

## J130-VB Datasheet

### P-Channel 500V (D-S) Power MOSFET

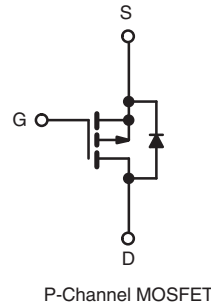
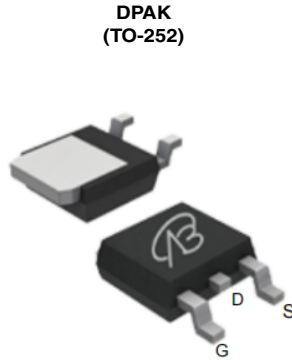
PRODUCT SUMMARY		
$V_{DS}$ (V)	- 500	
$R_{DS(on)}$ ( $\Omega$ )	$V_{GS} = -10\text{ V}$	4.0
$Q_g$ (Max.) (nC)	13	
$Q_{gs}$ (nC)	3.2	
$Q_{gd}$ (nC)	5.0	
Configuration	Single	

#### FEATURES

- P-Channel
- Surface Mount
- Straight Lead
- Advanced Process Technology
- Fast Switching
- Fully Avalanche Rated



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available



ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> = 25 °C, unless otherwise noted)					
PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V <sub>DS</sub>	- 500	V
Gate-Source Voltage			V <sub>GS</sub>	± 20	
Continuous Drain Current	V <sub>GS</sub> at - 10 V	T <sub>C</sub> = 25 °C	I <sub>D</sub>	- 4.0	A
		T <sub>C</sub> = 100 °C		- 3.1	
Pulsed Drain Current <sup>a</sup>			I <sub>DM</sub>	-15	
Linear Derating Factor				0.40	W/°C
Single Pulse Avalanche Energy <sup>b</sup>			E <sub>AS</sub>	92	mJ
Repetitive Avalanche Current <sup>a</sup>			I <sub>AR</sub>	- 4	A
Repetitive Avalanche Energy <sup>a</sup>			E <sub>AR</sub>	15.0	mJ
Maximum Power Dissipation	T <sub>C</sub> = 25 °C		P <sub>D</sub>	80	W
Peak Diode Recovery dV/dt <sup>c</sup>			dV/dt	- 24	V/ns
Operating Junction and Storage Temperature Range			T <sub>J</sub> , T <sub>stg</sub>	- 55 to + 150	°C
Soldering Recommendations (Peak Temperature) <sup>d</sup>	for 10 s			300	

#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- Starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $L = 57\text{ mH}$ ,  $R_g = 25\text{ }\Omega$ ,  $I_{AS} = -1.8\text{ A}$  (see fig. 12).
- $I_{SD} \leq -1.1\text{ A}$ ,  $dI/dt \leq 450\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq V_{DS}$ ,  $T_J \leq 150\text{ }^\circ\text{C}$ .
- 1.6 mm from case.



**THERMAL RESISTANCE RATINGS**

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	$R_{thJA}$	-	-	110	°C/W
Maximum Junction-to-Ambient (PCB Mount) <sup>a</sup>	$R_{thJA}$	-	-	50	
Maximum Junction-to-Case (Drain)	$R_{thJC}$	-	-	2.5	

