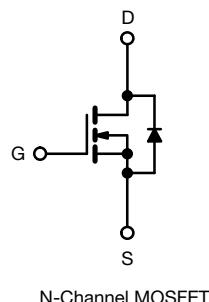
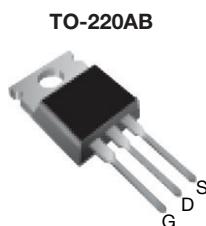


Power MOSFET



PRODUCT SUMMARY

V_{DS} (V)	100	
$R_{DS(on)}$ (Ω)	$V_{GS} = 5.0$ V	0.077
Q_g (Max.) (nC)	64	
Q_{gs} (nC)	9.4	
Q_{gd} (nC)	27	
Configuration	Single	

FEATURES

- 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
- Fast switching
- Ease of paralleling
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS*
Available

Note

* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

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 TO-220AB package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 50 W. The low thermal resistance and low package cost of the TO-220AB contribute to its wide acceptance throughout the industry.

ORDERING INFORMATION

Package	TO-220AB
Lead (Pb)-free	IRL540PbF
Lead (Pb)-free and halogen-free	IRL540PbF-BE3

ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	V_{DS}	100	V
Gate-source voltage	V_{GS}	± 10	
Continuous drain current	I_D	28	A
		20	
Pulsed drain current ^a	I_{DM}	110	
Linear derating factor		1.0	W/°C
Single pulse avalanche energy ^b	E_{AS}	440	mJ
Repetitive avalanche current ^a	I_{AR}	28	A
Repetitive avalanche energy ^a	E_{AR}	15	mJ
Maximum power dissipation	P_D	150	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 +175	°C
Soldering recommendations (peak temperature) ^d	For 10 s	300 ^d	
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. $V_{DD} = 25$ V, starting $T_J = 25$ °C, $L = 841$ μ H, $R_g = 25$ Ω , $I_{AS} = 28$ A (see fig. 12c)

c. $I_{SD} \leq 28$ A, $dI/dt \leq 170$ A/ μ s, $V_{DD} \leq V_{DS}$, $T_J \leq 175$ °C

