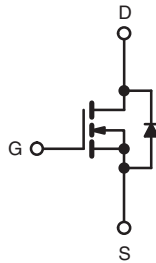
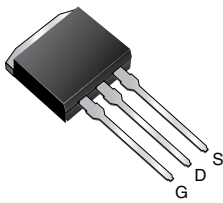


Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	500	
$R_{DS(on)}$ (Ω)	$V_{GS} = 10$ V	0.55
Q_g (Max.) (nC)	51	
Q_{gs} (nC)	12	
Q_{gd} (nC)	23	
Configuration	Single	

I²PAK
(TO-262)



N-Channel MOSFET

FEATURES

- Dynamic dV/dt Rating
- Repetitive Avalanche Rated
- Fast Switching
- Ease of Paralleling
- 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.

ORDERING INFORMATION	
Package	I ² PAK (TO-262)
Lead (Pb)-free	IRFSL11N50APbF
	SiHFSL11N50A-E3

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$, unless otherwise noted)				
PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-Source Voltage	V_{DS}	500	V	
Gate-Source Voltage	V_{GS}	± 30		
Continuous Drain Current	V_{GS} at 10 V	$T_C = 25^\circ\text{C}$	A	
		$T_C = 100^\circ\text{C}$		
Pulsed Drain Current ^a	I_{DM}	44		
Linear Derating Factor		1.3	W/ $^\circ\text{C}$	
Single Pulse Avalanche Energy ^b	E_{AS}	390	mJ	
Repetitive Avalanche Current ^a	I_{AR}	11	A	
Repetitive Avalanche Energy ^a	E_{AR}	19	mJ	
Maximum Power Dissipation	$T_C = 25^\circ\text{C}$	P_D	190	W
Peak Diode Recovery dV/dt ^c		dV/dt	4.1	V/ns
Operating Junction and Storage Temperature Range	T_J, T_{stg}		- 55 to + 175	$^\circ\text{C}$
Soldering Recommendations (Peak Temperature)	for 10 s		300 ^d	

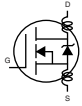

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- Starting $T_J = 25^\circ\text{C}$, $L = 6.4$ mH, $R_G = 25 \Omega$, $I_{AS} = 11$ A (see fig. 12).
- $I_{SD} \leq 11$ A, $di/dt \leq 185$ A/ μs , $V_{DD} \leq V_{DS}$, $T_J \leq 175^\circ\text{C}$.
- 1.6 mm from case.

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

THERMAL RESISTANCE RATINGS						
PARAMETER	SYMBOL	TYP.	MAX.	UNIT		
Maximum Junction-to-Ambient	R_{thJA}	-	40	°C/W		
Maximum Junction-to-Case (Drain)	R_{thJC}	-	0.75			

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}	$V_{GS} = 0, I_D = 250\text{ }\mu\text{A}$	500	-	-	V	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$, $I_D = 1\text{ mA}$	-	0.57	-	V/°C	
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}	$V_{GS} = \pm 30\text{ V}$	-	-	± 100	nA	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 500\text{ V}, V_{GS} = 0\text{ V}$	-	-	25	μA	
		$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$	-	-	250		
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 6.6\text{ A}^b$	-	-	0.55	Ω	
Forward Transconductance	g_{fs}	$V_{DS} = 50\text{ V}, I_D = 6.6\text{ A}^b$	6.0	-	-	S	
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$ $V_{DS} = 25\text{ V}$ $f = 1.0\text{ MHz}$, see fig. 5	-	1426	-	pF	
Output Capacitance	C_{oss}		-	208	-		
Reverse Transfer Capacitance	C_{riss}		-	9.6	-		
Output Capacitance	C_{oss}	$V_{GS} = 0\text{ V}$	$V_{DS} = 1.0\text{ V}, f = 1.0\text{ MHz}$	-	1954	-	
Effective Output Capacitance	$C_{oss\text{ eff.}}$		$V_{DS} = 400\text{ V}, f = 1.0\text{ MHz}$	-	53	-	
			$V_{DS} = 0\text{ V to } 400\text{ V}^c$	-	110	-	
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 11\text{ A}, V_{DS} = 400\text{ V}$ see fig. 6 and 13 ^b	-	-	51	nC
Gate-Source Charge	Q_{GS}			-	-	12	
Gate-Drain Charge	Q_{GD}			-	-	23	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 250\text{ V}, I_D = 11\text{ A}$ $R_G = 9.1\text{ }\Omega, R_D = 22\text{ }\Omega$, see fig. 10 ^b	-	14	-	ns	
Rise Time	t_r		-	34	-		
Turn-Off Delay Time	$t_{d(off)}$		-	32	-		
Fall Time	t_f		-	27	-		
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		-	-	11	A
Pulsed Diode Forward Current ^a	I_{SM}			-	-	44	
Body Diode Voltage	V_{SD}	$T_J = 25\text{ }^\circ\text{C}, I_S = 11\text{ A}, V_{GS} = 0\text{ V}^b$		-	-	1.5	V
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}, I_F = 11\text{ A}, di/dt = 100\text{ A}/\mu\text{s}^b$		-	530	790	ns
Body Diode Reverse Recovery Charge	Q_{rr}			-	3.4	5.1	μC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)					

