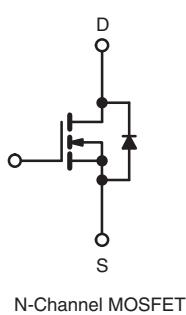
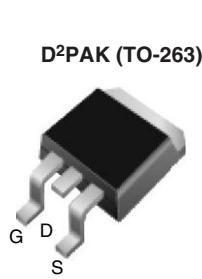


Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	100	
$R_{DS(on)}$ (Ω)	$V_{GS} = 10$ V	0.077
Q_g (Max.) (nC)	72	
Q_{gs} (nC)	11	
Q_{gd} (nC)	32	
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
- 175 °C Operating Temperature
- Fast Switching
- Ease of Parallelizing
- 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 (TO-263) is a surface mount power package capable of accommodating die size up to HEX-4. It provides the highest power capability and the lowest possible on-resistance in any existing surface mount package. The D²PAK (TO-263) 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	SiHF540S-GE3	SiHF540STR-GE3 ^a	SiHF540STR-GE3 ^a
Lead (Pb)-free	IRF540SPbF	IRF540STRLPbF ^a	IRF540STRRPbF ^a
	SIHF540S-E3	SIHF540STL-E3 ^a	SIHF540STR-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}	100	
Gate-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current	V_{GS} at 10 V	I_D	28	A
			20	
		I_{DM}	110	
Pulsed Drain Current ^a			1.0	W/°C
Linear Derating Factor			0.025	
Linear Derating Factor (PCB Mount) ^e				
Single Pulse Avalanche Energy ^b		E_{AS}	230	mJ
Avalanche Current ^a		I_{AR}	28	A
Repetitive Avalanche Energy ^a		E_{AR}	15	mJ
Maximum Power Dissipation	$T_C = 25$ °C	P_D	150	W
Maximum Power Dissipation (PCB Mount) ^e	$T_A = 25$ °C		3.7	
Peak Diode Recovery dV/dt ^c		dV/dt	5.5	V/ns
Operating Junction and Storage Temperature Range		T_J, T_{Stg}	- 55 to + 175	°C
Soldering Recommendations (Peak Temperature)	for 10 s		300 ^d	

Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- b. $V_{DD} = 25$ V, starting $T_J = 25$ °C, $L = 440$ μ H, $R_g = 25$ Ω , $I_{AS} = 28$ A (see fig. 12).
- c. $I_{SD} \leq 28$ A, $dI/dt \leq 170$ A/ μ s, $V_{DD} \leq V_{DS}$, $T_J \leq 175$ °C.
- d. 1.6 mm from case.
- e. When mounted on 1" square PCB (FR-4 or G-10 material).

* 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	$^{\circ}\text{C}/\text{W}$
Maximum Junction-to-Ambient (PCB Mount) ^a	R_{thJA}	-	40	
Maximum Junction-to-Case (Drain)	R_{thJC}	-	1.0	

Note

a. When mounted on 1" square PCB (FR-4 or G-10 material).

