Vdc}, I_B = 0$) ($V_{CE} = 300\text{ Vdc}, I_B = 0$)	I_{CEO}	— —	0.2 0.2	mAdc

*When surface mounted on minimum pad sizes recommended.
(1) Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2\%$.

(continued)

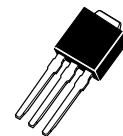
MJD47* MJD50*

*ON Semiconductor Preferred Device

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

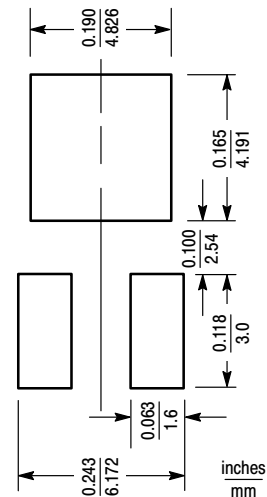


CASE 369A-13



CASE 369-07

MINIMUM PAD SIZES RECOMMENDED FOR SURFACE MOUNTED APPLICATIONS



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

MJD47 MJD50

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

Characteristic	Symbol	Min	Max	Unit
----------------	--------	-----	-----	------

OFF CHARACTERISTICS — continued

Collector Cutoff Current ($V_{CE} = 350\text{ Vdc}$, $V_{BE} = 0$) ($V_{CE} = 500\text{ Vdc}$, $V_{BE} = 0$)	MJD47 MJD50	I_{CES}	— 0.1	mAdc
Emitter Cutoff Current ($V_{BE} = 5\text{ Vdc}$, $I_C = 0$)		I_{EBO}	— 1	mAdc

ON CHARACTERISTICS (1)

DC Current Gain ($I_C = 0.3\text{ Adc}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 1\text{ Adc}$, $V_{CE} = 10\text{ Vdc}$)	h_{FE}	30 10	150 —	—
Collector–Emitter Saturation Voltage ($I_C = 1\text{ Adc}$, $I_B = 0.2\text{ Adc}$)	$V_{CE(sat)}$	—	1	Vdc
Base–Emitter On Voltage ($I_C = 1\text{ Adc}$, $V_{CE} = 10\text{ Vdc}$)	$V_{BE(on)}$	—	1.5	Vdc

DYNAMIC CHARACTERISTICS

Current Gain — Bandwidth Product ($I_C = 0.2\text{ Adc}$, $V_{CE} = 10\text{ Vdc}$, $f = 2\text{ MHz}$)	f_T	10	—	MHz
Small–Signal Current Gain ($I_C = 0.2\text{ Adc}$, $V_{CE} = 10\text{ Vdc}$, $f = 1\text{ kHz}$)	h_{fe}	25	—	—

(1) Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2\%$.