**Note**

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

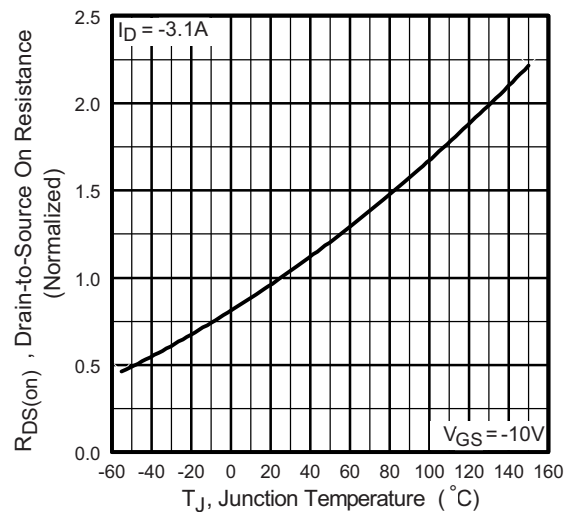
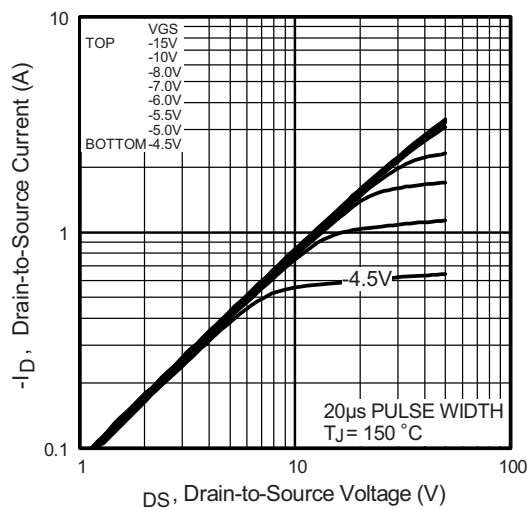
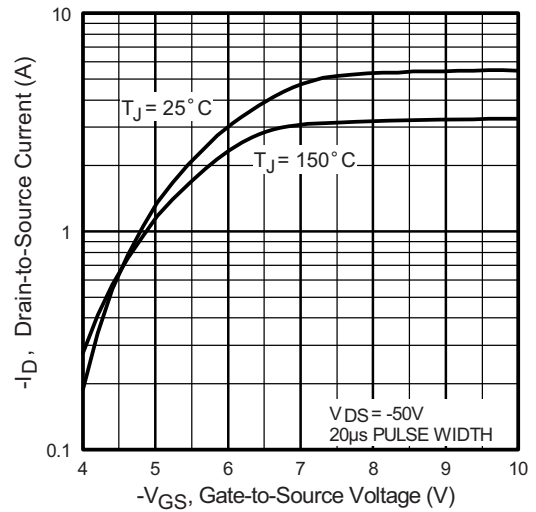
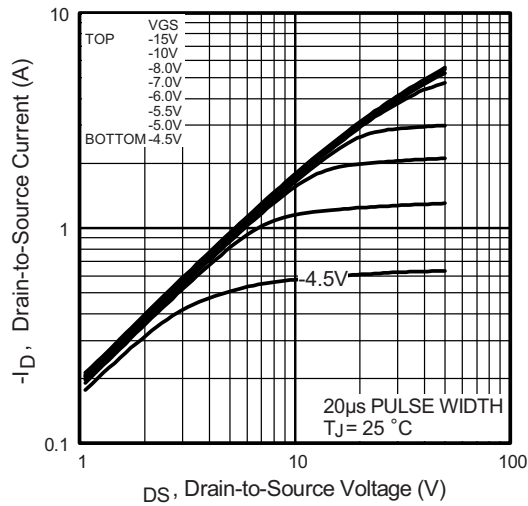
**SPECIFICATIONS** ( $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)

