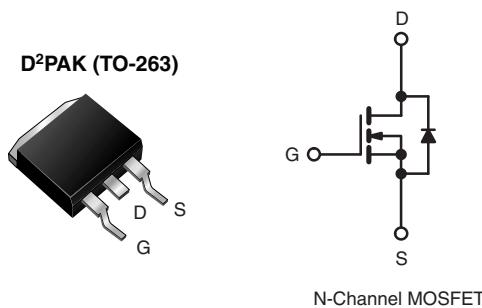


Power MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	200
$R_{DS(on)}$ (Ω)	$V_{GS} = 10$ V 0.40
Q_g (Max.) (nC)	43
Q_{gs} (nC)	7.0
Q_{gd} (nC)	23
Configuration	Single



FEATURES

- Halogen-free According to IEC 61249-2-21
- Definition
- Surface Mount
- Available in Tape and Reel
- Dynamic dV/dt Rating
- Repetitive Avalanche Rated
- Fast Switching
- Ease of Parallelizing
- Simple Drive Requirements
- Compliant to RoHS Directive 2002/95/EC



DESCRIPTION

Third generation Power MOSFETs from Vishay provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

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 2.0 W in a typical surface mount application.

ORDERING INFORMATION			
Package	D ² PAK (TO-263)	D ² PAK (TO-263)	D ² PAK (TO-263)
Lead (Pb)-free and Halogen-free	SiHF630S-GE3	SiHF630STR-GE3 ^a	SiHF630STRR-GE3 ^a
Lead (Pb)-free	IRF630SPbF	IRF630STRLPbF ^a	IRF630STRRPbF ^a
	SiHF630S-E3	SiHF630STL-E3 ^a	SiHF630STR-E3 ^a

Note

a. See device orientation.

ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		V_{DS}	200	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current	V_{GS} at 10 V	I_D	9.0	A
	$T_C = 25$ °C		5.7	
	$T_C = 100$ °C			
Pulsed Drain Current ^a		I_{DM}	36	
Linear Derating Factor			0.59	W/°C
Linear Derating Factor (PCB Mount) ^e			0.025	
Single Pulse Avalanche Energy ^b		E_{AS}	250	mJ
Repetitive Avalanche Current ^a		I_{AR}	9.0	A
Repetitive Avalanche Energy ^a		E_{AR}	7.4	mJ
Maximum Power Dissipation	$T_C = 25$ °C	P_D	74	W
Maximum Power Dissipation (PCB Mount) ^e	$T_A = 25$ °C		3.0	
Peak Diode Recovery dV/dt ^c		dV/dt	5.0	V/ns

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

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$
Soldering Recommendations (Peak Temperature)	for 10 s	300 ^d	

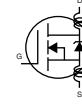
Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = 50\text{ V}$, starting $T_J = 25^\circ\text{C}$, $L = 4.6\text{ mH}$, $R_g = 25\text{ }\Omega$, $I_{AS} = 9.0\text{ A}$ (see fig. 12).
- $I_{SD} \leq 9.0\text{ A}$, $dI/dt \leq 120\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DS}$, $T_J \leq 150^\circ\text{C}$.
- 1.6 mm from case.
- When mounted on 1" square PCB (FR-4 or G-10 material).

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient (PCB Mount) ^c	R_{thJA}	-	-	40	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Ambient	R_{thJA}	-	-	62	
Maximum Junction-to-Case (Drain)	R_{thJC}	-	-	1.7	

