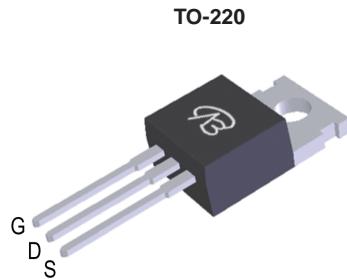


# Power MOSFET

PRODUCT SUMMARY		
$V_{DS}$ (V)	1500	
$R_{DS(on)}$ ( $\Omega$ )	$V_{GS} = 10$ V	6
$Q_g$ (Max.) (nC)	200	
$Q_{gs}$ (nC)	24	
$Q_{gd}$ (nC)	110	
Configuration	Single	

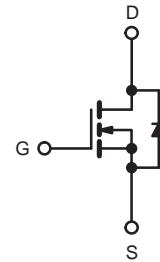
## FEATURES

- Dynamic  $dV/dt$  Rating
- Repetitive Avalanche Rated
- Isolated Central Mounting Hole
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements
- Compliant to RoHS Directive 2002/95/EC



TO-220

Top View



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$ °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		$V_{DS}$	1500	V
Gate-Source Voltage		$V_{GS}$	$\pm 30$	
Continuous Drain Current	$V_{GS}$ at 10 V	$I_D$	3	A
			2.4	
Pulsed Drain Current <sup>a</sup>		$I_{DM}$	9	
Linear Derating Factor			1.5	W/°C
Single Pulse Avalanche Energy <sup>b</sup>		$E_{AS}$	470	mJ
Repetitive Avalanche Current <sup>a</sup>		$I_{AR}$	4.8	A
Repetitive Avalanche Energy <sup>a</sup>		$E_{AR}$	19	mJ
Maximum Power Dissipation	$T_C = 25$ °C	$P_D$	120	W
Peak Diode Recovery $dV/dt$ <sup>c</sup>		$dV/dt$	2.0	V/ns
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	- 55 to + 150	°C
Soldering Recommendations (Peak Temperature)	for 10 s		300 <sup>d</sup>	
Mounting Torque	6-32 or M3 screw		10	lbf · in
			1.1	N · m

## Notes

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

b.  $V_{DD} = 50$  V, starting  $T_J = 25$  °C,  $L = 23$  mH,  $R_g = 25$   $\Omega$ ,  $I_{AS} = 7.8$  A (see fig. 12).

c.  $I_{SD} \leq 7.8$  A,  $dI/dt \leq 140$  A/ $\mu$ s,  $V_{DD} \leq 600$  V,  $T_J \leq 150$  °C.

d. 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	$^{\circ}\text{C}/\text{W}$
Case-to-Sink, Flat, Greased Surface	$R_{thCS}$	0.24	-	
Maximum Junction-to-Case (Drain)	$R_{thJC}$	-	0.65	