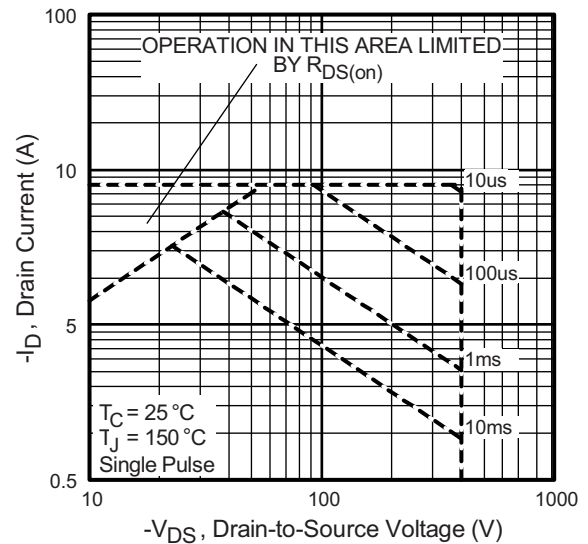
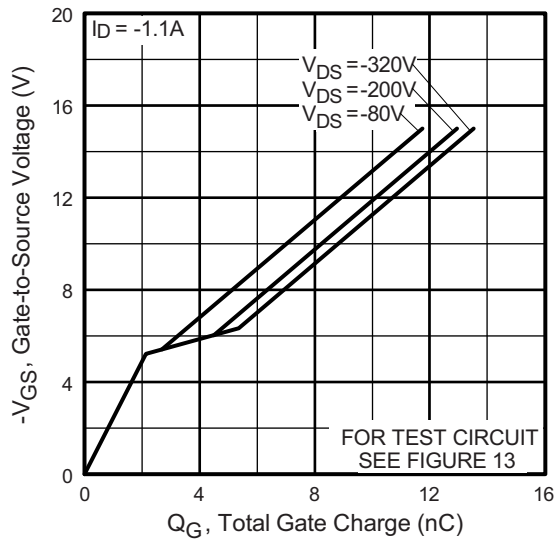
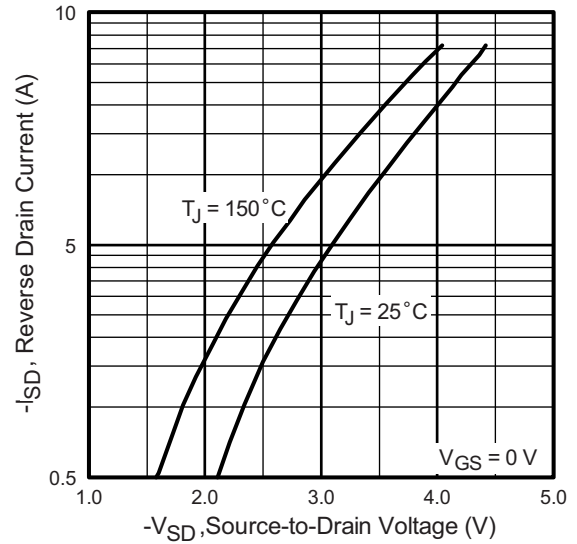
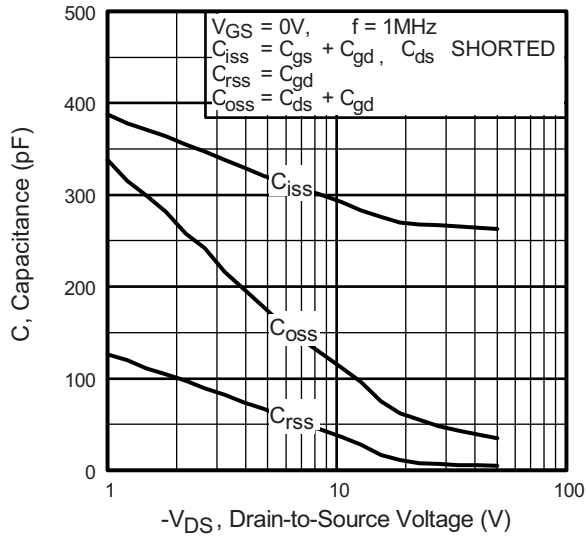
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = - 250 μA		- 500	-	-	V
V <sub>DS</sub> Temperature Coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	Reference to 25 °C, I <sub>D</sub> = - 1 mA		-	- 0.41	-	V/°C
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = - 250 μA		- 2.0	-	- 4.0	V
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>GS</sub> = ± 20 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = - 500 V, V <sub>GS</sub> = 0 V		-	-	- 100	μA
		V <sub>DS</sub> = - 400 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C		-	-	- 500	
Drain-Source On-State Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = - 10 V	I <sub>D</sub> = - 3.1 A <sup>b</sup>	-	4	-	Ω
Forward Transconductance	g <sub>fs</sub>	V <sub>DS</sub> = - 50 V, I <sub>D</sub> = - 3.1 A		0.91	-	-	S
Dynamic							
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = - 25 V, f = 1.0 MHz, see fig. 5		-	940	-	pF
Output Capacitance	C <sub>oss</sub>			-	50	-	
Reverse Transfer Capacitance	C <sub>rss</sub>			-	8.0	-	
Total Gate Charge	Q <sub>g</sub>	V <sub>GS</sub> = - 10 V	I <sub>D</sub> = - 1.1 A, V <sub>DS</sub> = - 320 V, see fig. 6 and 13 <sup>b</sup>	-	-	13	nC
