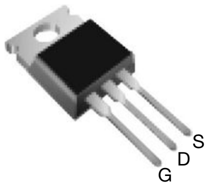
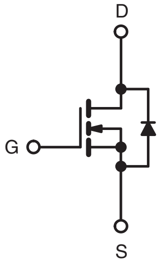
E Series Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V) at T_J max.	650	
$R_{DS(on)}$ max. at 25 °C (Ω)	V_{GS} = 10 V	0.125
Q_g max. (nC)	130	
Q_{gs} (nC)	15	
Q_{gd} (nC)	39	
Configuration	Single	

TO-220AB





N-Channel MOSFET

FEATURES

- Low Figure-of-Merit (FOM) R_{on} x Q_g
- Low Input Capacitance (C_{iss})
- Reduced Switching and Conduction Losses
- Ultra Low Gate Charge (Q_g)
- Avalanche Energy Rated (UIS)
- Compliant to RoHS Directive 2002/95/EC

RoHS
COMPLIANT

APPLICATIONS

- Server and Telecom Power Supplies
- Switch Mode Power Supplies (SMPS)
- Power Factor Correction Power Supplies (PFC)
- Lighting
    - High-Intensity Discharge (HID)
    - Fluorescent Ballast Lighting
    - LED Lighting
- Industrial
    - Welding
    - Induction Heating
    - Motor Drives
- Battery Chargers
- Renewable Energy
    - Solar (PV Inverters)

ORDERING INFORMATION	
Package	TO-220AB
Lead (Pb)-free	SiHP30N60E-E3

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

PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V_{DS}	600	V
Gate-Source Voltage			V_{GS}	± 20	
Gate-Source Voltage AC (f > 1 Hz)				30	
Continuous Drain Current (T_J = 150 °C)	V_{GS} at 10 V	T_C = 25 °C	I_D	29	A
		T_C = 100 °C		18	
Pulsed Drain Current[a]			I_{DM}	65	
Linear Derating Factor				2	W/°C
Avalanche Energy (repetitive)			E_{AR}	0.25	mJ
Single Pulse Avalanche Energy[b]			E_{AS}	690	
Maximum Power Dissipation			P_D	250	W
Operating Junction and Storage Temperature Range			T_J, T_{stg}	- 55 to + 150	°C
Drain-Source Voltage Slope	T_J = 125 °C		dV/dt	37	V/ns
Reverse Diode dV/dt[d]				18	
Soldering Recommendations (Peak Temperature)	for 10 s			300[c]	°C

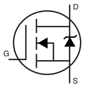
Notes

a. Repetitive rating; pulse width limited by maximum junction temperature.
b. V_{DD} = 50 V, starting T_J = 25 °C, L = 28.2 mH, R_g = 25 Ω, I_{AS} = 7 A.
c. 1.6 mm from case.
d. $I_{SD} \leq I_D$, dI/dt = 100 A/μs, starting T_J = 25 °C.

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	62	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	0.5	

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	600	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, I_D = 250 μA	-	0.64	-	V/°C
Gate-Source Threshold Voltage (N)	$V_{GS(th)}$	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} = 600 V, V_{GS} = 0 V	-	-	1	μA
		V_{DS} = 600 V, V_{GS} = 0 V, T_J = 150 °C	-	-	100	
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS} = 10 V I_D = 15 A	-	0.104	0.125	Ω
Forward Transconductance[a]	g_{fs}	V_{DS} = 8 V, I_D = 3 A	-	5.4	-	S
Dynamic						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 100 V, f = 1.0 MHz	-	2600	-	pF
Output Capacitance	C_{oss}		-	138	-	
Reverse Transfer Capacitance	C_{rss}		-	3	-	
Total Gate Charge	Q_g	V_{GS} = 10 V I_D = 15 A, V_{DS} = 480 V	-	85	130	nC
Gate-Source Charge	Q_{gs}		-	15	-	
Gate-Drain Charge	Q_{gd}		-	39	-	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 380 V, I_D = 15 A, V_{GS} = 10 V, R_g = 4.7 Ω	-	19	40	ns
Rise Time	t_r		-	32	65	
Turn-Off Delay Time	$t_{d(off)}$		-	63	95	
Fall Time	t_f		-	36	75	
Gate Input Resistance	R_g	f = 1 MHz, open drain	-	0.63	-	Ω
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	29	A
Pulsed Diode Forward Current	I_{SM}		-	-	65	
Diode Forward Voltage	V_{SD}	T_J = 25 °C, I_S = 15 A, V_{GS} = 0 V	-	-	1.3	V
Body Diode Reverse Recovery Time	t_{rr}	T_J = 25 °C, I_F = I_S = 15 A, dI/dt = 100 A/μs, V_R = 20 V	-	402	605	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	7	15	μC
Reverse Recovery Current	I_{RRM}		-	32	65	A

