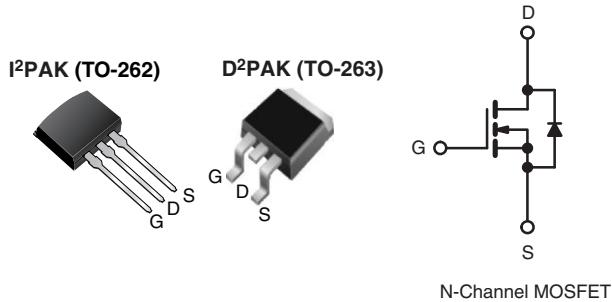


Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	60	
$R_{DS(on)}$ (Ω)	$V_{GS} = 10$ V	0.018
Q_g (Max.) (nC)	110	
Q_{gs} (nC)	29	
Q_{gd} (nC)	36	
Configuration	Single	



FEATURES

- Halogen-free According to IEC 61249-2-21

Definition

- Advanced Process Technology
- Dynamic dV/dt
- 175 °C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Drop in Replacement of the IRFZ48, SiHFZ48 for Linear/Audio Applications
- Compliant to RoHS Directive 2002/95/EC



RoHS*
COMPLIANT
HALOGEN
FREE
Available

DESCRIPTION

Advanced Power MOSFETs from Vishay utilize advanced processing techniques to achieve extremely low on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design that Power MOSFETs are well known for, provides the designer with an extremely efficient and reliable device for use in a wide variety of applications.

The D²PAK is a surface mount power package capable of accommodating die sizes up to HEX-4. It provides the highest power capability and the lowest possible on-resistance in any existing surface mount package. The D²PAK is suitable for high current applications because of its low internal connection resistance and can dissipate up to 2 W in a typical surface mount application.

ORDERING INFORMATION			
Package	D ² PAK (TO-263)	I ² PAK (TO-262)	
Lead (Pb)-free and Halogen-free	SiHFZ48RS-GE3	-	
Lead (Pb)-free	IRFZ48RSPbF	IRFZ48RLPbF	
	SiHFZ48RS-E3	SiHFZ48RL-E3	

ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ^{a, e}	V_{GS} at 10 V	50	A
		50	
Pulsed Drain Current ^{a, e}	I_{DM}	290	
Linear Derating Factor		1.3	W/°C
Single Pulse Avalanche Energy ^{b, e}	E_{AS}	100	mJ
Maximum Power Dissipation	P_D	190	W
Peak Diode Recovery dV/dt ^{c, e}	dV/dt	4.5	V/ns
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to + 175	°C
Soldering Recommendations (Peak Temperature) ^d	for 10 s	300 ^d	
Mounting Torque	6-32 or M3 screw	10	Ibf · in
		1.1	N · m

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = 25$ V, Starting $T_J = 25$ °C, $L = 22$ μ H, $R_g = 25$ Ω , $I_{AS} = 72$ A (see fig. 12).
- $I_{SD} \leq 72$ A, $dI/dt \leq 200$ A/ μ s, $V_{DD} \leq V_{DS}$, $T_J \leq 175$ °C.
- 1.6 mm from case.
- Current limited by the package, (die current = 72 A).

* Pb containing terminations are not RoHS compliant, exemptions may apply

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	62	$^{\circ}\text{C}/\text{W}$
Case-to-Sink, Flat, Greased Surface	R_{thCS}	0.50	-	
Maximum Junction-to-Case (Drain)	R_{thJC}	-	0.8	

SPECIFICATIONS ($T_J = 25^{\circ}\text{C}$, unless otherwise noted)