Gate-Source Charge	Q <sub>gs</sub>			-	-	3.2	
Gate-Drain Charge	Q <sub>gd</sub>			-	-	5.0	
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = - 200 V, I <sub>D</sub> = - 1.1 A, R <sub>g</sub> = 21 Ω, R <sub>D</sub> = 180 Ω, see fig. 10 <sup>b</sup>		-	11	-	ns
Rise Time	t <sub>r</sub>			-	10	-	
Turn-Off Delay Time	t <sub>d(off)</sub>			-	25	-	
Fall Time	t <sub>f</sub>			-	24	-	
Internal Drain Inductance	L <sub>D</sub>	Between lead, 6 mm (0.25") from package and center of die contact <sup>c</sup> 		-	4.5	-	nH
Internal Source Inductance	L <sub>S</sub>			-	7.5	-	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I <sub>S</sub>	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	- 1.9	A
Pulsed Diode Forward Current <sup>a</sup>	I <sub>SM</sub>			-	-	- 7.6	
Body Diode Voltage	V <sub>SD</sub>	T <sub>J</sub> = 25 °C, I <sub>S</sub> = - 1.1 A, V <sub>GS</sub> = 0 V <sup>b</sup>		-	-	- 4.0	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> = 25 °C, I <sub>F</sub> = -1.1 A, dI/dt = 100 A/μs <sup>b</sup>		-	170	260	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			-	640	960	nC
Forward Turn-On Time	t <sub>on</sub>	Intrinsic turn-on time is negligible (turn-on is dominated by L <sub>S</sub> and L <sub>D</sub> )					