d. 1.6 mm from case

THERMAL RESISTANCE RATINGS

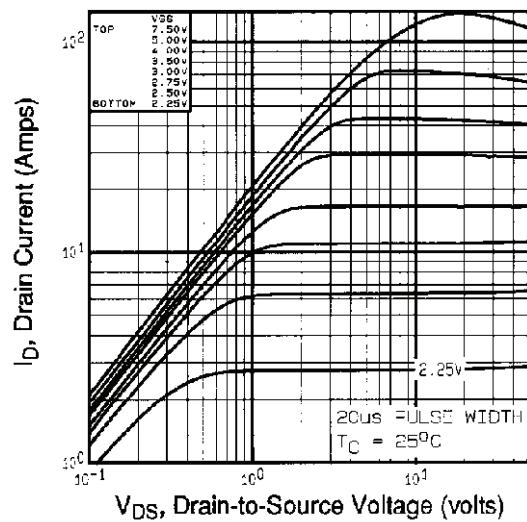
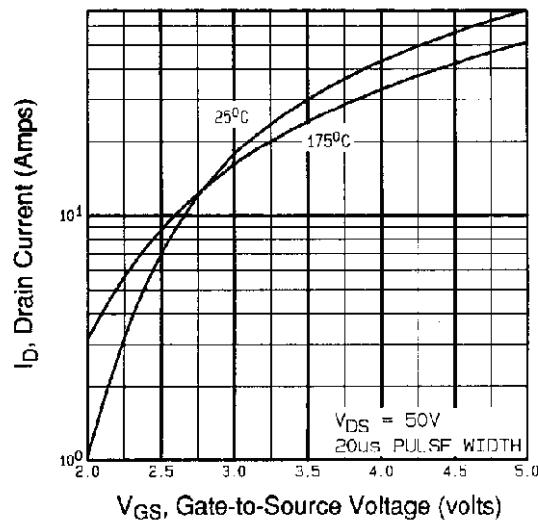
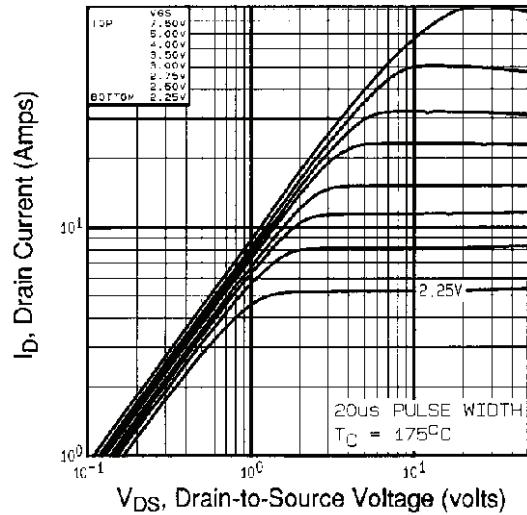
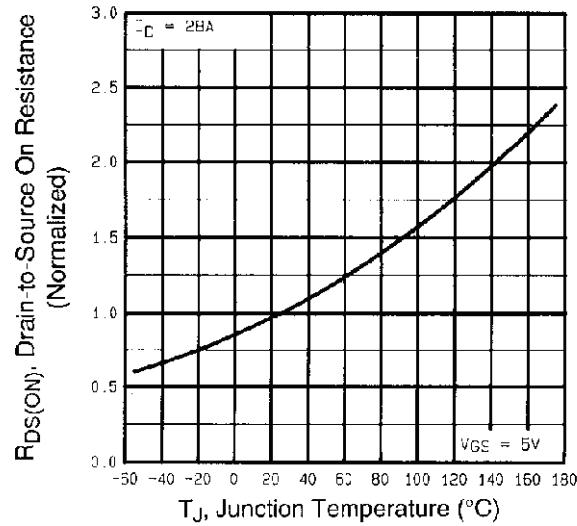
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	R_{thJA}	-	62	$^{\circ}\text{C}/\text{W}$
Case-to-sink, flat, greased surface	R_{thCS}	0.50	-	
Maximum junction-to-case (drain)	R_{thJC}	-	1.0	

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}	$V_{GS} = 0 \text{ V}$, $I_D = 250 \mu\text{A}$		100	-	-	V	
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	Reference to 25°C , $I_D = 1 \text{ mA}$		-	0.12	-	$^{\circ}\text{C}/\text{C}$	
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	$R_{DS(on)}$	$V_{GS} = 5.0 \text{ V}$	$I_D = 17 \text{ A}^b$	-	-	0.077	Ω	
		$V_{GS} = 4.0 \text{ V}$	$I_D = 14 \text{ A}^b$	-	-	0.11		
Forward transconductance	g_{fs}	$V_{DS} = 50 \text{ V}$, $I_D = 17 \text{ A}$		12	-	-	S	
Dynamic								
Input capacitance	C_{iss}	$V_{GS} = 0 \text{ V}$, $V_{DS} = 25 \text{ V}$, $f = 1.0 \text{ MHz}$, see fig. 5		-	2200	-	pF	