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

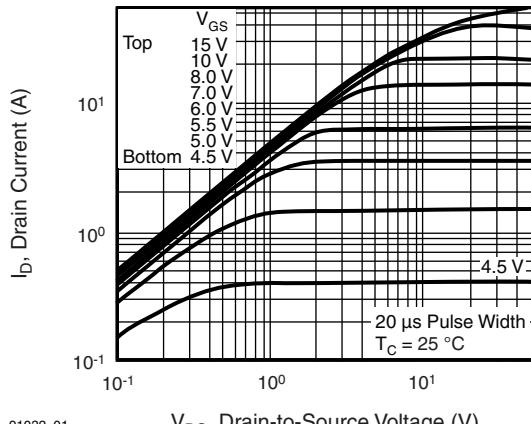
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0$, $I_D = 250\text{ }\mu\text{A}$		200	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25°C , $I_D = 1\text{ mA}$		-	0.24	-	$^\circ\text{C}/\text{V}$
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$		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}	$V_{DS} = 200\text{ V}$, $V_{GS} = 0\text{ V}$		-	-	25	μA
		$V_{DS} = 160\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125^\circ\text{C}$		-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 5.4\text{ A}^b$	-	-	0.40	Ω
Forward Transconductance	g_{fs}	$V_{DS} = 50\text{ V}$	$I_D = 5.4\text{ A}^b$	3.8	-	-	S
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1.0\text{ MHz}$, see fig. 5		-	800	-	pF
Output Capacitance	C_{oss}			-	240	-	
Reverse Transfer Capacitance	C_{rss}			-	76	-	
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 5.9\text{ A}$, $V_{DS} = 160\text{ V}$ see fig. 6 and 13 ^b	-	-	43	nC
Gate-Source Charge	Q_{gs}			-	-	7.0	
Gate-Drain Charge	Q_{gd}			-	-	23	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 100\text{ V}$, $I_D = 5.9\text{ A}$ $R_g = 12\text{ }\Omega$, $R_D = 16\text{ }\Omega$ see fig. 10 ^b		-	9.4	-	ns
Rise Time	t_r		-	28	-		
Turn-Off Delay Time	$t_{d(off)}$		-	39	-		
Fall Time	t_f		-	20	-		
Internal Drain Inductance	L_D	Between lead, 6 mm (0.25") from package and center of die contact		-	4.5	-	nH
Internal Source Inductance	L_S			-	7.5	-	

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

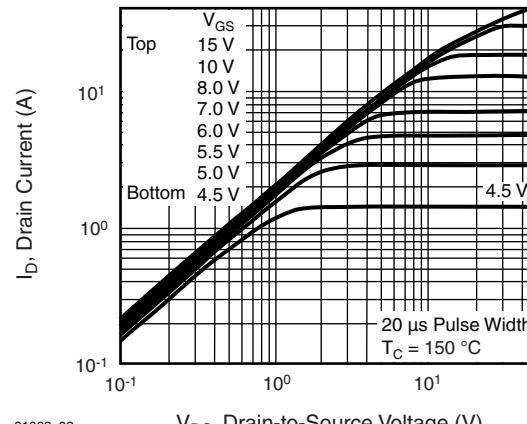
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode	-	-	9.0	A
Pulsed Diode Forward Current ^a	I_{SM}		-	-	36	
Body Diode Voltage	V_{SD}	$T_J = 25^\circ\text{C}$, $I_S = 9.0\text{ A}$, $V_{GS} = 0\text{ V}^b$	-	-	2.0	V
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25^\circ\text{C}$, $I_F = 5.9\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}^b$	-	170	340	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	1.1	2.2	μC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)				

Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- b. Pulse width $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\%$.
- c. When mounted on 1" square PCB (FR-4 or G-10 material).

TYPICAL CHARACTERISTICS (25°C , unless otherwise noted)


91032_01

 V_{DS} , Drain-to-Source Voltage (V)

91032_02

 V_{DS} , Drain-to-Source Voltage (V)Fig. 1 - Typical Output Characteristics, $T_C = 25^\circ\text{C}$ Fig. 2 - Typical Output Characteristics, $T_C = 150^\circ\text{C}$