**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. This is applied for IPAK,  $L_S$  of DPAK is measured between lead and center of die contact.

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)





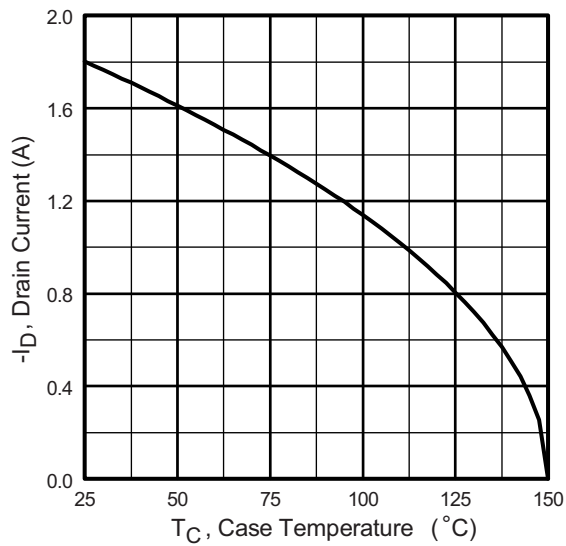


Fig. 9 - Maximum Drain Current vs. Case Temperature

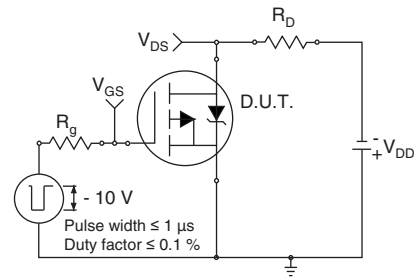


Fig. 10a - Switching Time Test Circuit

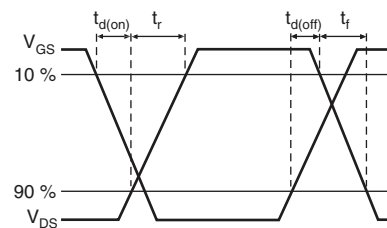


Fig. 10b - Switching Time Waveforms

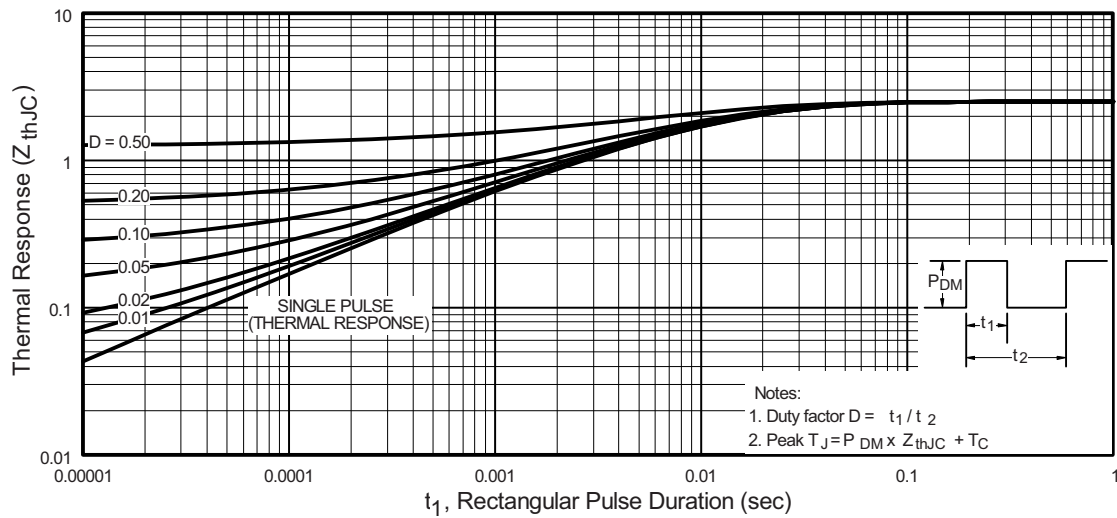