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- Pulse width $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\%$.
- $C_{oss\text{ eff.}}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 % to 80% V_{DS} .

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

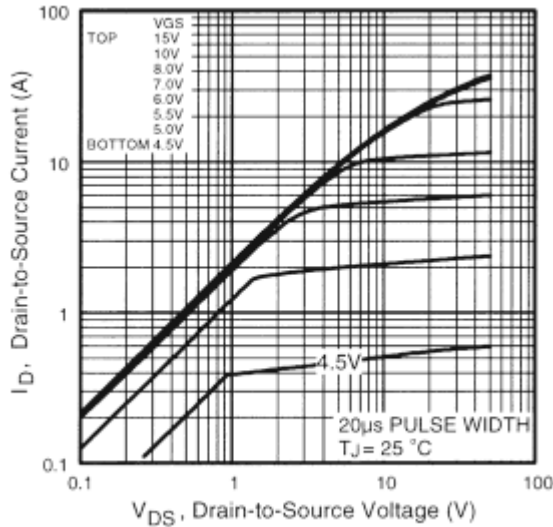


Fig. 1 - Typical Output Characteristics

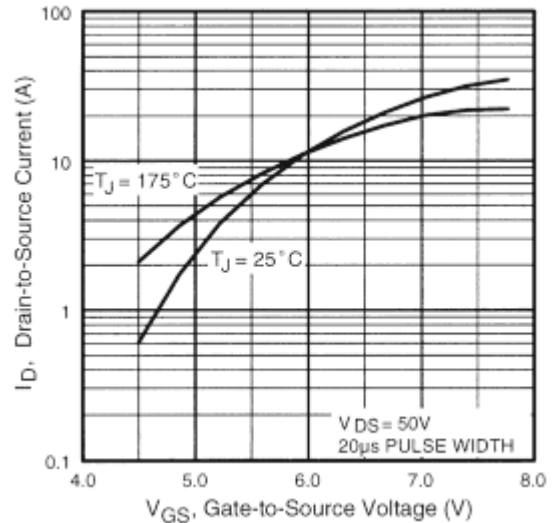


Fig. 3 - Typical Transfer Characteristics

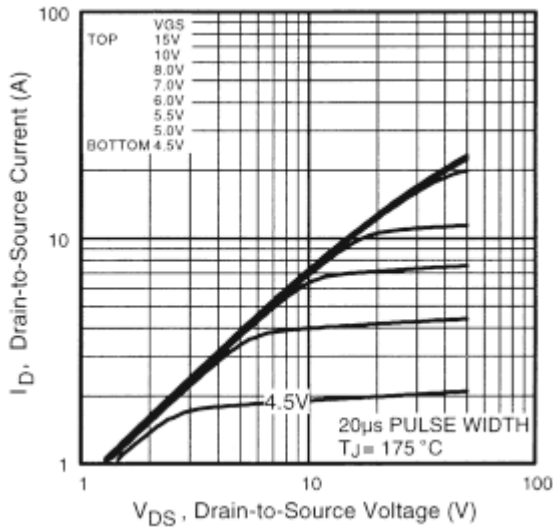


Fig. 2 - Typical Output Characteristics

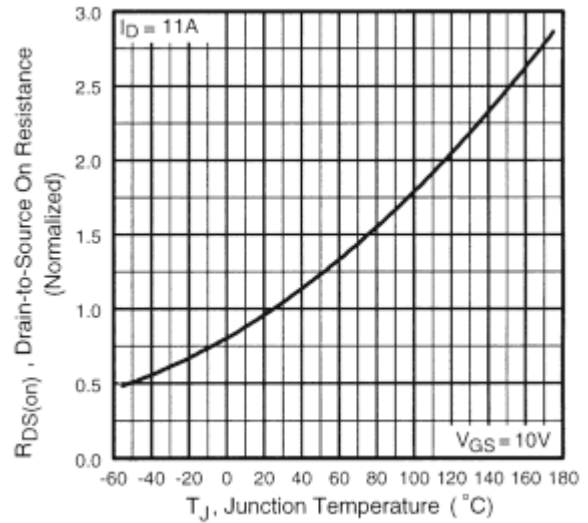


