

AP9950GP-VB Datasheet

N-Channel 80 V (D-S) MOSFET

PRODUCT SUMMARY		
V_{DS}	80	V
$R_{DS(on)}$ $V_{GS} = 10\text{ V}$	7	$m\Omega$
$R_{DS(on)}$ $V_{GS} = 4.5\text{ V}$	9	$m\Omega$
I_D	100	A
Configuration	Single	

FEATURES

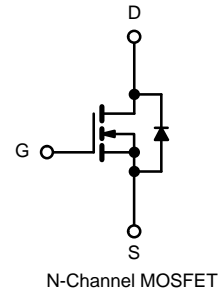
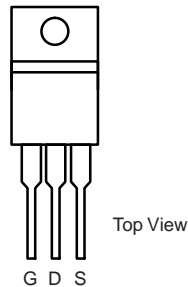
- TrenchFET® Power MOSFET
- 100 % R_g and UIS Tested



APPLICATIONS

- Primary Side Switching
- Synchronous Rectification
- DC/AC Inverters
- LED Backlighting

TO-220AB



ABSOLUTE MAXIMUM RATINGS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)			
Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	80	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 150\text{ }^\circ\text{C}$)	I_D	$T_C = 25\text{ }^\circ\text{C}$	100 ^a
		$T_C = 70\text{ }^\circ\text{C}$	85 ^a
		$T_A = 25\text{ }^\circ\text{C}$	28.6 ^{b, c}
		$T_A = 70\text{ }^\circ\text{C}$	24.9 ^{b, c}
Pulsed Drain Current ($t = 100\text{ }\mu\text{s}$)	I_{DM}	350	A
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$	
		$T_A = 25\text{ }^\circ\text{C}$	4.5 ^{b, c}
Single Pulse Avalanche Current	I_{AS}	30	mJ
Single Pulse Avalanche Energy	E_{AS}	45	
Maximum Power Dissipation	P_D	$T_C = 25\text{ }^\circ\text{C}$	180
		$T_C = 70\text{ }^\circ\text{C}$	120
		$T_A = 25\text{ }^\circ\text{C}$	5 ^{b, c}
		$T_A = 70\text{ }^\circ\text{C}$	3.2 ^{b, c}
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	$^\circ\text{C}$
Soldering Recommendations (Peak Temperature)		260	

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^a	$t \leq 10\text{ sec}$	R_{thJA}	15	18	$^\circ\text{C/W}$
	Steady State		40	50	
Maximum Junction-to-Case		R_{thJC}	0.85	1.1	

Notes

- a. Package limited.
- b. Surface mounted on 1" x 1" FR4 board.
- c. $t = 10\text{ s}$.

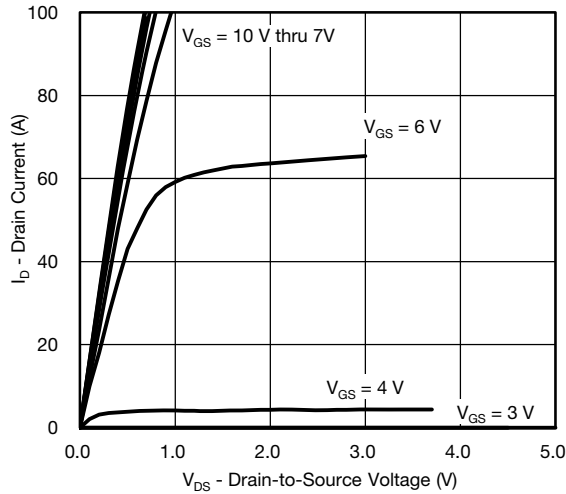
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)							
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
Static							
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	80			V	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		37		mV/°C	
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			-6.1			
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2.0		3.5	V	
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 80\text{ V}, V_{GS} = 0\text{ V}$			1	μA	
		$V_{DS} = 80\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			10		
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	85			A	
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		7		mΩ	
		$V_{GS} = 6\text{ V}, I_D = 15\text{ A}$		7.5			
		$V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$		9			
Forward Transconductance ^a	g_{fs}	$V_{DS} = 10\text{ V}, I_D = 20\text{ A}$		60		S	
Dynamic^b							
Input Capacitance	C_{iss}	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		3855		pF	
Output Capacitance	C_{oss}			1120			
Reverse Transfer Capacitance	C_{rss}			376			
Total Gate Charge	Q_g	$V_{DS} = 40\text{ V}, V_{GS} = 10\text{ V}, I_D = 10\text{ A}$		35.5		nC	
		$V_{DS} = 40\text{ V}, V_{GS} = 6\text{ V}, I_D = 10\text{ A}$		22			
		$V_{DS} = 40\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$		18			
Gate-Source Charge	Q_{gs}		5.3				
Gate-Drain Charge	Q_{gd}		7.3				
Output Charge	Q_{oss}	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$		57	86		
Gate Resistance	R_g	$f = 1\text{ MHz}$	0.5	1.3	2	Ω	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 40\text{ V}, R_L = 4\text{ }\Omega$ $I_D \cong 10\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		12	24	ns	
Rise Time	t_r			8	16		
Turn-Off Delay Time	$t_{d(off)}$			32	64		
Fall Time	t_f			7	14		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 40\text{ V}, R_L = 4\text{ }\Omega$ $I_D \cong 10\text{ A}, V_{GEN} = 6.0\text{ V}, R_g = 1\text{ }\Omega$		14	28		
Rise Time	t_r			11	22		
Turn-Off Delay Time	$t_{d(off)}$			30	60		
Fall Time	t_f			8	16		
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			75		A
Pulse Diode Forward Current ($t = 100\text{ }\mu\text{s}$)	I_{SM}				150		
Body Diode Voltage	V_{SD}	$I_S = 5\text{ A}$		0.76	1.1	V	
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 10\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		38	75	ns	
Body Diode Reverse Recovery Charge	Q_{rr}			36	70	nC	
Reverse Recovery Fall Time	t_a			19		ns	
Reverse Recovery Rise Time	t_b			19			