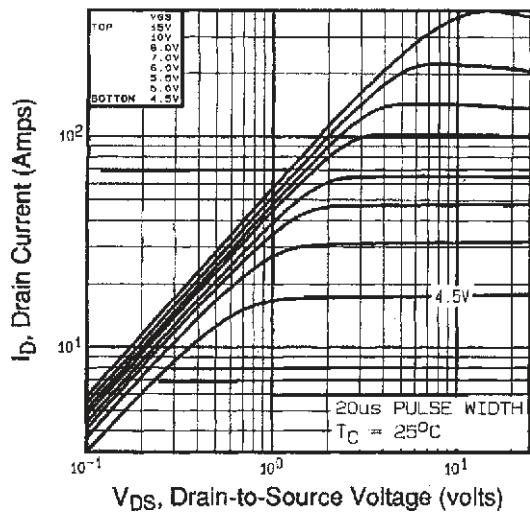
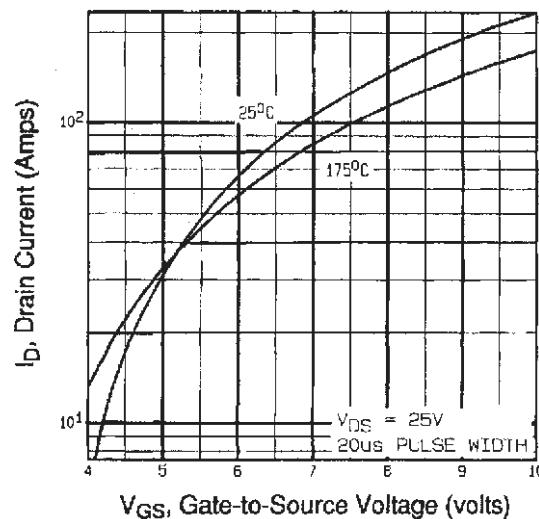
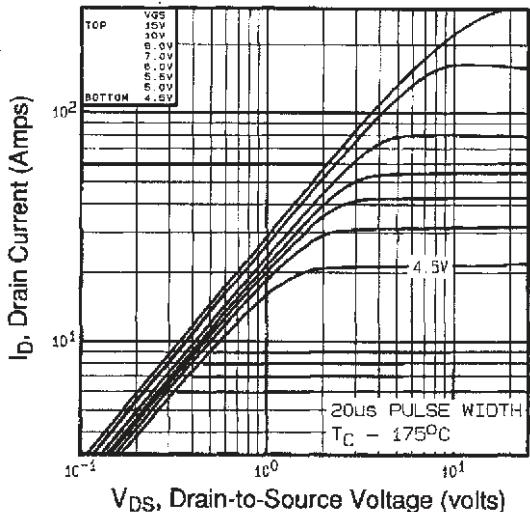
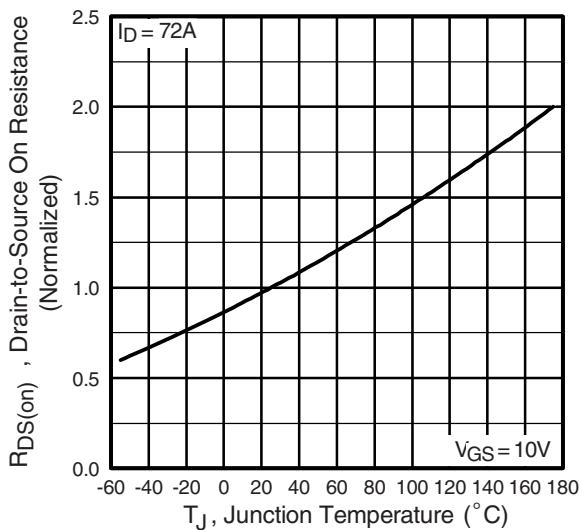
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Static							
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0 \text{ V}$, $I_D = 250 \mu\text{A}$	60	-	-	V	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25°C , $I_D = 1 \text{ mA}^c$	-	0.60	-	$^{\circ}\text{C}/\text{V}$	
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250 \mu\text{A}$	2.0	-	4.0	V	
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 20 \text{ V}$	-	-	± 100	nA	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 60 \text{ V}$, $V_{GS} = 0 \text{ V}$	-	-	25	μA	
		$V_{DS} = 48 \text{ V}$, $V_{GS} = 0 \text{ V}$, $T_J = 150^{\circ}\text{C}$	-	-	250		
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10 \text{ V}$	$I_D = 43 \text{ A}^b$	-	-	0.018	
Forward Transconductance	g_{fs}	$V_{DS} = 25 \text{ V}$	$I_D = 43 \text{ A}^b$	27	-	-	
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0 \text{ V}$, $V_{DS} = 25 \text{ V}$, $f = 1.0 \text{ MHz}$, see fig. 5 ^c	-	2400	-	pF	
Output Capacitance	C_{oss}		-	1300	-		
Reverse Transfer Capacitance	C_{rss}		-	190	-		
Total Gate Charge	Q_g	$V_{GS} = 10 \text{ V}$	$I_D = 72 \text{ A}$, $V_{DS} = 48 \text{ V}$, see fig. 6 and 13 ^{b, c}	-	-	110	
Gate-Source Charge	Q_{gs}			-	-	29	
Gate-Drain Charge	Q_{gd}			-	-	36	
Turn-On Delay Time	$t_{d(on)}$			-	8.1	-	
Rise Time	t_r	$V_{DD} = 30 \text{ V}$, $I_D = 72 \text{ A}$, $R_g = 9.1 \Omega$, $R_D = 0.34 \Omega$, see fig. 10 ^{b, c}	-	250	-	ns	
Turn-Off Delay Time	$t_{d(off)}$		-	210	-		
Fall Time	t_f		-	250	-		
Internal Drain Inductance	L_D		-	4.5	-	nH	
Internal Source Inductance	L_S	Between lead, 6 mm (0.25") from package and center of die contact		-	7.5		-
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode		-	-	50 ^c	A
Pulsed Diode Forward Current ^a	I_{SM}			-	-	290	
Body Diode Voltage	V_{SD}	$T_J = 25^{\circ}\text{C}$, $I_S = 72 \text{ A}$, $V_{GS} = 0 \text{ V}^b$	-	-	2.0	V	
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25^{\circ}\text{C}$, $I_F = 72 \text{ A}$, $dI/dt = 100 \text{ A}/\mu\text{s}^{b, c}$	-	120	180	ns	
Body Diode Reverse Recovery Charge	Q_{rr}		-	0.50	0.80	μC	
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)					