Fig. 4 - Normalized On-Resistance vs. Temperature

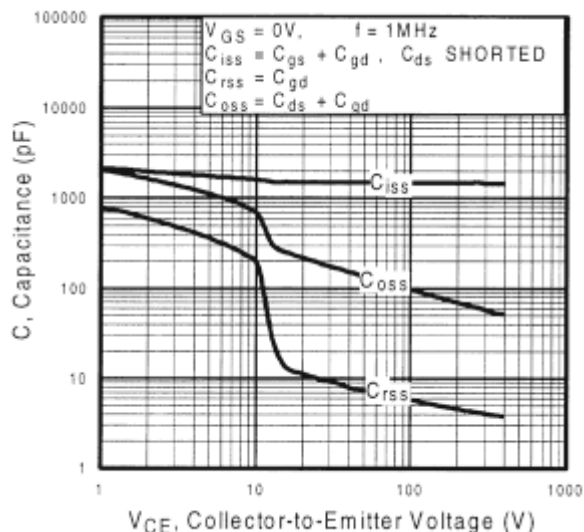


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

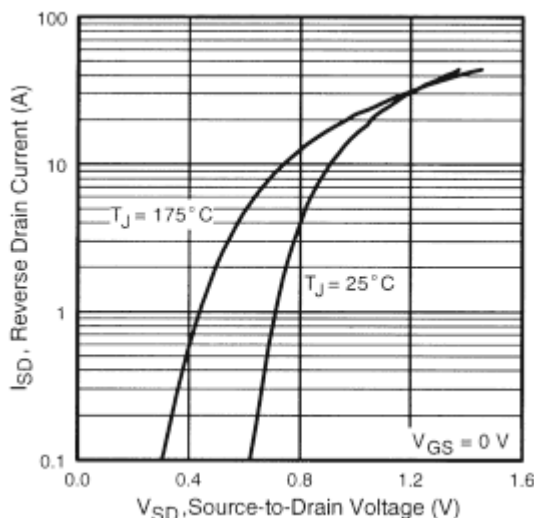


Fig. 7 - Typical Source-Drain Diode Forward Voltage

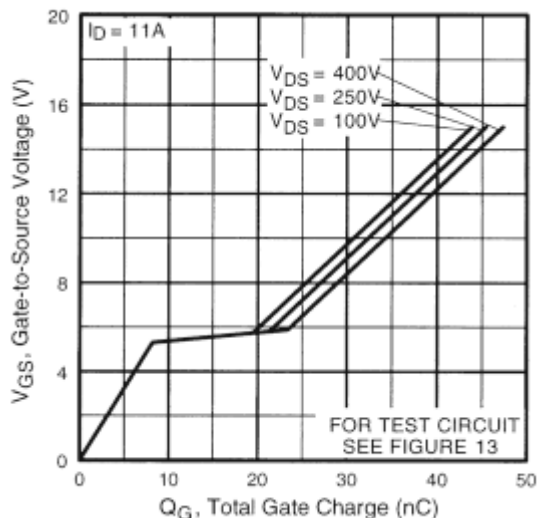


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

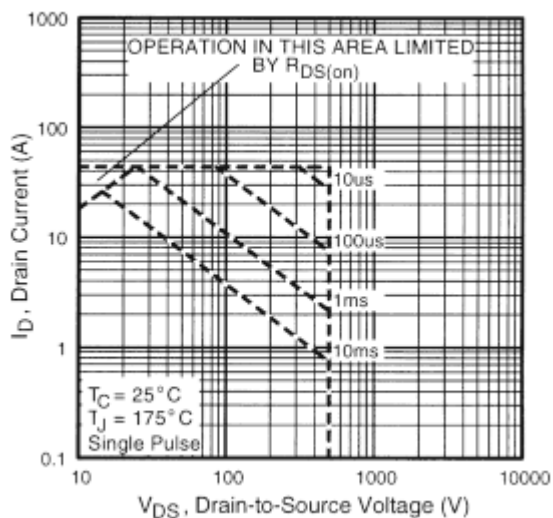


Fig. 8 - Maximum Safe Operating Area

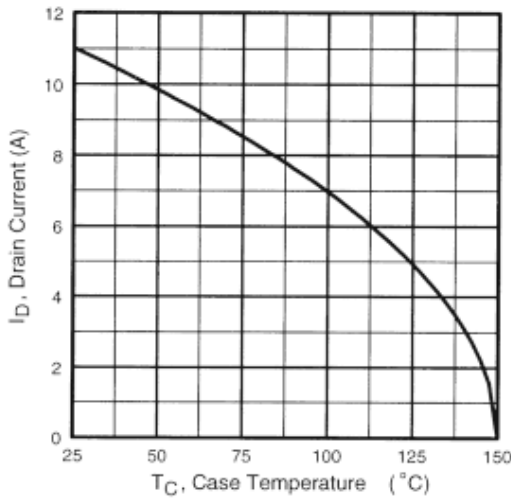


Fig. 9 - Maximum Drain Current vs. Case Temperature

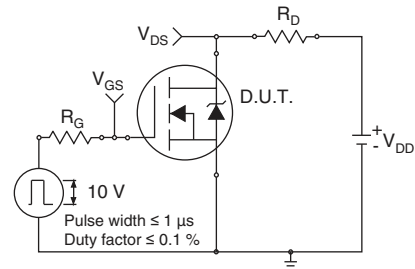


Fig. 10a - Switching Time Test Circuit