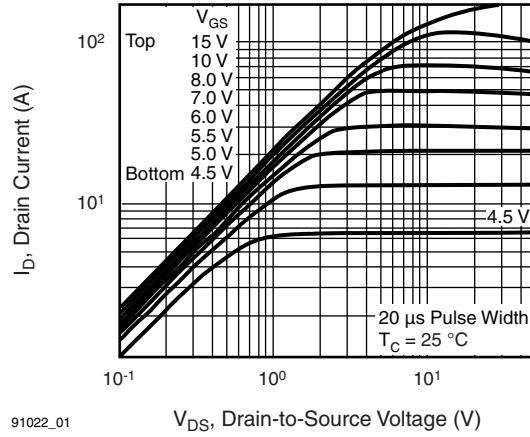
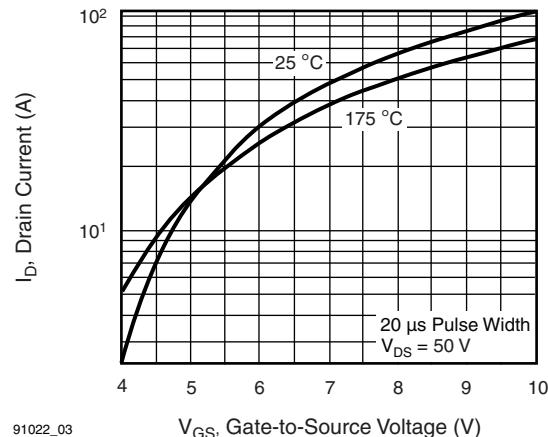
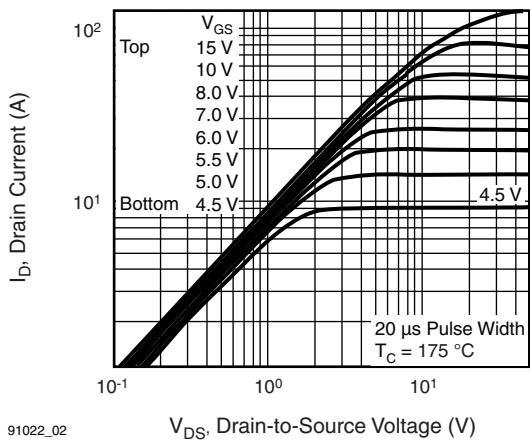
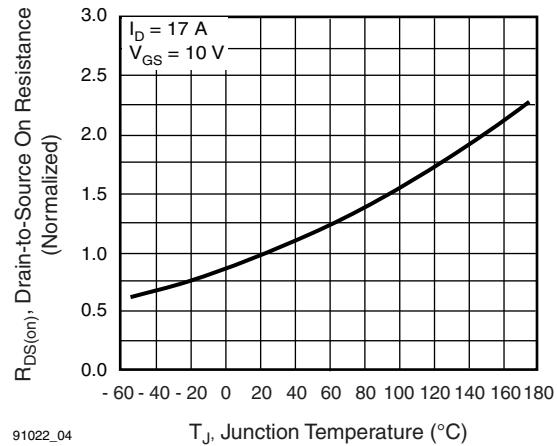
SPECIFICATIONS $T_J = 25 \text{ }^{\circ}\text{C}$, unless otherwise noted

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT	
Static								
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0, I_D = 250 \mu\text{A}$		100	-	-	V	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25 \text{ }^{\circ}\text{C}$, $I_D = 1 \text{ mA}$		-	0.13	-	$^{\circ}\text{C}/\text{V}$	
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}	$V_{DS} = 100 \text{ V}, V_{GS} = 0 \text{ V}$		-	-	25	μA	
		$V_{DS} = 80 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 150 \text{ }^{\circ}\text{C}$		-	-	250		
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10 \text{ V}$	$I_D = 17 \text{ A}^b$	-	-	0.077	Ω	
Forward Transconductance	g_{fs}	$V_{DS} = 50 \text{ V}, I_D = 17 \text{ A}^b$		8.7	-	-	S	
Dynamic								
Input Capacitance	C_{iss}	$V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1.0 \text{ MHz}$, see fig. 5		-	1700	-	pF	
Output Capacitance	C_{oss}			-	560	-		