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

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT	
<b>Static</b>								
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$		1500	-	-	V	
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25^{\circ}\text{C}$ , $I_D = 1 \text{ mA}$		-	0.98	-	$^{\circ}\text{C}/\text{V}$	
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$		3.0	-	5.0	V	
Gate-Source Leakage	$I_{GSS}$	$V_{GS} = \pm 30 \text{ V}$		-	-	$\pm 100$	nA	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 1200 \text{ V}$ , $V_{GS} = 0 \text{ V}$		-	-	100	$\mu\text{A}$	
		$V_{DS} = 1200 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 125^{\circ}\text{C}$		-	-	500		
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10 \text{ V}$	$I_D = 1.7 \text{ A}^b$	-	6	-	$\Omega$	
Forward Transconductance	$g_{fs}$	$V_{DS} = 100 \text{ V}$ , $I_D = 1.7 \text{ A}^b$		5.6	-	-	S	
<b>Dynamic</b>								
Input Capacitance	$C_{iss}$	$V_{GS} = 0 \text{ V}$ , $V_{DS} = 25 \text{ V}$ , $f = 1.0 \text{ MHz}$ , see fig. 5		-	1600	-	pF	
Output Capacitance	$C_{oss}$			-	500	-		
Reverse Transfer Capacitance	$C_{rss}$			-	290	-		
Total Gate Charge	$Q_g$	$V_{GS} = 10 \text{ V}$	$I_D = 1.8 \text{ A}$ , $V_{DS} = 400 \text{ V}$ , see fig. 6 and 13 <sup>b</sup>	-	-	200	nC	
Gate-Source Charge	$Q_{gs}$			-	-	24		
Gate-Drain Charge	$Q_{gd}$			-	-	110		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 400 \text{ V}$ , $I_D = 1.8 \text{ A}$ , $R_g = 6.2 \Omega$ , $R_D = 52 \Omega$ see fig. 10 <sup>b</sup>		-	19	-	ns	
Rise Time	$t_r$			-	38	-		
Turn-Off Delay Time	$t_{d(off)}$			-	120	-		
Fall Time	$t_f$			-	39	-		
Internal Drain Inductance	$L_D$	Between lead, 6 mm (0.25") from package and center of die contact		-	5.0	-	nH	
Internal Source Inductance	$L_S$			-	13	-		
<b>Drain-Source Body Diode Characteristics</b>								
Continuous Source-Drain Diode Current	$I_S$	MOSFET symbol showing the integral reverse p - n junction diode		-	-	3	A	
Pulsed Diode Forward Current <sup>a</sup>	$I_{SM}$			-	-	9		
Body Diode Voltage	$V_{SD}$	$T_J = 25^{\circ}\text{C}$ , $I_S = 1.8 \text{ A}$ , $V_{GS} = 0 \text{ V}^b$		-	-	1.8	V	
Body Diode Reverse Recovery Time	$t_{rr}$	$T_J = 25^{\circ}\text{C}$ , $I_F = 1.8 \text{ A}$ , $dI/dt = 100 \text{ A}/\mu\text{s}^b$		-	110	-	ns	
Body Diode Reverse Recovery Charge	$Q_{rr}$			-	3.8	5.7	$\mu\text{C}$	
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  $\leq 2\%$ .

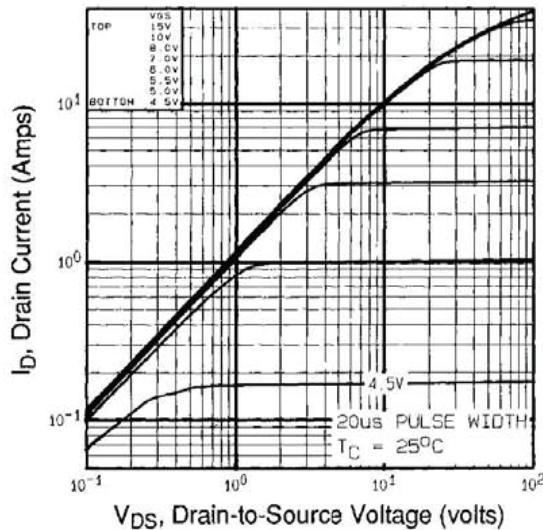
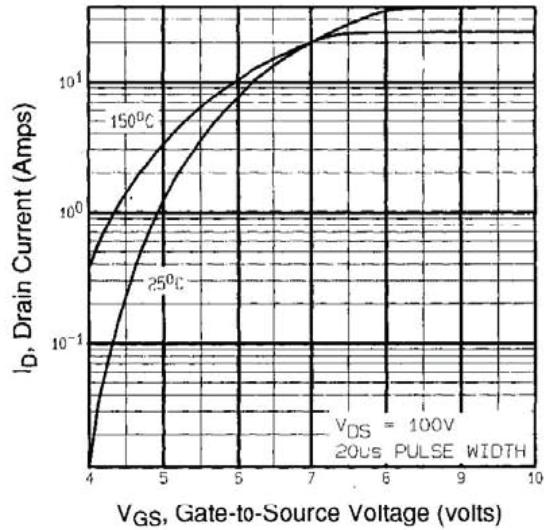
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)
Fig. 1 - Typical Output Characteristics,  $T_C = 25$  °C

