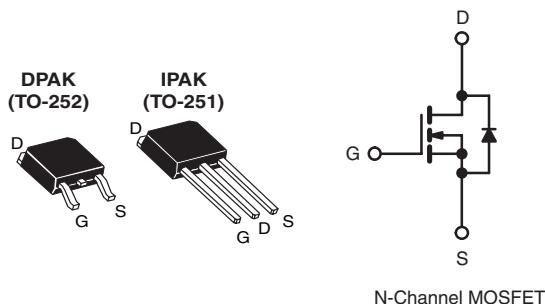


Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	100	
$R_{DS(on)}$ (Ω)	$V_{GS} = 5.0$ V	0.27
Q_g (Max.) (nC)		12
Q_{gs} (nC)		3.0
Q_{gd} (nC)		7.1
Configuration	Single	



FEATURES

- Halogen-free According to IEC 61249-2-21
- Definition
- Dynamic dV/dt Rating
- Repetitive Avalanche Rated
- Surface Mount (IRLR120, SiHLR120)
- Straight Lead (IRLU120, SiHLU120)
- Available in Tape and Reel
- Logic-Level Gate Drive
- $R_{DS(on)}$ Specified at $V_{GS} = 4$ V and 5 V
- 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 DPAK is designed for surface mounting using vapor phase, infrared, or wave soldering techniques. The straight lead version (IRLU, SiHLU series) is for through-hole mounting applications. Power dissipation levels up to 1.5 W are possible in typical surface mount applications.

ORDERING INFORMATION					
Package	DPAK (TO-252)	DPAK (TO-252)	DPAK (TO-252)	DPAK (TO-252)	IPAK (TO-251)
Lead (Pb)-free and Halogen-free	SiHLR120-GE3	SiHLR120TRL-GE3	SiHLR120TR-GE3	SiHLR120TRR-GE3	SiHLU120-GE3
Lead (Pb)-free	IRLR120PbF	IRLR120TRLPbF ^a	IRLR120TRPbF ^a	IRLR120TRRPbF ^a	IRLU120PbF
SnPb	SIHLR120-E3	SIHLR120TL-E3 ^a	SIHLR120T-E3 ^a	SIHLR120TR-E3 ^a	SIHLU120-E3
IRLR120	IRLR120TRL ^a	IRLR120TR ^a	-	-	-
SIHLR120	SIHLR120TL ^a	SIHLR120T ^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	V
Continuous Drain Current	V_{GS} at 5.0 V	$T_C = 25$ °C	I_D	7.7	
		$T_C = 100$ °C		4.9	A
Pulsed Drain Current ^a			I_{DM}	31	
Linear Derating Factor				0.33	
Linear Derating Factor (PCB Mount) ^e				0.020	W/°C
Single Pulse Avalanche Energy ^b			E_{AS}	210	mJ
Repetitive Avalanche Current ^a			I_{AR}	7.7	A
Repetitive Avalanche Energy ^a			E_{AR}	4.2	mJ
Maximum Power Dissipation		$T_C = 25$ °C	P_D	42	
Maximum Power Dissipation (PCB Mount) ^e		$T_A = 25$ °C		2.5	W
Peak Diode Recovery dV/dt ^c			dV/dt	5.5	V/ns
Operating Junction and Storage Temperature Range			T_J, T_{stg}	- 55 to + 150	
Soldering Recommendations (Peak Temperature)	for 10 s			260 ^d	°C

Notes

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

b. $V_{DD} = 25$ V, starting $T_J = 25$ °C, $L = 5.3$ mH, $R_g = 25$ Ω , $I_{AS} = 7.7$ A (see fig. 12).

c. $I_{SD} \leq 9.2$ A, $dI/dt \leq 110$ A/ μ s, $V_{DD} \leq V_{DS}$, $T_J \leq 150$ °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	MIN.	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	-	110	°C/W
Maximum Junction-to-Ambient (PCB Mount) ^a	R_{thJA}	-	-	50	
Maximum Junction-to-Case (Drain)	R_{thJC}	-	-	3.0	