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TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

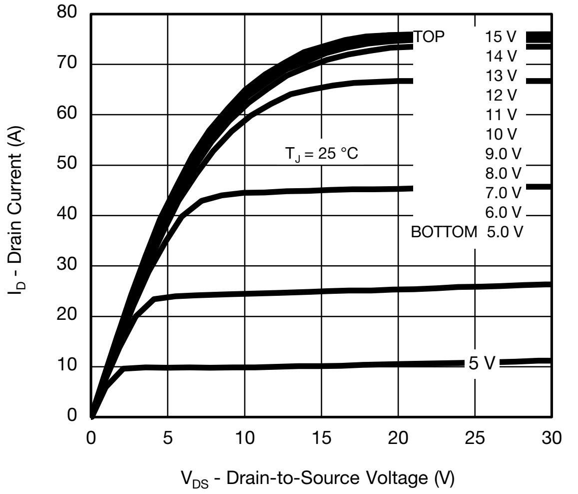


Fig. 1 - Typical Output Characteristics, T_C = 25 °C

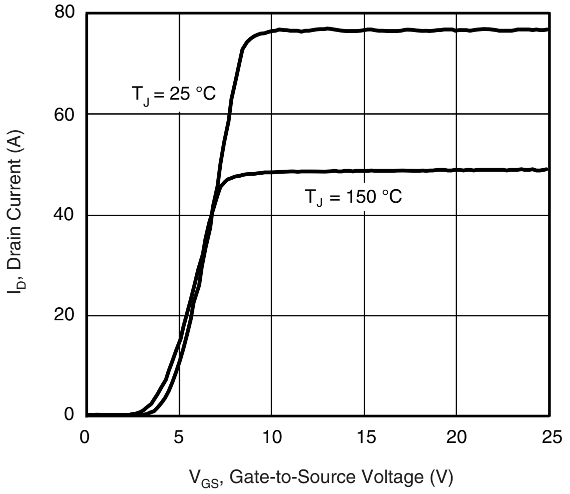


Fig. 3 - Typical Transfer Characteristics

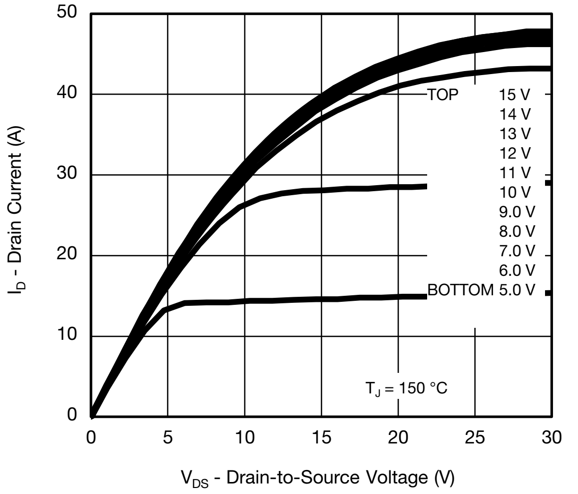


Fig. 2 - Typical Output Characteristics, T_C = 150 °C