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

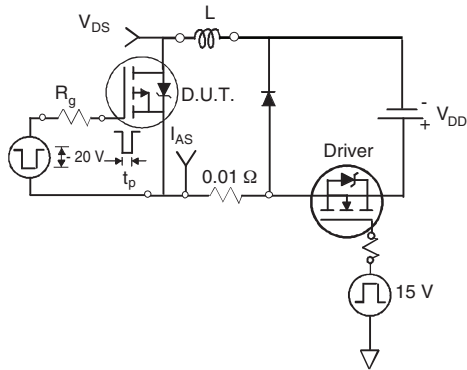


Fig. 12a - Unclamped Inductive Test Circuit

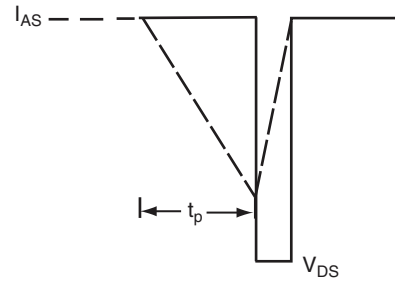


Fig. 12b - Unclamped Inductive Waveforms

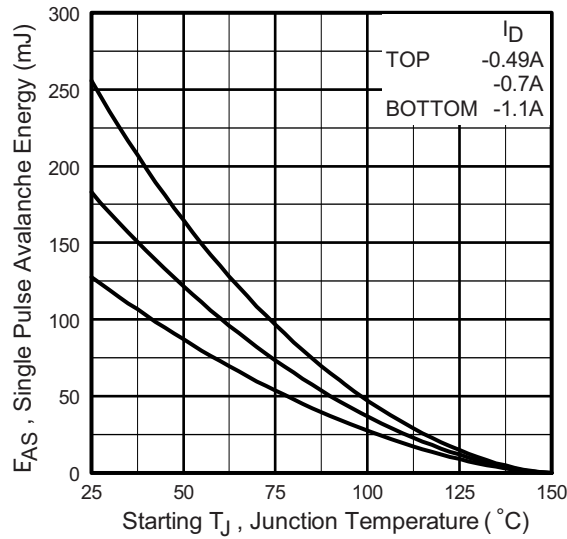


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

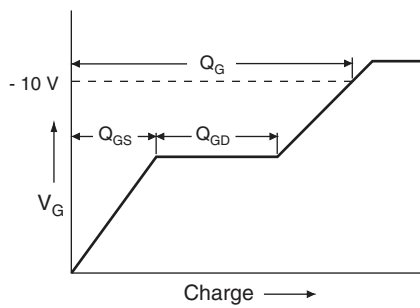


Fig. 13a - Basic Gate Charge Waveform

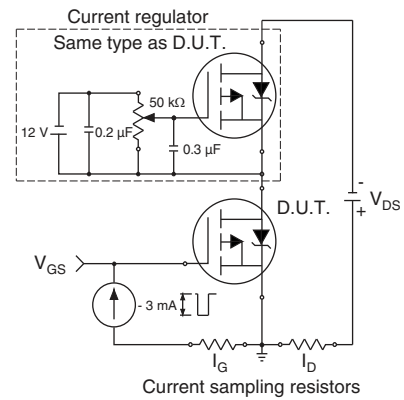
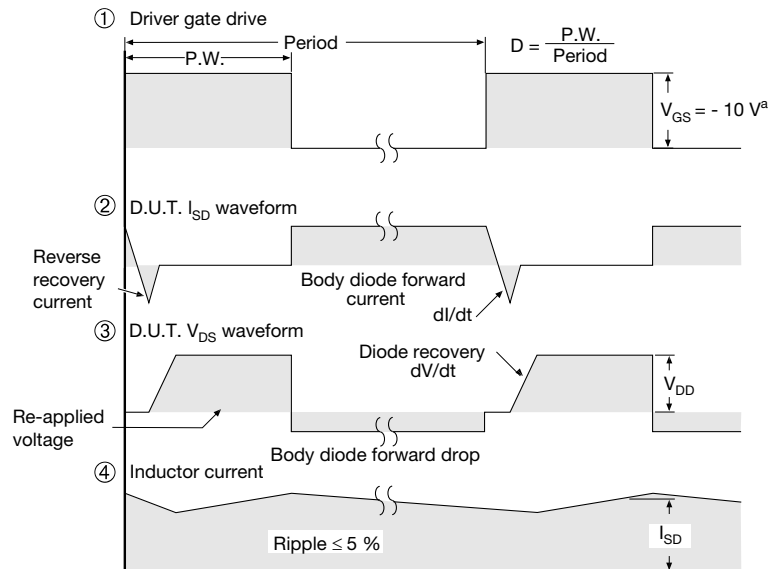
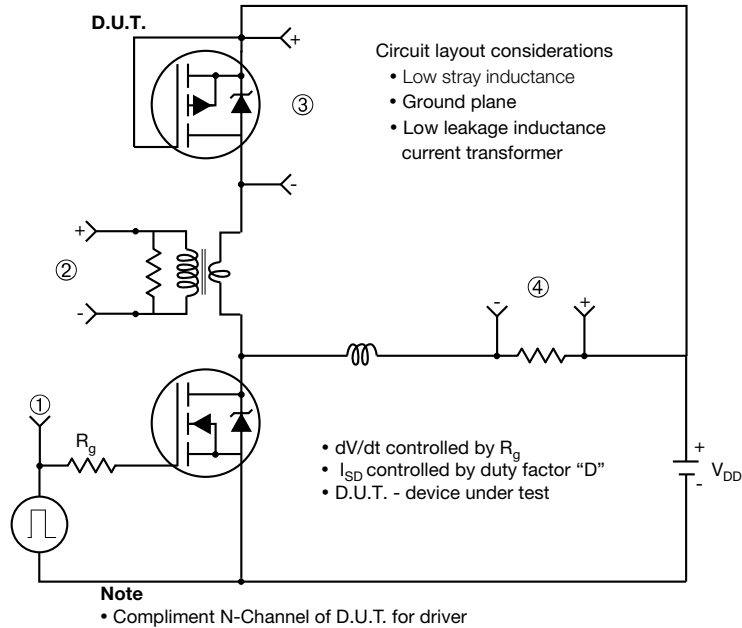