Note

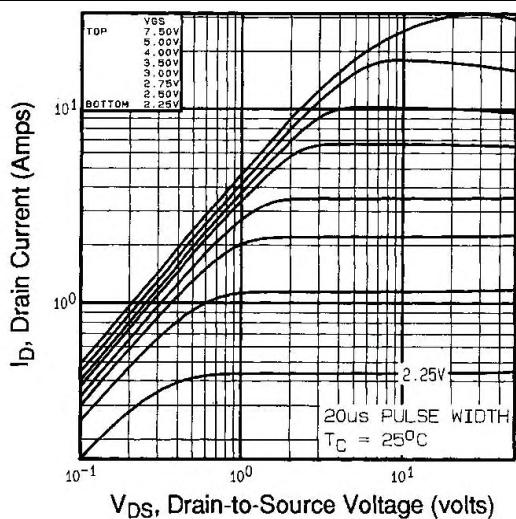
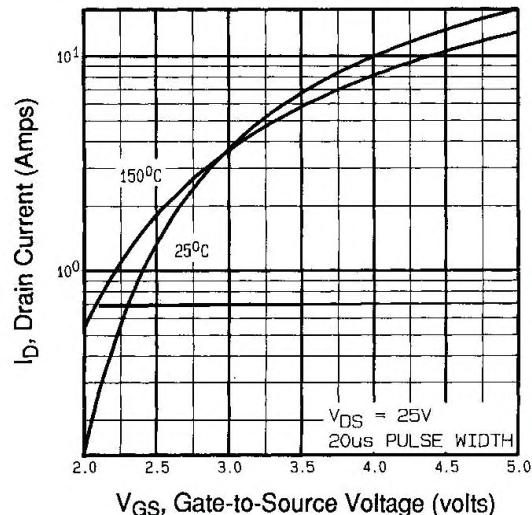
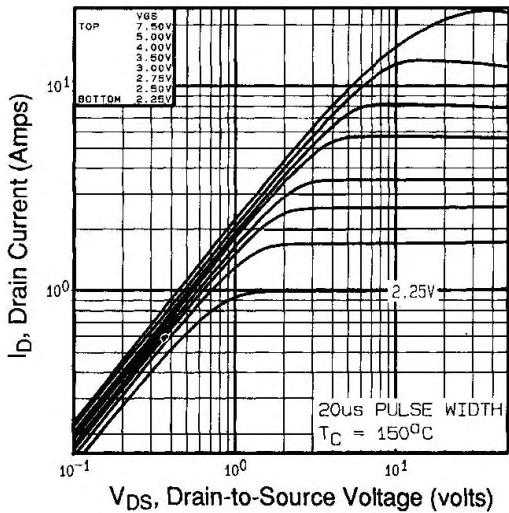
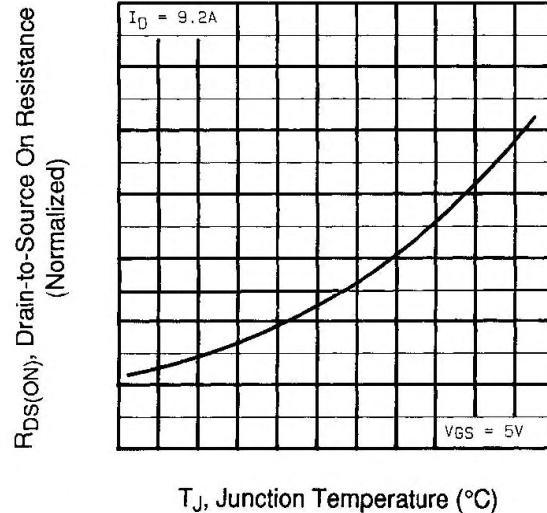
a. When mounted on 1" square PCB (FR-4 or G-10 material).

