

## HY1420P-VB Datasheet

### N-Channel 200-V (D-S) MOSFET

#### PRODUCT SUMMARY

$V_{(BR)DSS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)	$Q_g$ (Typ.)
200	0.048 at $V_{GS} = 10\text{ V}$	40	57
	0.104 at $V_{GS} = 4.5\text{ V}$	18	

#### FEATURES

- Trench Power MOSFETS
- 175 °C Junction Temperature
- 100 %  $R_g$  and UIS Tested

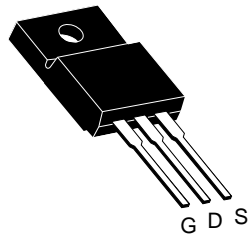


**RoHS**  
COMPLIANT

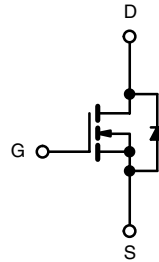
#### APPLICATIONS

- Power Supply
- Lighting Systems

TO-220 FULLPAK



Top View



N-Channel MOSFET

#### ABSOLUTE MAXIMUM RATINGS $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	200	V
Gate-Source Voltage	$V_{GS}$	$\pm 25$	
Continuous Drain Current ( $T_J = 175\text{ }^\circ\text{C}$ )	$I_D$	40	A
		26	
Pulsed Drain Current	$I_{DM}$	150	
Single Pulse Avalanche Current	$I_{AS}$	20	
Single Pulse Avalanche Energy <sup>a</sup>	$E_{AS}$	20	mJ
Maximum Power Dissipation <sup>a</sup>	$P_D$	55 <sup>b</sup>	W
		3.12	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 175	$^\circ\text{C}$

#### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Limit	Unit
Junction-to-Ambient (PCB Mount) <sup>c</sup>	$R_{thJA}$	40	$^\circ\text{C/W}$
Junction-to-Case (Drain)	$R_{thJC}$	0.75	

Notes:

a. Duty cycle  $\leq 1\%$ .

b. See SOA curve for voltage derating.

c. When Mounted on 1" square PCB (FR-4 material).

