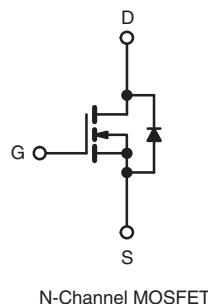
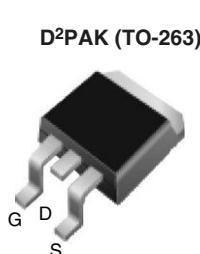


Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	100	
$R_{DS(on)}$ (Ω)	$V_{GS} = 5$ V	0.54
Q_g (Max.) (nC)	6.1	
Q_{gs} (nC)	2.6	
Q_{gd} (nC)	3.3	
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
- Logic-Level Gate Drive
- $R_{DS(on)}$ Specified at $V_{GS} = 4$ V and 5 V
- 175 °C Operating Temperature
- 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)
Lead (Pb)-free and Halogen-free	SiHL510S-GE3	SiHL510STRL-GE3 ^a
Lead (Pb)-free	IRL510SPbF	IRL510STRLPbF ^a
	SiHL510S-E3	SiHL510STL-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}	± 10	
Continuous Drain Current	I_D	5.6	A
		4.0	
Pulsed Drain Current ^a	I_{DM}	18	
Linear Derating Factor		0.29	W/°C
		0.025	
Single Pulse Avalanche Energy ^b	E_{AS}	100	mJ
Avalanche Current ^a	I_{AR}	5.6	A
Repetitive Avalanche Energy ^a	E_{AR}	4.3	mJ
Maximum Power Dissipation	P_D	43	W
		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	
Soldering Recommendations (Peak Temperature)	for 10 s	300 ^d	°C

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = 25$ V, starting $T_J = 25$ °C, $L = 4.8$ mH, $R_g = 25$ Ω , $I_{AS} = 5.6$ A (see fig. 12).
- $I_{SD} \leq 5.6$ A, $dI/dt \leq 75$ A/ μ s, $V_{DD} \leq V_{DS}$, $T_J \leq 175$ °C.
- 1.6 mm from case.
- 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}	-	3.5	

Note

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

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}	$V_{GS} = 0$, $I_D = 250 \mu\text{A}$		100	-	-	V	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25°C , $I_D = 1 \text{ mA}$		-	0.12	-	$^{\circ}\text{C}/\text{V}$	
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250 \mu\text{A}$		1.0	-	2.0	V	
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 10 \text{ V}$		-	-	± 100	nA	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 100 \text{ V}$, $V_{GS} = 0 \text{ V}$		-	-	25	μA	
		$V_{DS} = 80 \text{ V}$, $V_{GS} = 0 \text{ V}$, $T_J = 150^{\circ}\text{C}$		-	-	250		
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 5 \text{ V}$	$I_D = 3.4 \text{ A}^b$	-	-	0.54	Ω	
		$V_{GS} = 4 \text{ V}$	$I_D = 2.8 \text{ A}^b$	-	-	0.76		
Forward Transconductance	g_{fs}	$V_{DS} = 50 \text{ V}$, $I_D = 3.4 \text{ A}^b$		1.9	-	-	S	
Dynamic								
Input Capacitance	C_{iss}	$V_{GS} = 0 \text{ V}$, $V_{DS} = 25 \text{ V}$, $f = 1.0 \text{ MHz}$, see fig. 5		-	250	-	pF	
Output Capacitance	C_{oss}			-	80	-		
Reverse Transfer Capacitance	C_{rss}			-	15	-		
Total Gate Charge	Q_g	$V_{GS} = 5 \text{ V}$	$I_D = 5.6 \text{ A}$, $V_{DS} = 80 \text{ V}$, see fig. 6 and 13 ^b	-	-	6.1	nC	
Gate-Source Charge	Q_{gs}			-	-	2.6		
Gate-Drain Charge	Q_{gd}			-	-	3.3		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 50 \text{ V}$, $I_D = 5.6 \text{ A}$, $R_g = 12 \Omega$, $R_D = 8.4 \Omega$, see fig. 10 ^b		-	9.3	-	ns	
Rise Time	t_r			-	47	-		
Turn-Off Delay Time	$t_{d(off)}$			-	16	-		
Fall Time	t_f			-	18	-		
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	-		