SPECIFICATIONS $T_J = 25$ °C, unless otherwise noted

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT	
Static								
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0$ V, $I_D = 250$ µA		100	-	-	V	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, $I_D = 1$ mA		-	0.13	-	V/°C	
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250$ µA		1.0	-	2.0	V	
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 10$ V		-	-	± 100	nA	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 100$ V, $V_{GS} = 0$ V		-	-	25	µA	
		$V_{DS} = 80$ V, $V_{GS} = 0$ V, $T_J = 125$ °C		-	-	250		
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 5.0$ V	$I_D = 4.6$ A ^b	-	-	0.27	Ω	
		$V_{GS} = 4.0$ V	$I_D = 3.9$ A ^b	-	-	0.38		
Forward Transconductance	g_{fs}	$V_{DS} = 50$ V, $I_D = 4.6$ A ^b		4.4	-	-	S	
Dynamic								
Input Capacitance	C_{iss}	$V_{GS} = 0$ V, $V_{DS} = 25$ V, $f = 1.0$ MHz, see fig. 5		-	490	-	pF	
Output Capacitance	C_{oss}			-	150	-		
Reverse Transfer Capacitance	C_{rss}			-	30	-		
Total Gate Charge	Q_g	$V_{GS} = 5.0$ V	$I_D = 9.2$ A, $V_{DS} = 80$ V, see fig. 6 and 13 ^b	-	-	12	nC	
Gate-Source Charge	Q_{gs}			-	-	3.0		
Gate-Drain Charge	Q_{gd}			-	-	7.1		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 50$ V, $I_D = 9.2$ A, $R_g = 9.0$ Ω, $R_D = 5.2$ Ω, see fig. 10 ^b		-	9.8	-	ns	
Rise Time	t_r			-	64	-		
Turn-Off Delay Time	$t_{d(off)}$			-	21	-		
Fall Time	t_f			-	27	-		
Internal Drain Inductance	L_D	Between lead, 6 mm (0.25") from package and center of die contact ^c		-	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		-	-	7.7	A	
Pulsed Diode Forward Current ^a	I_{SM}			-	-	31		
Body Diode Voltage	V_{SD}	$T_J = 25$ °C, $I_S = 7.7$ A, $V_{GS} = 0$ V ^b		-	-	2.5	V	
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25$ °C, $I_F = 9.2$ A, $dI/dt = 100$ A/µs ^b		-	110	140	ns	
Body Diode Reverse Recovery Charge	Q_{rr}			-	0.80	1.0	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 ≤ 300 µs; duty cycle ≤ 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, $T_c = 150\text{ }^{\circ}\text{C}$