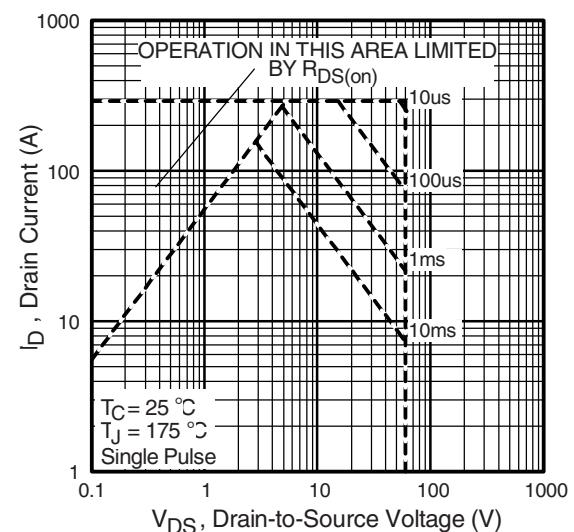
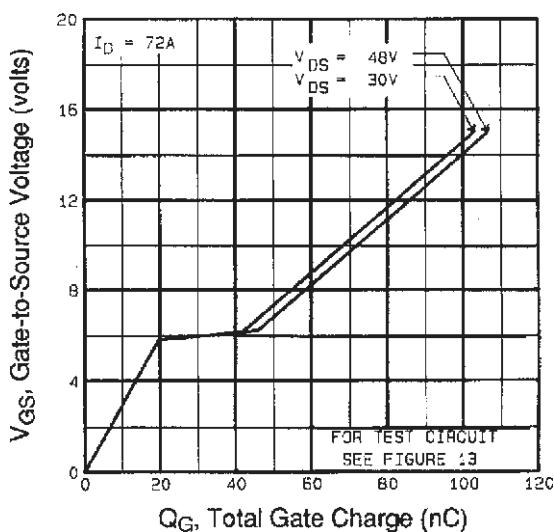
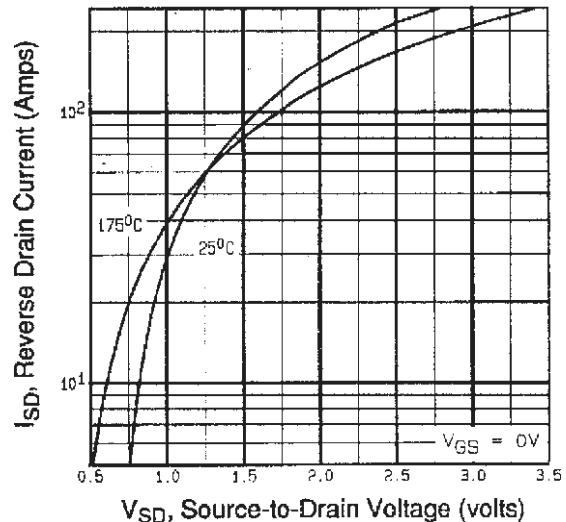
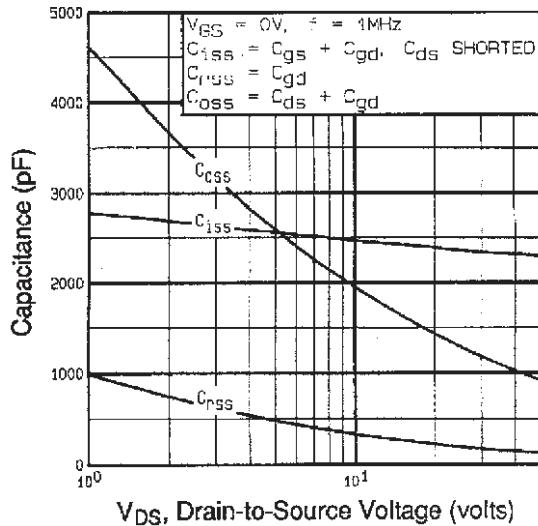
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