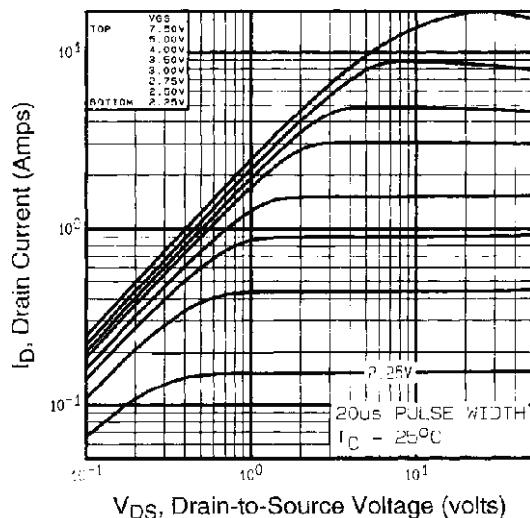
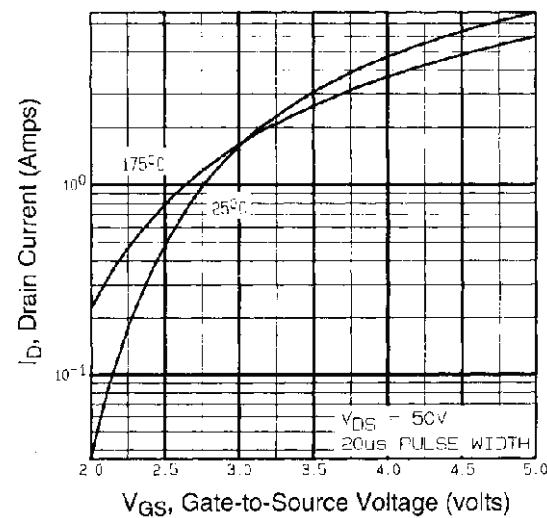
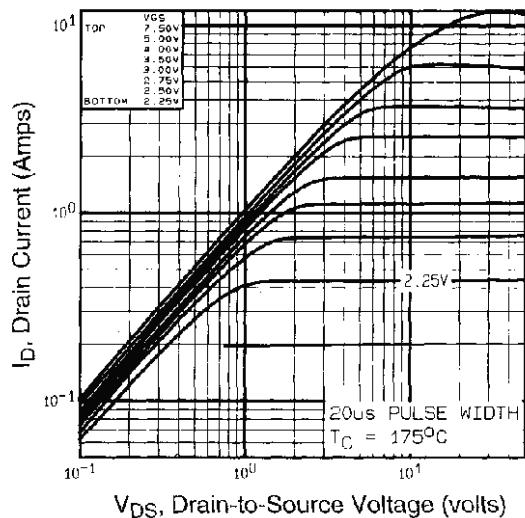
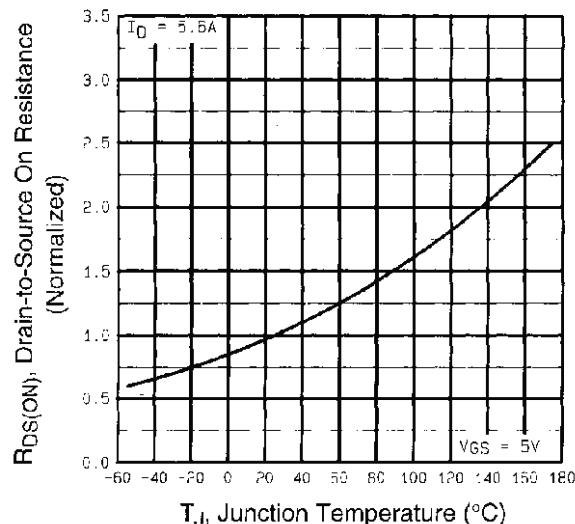
Drain-Source Body Diode Characteristics

Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode		-	-	5.6	A
Pulsed Diode Forward Current ^a	I_{SM}			-	-	18	
Body Diode Voltage	V_{SD}	$T_J = 25^{\circ}\text{C}$, $I_S = 5.6 \text{ A}$, $V_{GS} = 0 \text{ V}^b$		-	-	2.5	V
Body Diode Reverse Recovery Time	t_{rr}			-	110	130	ns
Body Diode Reverse Recovery Charge	Q_{rr}			-	0.50	0.65	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