Fig. 3 - Typical Transfer Characteristics

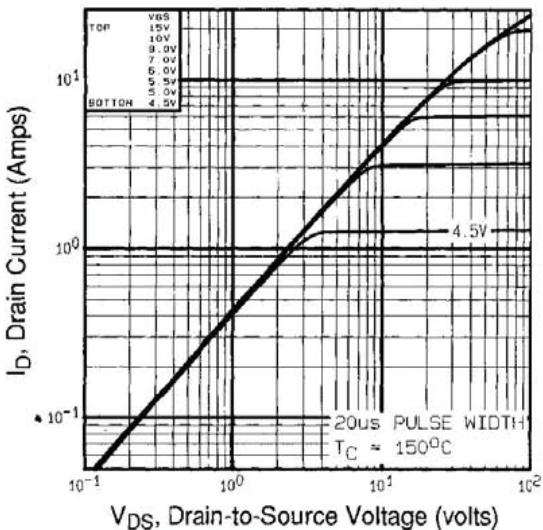
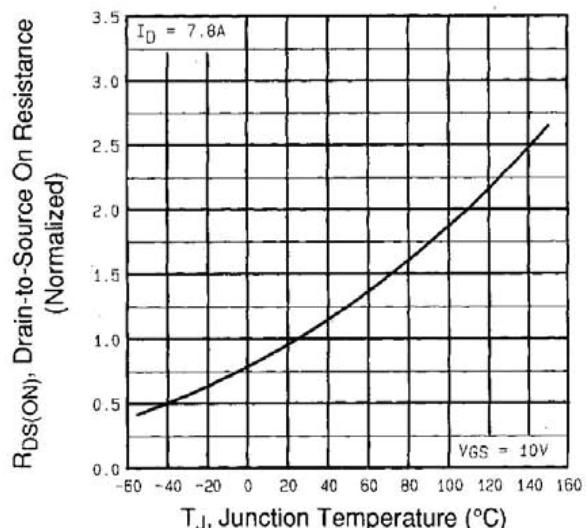
Fig. 2 - Typical Output Characteristics,  $T_C = 150$  °C