Output capacitance	C_{oss}			-	560	-		
Reverse transfer capacitance	C_{rss}			-	140	-		
Total gate charge	Q_g	$V_{GS} = 5.0 \text{ V}$	$I_D = 28 \text{ A}$, $V_{DS} = 80 \text{ V}$, see fig. 6 and 13 ^b	-	-	64	nC	
Gate-source charge	Q_{gs}			-	-	9.4		
Gate-drain charge	Q_{gd}			-	-	27		
Turn-on delay time	$t_{d(on)}$			-	8.5	-		
Rise time	t_r	$V_{DD} = 50 \text{ V}$, $I_D = 28 \text{ A}$, $R_g = 9.0 \Omega$, $R_D = 1.7 \Omega$, see fig. 10 ^b		-	170	-	ns	
Turn-off delay time	$t_{d(off)}$			-	35	-		
Fall time	t_f			-	80	-		
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		-	-	28	A	
Pulsed diode forward current ^a	I_{SM}			-	-	110		
Body diode voltage	V_{SD}	$T_J = 25^{\circ}\text{C}$, $I_S = 28 \text{ A}$, $V_{GS} = 0 \text{ V}^b$		-	-	2.5	V	
Body diode reverse recovery time	t_{rr}	$T_J = 25^{\circ}\text{C}$, $I_F = 28 \text{ A}$, $dI/dt = 100 \text{ A}/\mu\text{s}^b$		-	200	260	ns	
Body diode reverse recovery charge	Q_{rr}			-	1.7	2.90	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 $\leq 300 \mu\text{s}$; 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