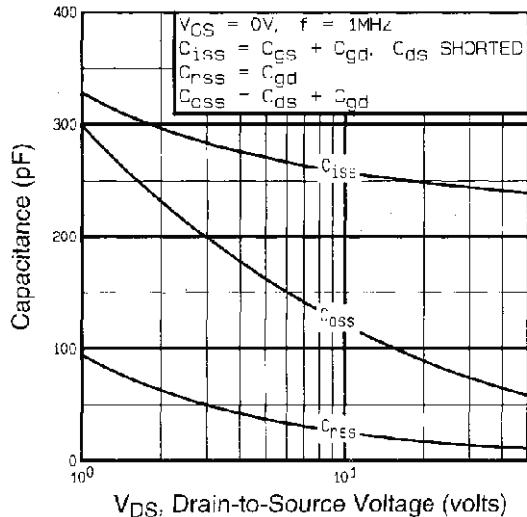


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

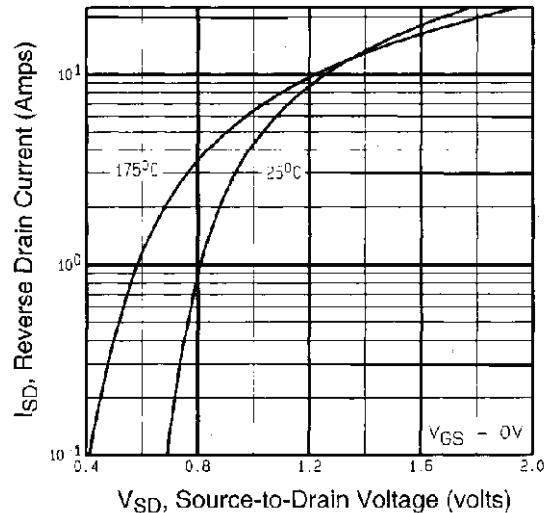


Fig. 7 - Typical Source-Drain Diode Forward Voltage

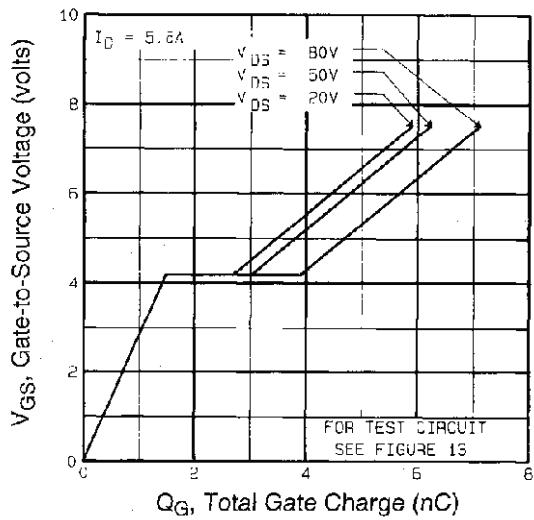