Fig. 4 - Normalized On-Resistance vs. Temperature

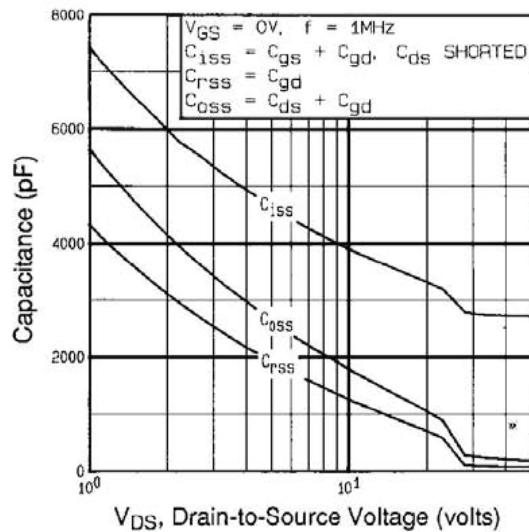


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

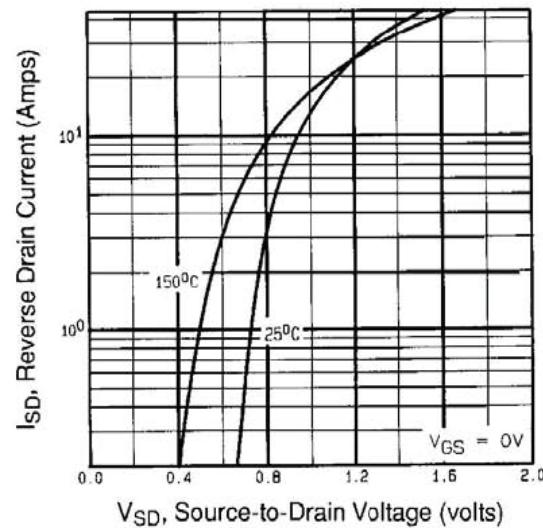


Fig. 7 - Typical Source-Drain Diode Forward Voltage

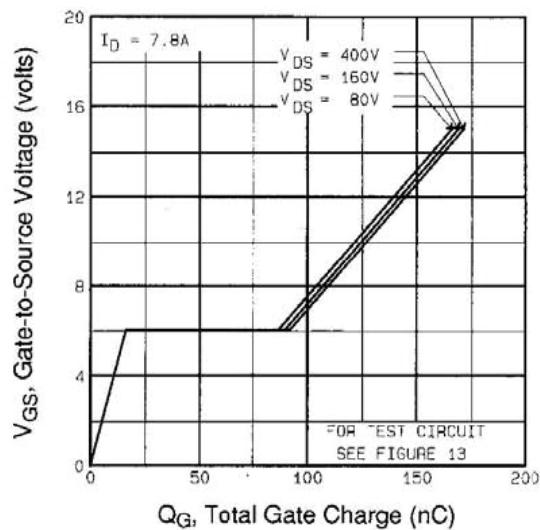


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

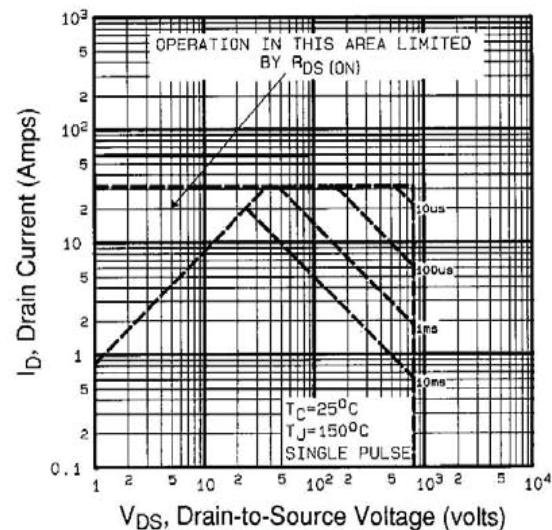


Fig. 8 - Maximum Safe Operating Area

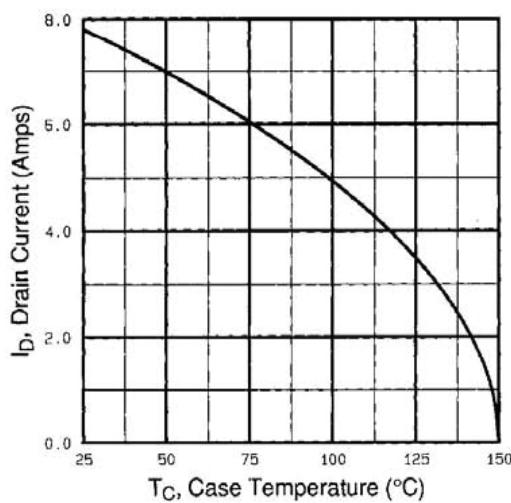


Fig. 9 - Maximum Drain Current vs. Case Temperature

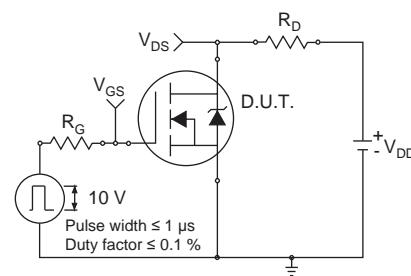


Fig. 10a - Switching Time Test Circuit

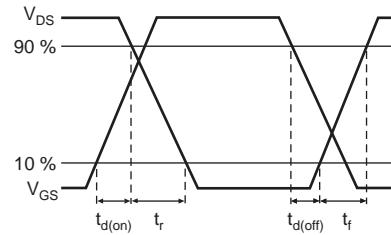