Reverse Transfer Capacitance	C_{rss}			-	120	-		
Total Gate Charge	Q_g	$V_{GS} = 10 \text{ V}$	$I_D = 17 \text{ A}, V_{DS} = 80 \text{ V}$, see fig. 6 and 13 ^b	-	-	72	nC	
Gate-Source Charge	Q_{gs}			-	-	11		
Gate-Drain Charge	Q_{gd}			-	-	32		
Turn-On Delay Time	$t_{d(on)}$			-	11	-		
Rise Time	t_r	$V_{DD} = 50 \text{ V}, I_D = 17 \text{ A}, R_g = 9.1 \Omega, R_D = 2.9 \Omega$, see fig. 10 ^b		-	44	-	ns	
Turn-Off Delay Time	$t_{d(off)}$			-	53	-		
Fall Time	t_f			-	43	-		
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		-	-	28	A	
Pulsed Diode Forward Current ^a	I_{SM}			-	-	110		
Body Diode Voltage	V_{SD}	$T_J = 25 \text{ }^{\circ}\text{C}, I_S = 28 \text{ A}, V_{GS} = 0 \text{ V}^b$		-	-	2.5	V	
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25 \text{ }^{\circ}\text{C}, I_F = 17 \text{ A}, dI/dt = 100 \text{ A}/\mu\text{s}^b$		-	180	360	ns	
Body Diode Reverse Recovery Charge	Q_{rr}			-	1.3	2.8	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 $\leq 300 \mu\text{s}$; duty cycle $\leq 2 \%$.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Fig. 1 - Typical Output Characteristics, $T_C = 25 \text{ }^\circ\text{C}$