TYPICAL CHARACTERISTICS

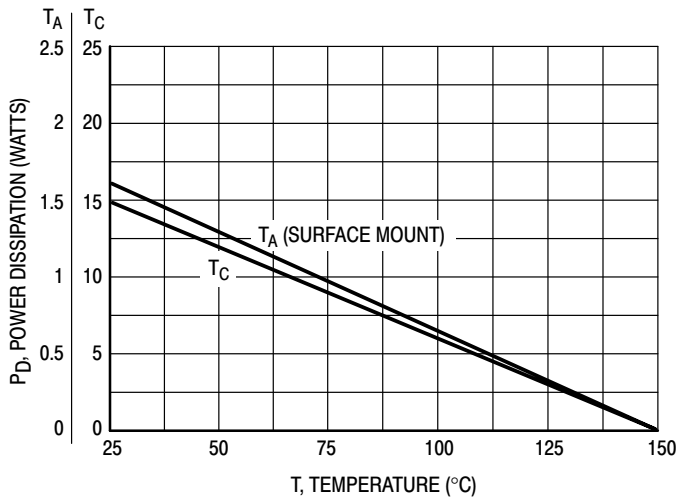


Figure 1. Power Derating

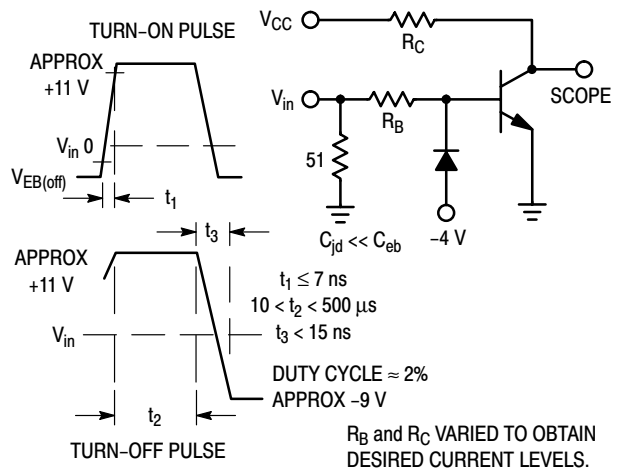


Figure 2. Switching Time Equivalent Circuit

MJD47 MJD50

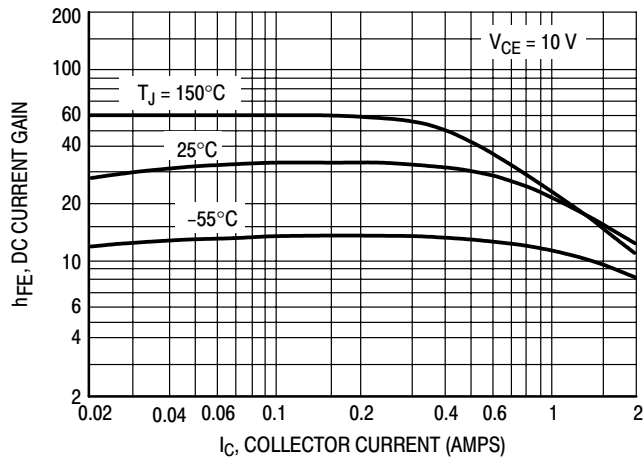


Figure 3. DC Current Gain

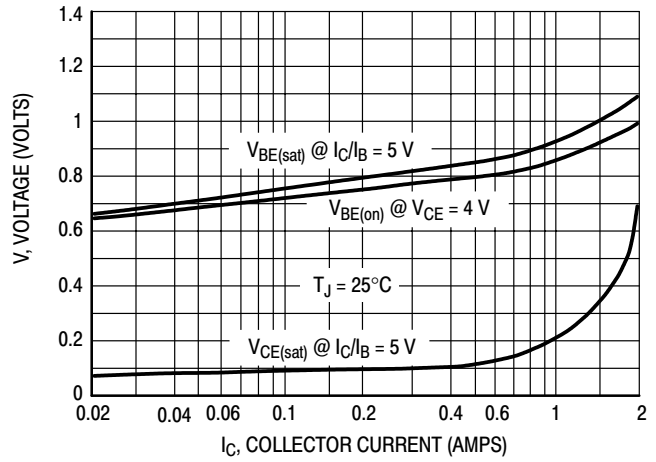


Figure 4. "On" Voltages

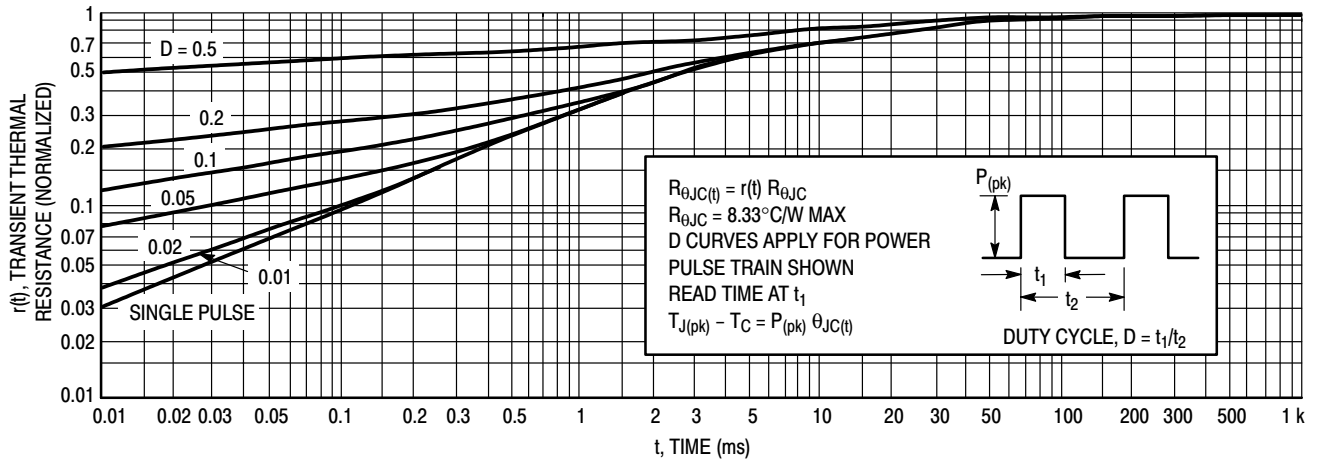


Figure 5. Thermal Response

MJD47 MJD50

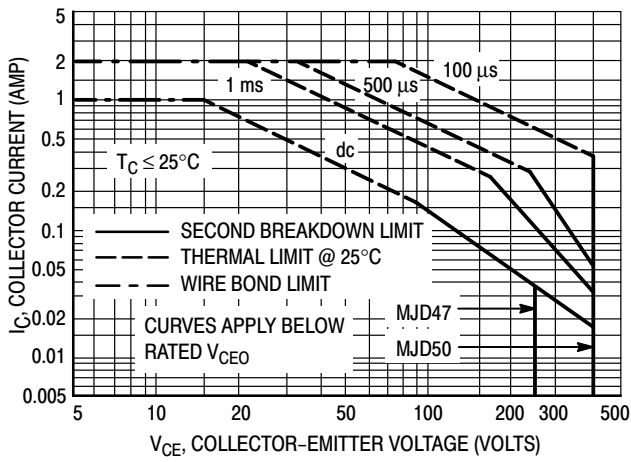


Figure 6. Active Region Safe Operating Area

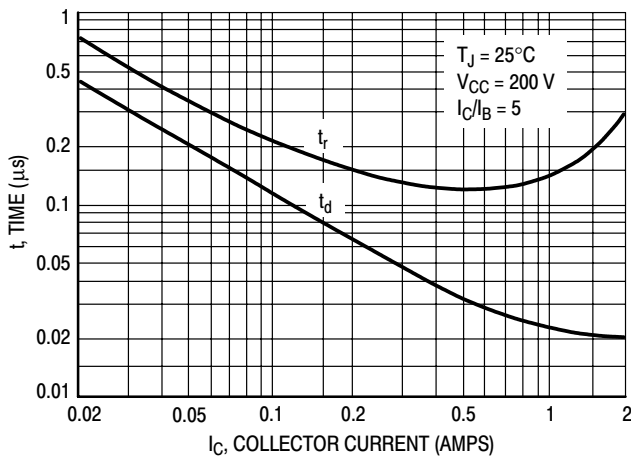


Figure 7. Turn-On Time

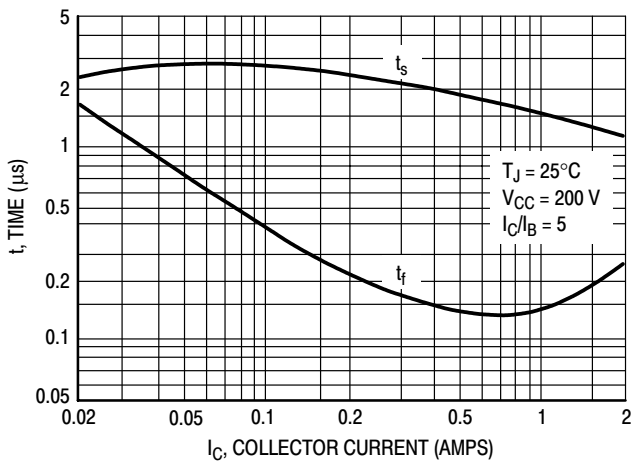


Figure 8. Turn-Off Time

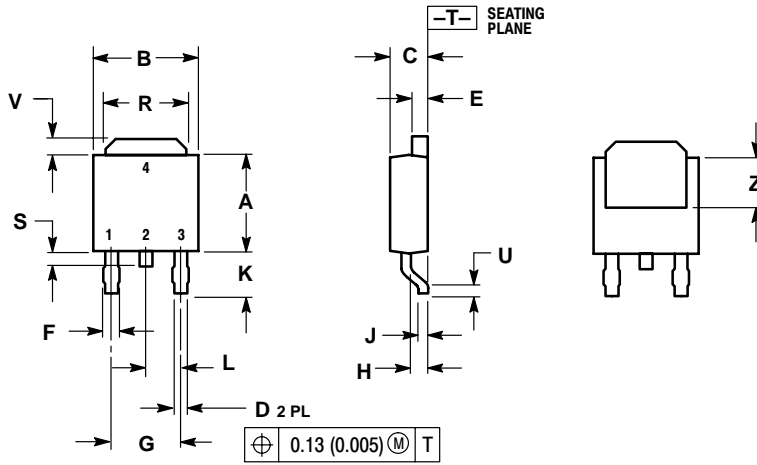