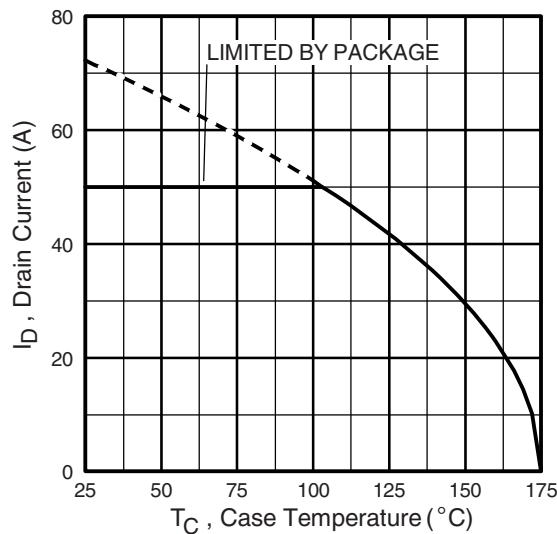
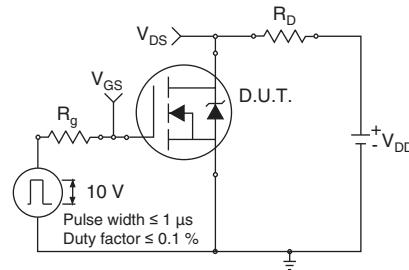
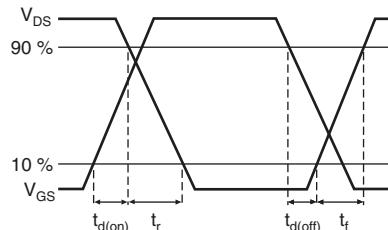
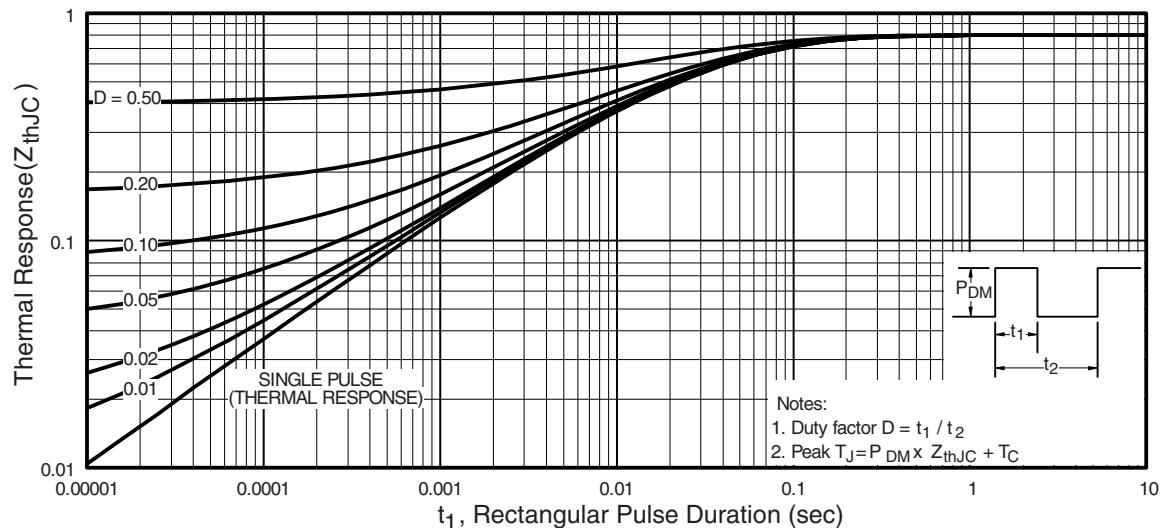
a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).