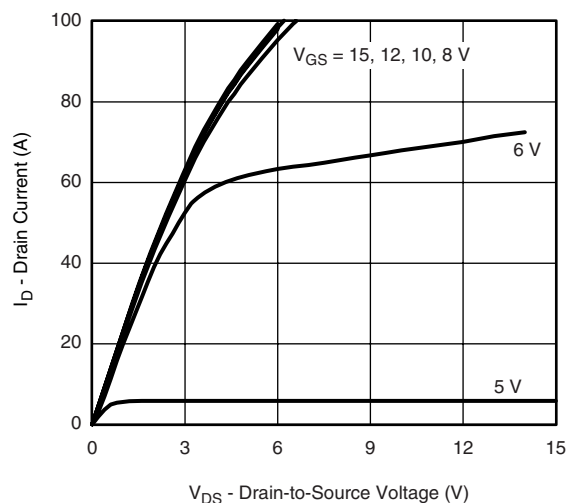
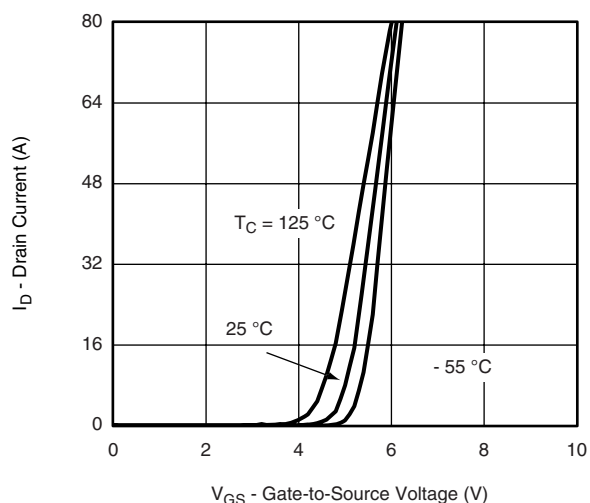
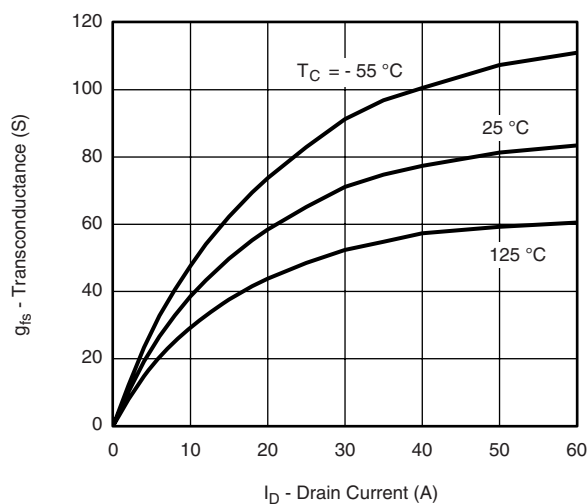
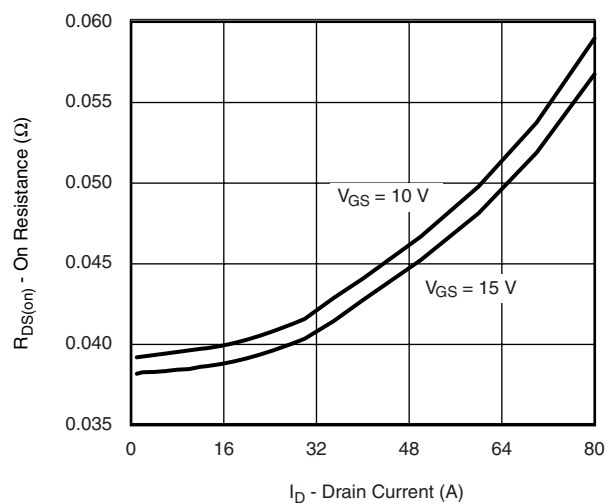
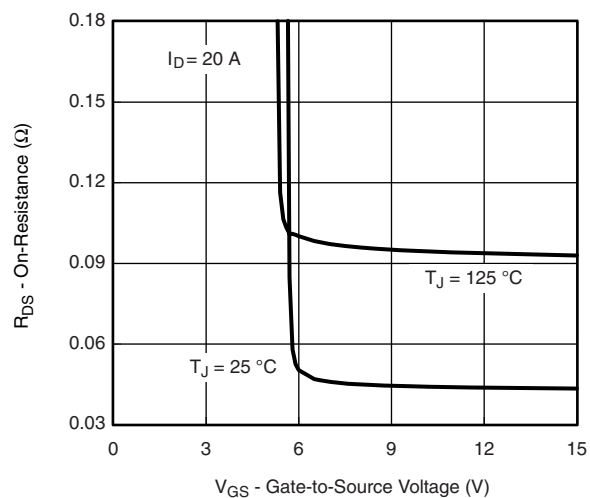
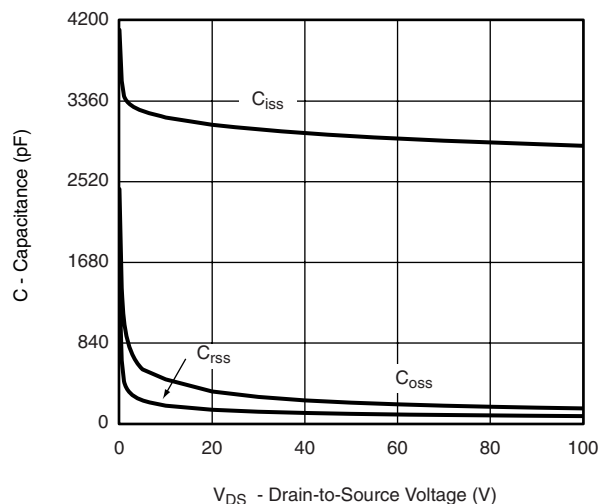
**SPECIFICATIONS**  $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	200			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2.5		4.5	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 25\text{ V}$			$\pm 300$	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}, T_J = 100\text{ }^{\circ}\text{C}$			25	
		$V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^{\circ}\text{C}$			250	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 10\text{ V}, V_{GS} = 10\text{ V}$	40			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		0.048		$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$		0.104		
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 100\text{ }^{\circ}\text{C}$		0.088		
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 150\text{ }^{\circ}\text{C}$		0.120		
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 20\text{ A}$	25			S
Dynamic <sup>b</sup>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		3200		pF
Output Capacitance	$C_{oss}$			300		