Fig. 4 - Normalized On-Resistance vs. Temperature

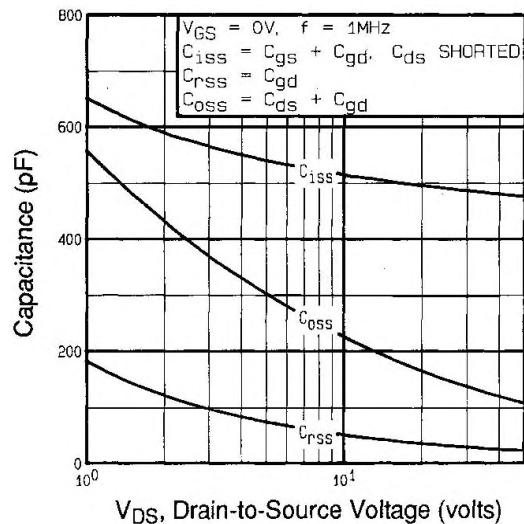


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

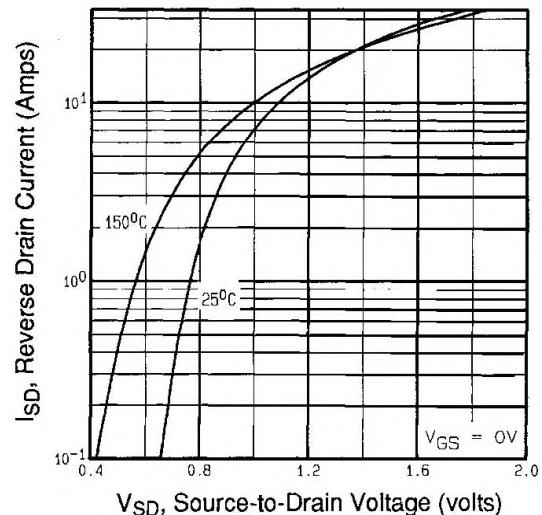


Fig. 7 - Typical Source-Drain Diode Forward Voltage

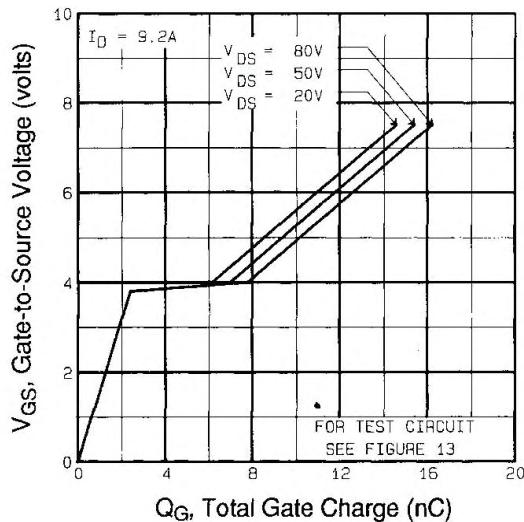


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

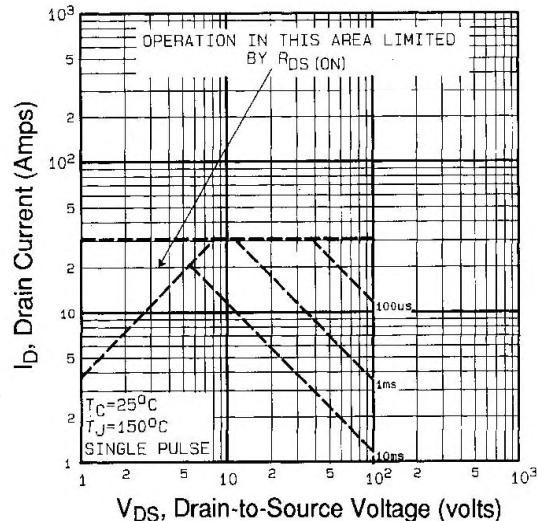
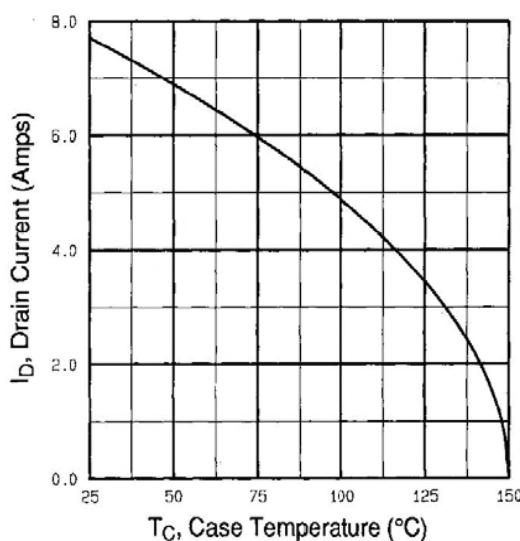
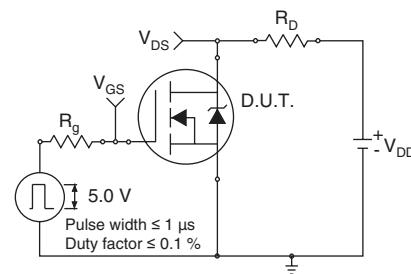
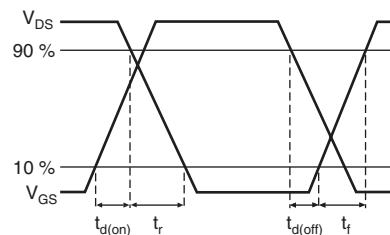
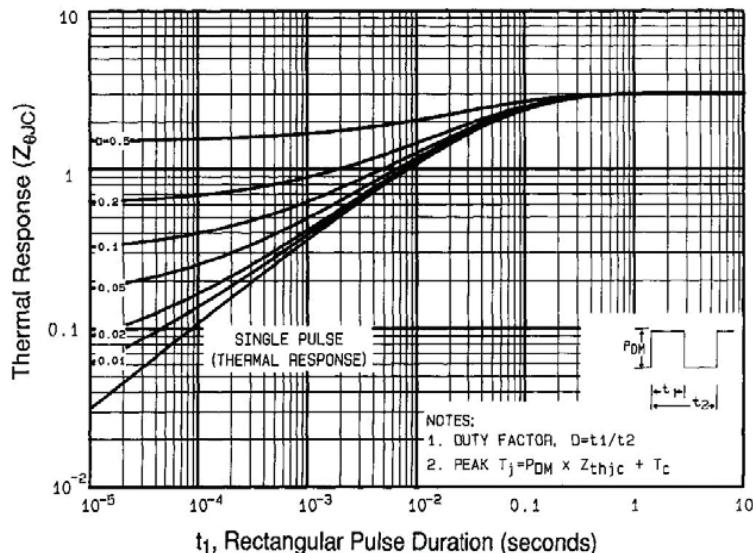