b. Pulse width $\leq 300 \mu\text{s}$; duty cycle $\leq 2\%$.

c. Current limited by the package, (die current = 72 A).

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Fig. 1 - Typical Output Characteristics

Fig. 3 - Typical Transfer Characteristics

Fig. 2 - Typical Output Characteristics

Fig. 4 - Normalized On-Resistance vs. Temperature




Fig. 9 - Maximum Drain Current vs. Case Temperature

Fig. 10a - Switching Time Test Circuit

Fig. 10b - Switching Time Waveforms

Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

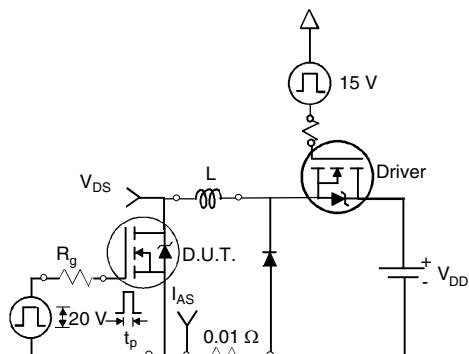


Fig. 12a - Unclamped Inductive Test Circuit

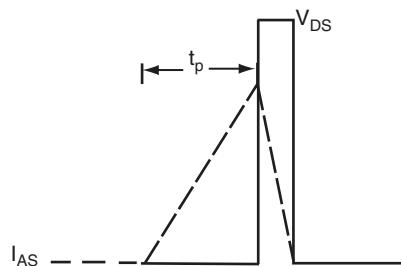


Fig. 12b - Unclamped Inductive Waveforms

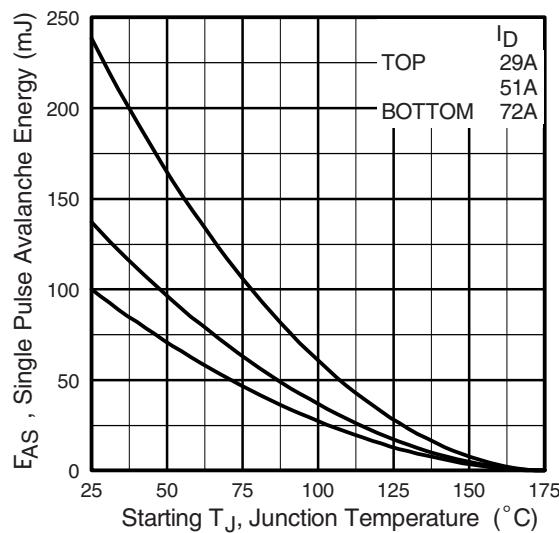


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

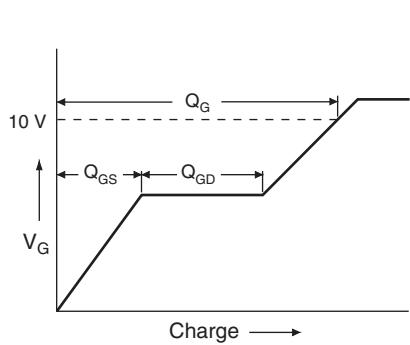


Fig. 13a - Maximum Avalanche Energy vs. Drain Current

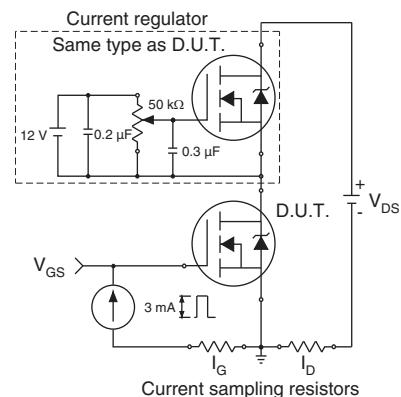
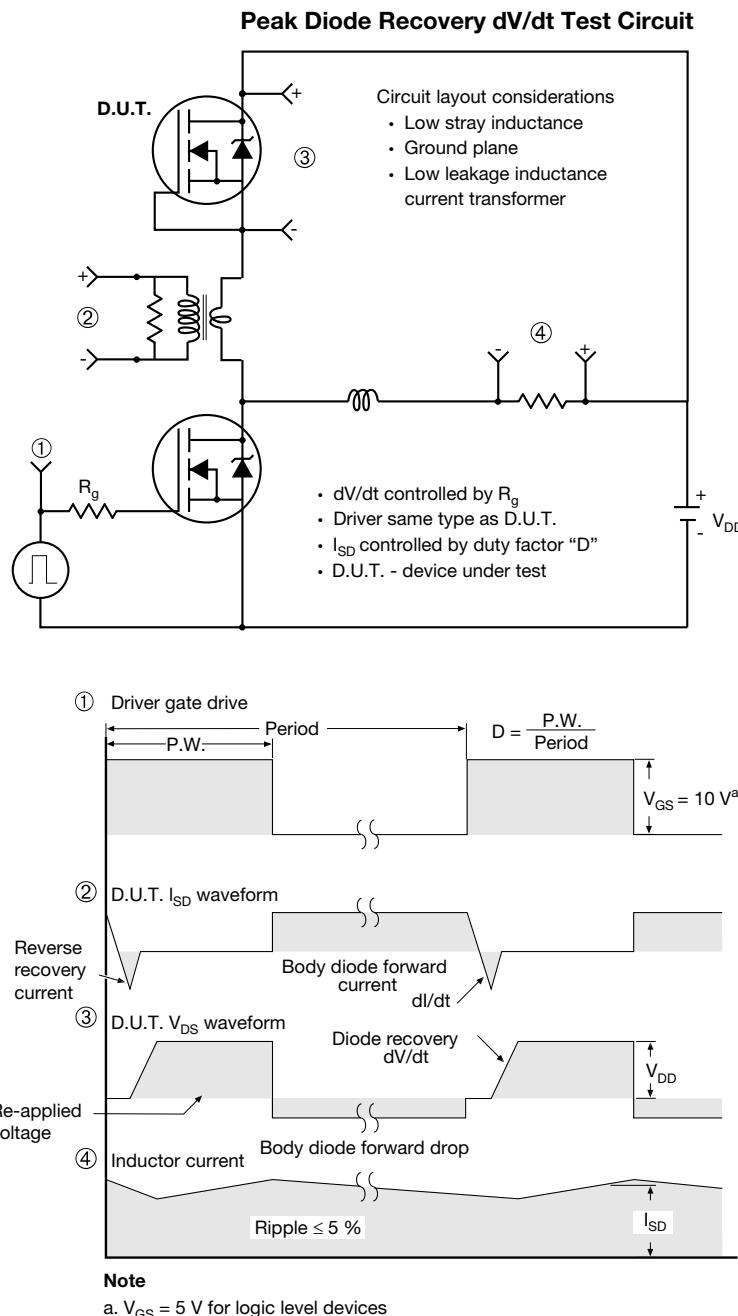
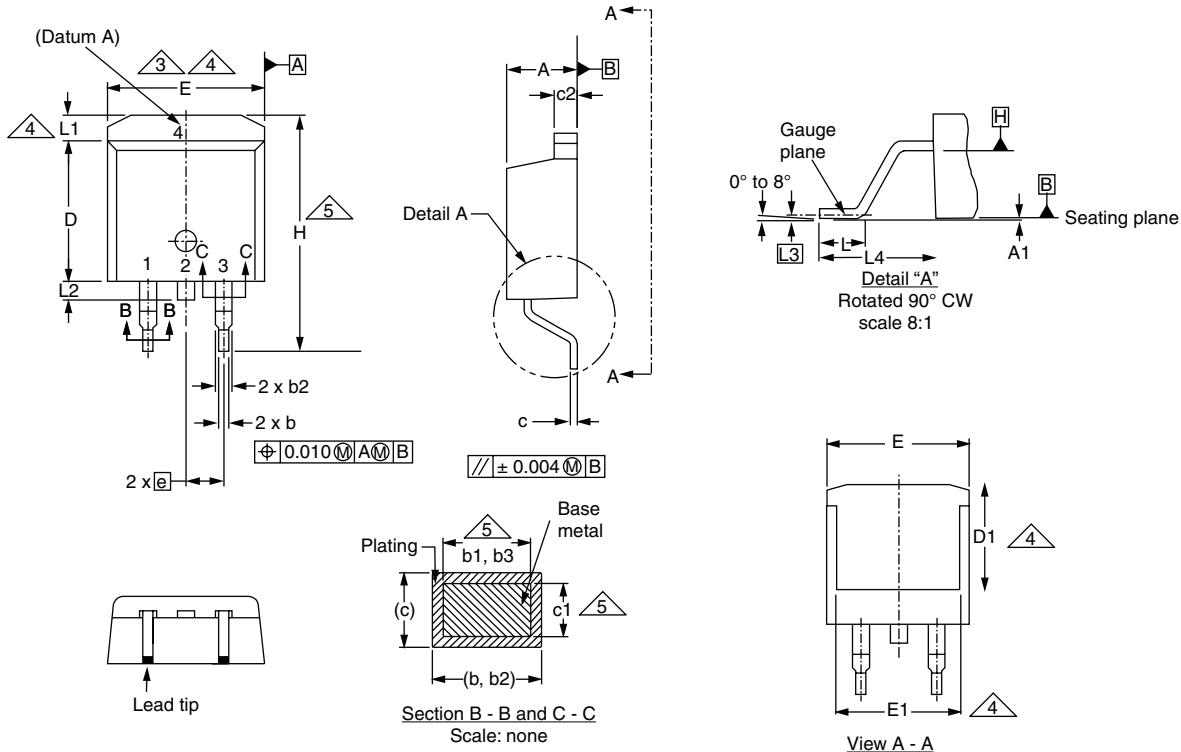