Fig. 3 - Typical Transfer Characteristics

Fig. 2 - Typical Output Characteristics, $T_C = 175 \text{ }^\circ\text{C}$

Fig. 4 - Normalized On-Resistance vs. Temperature

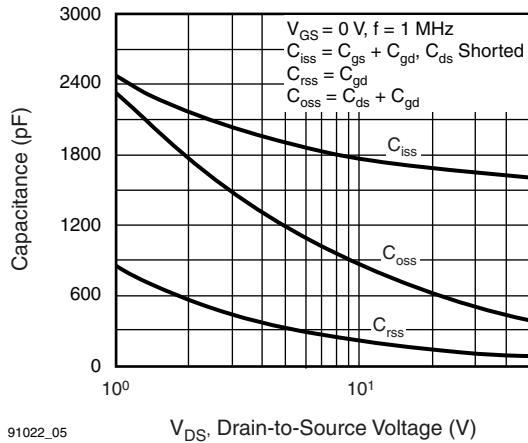


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

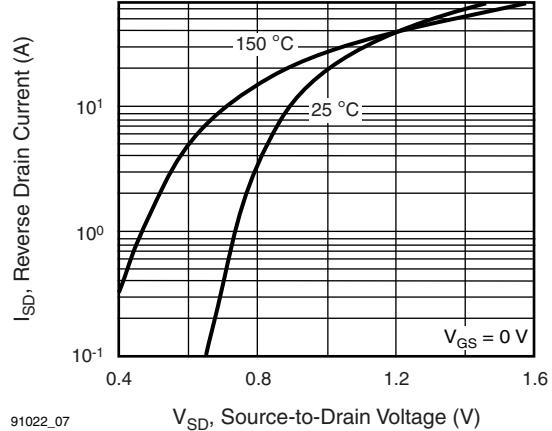


Fig. 7 - Typical Source-Drain Diode Forward Voltage

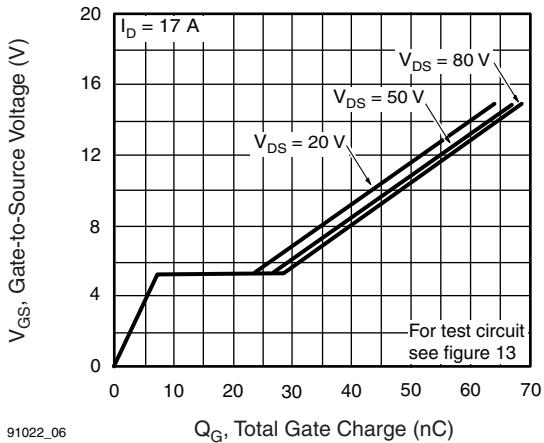


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