Fig. 8 - Maximum Safe Operating Area


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

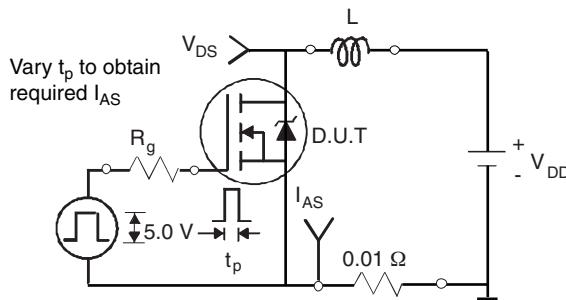


Fig. 12a - Unclamped Inductive Test Circuit

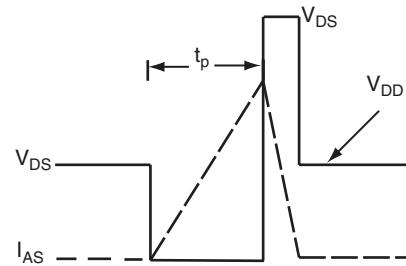


Fig. 12b - Unclamped Inductive Waveforms

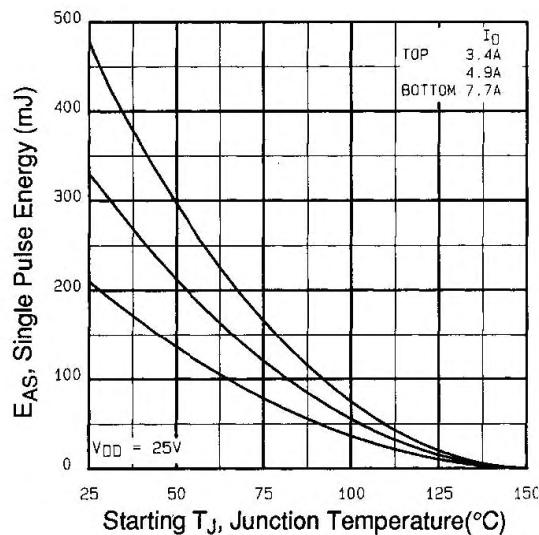


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

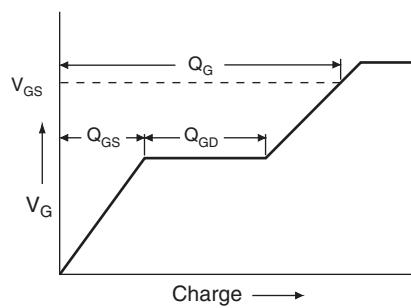


Fig. 13a - Basic Gate Charge Waveform

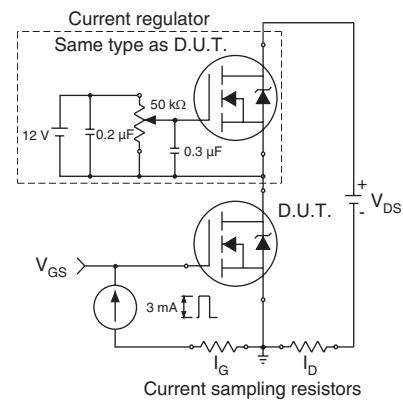
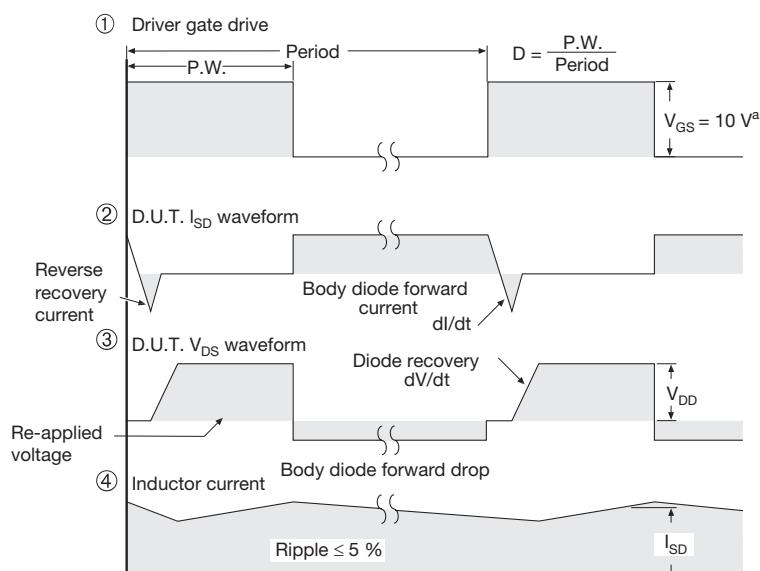
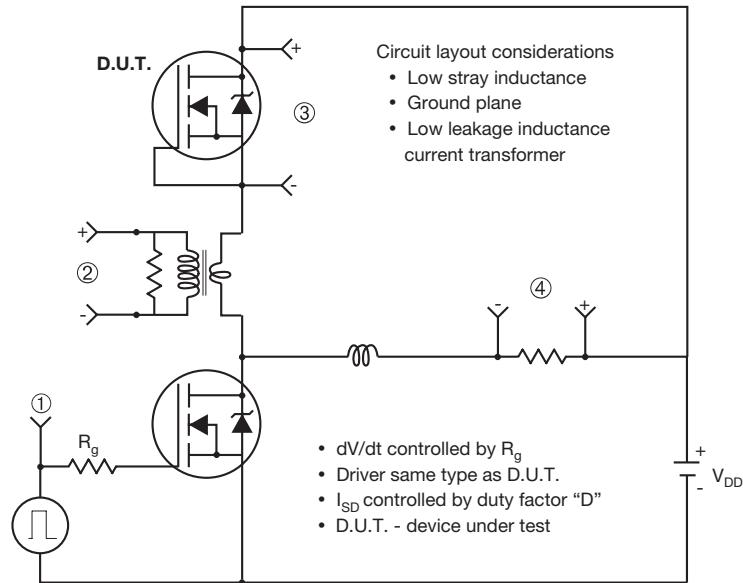


