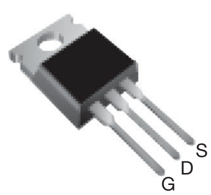
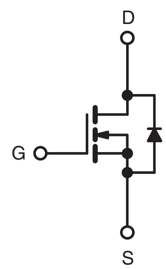
Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	1000	
$R_{DS(on)}$ (Ω)	V_{GS} = 10 V	11
Q_g (Max.) (nC)	38	
Q_{gs} (nC)	4.9	
Q_{gd} (nC)	22	
Configuration	Single	

TO-220AB





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

Pb Available
RoHS*
COMPLIANT

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-effictiveness.
The TO-220AB package is universially 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.

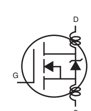
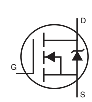
ORDERING INFORMATION	
Package	TO-220AB
Lead (Pb)-free	IRFBG20PbF
	SiHFBG20-E3
SnPb	IRFBG20
	SiHFBG20

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)					
PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V_{DS}	1000	V
Gate-Source Voltage			V_{GS}	± 20	
Continuous Drain Current	V_{GS} at 10 V	T_C = 25 °C	I_D	1.4	A
		T_C = 100 °C		0.86	
Pulsed Drain Current[a]			I_{DM}	5.6	
Linear Derating Factor				0.43	W/°C
Single Pulse Avalanche Energy[b]			E_{AS}	200	mJ
Repetitive Avalanche Current[a]			I_{AR}	1.4	A
Repetitive Avalanche Energy[a]			E_{AR}	5.4	mJ
Maximum Power Dissipation	T_C = 25 °C		P_D	54	W
Peak Diode Recovery dV/dt[c]			dV/dt	1.0	V/ns
Operating Junction and Storage Temperature Range			T_J, T_{stg}	- 55 to + 150	°C
Soldering Recommendations (Peak Temperature)	for 10 s			300[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} = 50 V, starting T_J = 25 °C, L = 193 µH, R_g = 25 Ω, I_{AS} = 1.4 A (see fig. 12).
c. $I_{SD} \leq$ 1.4 A, dI/dt $\leq$ 60 A/µs, $V_{DD} \leq$ 600, $T_J \leq$ 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}	-	62	°C/W
Case-to-Sink, Flat, Greased Surface	R_{thCS}	0.50	-	
Maximum Junction-to-Case (Drain)	R_{thJC}	-	2.3	

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	1000	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, I_D = 1 mA	-	1.2	-	V/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA	2.0	-	4.0	V
Gate-Source Leakage	I_{GSS}	V_{GS} = ± 20 V	-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 1000 V, V_{GS} = 0 V	-	-	100	μA
		V_{DS} = 800 V, V_{GS} = 0 V, T_J = 125 °C	-	-	500	
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS} = 10 V; I_D = 0.84 A[b]	-	-	11	Ω
Forward Transconductance	g_{fs}	V_{DS} = 50 V, I_D = 0.84 A[b]	1.0	-	-	S
Dynamic						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1.0 MHz, see fig. 5	-	500	-	pF
Output Capacitance	C_{oss}		-	52	-	
Reverse Transfer Capacitance	C_{rss}		-	17	-	
Total Gate Charge	Q_g	V_{GS} = 10 V; I_D = 1.4 A, V_{DS} = 400 V, see fig. 6 and 13[b]	-	-	38	nC
Gate-Source Charge	Q_{gs}		-	-	4.9	
Gate-Drain Charge	Q_{gd}		-	-	22	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 500 V, I_D = 1.4 A, R_g = 18 Ω, R_D = 370 Ω, see fig. 10[b]	-	9.4	-	ns
Rise Time	t_r		-	17	-	
Turn-Off Delay Time	$t_{d(off)}$		-	58	-	
Fall Time	t_f		-	31	-	
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 	-	-	1.4	A
Pulsed Diode Forward Current[a]	I_{SM}		-	-	5.6	
Body Diode Voltage	V_{SD}	T_J = 25 °C, I_S = 1.4 A, V_{GS} = 0 V[b]	-	-	1.5	V
Body Diode Reverse Recovery Time	t_{rr}	T_J = 25 °C, I_F = 1.4 A, dI/dt = 100 A/μs[b]	-	130	190	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	0.46	0.69	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)