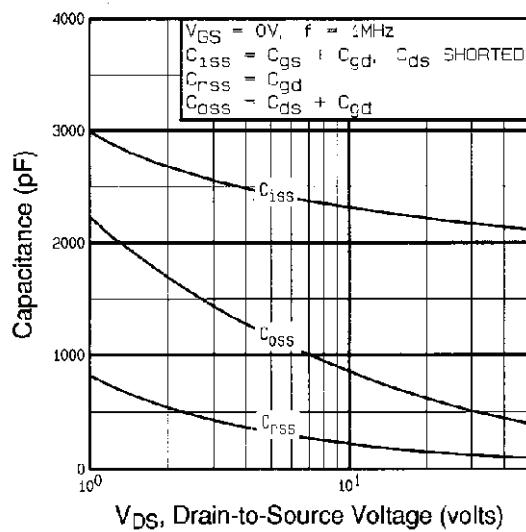


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

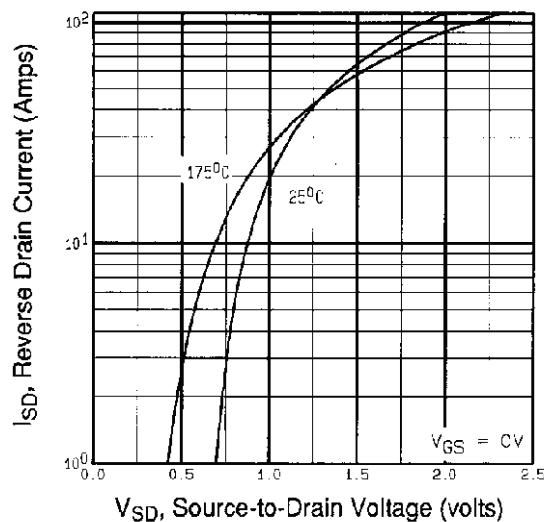


Fig. 7 - Typical Source-Drain Diode Forward Voltage

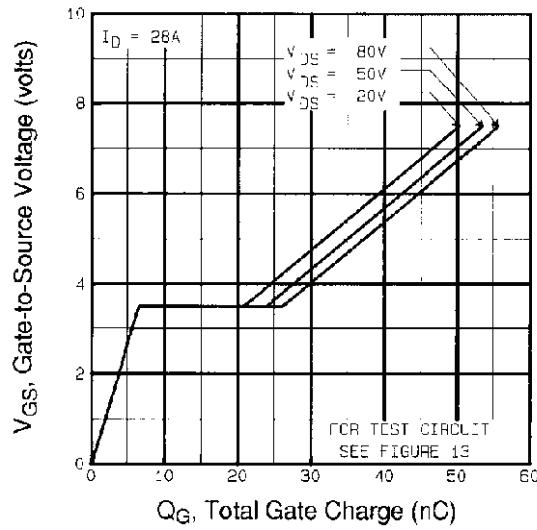


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

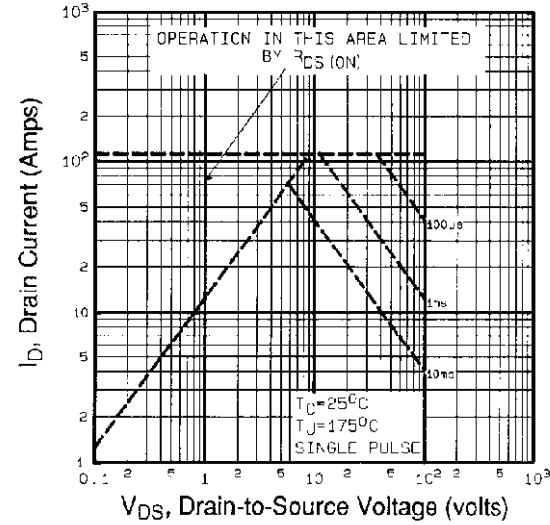