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

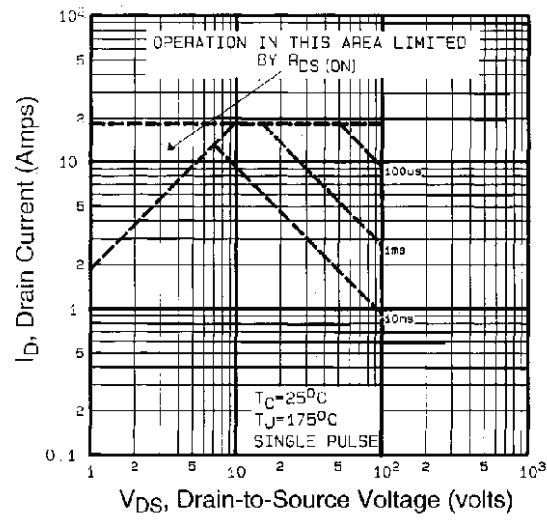
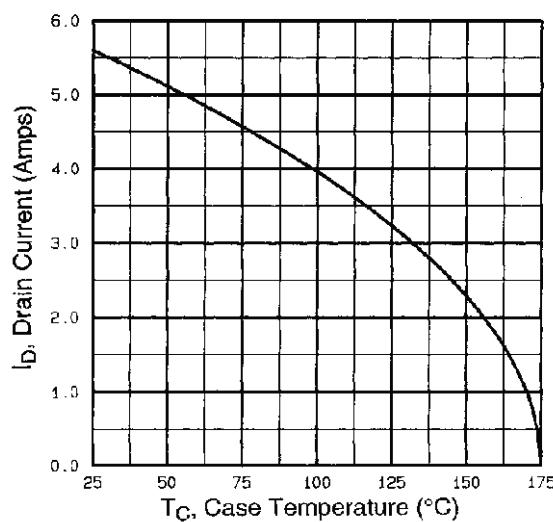
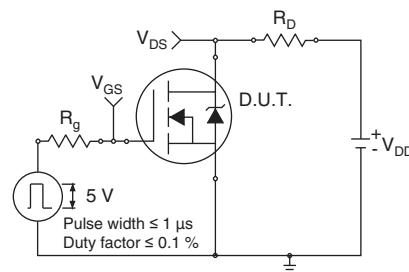
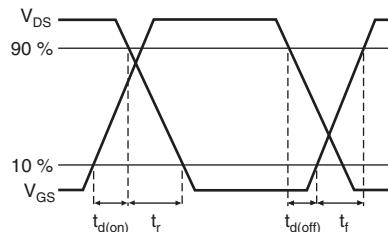
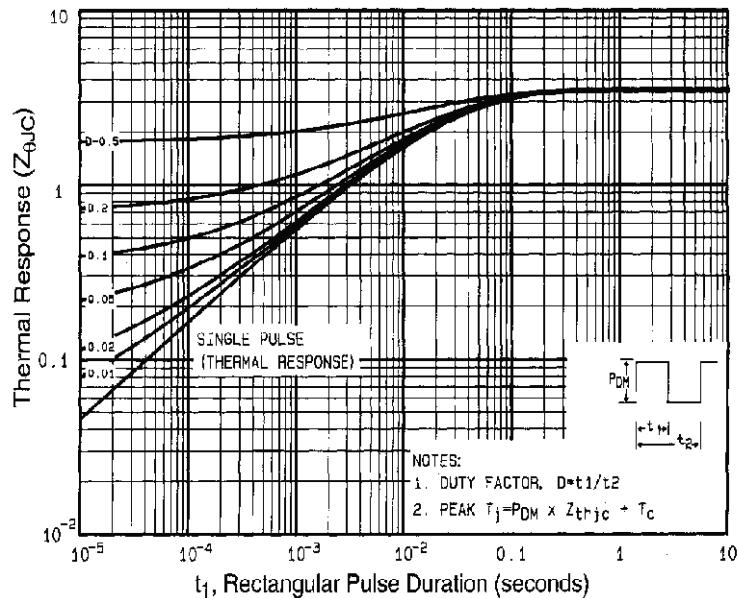