Fig. 10b - Switching Time Waveforms

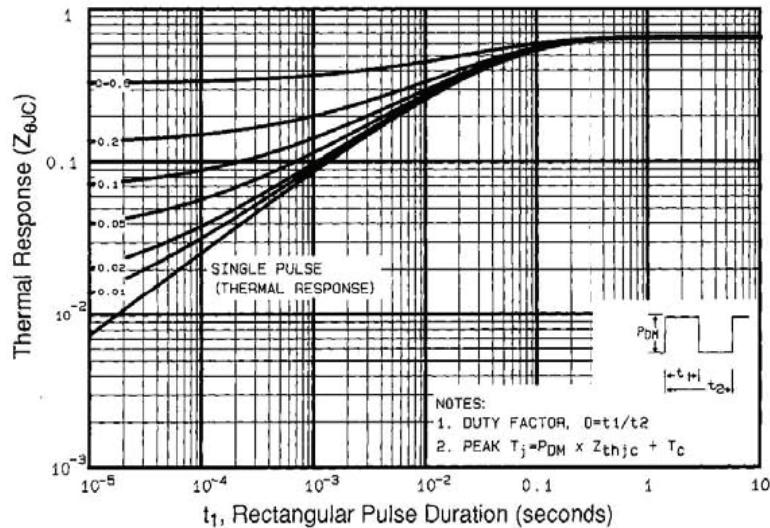


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

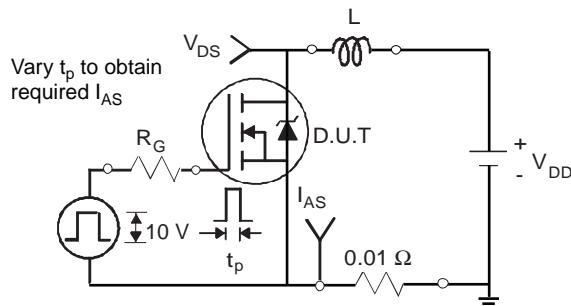


Fig. 12a - Unclamped Inductive Test Circuit

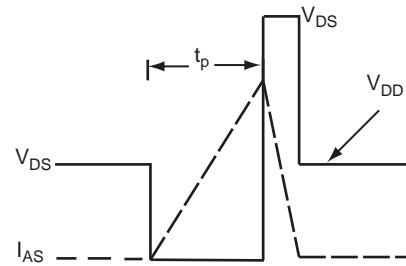


Fig. 12b - Unclamped Inductive Waveforms

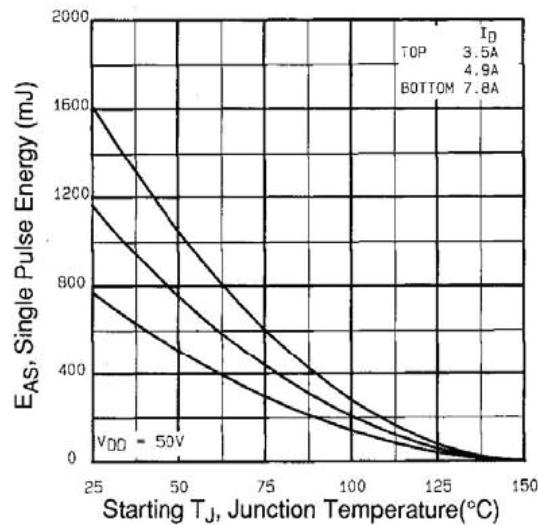


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

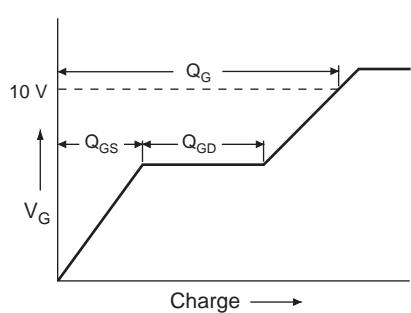


Fig. 13a - Basic Gate Charge Waveform

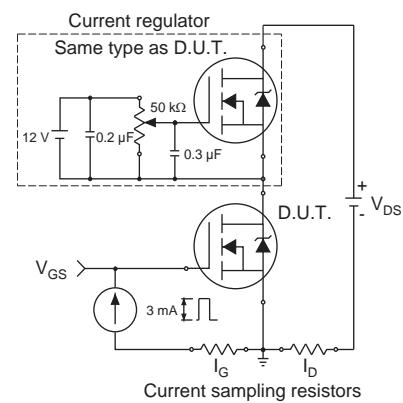


Fig. 13b - Gate Charge Test Circuit

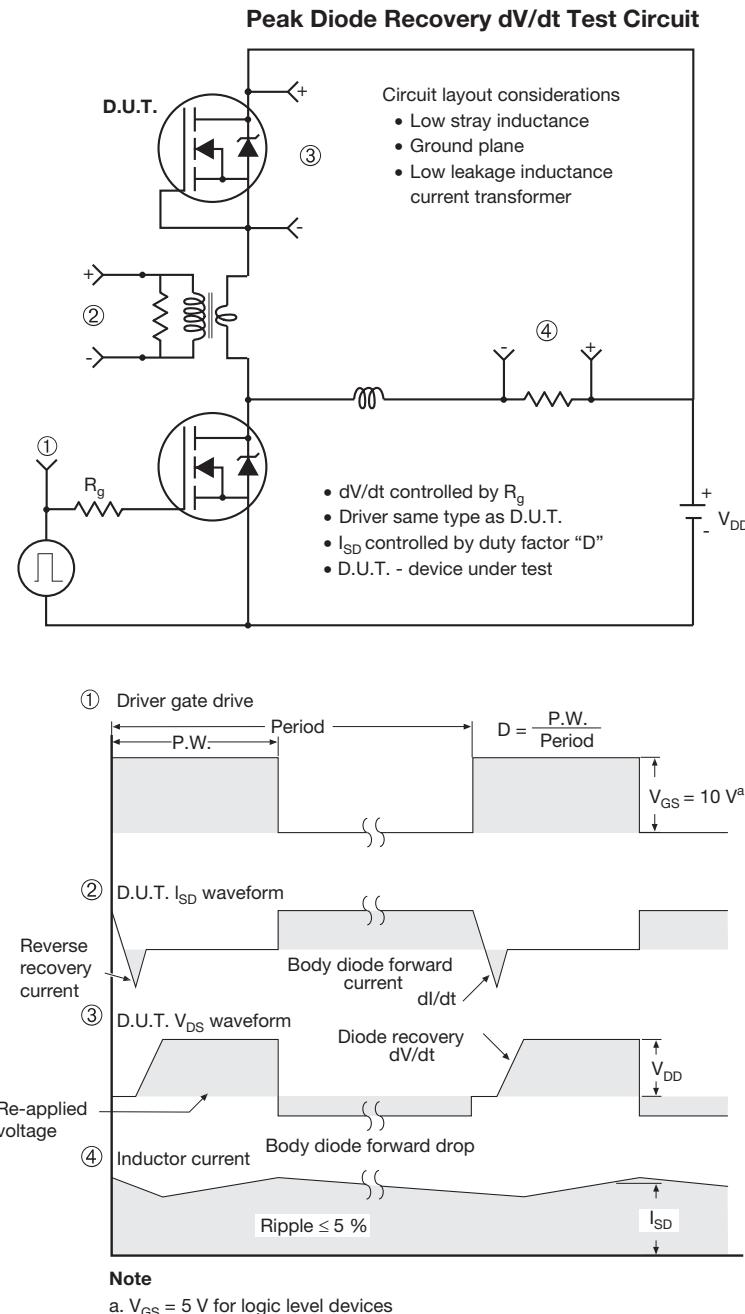