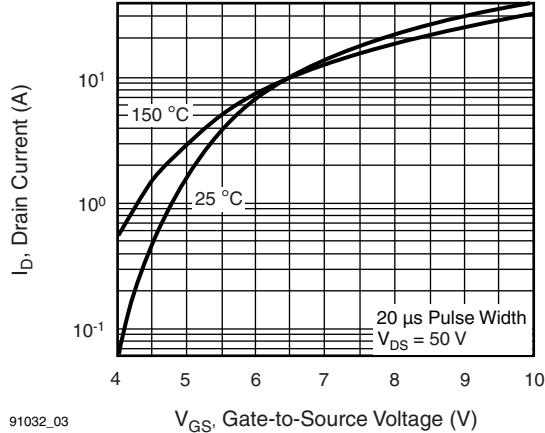


Fig. 3 - Typical Transfer Characteristics

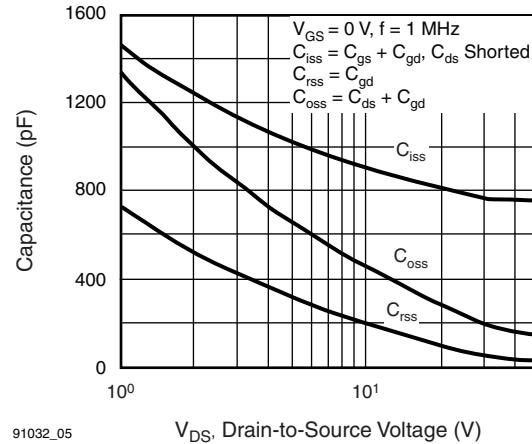


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

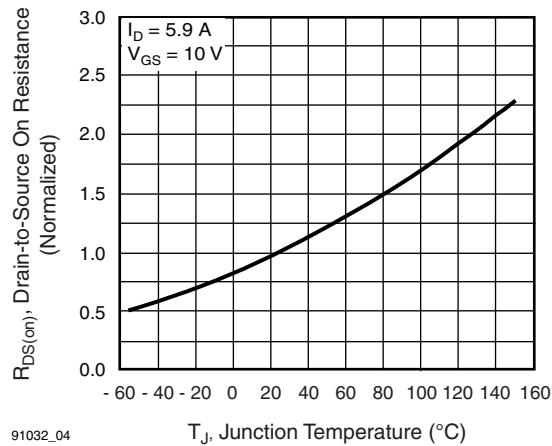


Fig. 4 - Normalized On-Resistance vs. Temperature

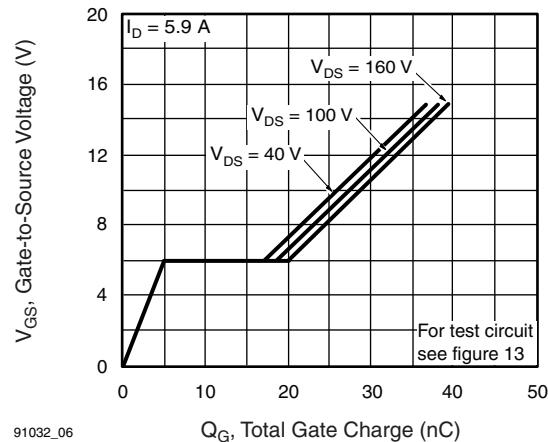


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

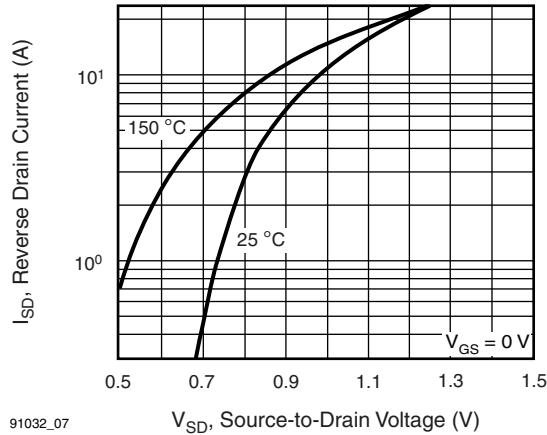