There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate $I_C - V_{CE}$ limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 6 is based on $T_{J(pk)} = 150^\circ\text{C}$; 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 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.

MJD47 MJD50

PACKAGE DIMENSIONS

DPAK CASE 369A-13 ISSUE AA



NOTES:

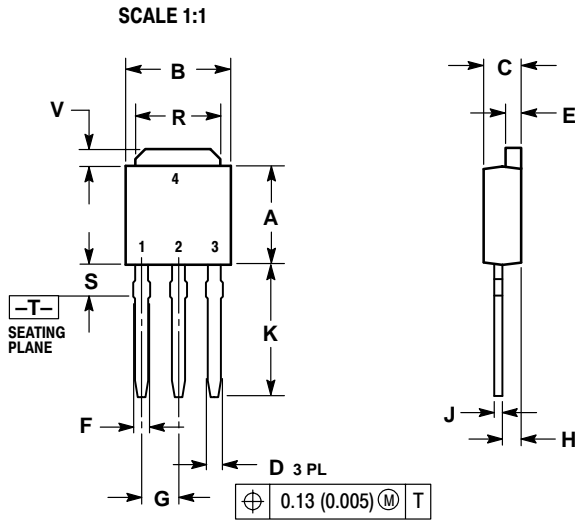
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

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	0.180 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	---

MJD47 MJD50

PACKAGE DIMENSIONS


DPAK 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

Notes

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer.

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.