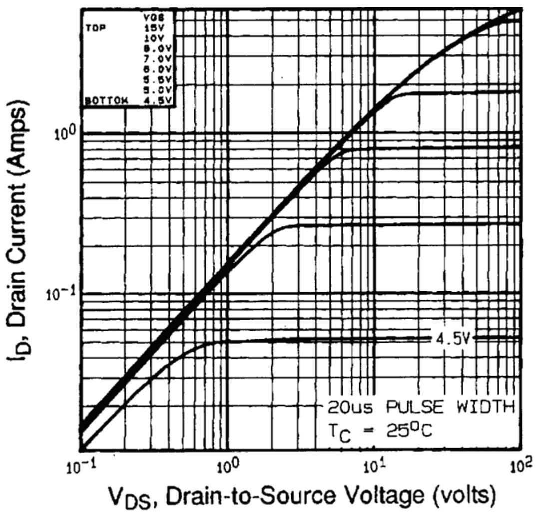


Fig. 1 - Typical Output Characteristics, T_C = 25 °C

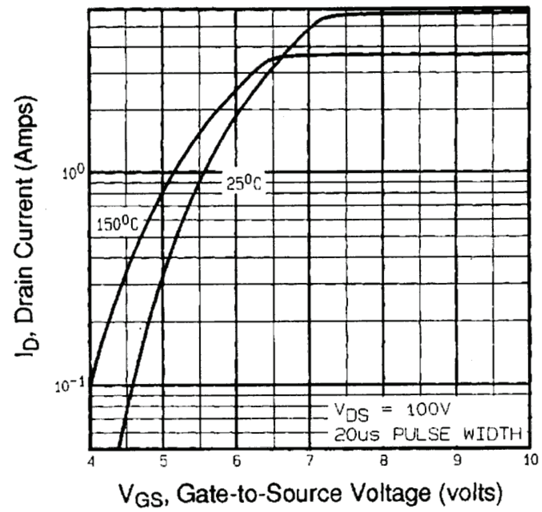


Fig. 3 - Typical Transfer Characteristics

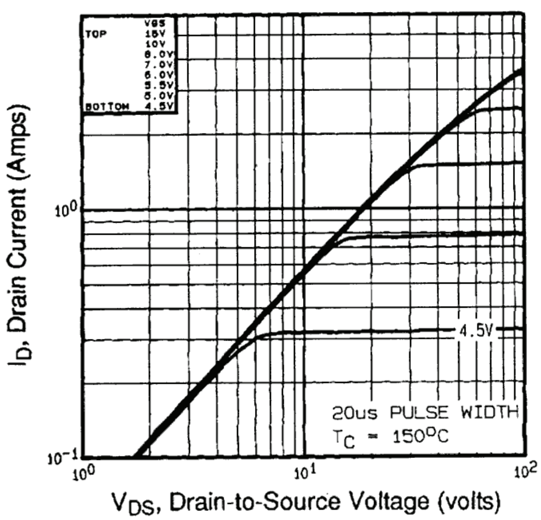


Fig. 2 -Typical Output Characteristics, T_C = 150 °C

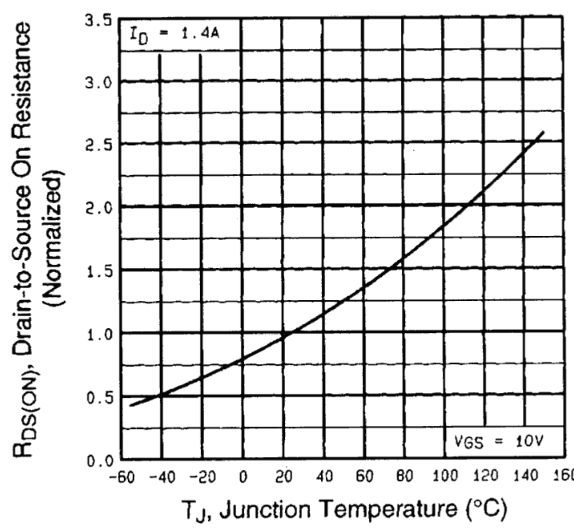


Fig. 4 - Normalized On-Resistance vs. Temperature

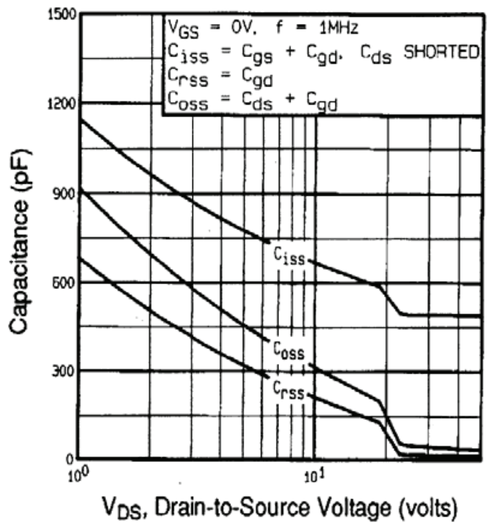