Reverse Transfer Capacitance	$C_{rss}$			135		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 100\text{ V}, V_{GS} = 15\text{ V}, I_D = 50\text{ A}$		85	127	nC
		$V_{DS} = 100\text{ V}, V_{GS} = 10\text{ V}, I_D = 50\text{ A}$		57	85	
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			14		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			20		
Gate Resistance	$R_g$	$f = 1\text{ MHz}$		1.2	1.8	$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 100\text{ V}, R_L = 2\text{ }\Omega$ $I_D \cong 50\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		16	25	ns
Rise Time <sup>c</sup>	$t_r$			170	260	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			27	42	
Fall Time <sup>c</sup>	$t_f$			9	18	
Source-Drain Diode Ratings and Characteristics <sup>T</sup> $T_{CG} = 25^{\circ}\text{C}$						
Continuous Current	$I_S$				35	A
Pulsed Current	$I_{SM}$				70	
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = 20\text{ A}, V_{GS} = 0\text{ V}$		0.86	1.5	V
Reverse Recovery Time	$t_{rr}$	$I_F = 40\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		116	175	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			9	14	A
Reverse Recovery Charge	$Q_{rr}$			0.53	0.8	$\mu\text{C}$
Reverse Recovery Fall Time	$t_a$			84		nS
Reverse Recovery Rise Time	$t_b$			32		