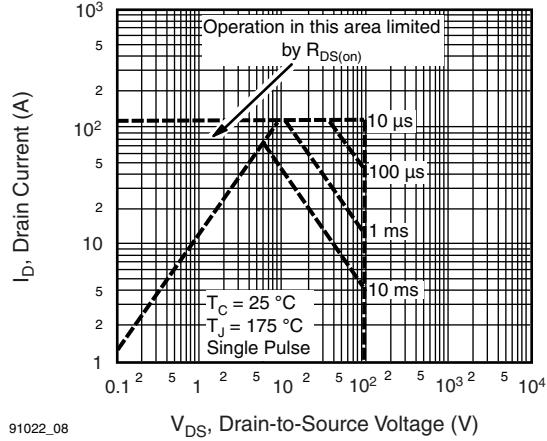


Fig. 8 - Maximum Safe Operating Area

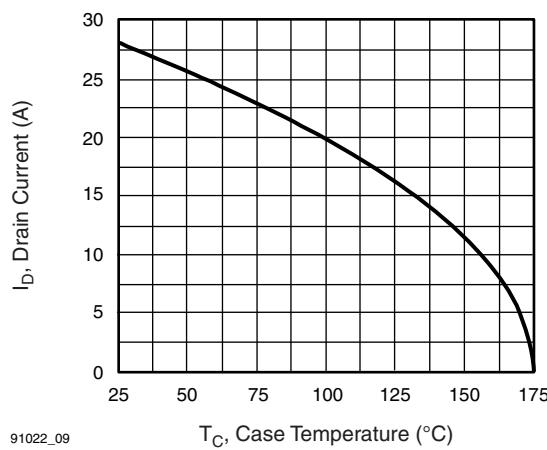


Fig. 9 - Maximum Drain Current vs. Case Temperature

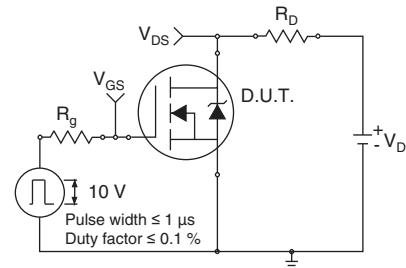


Fig. 10a - Switching Time Test Circuit

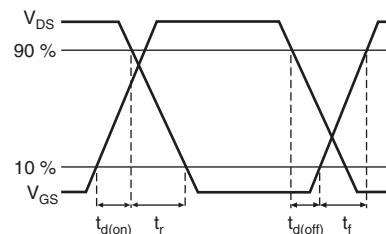


Fig. 10b - Switching Time Waveforms

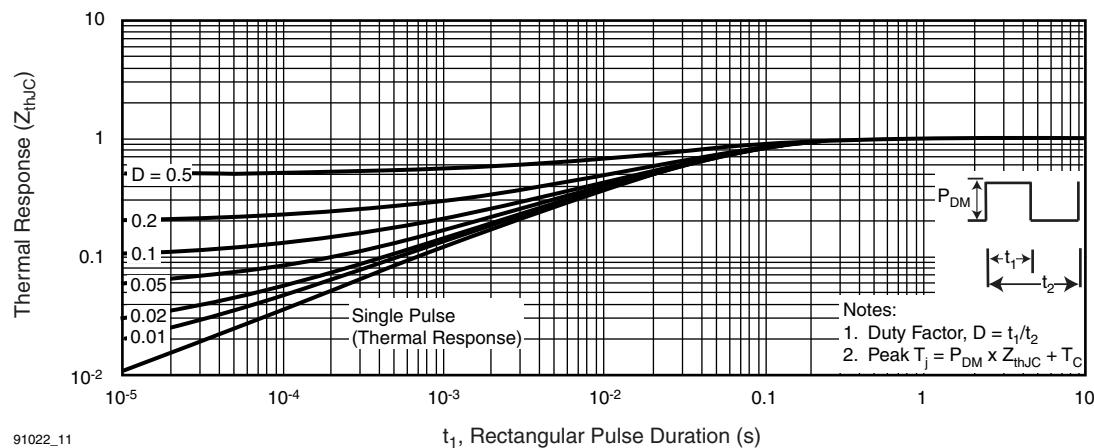


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