Fig. 8 - Maximum Safe Operating Area


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

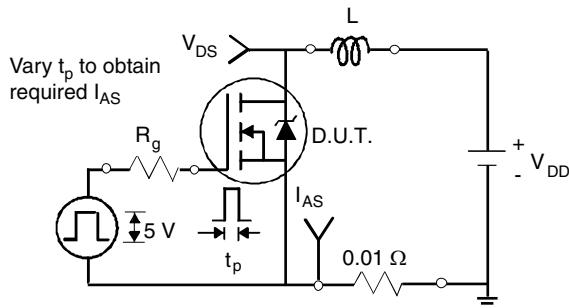


Fig. 12a - Unclamped Inductive Test Circuit

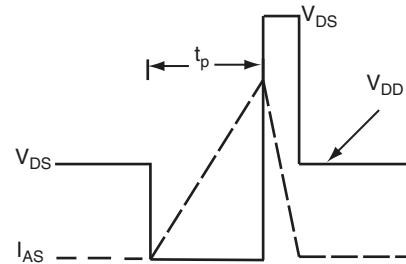


Fig. 12b - Unclamped Inductive Waveforms

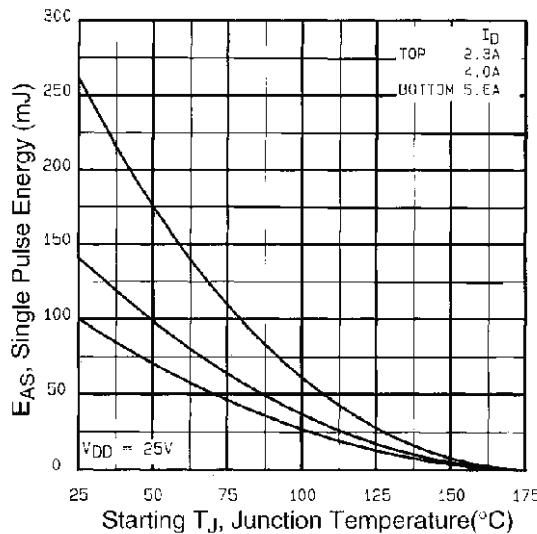


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