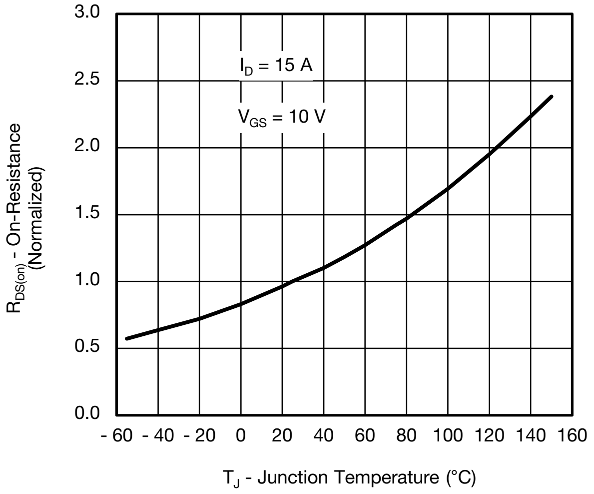


Fig. 4 - Normalized On-Resistance vs. Temperature

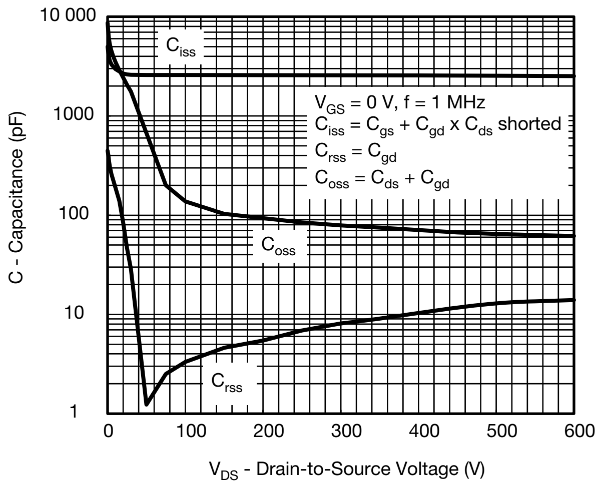


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

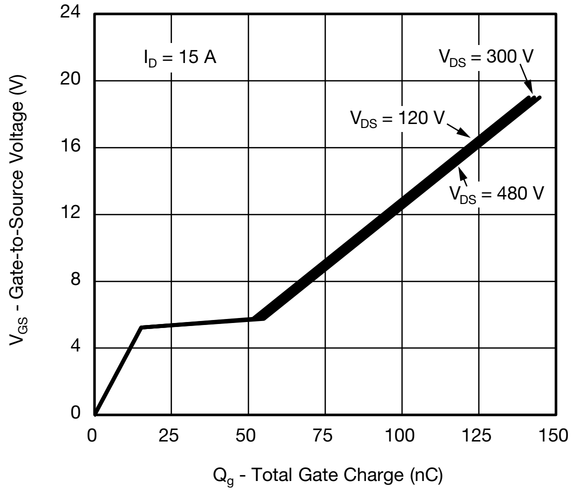


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

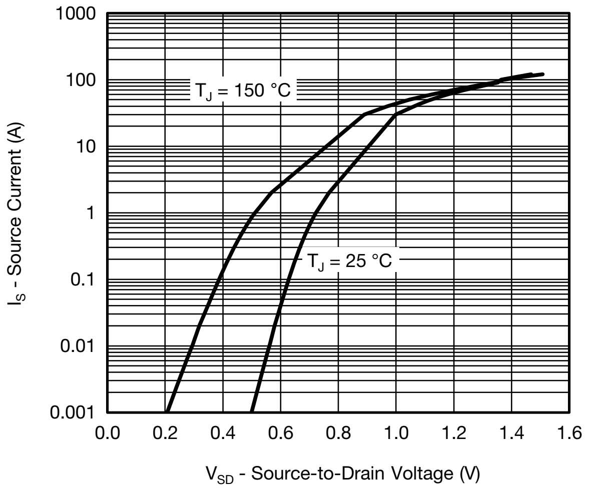
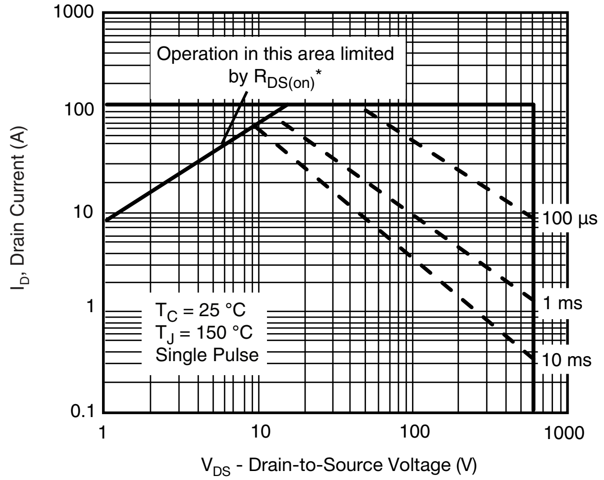