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

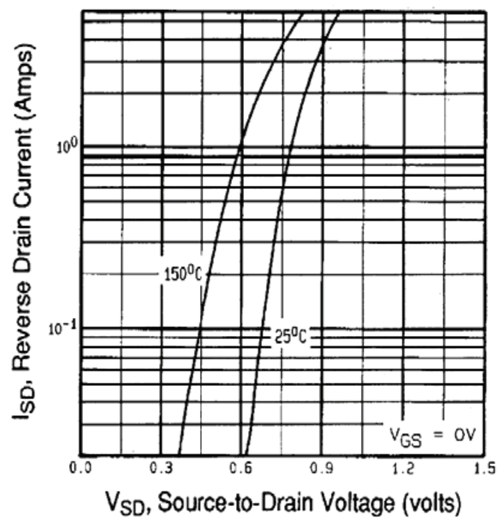


Fig. 7 - Typical Source-Drain Diode Forward Voltage

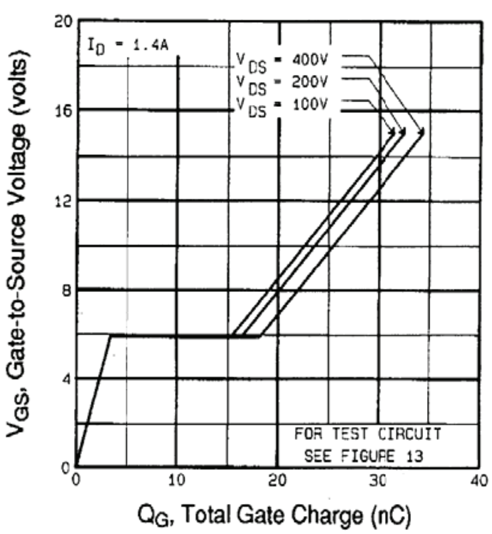


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

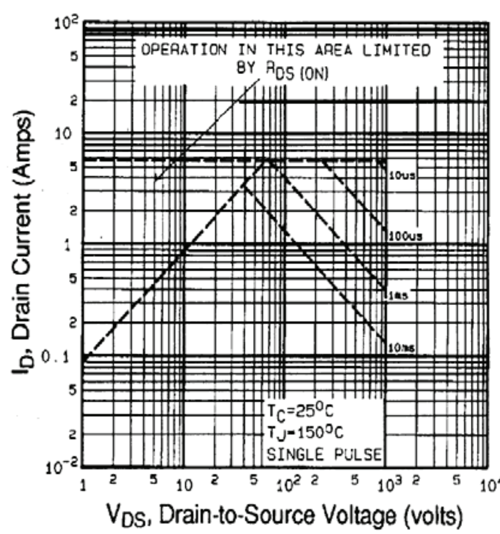


Fig. 8 - Maximum Safe Operating Area

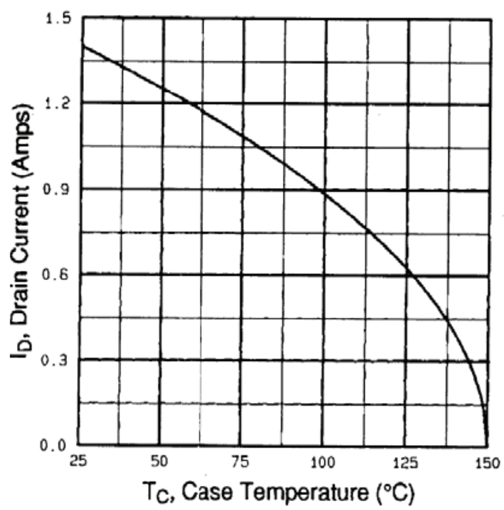


Fig. 9 - Maximum Drain Current vs. Case Temperature