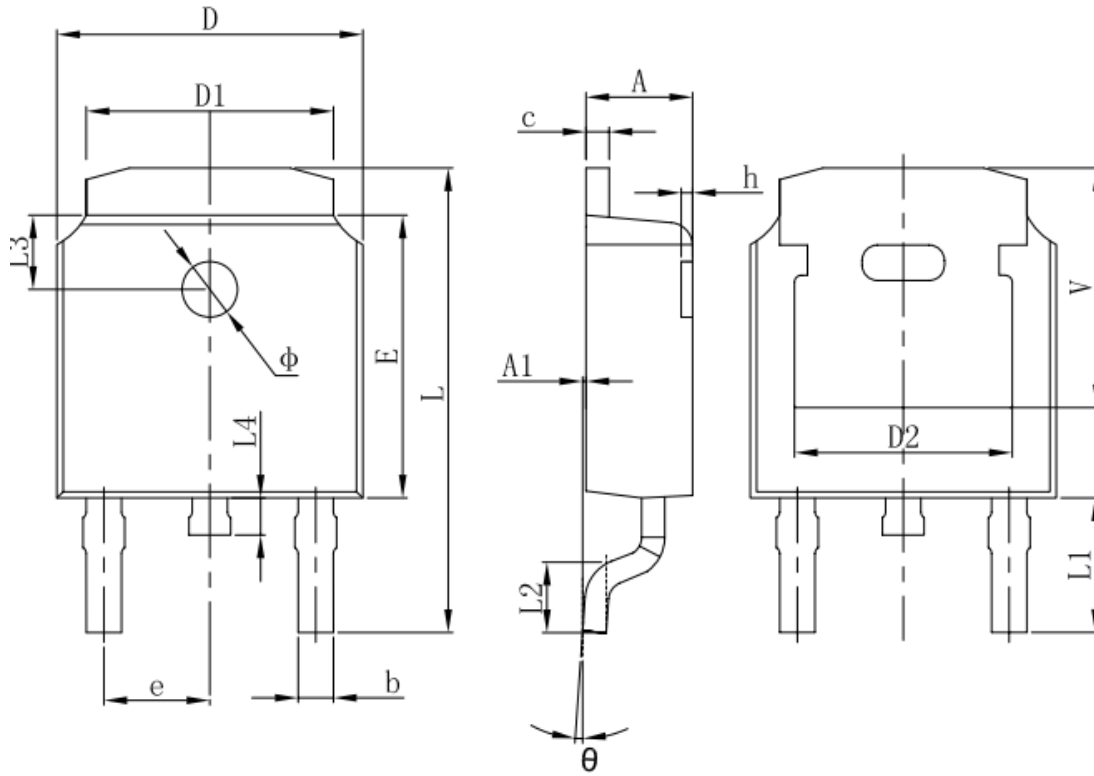
Fig. 13b - Gate Charge Test Circuit

### Peak Diode Recovery dV/dt Test Circuit



**Fig. 14 - For P-Channel**

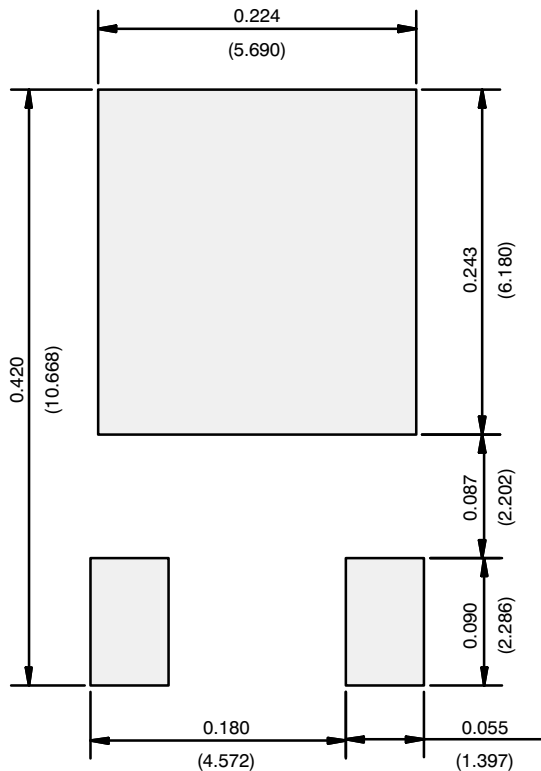
## TO252 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.635	0.770	0.025	0.030
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.712	10.312	0.382	0.406
L1	2.900 REF.		0.114 REF.	
L2	1.400	1.700	0.055	0.067
L3	1.600 REF.		0.063 REF.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.250 REF.		0.207 REF.	



RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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