Fig. 7 - Typical Source-Drain Diode Forward Voltage

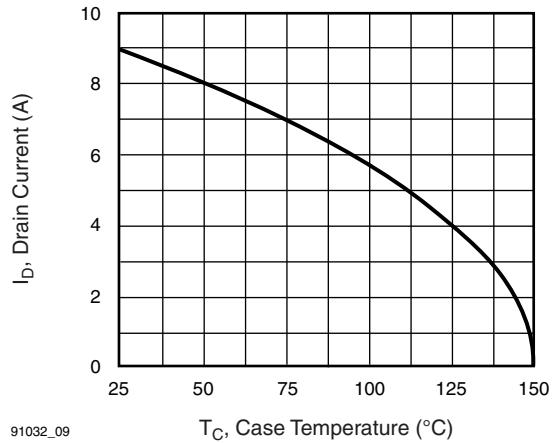


Fig. 9 - Maximum Drain Current vs. Case Temperature

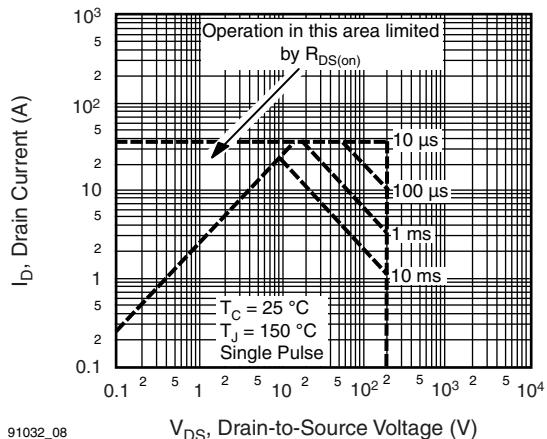


Fig. 8 - Maximum Safe Operating Area

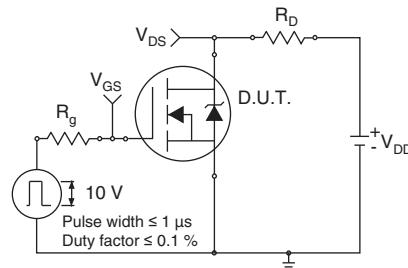


Fig. 10a - Switching Time Test Circuit

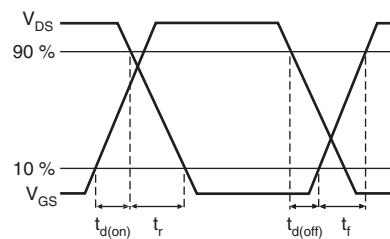


Fig. 10b - Switching Time Waveforms

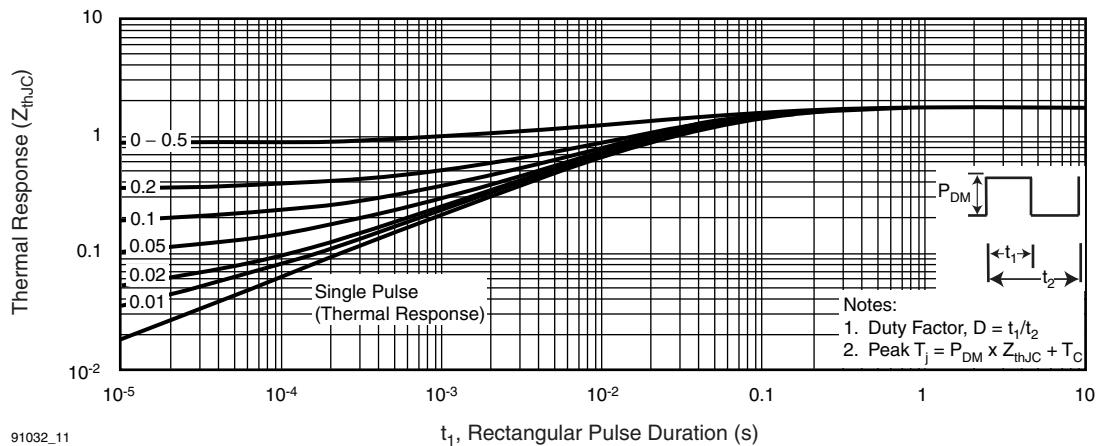