Fig. 7 - Typical Source-Drain Diode Forward Voltage



* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Fig. 8 - Maximum Safe Operating Area

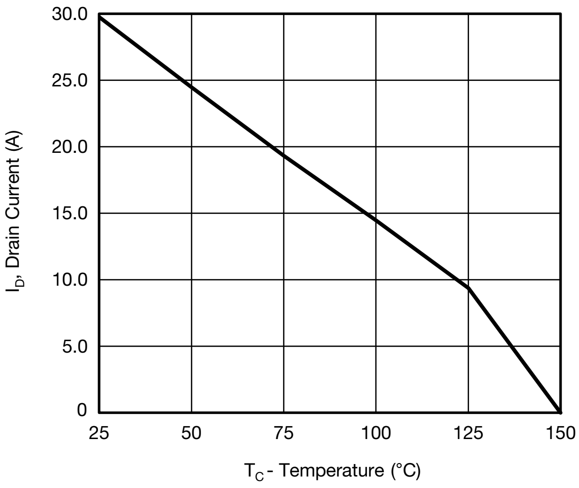


Fig. 9 - Maximum Drain Current vs. Case Temperature

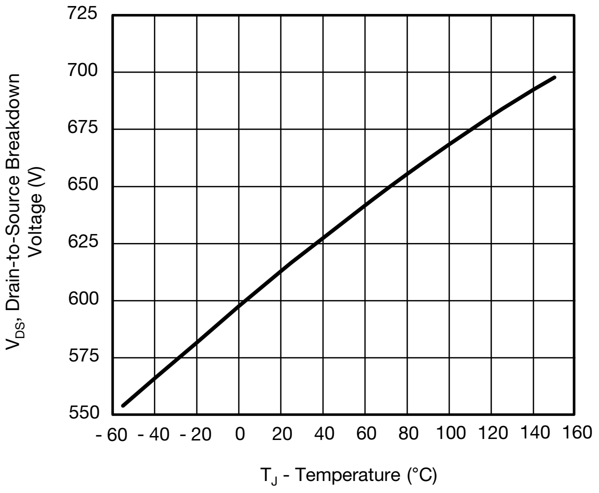


Fig. 10 - Temperature vs. Drain-to-Source Voltage

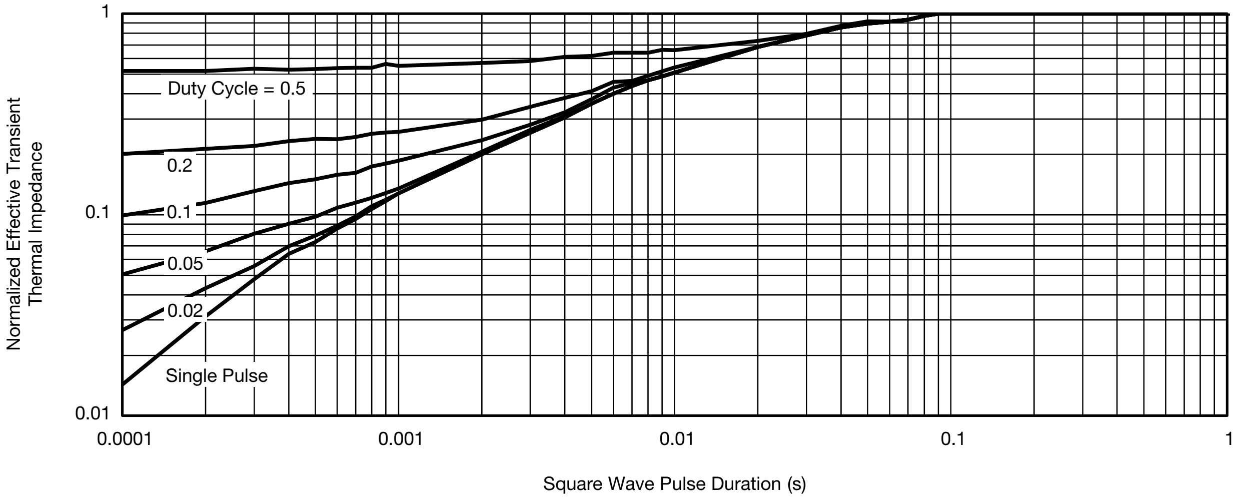


Fig. 11 - Normalized Thermal Transient Impedance, Junction-to-Case

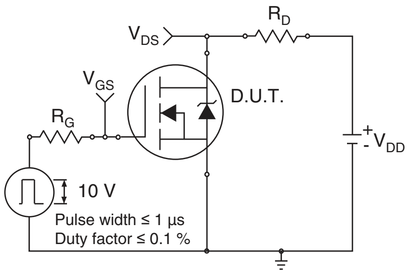