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



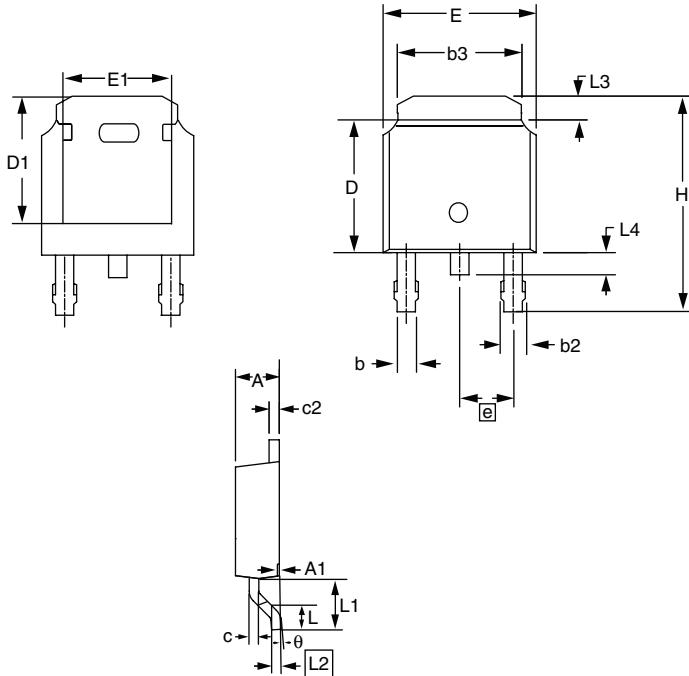
Note

a. $V_{CS} = 5$ V for logic level devices

Fig. 14 - For N-Channel

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TO-252AA (HIGH VOLTAGE)