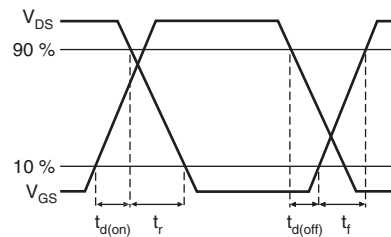


Fig. 10b - Switching Time Waveforms

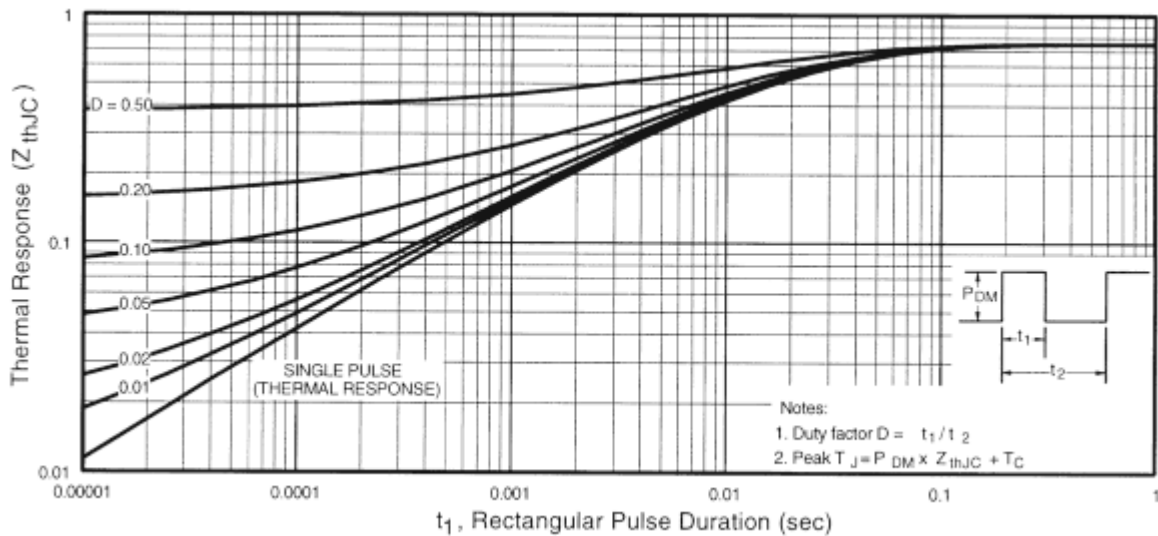


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

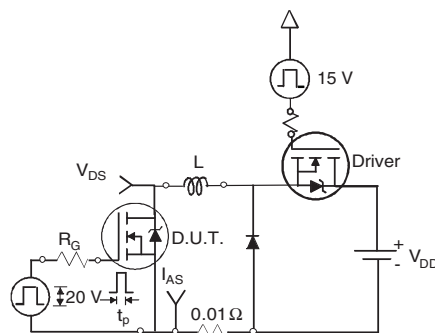


Fig. 12a - Unclamped Inductive Test Circuit

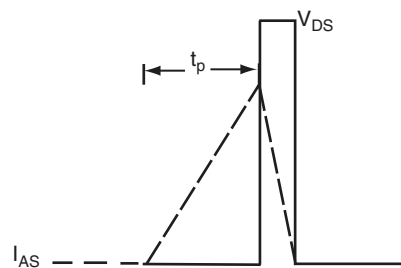


Fig. 12b - Unclamped Inductive Waveforms

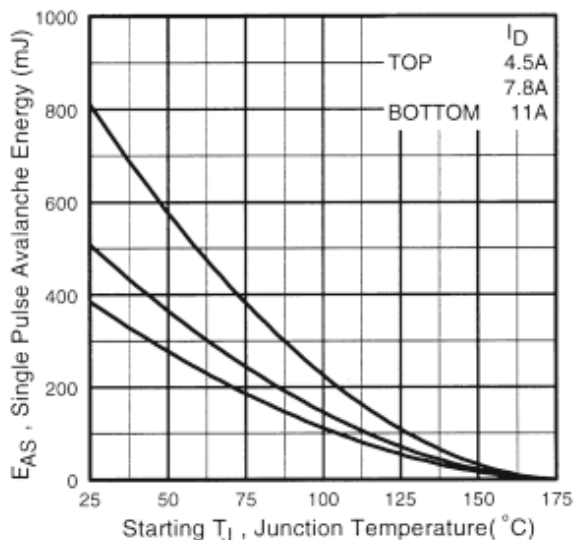


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

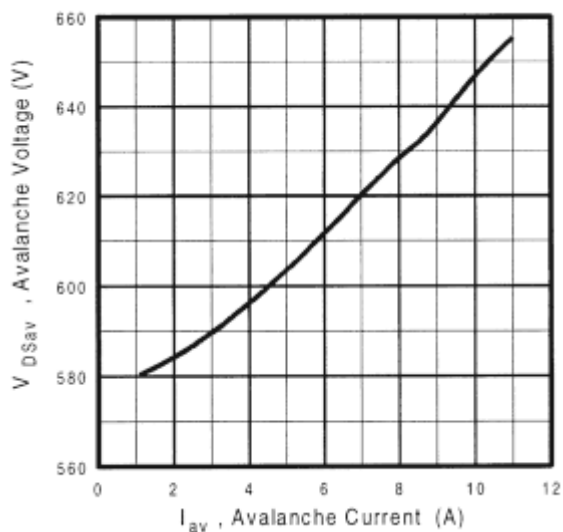


Fig. 12d - Typical Drain-to-Source Voltage vs. Avalanche Current

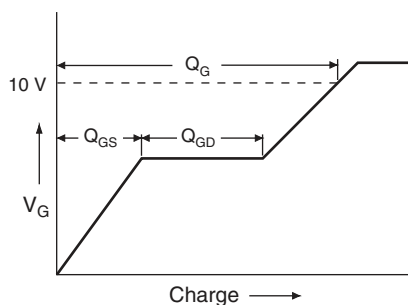