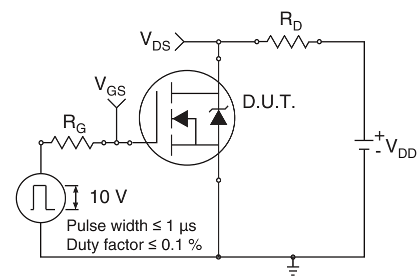


Fig. 10a - Switching Time Test Circuit

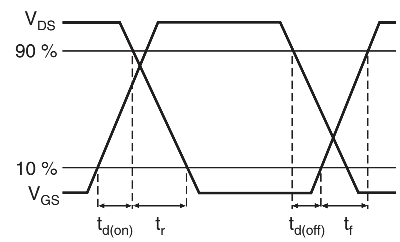


Fig. 10b - Switching Time Waveforms

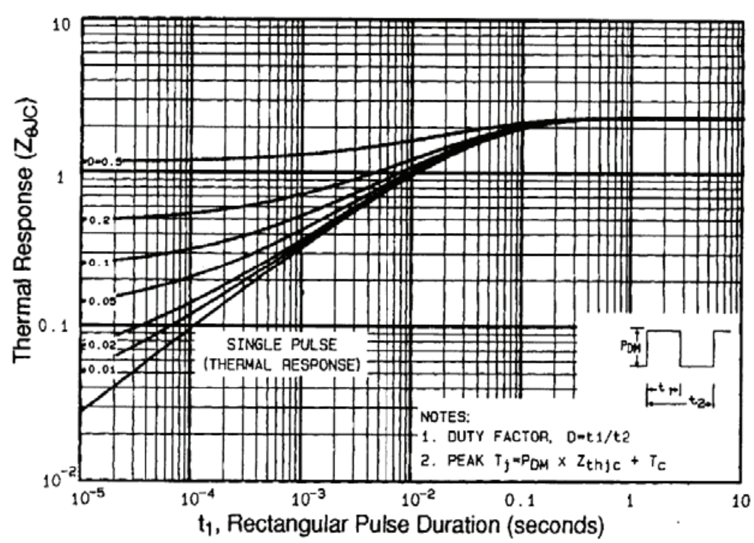


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

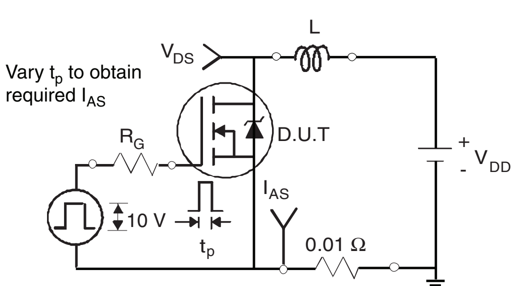


Fig. 12a - Unclamped Inductive Test Circuit

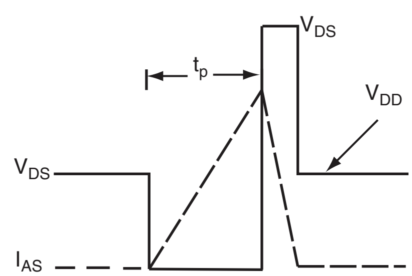


Fig. 12b - Unclamped Inductive Waveforms