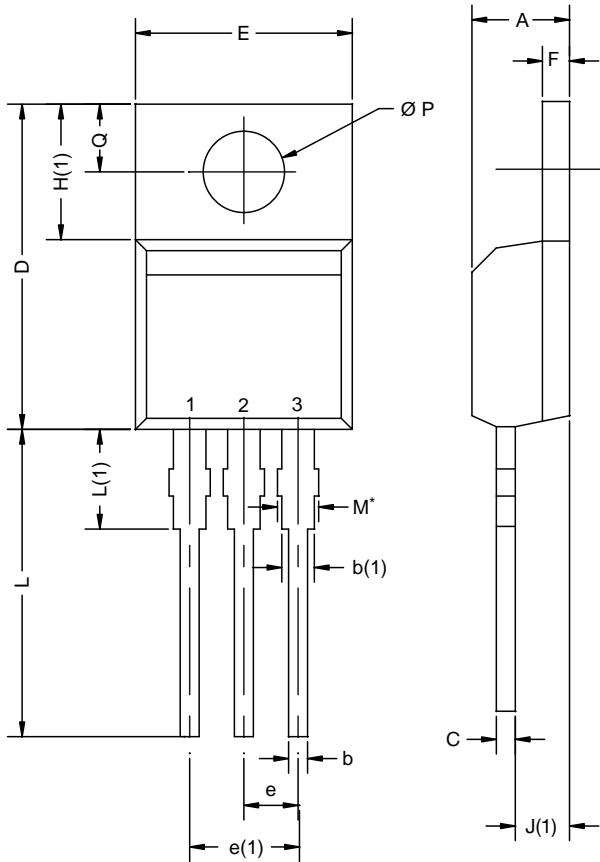


Fig. 14 - For N-Channel

# TO-220AB



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.25	4.65	0.167	0.183
b	0.69	1.01	0.027	0.040
b(1)	1.20	1.73	0.047	0.068
c	0.36	0.61	0.014	0.024
D	14.85	15.49	0.585	0.610
E	10.04	10.51	0.395	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	6.09	6.48	0.240	0.255
J(1)	2.41	2.92	0.095	0.115
L	13.35	14.02	0.526	0.552
L(1)	3.32	3.82	0.131	0.150
Ø P	3.54	3.94	0.139	0.155
Q	2.60	3.00	0.102	0.118

---

## Notes

\* M = 1.32 mm to 1.62 mm (dimension including protrusion)  
Heatsink hole for HVM

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