Fig. 12 - Switching Time Test Circuit

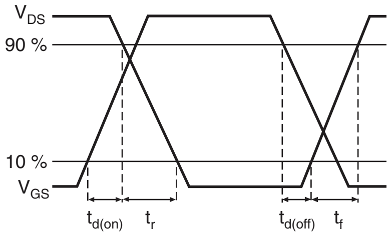


Fig. 13 - Switching Time Waveforms

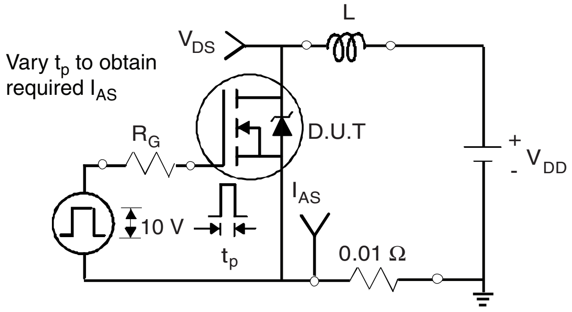


Fig. 14 - Unclamped Inductive Test Circuit

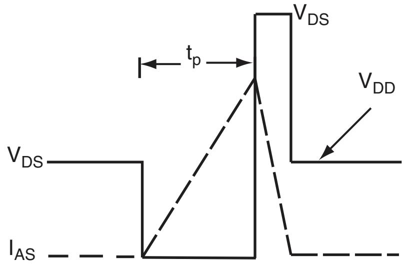


Fig. 15 - Unclamped Inductive Waveforms

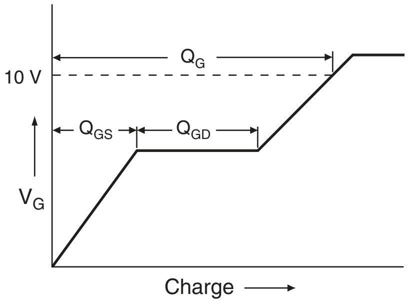


Fig. 16 - Basic Gate Charge Waveform

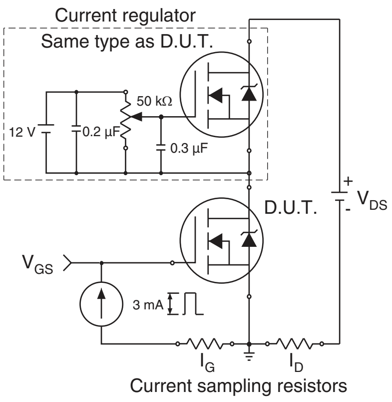
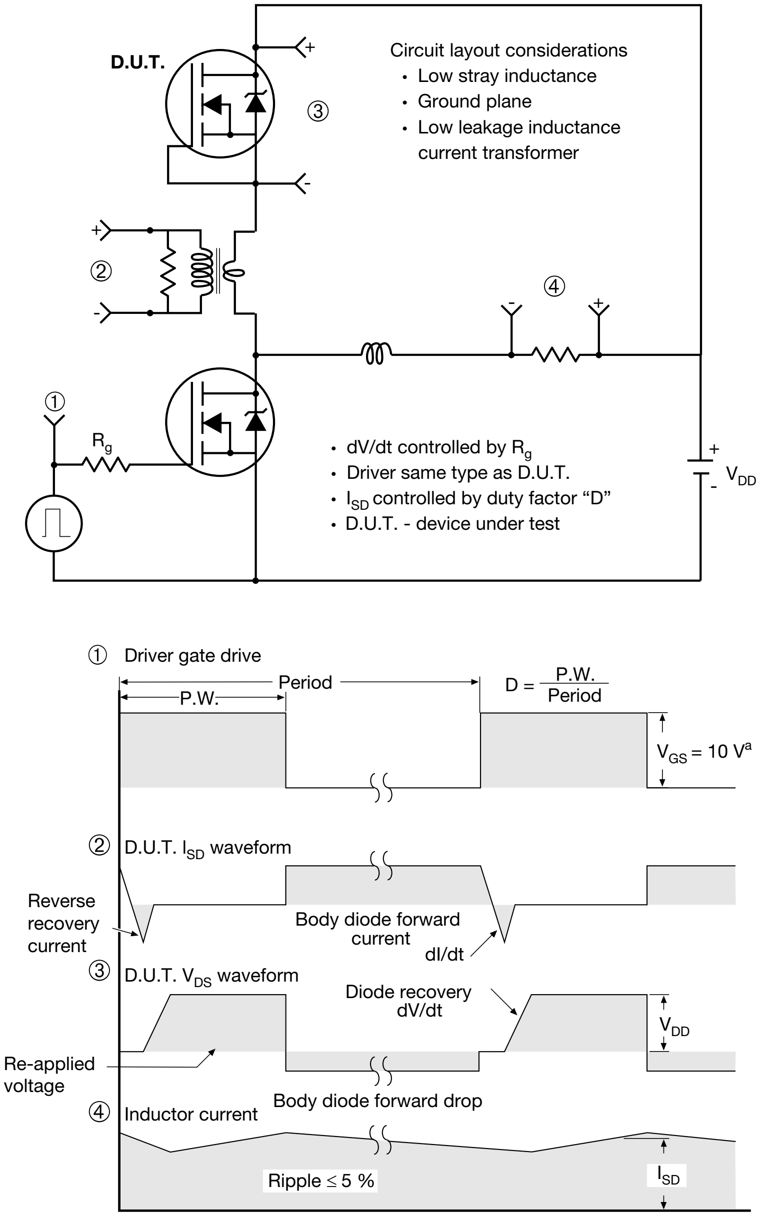