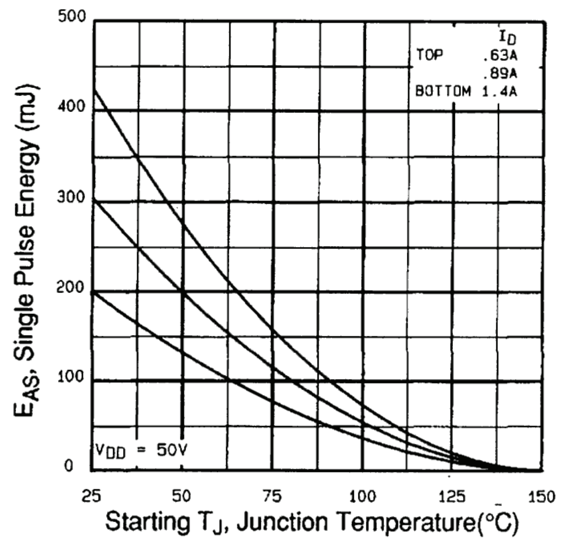


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

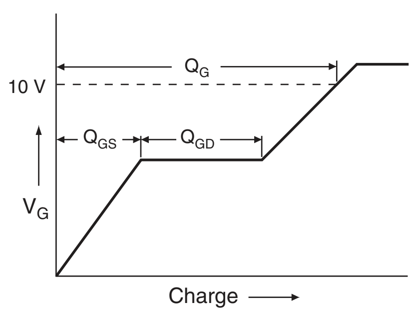


Fig. 13a - Basic Gate Charge Waveform

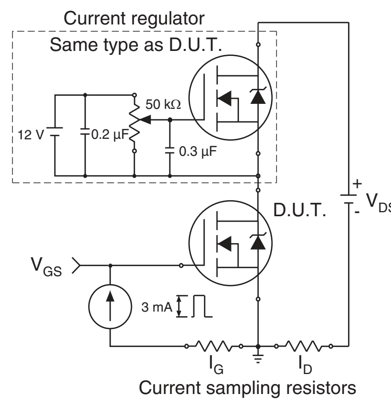


Fig. 13b - Gate Charge Test Circuit

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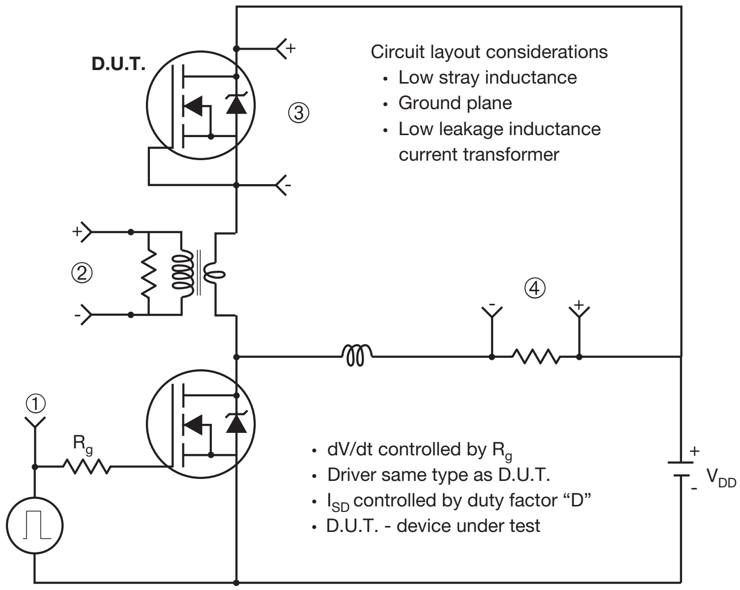
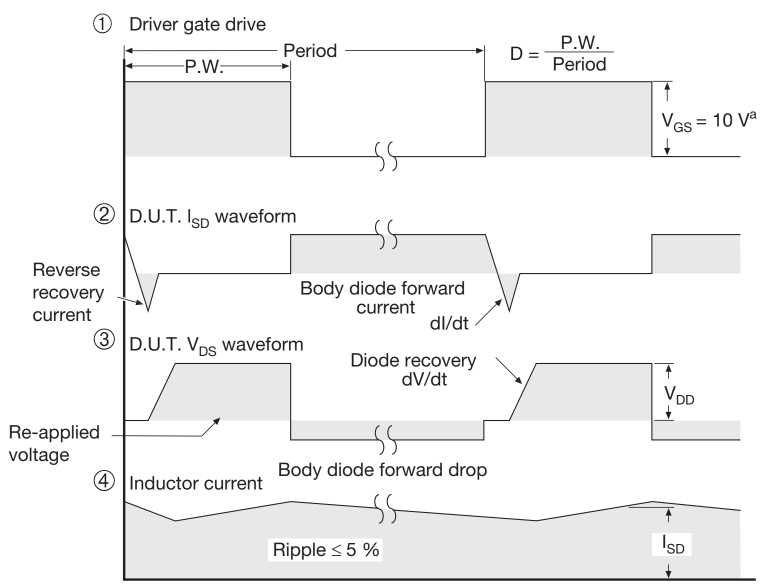
Peak Diode Recovery dV/dt Test Circuit