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

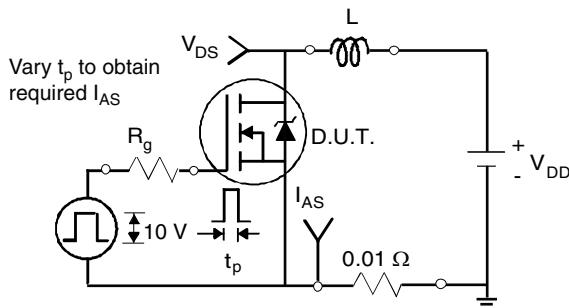


Fig. 12a - Unclamped Inductive Test Circuit

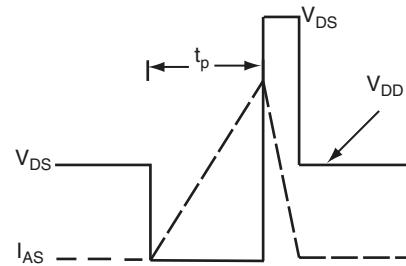


Fig. 12b - Unclamped Inductive Waveforms

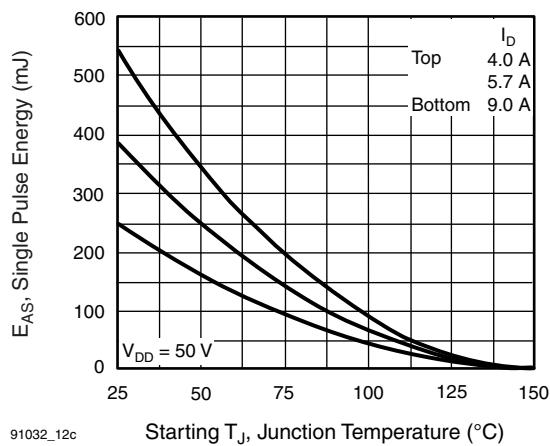
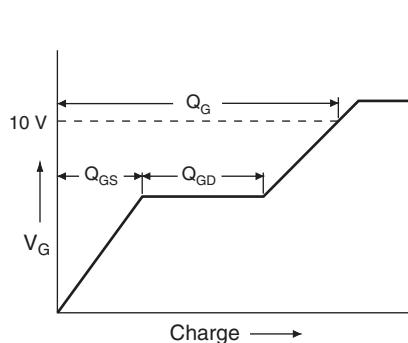
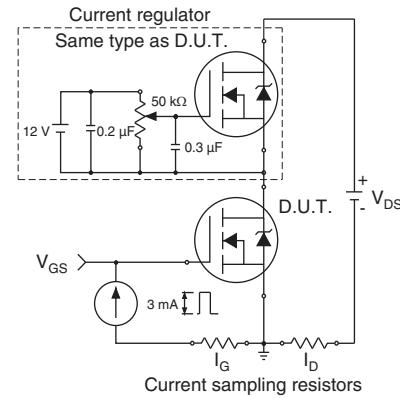
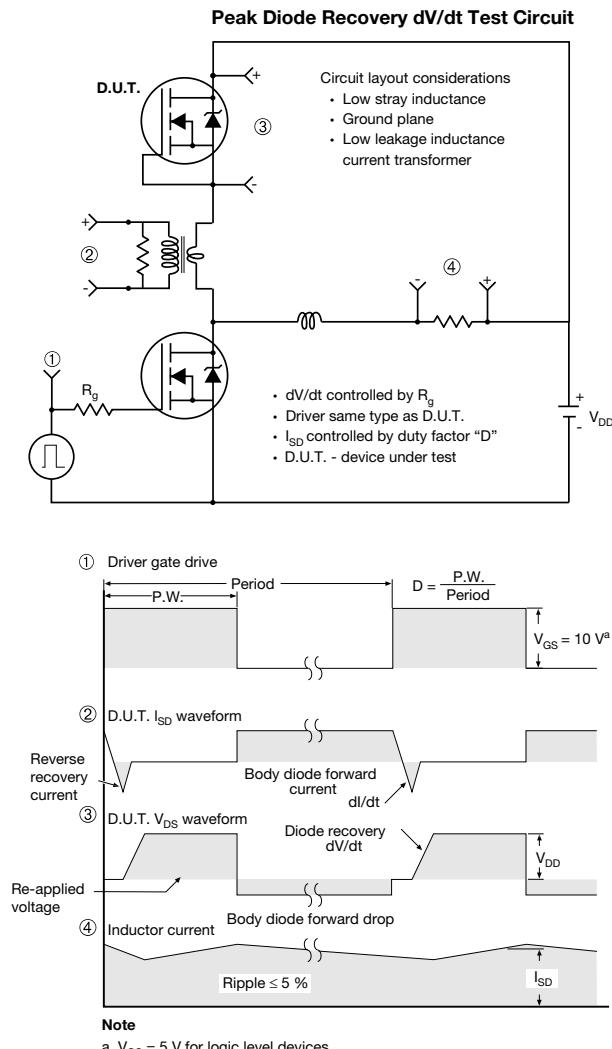
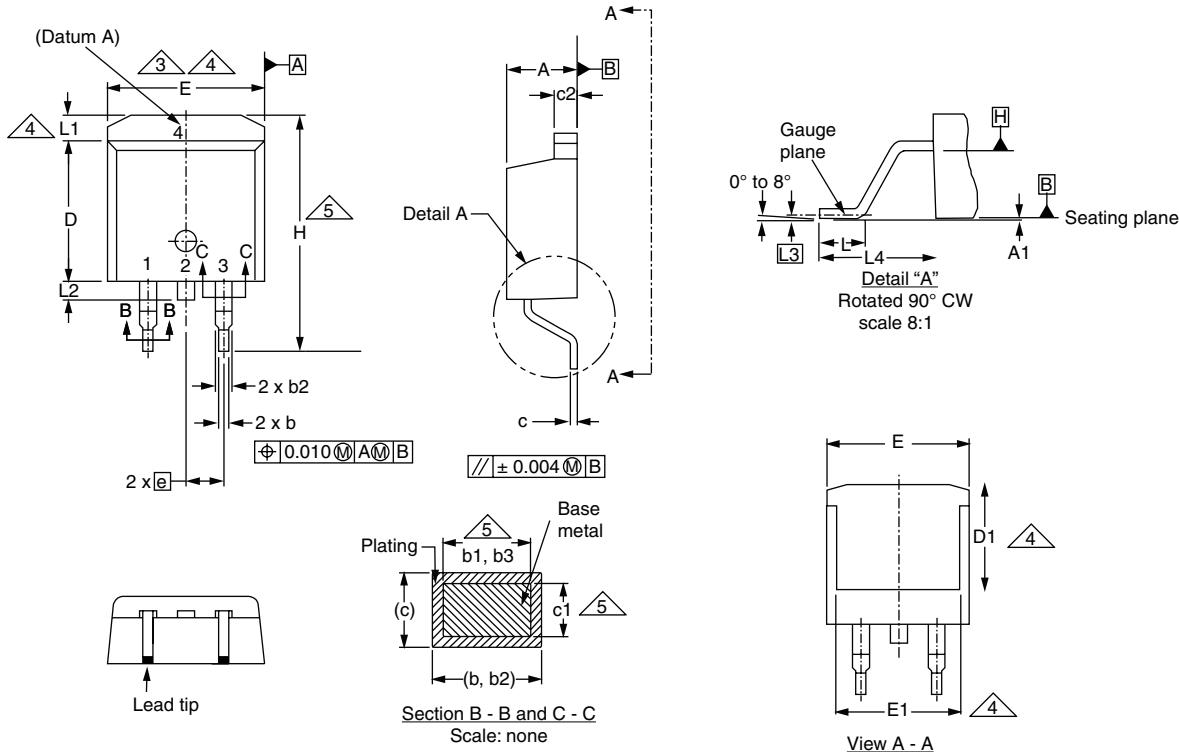