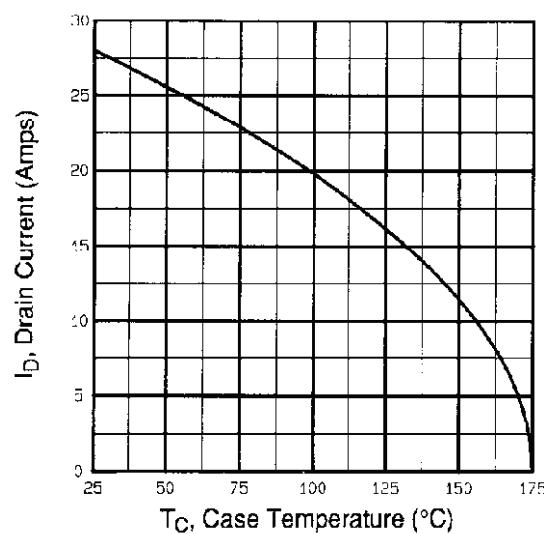
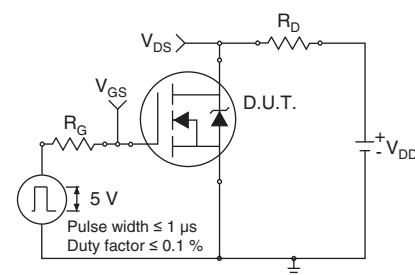
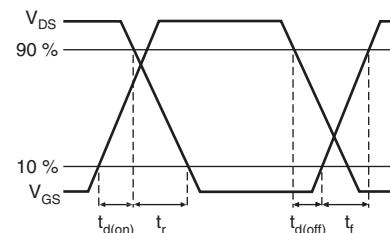
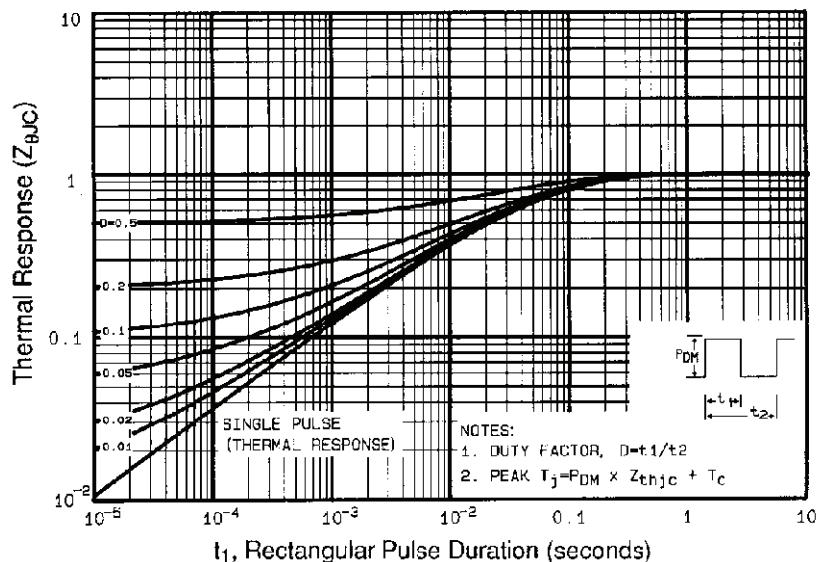
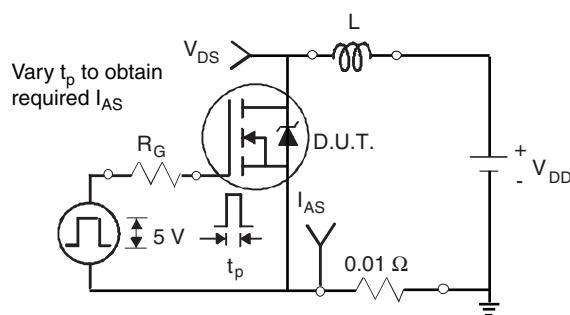
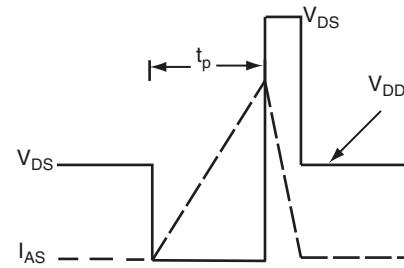
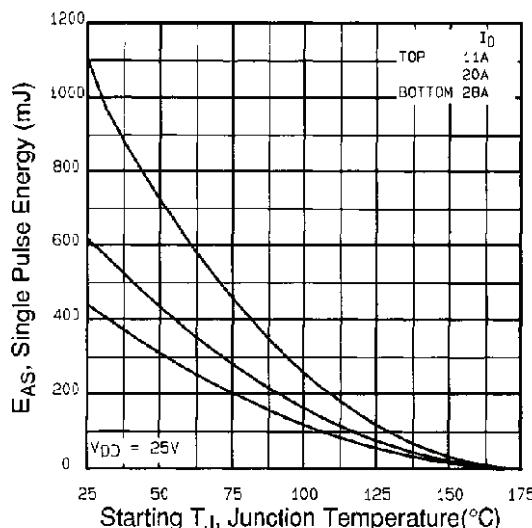
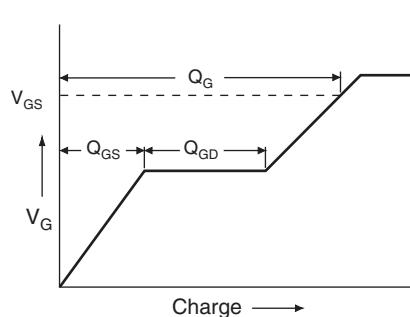
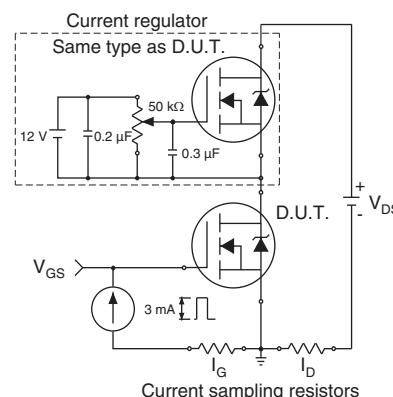