Note

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

Fig. 14 - For N-Channel

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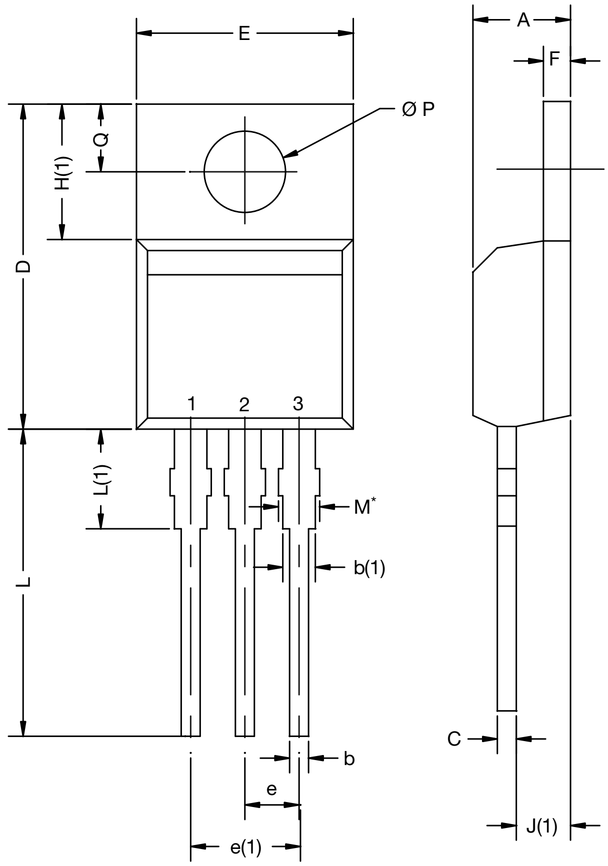
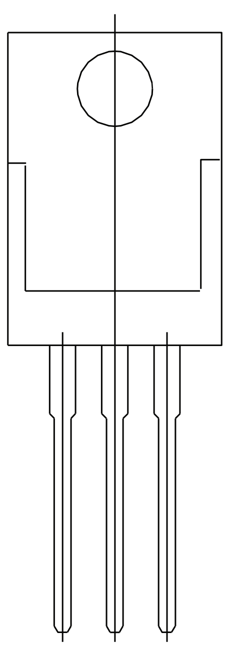
TO-220-1



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.14	4.70	0.163	0.185
b	0.69	1.02	0.027	0.040
b(1)	1.14	1.73	0.045	0.068
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	0.43	1.40	0.017	0.055
H(1)	6.10	6.48	0.240	0.255
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	2.59	3.00	0.102	0.118
ECN: X15-0003-Rev. A, 19-Jan-15 DWG: 6031				

Notes

- M* = 0.052 inches to 0.064 inches (dimension including protrusion), heatsink hole for HVM
- Outline conforms to JEDEC® outline TO-220AB with exception of dimension F



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