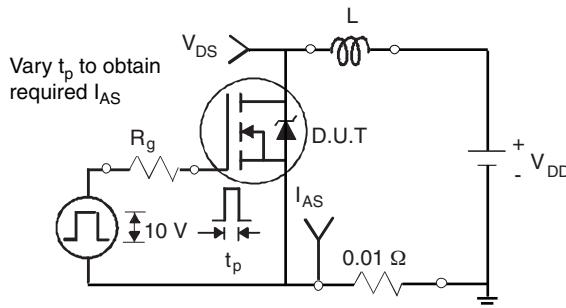


Fig. 12a - Unclamped Inductive Test Circuit

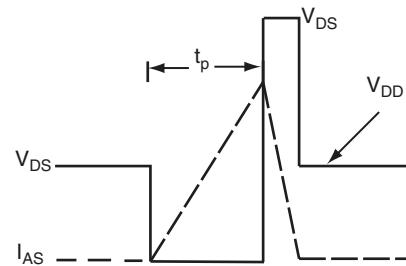


Fig. 12b - Unclamped Inductive Waveforms

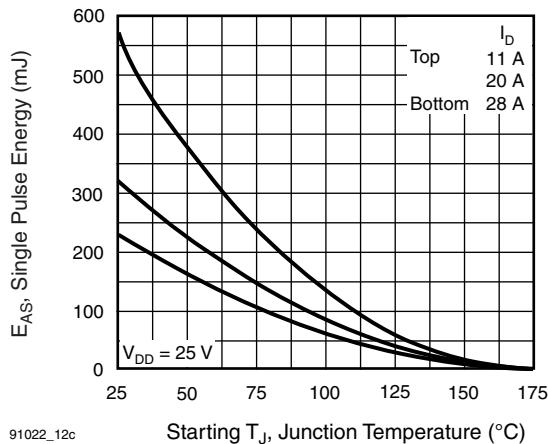


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

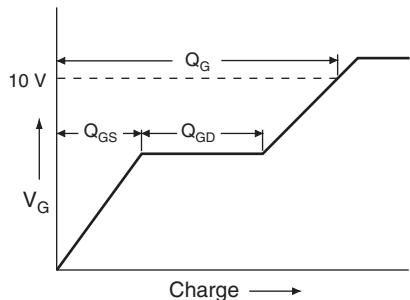


Fig. 13a - Basic Gate Charge Waveform

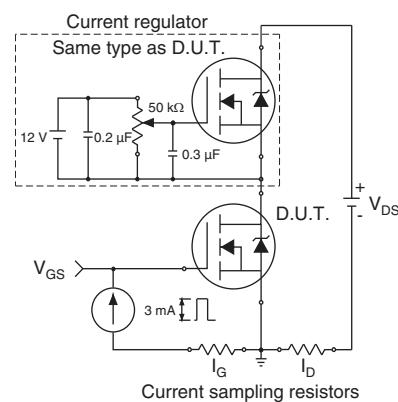
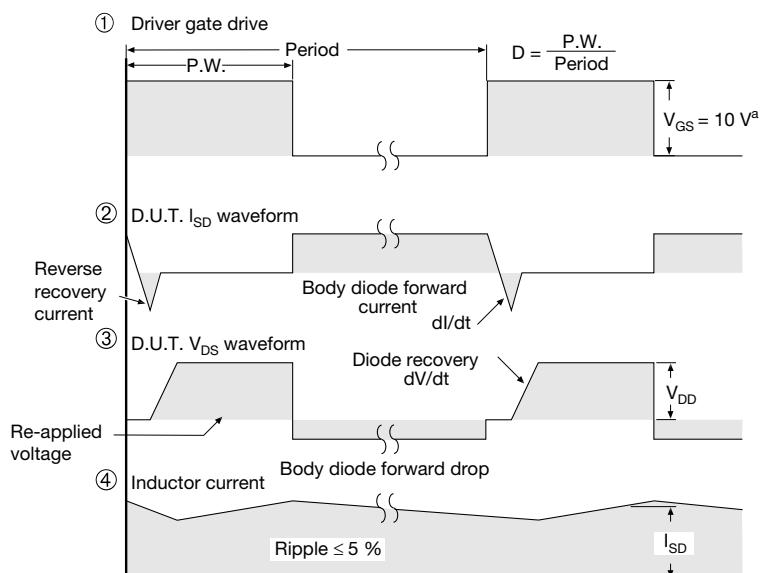
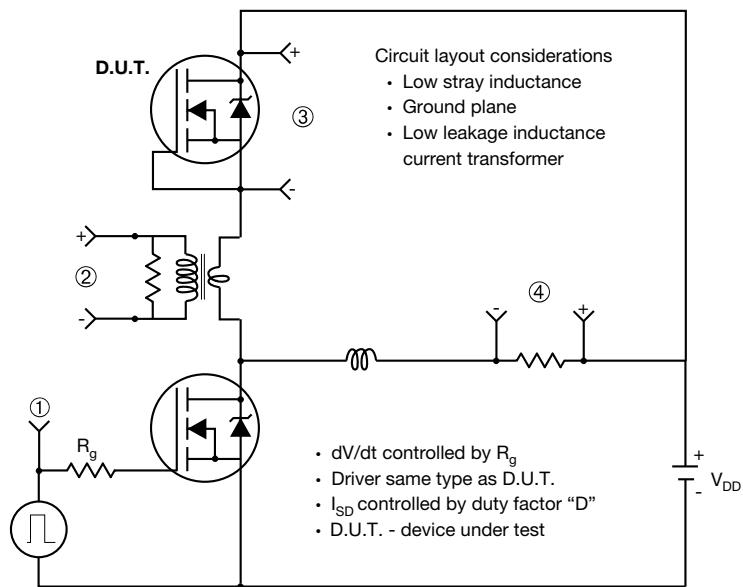