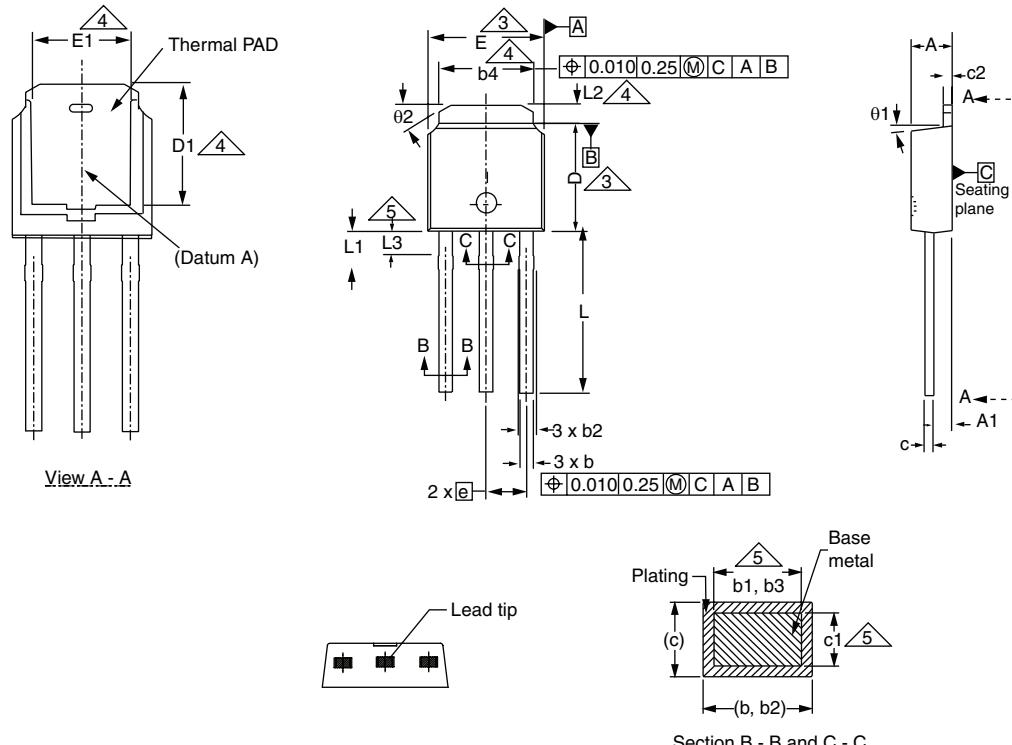
DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
E	6.40	6.73	0.252	0.265
L	1.40	1.77	0.055	0.070
L1	2.743 REF		0.108 REF	
L2	0.508 BSC		0.020 BSC	
L3	0.89	1.27	0.035	0.050
L4	0.64	1.01	0.025	0.040
D	6.00	6.22	0.236	0.245
H	9.40	10.40	0.370	0.409
b	0.64	0.88	0.025	0.035
b2	0.77	1.14	0.030	0.045
b3	5.21	5.46	0.205	0.215
e	2.286 BSC		0.090 BSC	
A	2.20	2.38	0.087	0.094
A1	0.00	0.13	0.000	0.005
c	0.45	0.60	0.018	0.024
c2	0.45	0.58	0.018	0.023
D1	5.30	-	0.209	-
E1	4.40	-	0.173	-
θ	0'	10'	0'	10'

ECN: S-81965-Rev. A, 15-Sep-08
DWG: 5973

Notes

1. Package body sizes exclude mold flash, protrusion or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 0.10 mm per side.
2. Package body sizes determined at the outermost extremes of the plastic body exclusive of mold flash, gate burrs and interlead flash, but including any mismatch between the top and bottom of the plastic body.
3. The package top may be smaller than the package bottom.
4. Dimension "b" does not include dambar protrusion. Allowable dambar protrusion shall be 0.10 mm total in excess of "b" dimension at maximum material condition. The dambar cannot be located on the lower radius of the foot.

TO-251AA (HIGH VOLTAGE)



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.39	0.086	0.094
A1	0.89	1.14	0.035	0.045
b	0.64	0.89	0.025	0.035
b1	0.65	0.79	0.026	0.031
b2	0.76	1.14	0.030	0.045
b3	0.76	1.04	0.030	0.041
b4	4.95	5.46	0.195	0.215
c	0.46	0.61	0.018	0.024
c1	0.41	0.56	0.016	0.022
c2	0.46	0.86	0.018	0.034
D	5.97	6.22	0.235	0.245

ECN: S-82111-Rev. A, 15-Sep-08
DWG: 5968

DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
D1	5.21	-	0.205	-
E	6.35	6.73	0.250	0.265
E1	4.32	-	0.170	-
e	2.29 BSC		2.29 BSC	
L	8.89	9.65	0.350	0.380
L1	1.91	2.29	0.075	0.090
L2	0.89	1.27	0.035	0.050
L3	1.14	1.52	0.045	0.060
01	0'	15'	0'	15'
02	25'	35'	25'	35'

Notes

1. Dimensioning and tolerancing per ASME Y14.5M-1994.
2. Dimension are shown in inches and millimeters.
3. Dimension D and E do not include mold flash. Mold flash shall not exceed 0.13 mm (0.005") per side. These dimensions are measured at the outermost extremes of the plastic body.
4. Thermal pad contour optional with dimensions b4, L2, E1 and D1.
5. Lead dimension uncontrolled in L3.
6. Dimension b1, b3 and c1 apply to base metal only.
7. Outline conforms to JEDEC outline TO-251AA.

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