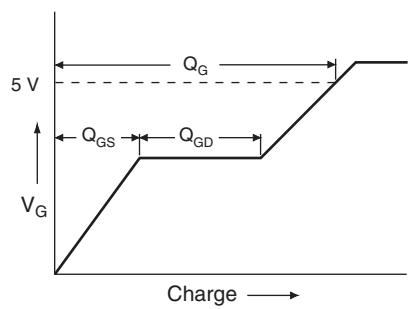


Fig. 13a - Basic Gate Charge Waveform

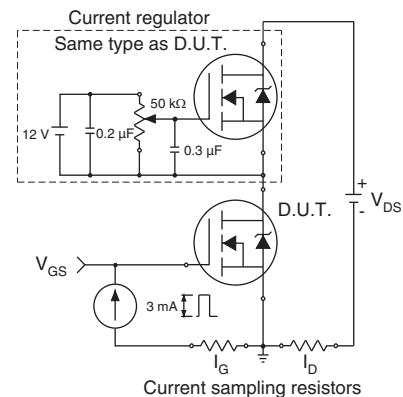
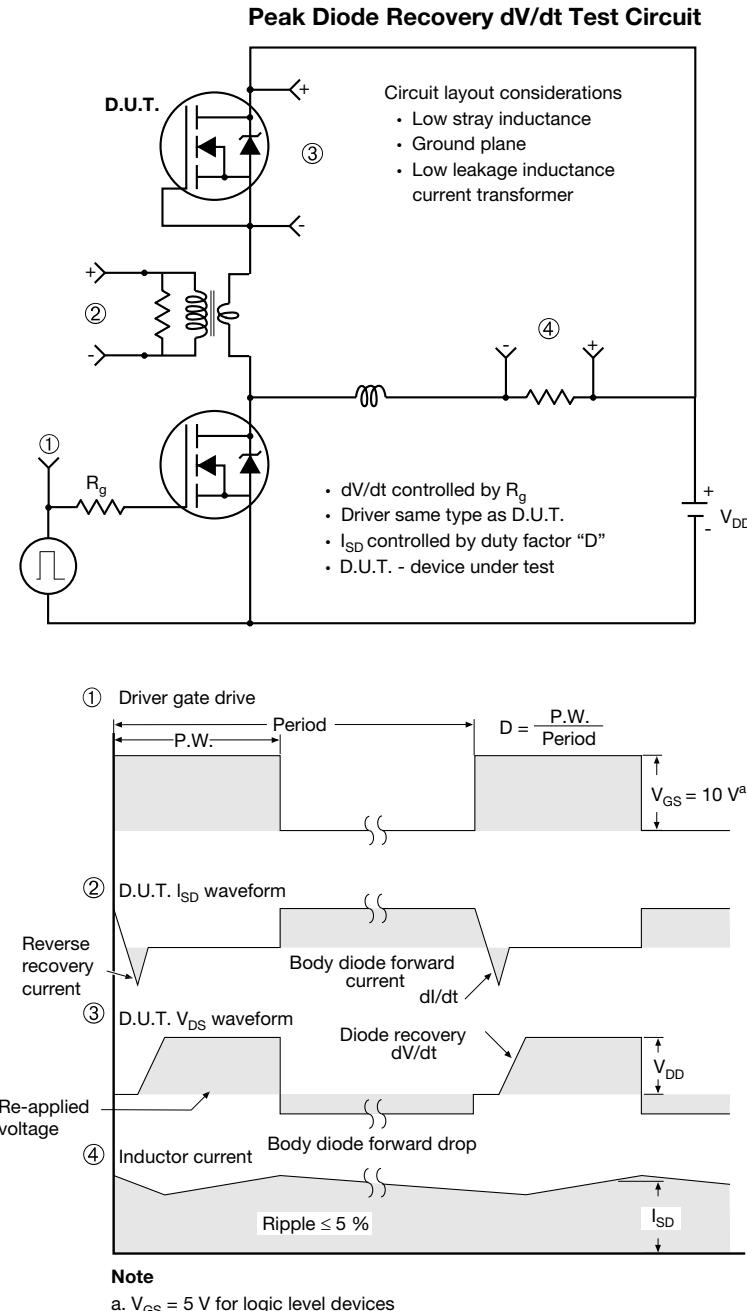
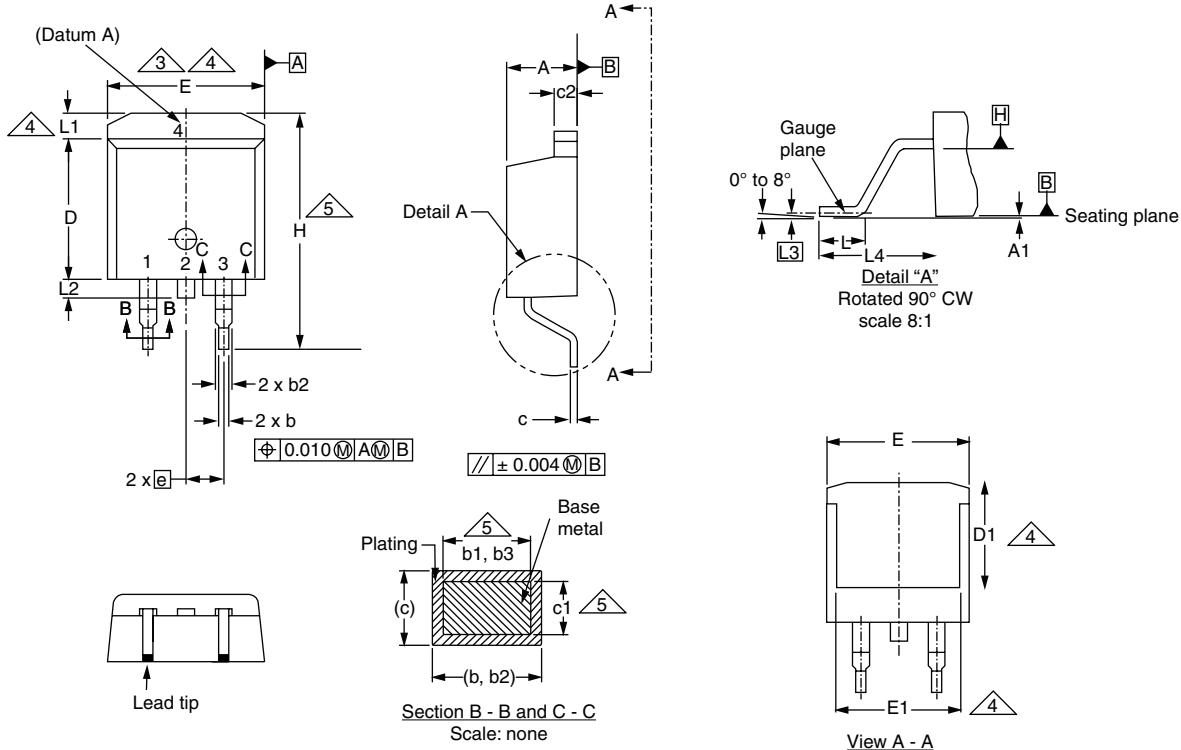


Fig. 13b - Gate Charge Test Circuit


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.

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