Fig. 8 - Maximum Safe Operating Area


Fig. 9 - Maximum Safe Operating Area

Fig. 10a - Switching Time Test Circuit

Fig. 10b - Switching Time Waveforms

Fig. 3 - 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

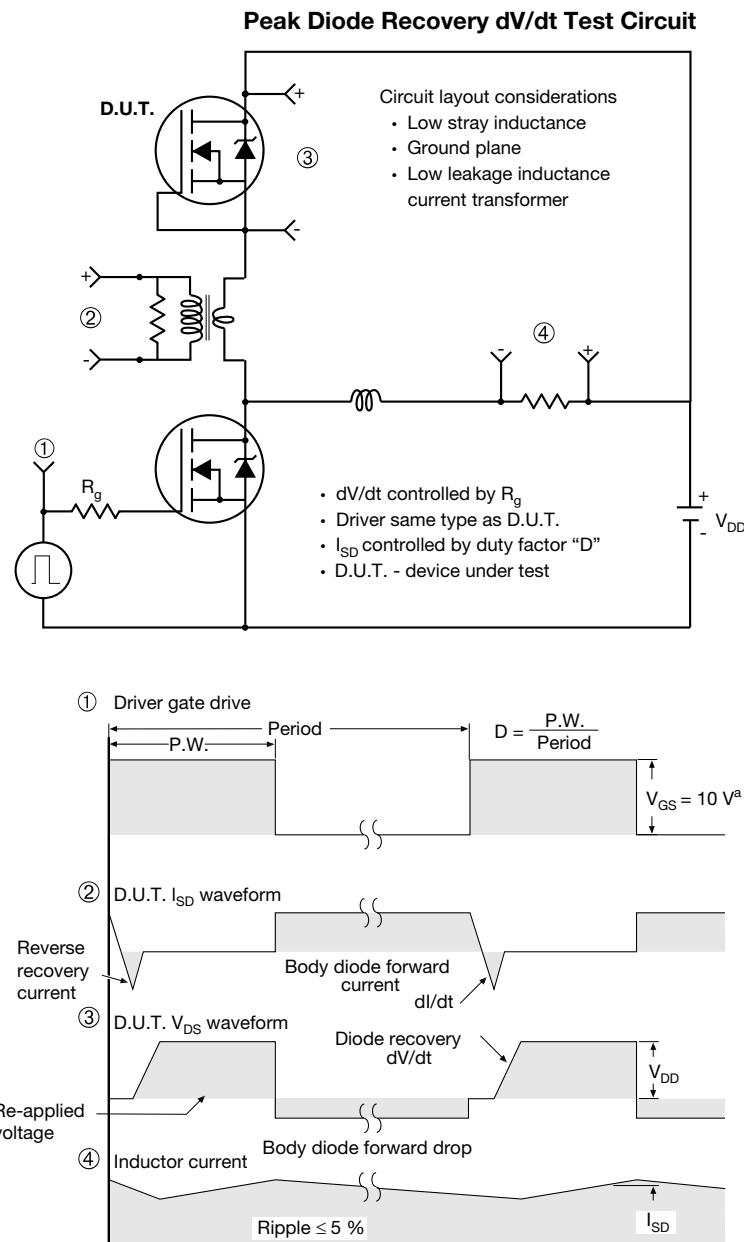
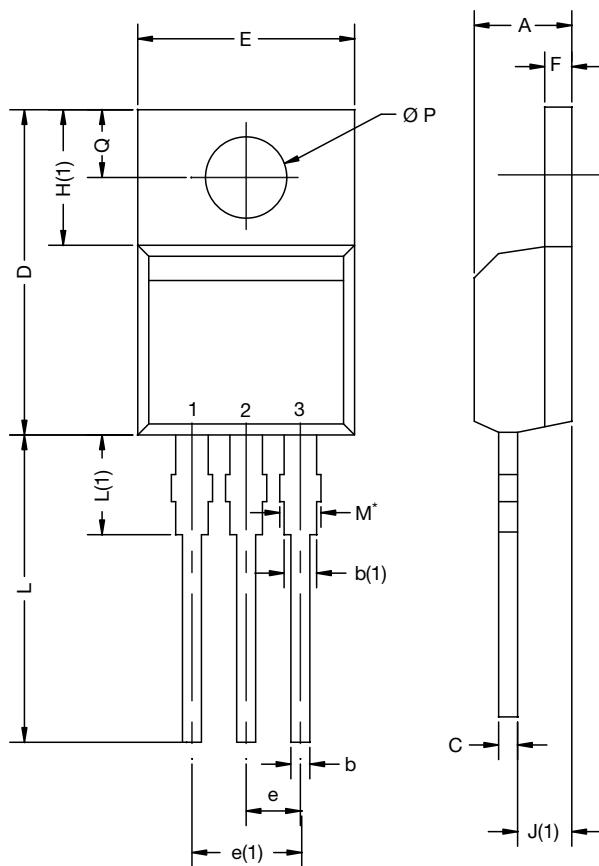


Fig. 14 - For N-Channel

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TO-220-1



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.24	4.65	0.167	0.183
b	0.69	1.02	0.027	0.040
b(1)	1.14	1.78	0.045	0.070
c	0.36	0.61	0.014	0.024
D	14.33	15.85	0.564	0.624
E	9.96	10.52	0.392	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)	6.10	6.71	0.240	0.264
J(1)	2.41	2.92	0.095	0.115
L	13.36	14.40	0.526	0.567
L(1)	3.33	4.04	0.131	0.159
Ø P	3.53	3.94	0.139	0.155
Q	2.54	3.00	0.100	0.118

ECN: E21-0621-Rev. D, 04-Nov-2021
DWG: 6031

Note

- $M^* = 0.052$ inches to 0.064 inches (dimension including protrusion), heatsink hole for HVM

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