Fig. 12c - Maximum Avalanche Energy vs. Drain Current


Fig. 13a - Basic Gate Charge Waveform

Fig. 13b - Gate Charge Test Circuit

Fig. 14 - For N-Channel

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TO-263AB (HIGH VOLTAGE)

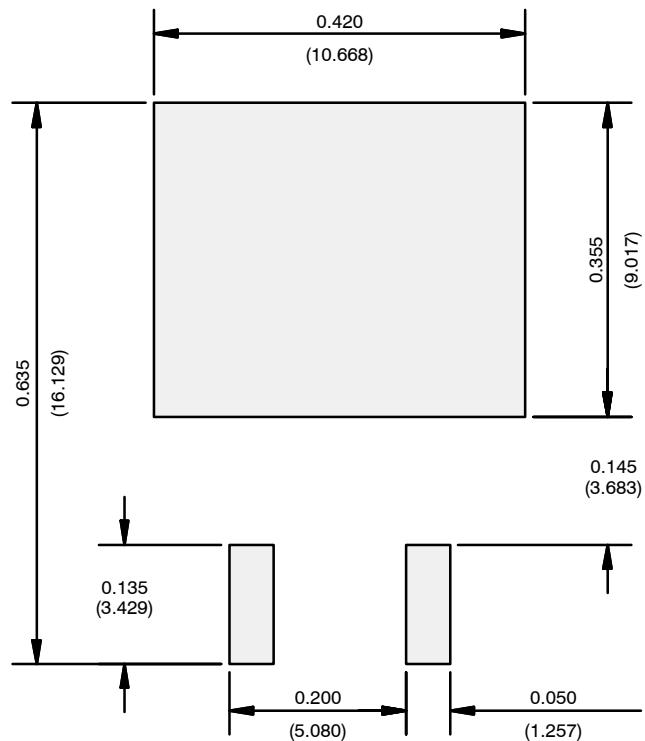


		MILLIMETERS		INCHES	
DIM.		MIN.	MAX.	MIN.	MAX.
A		4.06	4.83	0.160	0.190
A1		0.00	0.25	0.000	0.010
b		0.51	0.99	0.020	0.039
b1		0.51	0.89	0.020	0.035
b2		1.14	1.78	0.045	0.070
b3		1.14	1.73	0.045	0.068
c		0.38	0.74	0.015	0.029
c1		0.38	0.58	0.015	0.023
c2		1.14	1.65	0.045	0.065
D		8.38	9.65	0.330	0.380

	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.

RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead

Recommended Minimum Pads
Dimensions in Inches/(mm)

[Return to Index](#)

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