Fig. 17 - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



Note

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

Fig. 18 - For N-Channel

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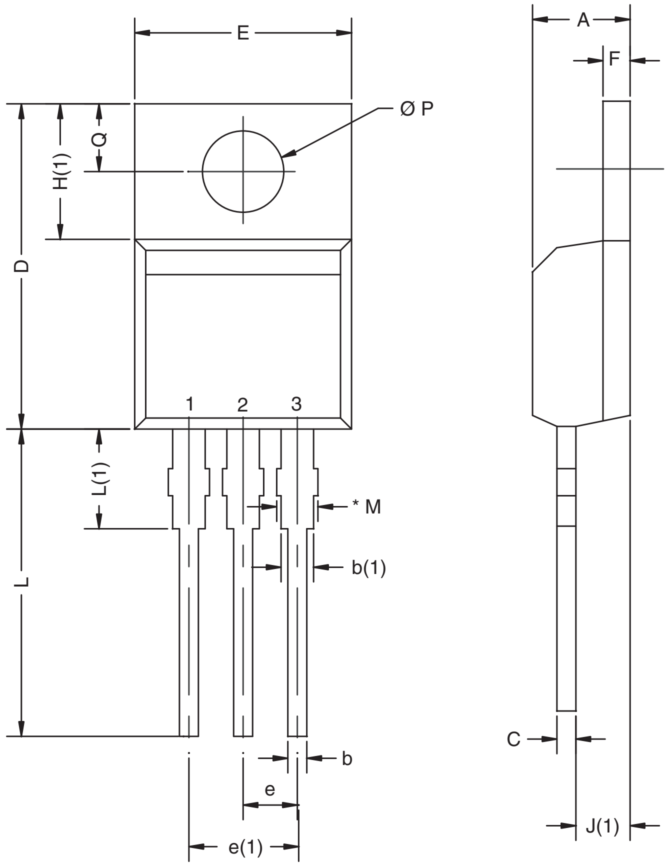
TO-220AB



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
ECN: X10-0416-Rev. M, 01-Nov-10 DWG: 5471				

Note

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

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