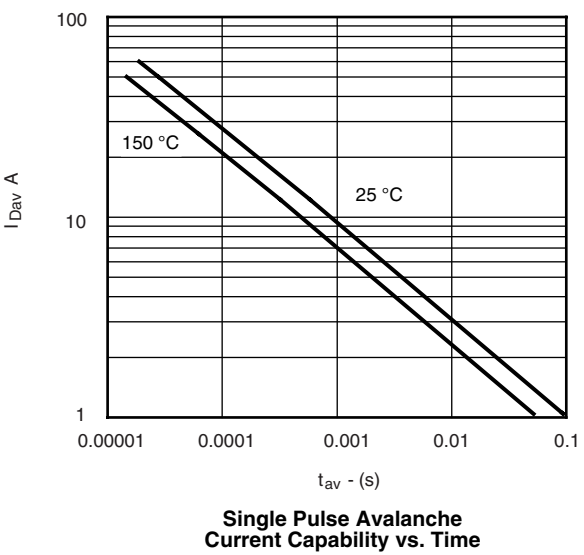
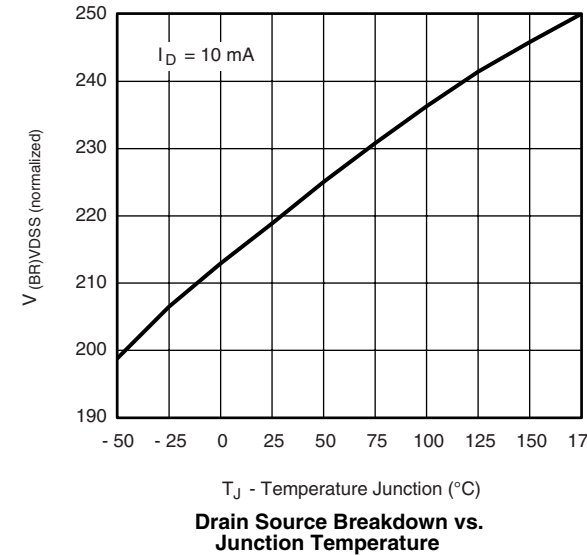
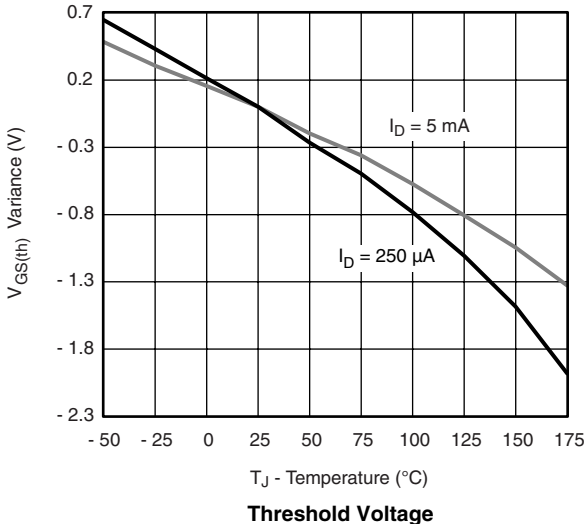
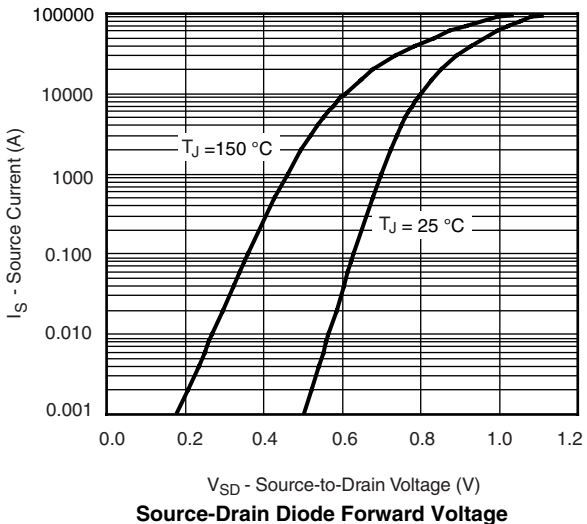
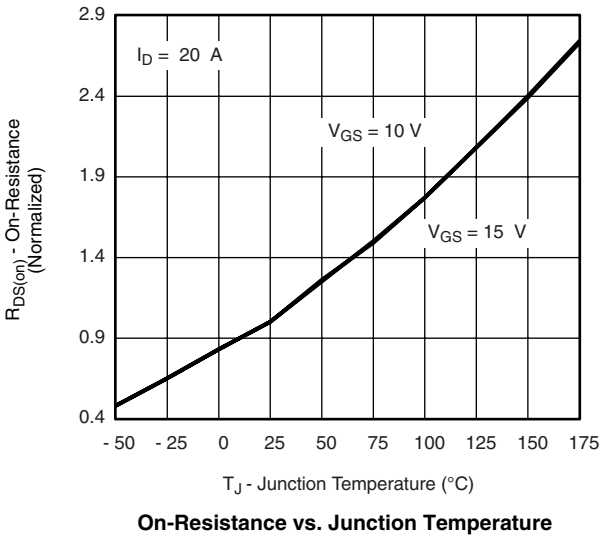
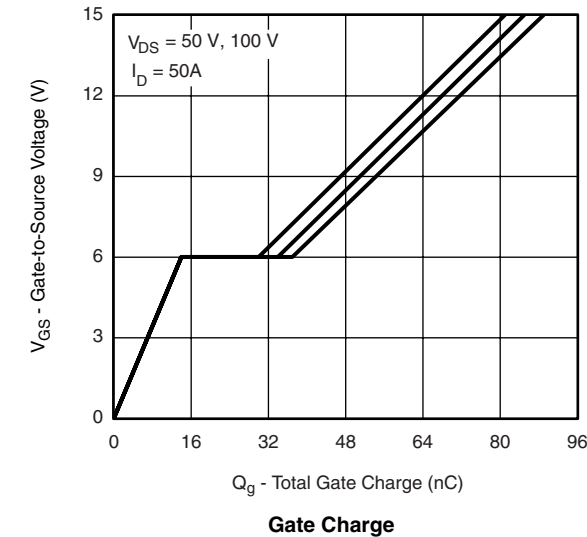
Notes:

- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
 b. Guaranteed by design, not subject to production testing.  
 c. Independent of operating temperature.

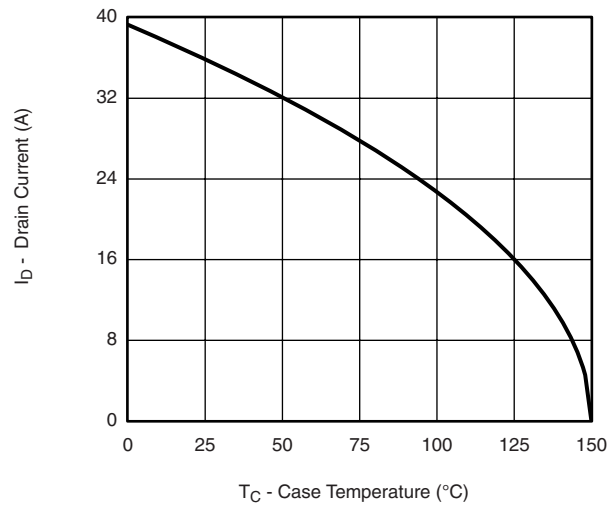
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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

**Output Characteristics**

**Transfer Characteristics**

**Transconductance**

**On-Resistance vs. Drain Current**

**On-Resistance vs. Gate-to-Source Voltage**

**Capacitance**

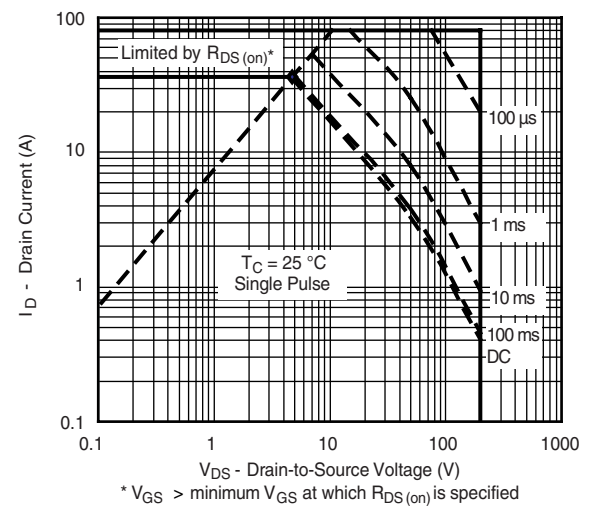
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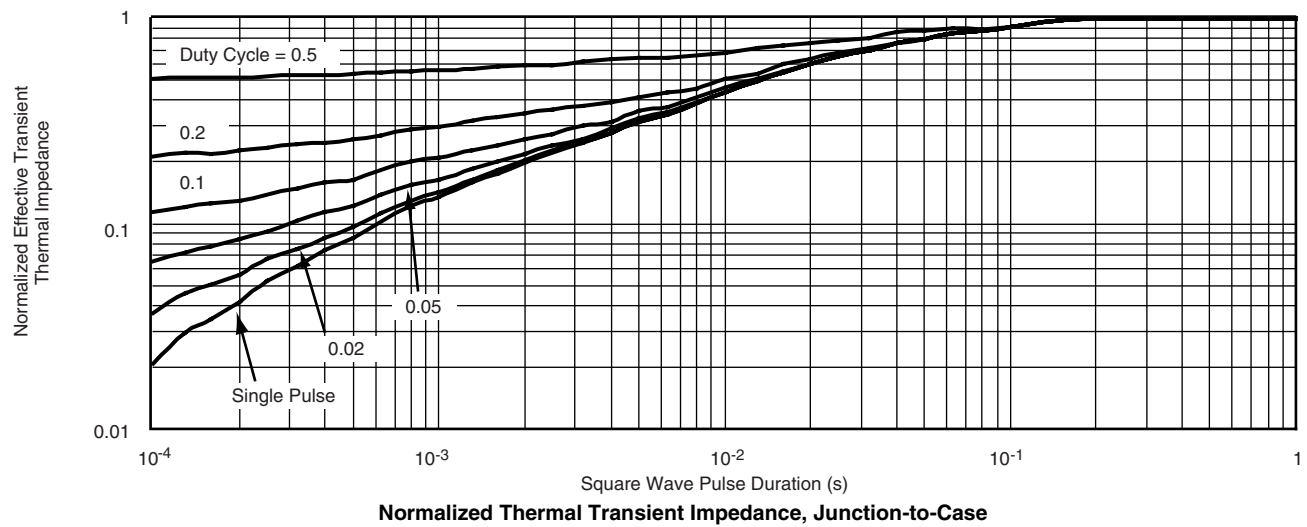
**THERMAL RATINGS**



**Maximum Drain Current vs. Case Temperature**

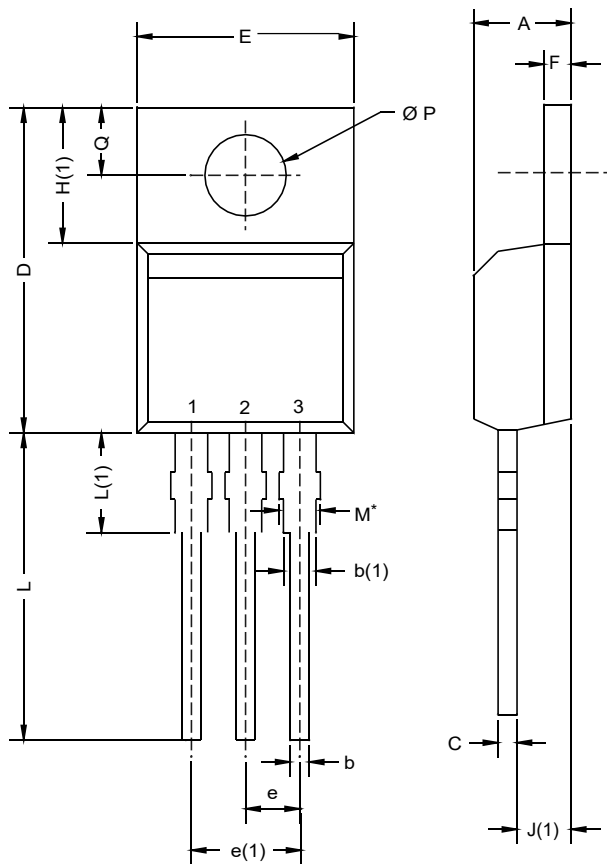


**Safe Operating Area**



**Normalized Thermal Transient Impedance, Junction-to-Case**

# 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
$\varnothing P$	3.54	3.94	0.139	0.155
Q	2.60	3.00	0.102	0.118
ECN: X12-0208-Rev. N, DWG: 5471				

## Notes

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

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