Fig. 13b - Gate Charge Test Circuit


Fig. 14 - For N-Channel

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TO-263AB (HIGH VOLTAGE)



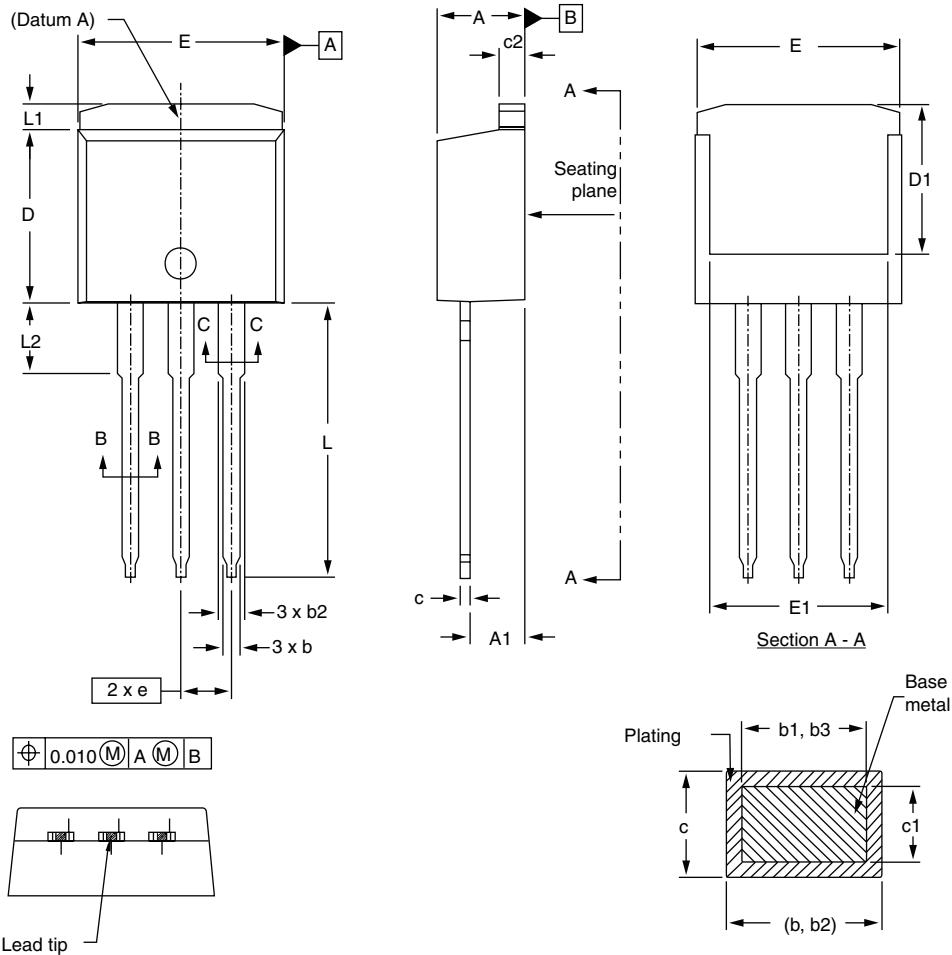
	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
A	4.06	4.83	0.160	0.190
A1	0.00	0.25	0.000	0.010
b	0.51	0.99	0.020	0.039
b1	0.51	0.89	0.020	0.035
b2	1.14	1.78	0.045	0.070
b3	1.14	1.73	0.045	0.068
c	0.38	0.74	0.015	0.029
c1	0.38	0.58	0.015	0.023
c2	1.14	1.65	0.045	0.065
D	8.38	9.65	0.330	0.380