Fig. 13a - Basic Gate Charge Waveform

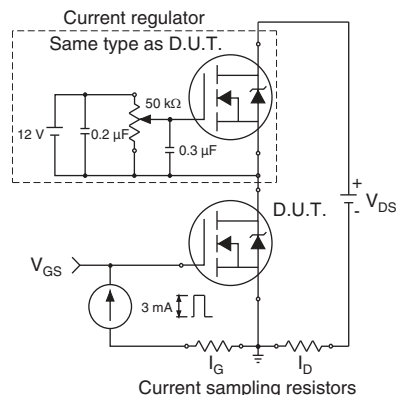
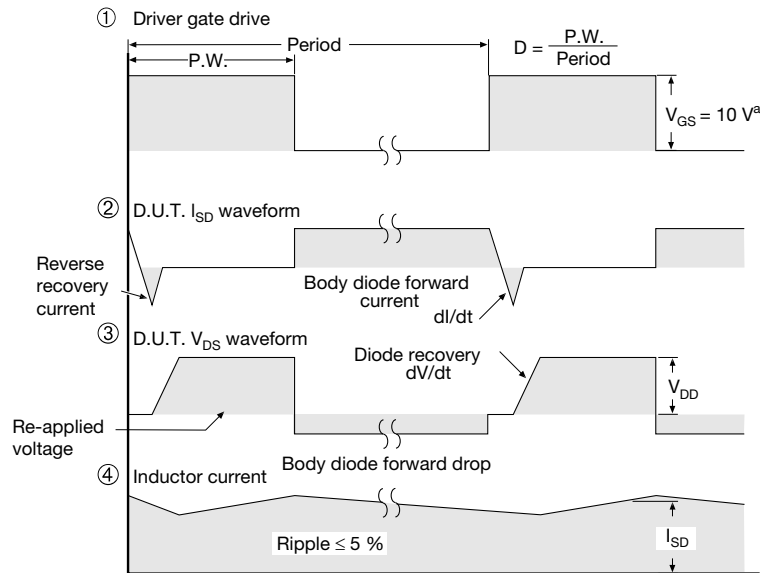


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



Note

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

Fig. 11 - For N-Channel

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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

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

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

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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