Fig. 13b - Gate Charge Test Circuit

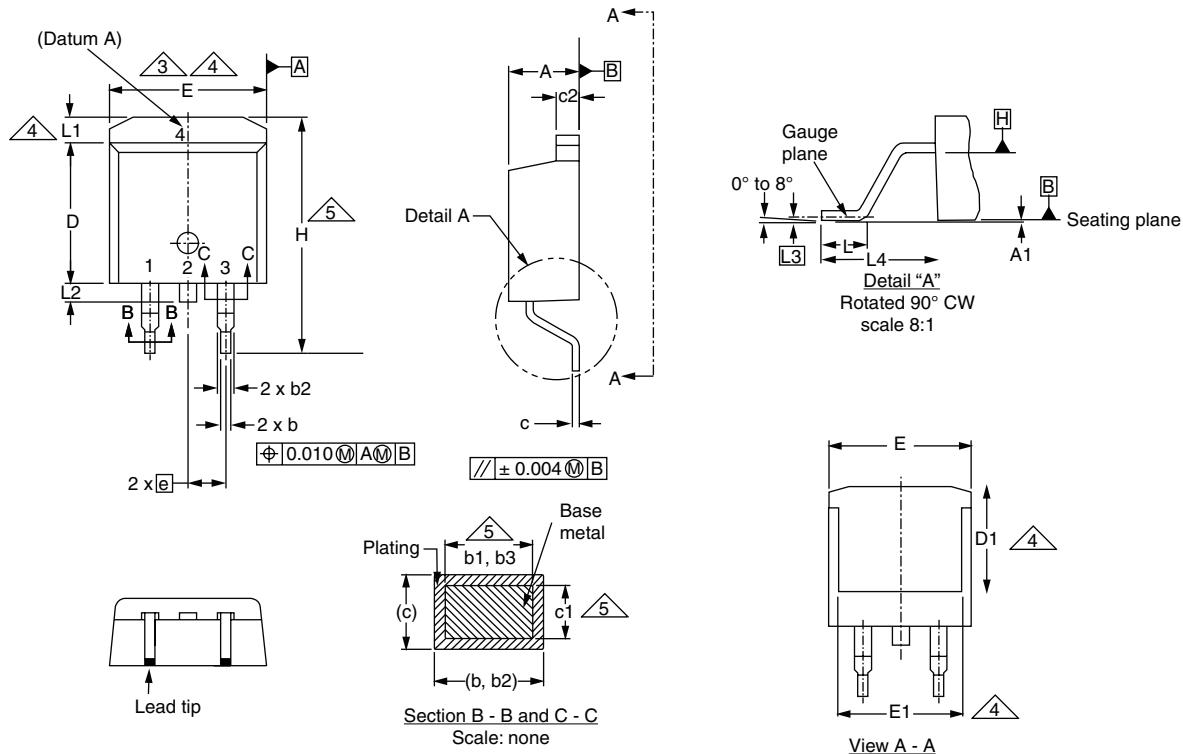
Peak Diode Recovery dV/dt Test Circuit

Note

a. $V_{GS} = 5 \text{ V}$ for logic level devices

Fig. 14 - For N-Channel

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see www.vishay.com/ppg?91022.

TO-263AB (HIGH VOLTAGE)



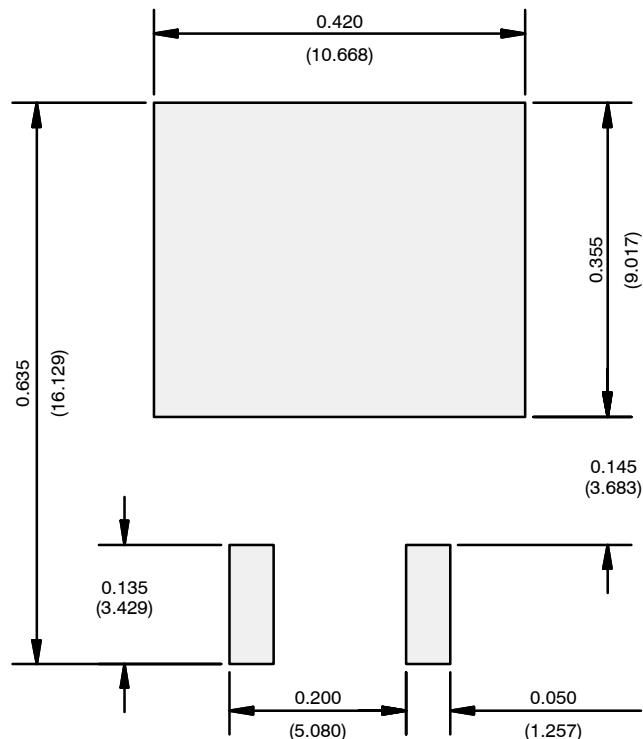
DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.06	4.83	0.160	0.190
A1	0.00	0.25	0.000	0.010
b	0.51	0.99	0.020	0.039
b1	0.51	0.89	0.020	0.035
b2	1.14	1.78	0.045	0.070
b3	1.14	1.73	0.045	0.068
c	0.38	0.74	0.015	0.029
c1	0.38	0.58	0.015	0.023
c2	1.14	1.65	0.045	0.065
D	8.38	9.65	0.330	0.380

ECN: S-82110-Rev. A, 15-Sep-08
DWG: 5970

DIM.	MILLIMETERS		INCHES	
	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)

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