	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
D1	6.86	-	0.270	-
E	9.65	10.67	0.380	0.420
E1	6.22	-	0.245	-
e	2.54 BSC		0.100 BSC	
H	14.61	15.88	0.575	0.625
L	1.78	2.79	0.070	0.110
L1	-	1.65	-	0.066
L2	-	1.78	-	0.070
L3	0.25 BSC		0.010 BSC	
L4	4.78	5.28	0.188	0.208

Notes

1. Dimensioning and tolerancing per ASME Y14.5M-1994.
2. Dimensions are shown in millimeters (inches).
3. Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body at datum A.
4. Thermal PAD contour optional within dimension E, L1, D1 and E1.
5. Dimension b1 and c1 apply to base metal only.
6. Datum A and B to be determined at datum plane H.
7. Outline conforms to JEDEC outline to TO-263AB.

I²PAK (TO-262) (HIGH VOLTAGE)



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.06	4.83	0.160	0.190
A1	2.03	3.02	0.080	0.119
b	0.51	0.99	0.020	0.039
b1	0.51	0.89	0.020	0.035
b2	1.14	1.78	0.045	0.070
b3	1.14	1.73	0.045	0.068
c	0.38	0.74	0.015	0.029
c1	0.38	0.58	0.015	0.023
c2	1.14	1.65	0.045	0.065

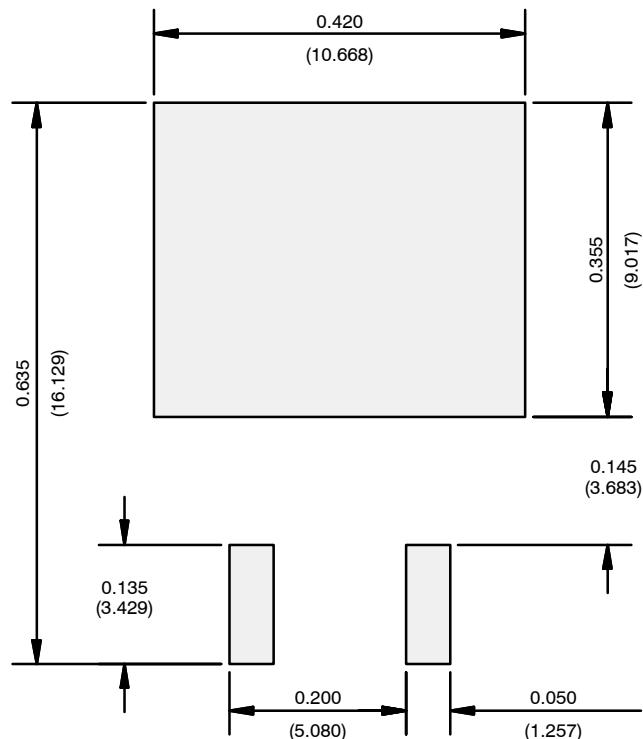
ECN: S-82442-Rev. A, 27-Oct-08

DWG: 5977

Notes

1. Dimensioning and tolerancing per ASME Y14.5M-1994.
2. Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm per side. These dimensions are measured at the outmost extremes of the plastic body.
3. Thermal pad contour optional within dimension E, L1, D1, and E1.
4. Dimension b1 and c1 apply to base metal only.

DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
D	8.38	9.65	0.330	0.380
D1	6.86	-	0.270	-
E	9.65	10.67	0.380	0.420
E1	6.22	-	0.245	-
e	2.54 BSC		0.100 BSC	
L	13.46	14.10	0.530	0.555
L1	-	1.65	-	0.065
L2	3.56	3.71	0.140	0.146

RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead

Recommended Minimum Pads
Dimensions in Inches/(mm)

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