Notes

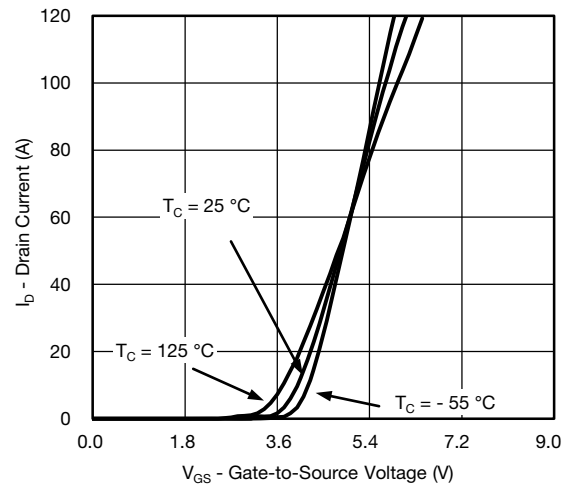
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- b. Guaranteed by design, not subject to production testing.

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.

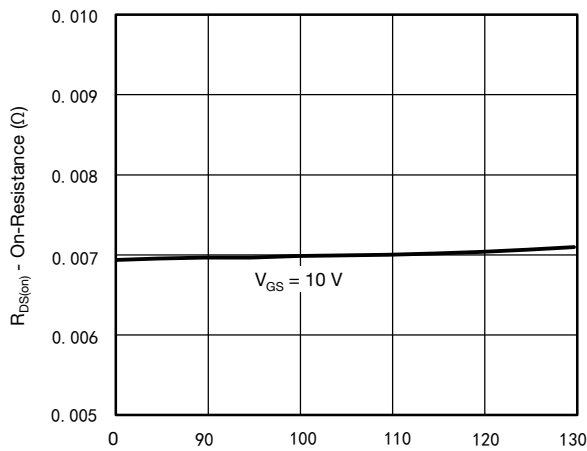
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Output Characteristics



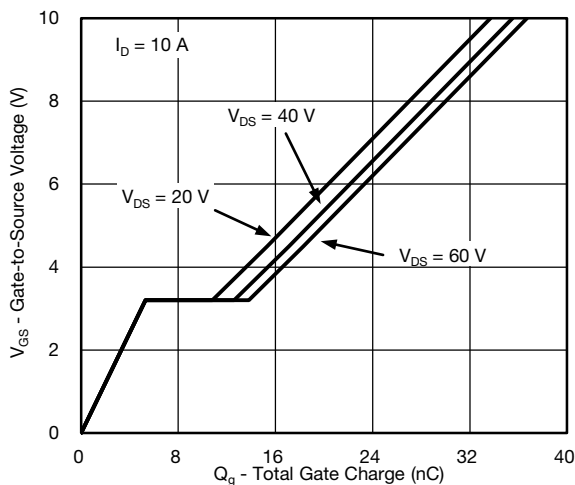
Transfer Characteristics



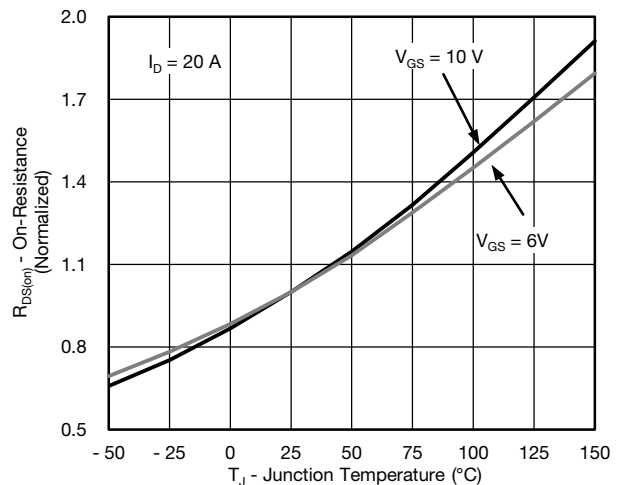
On-Resistance vs. Drain Current



Capacitance

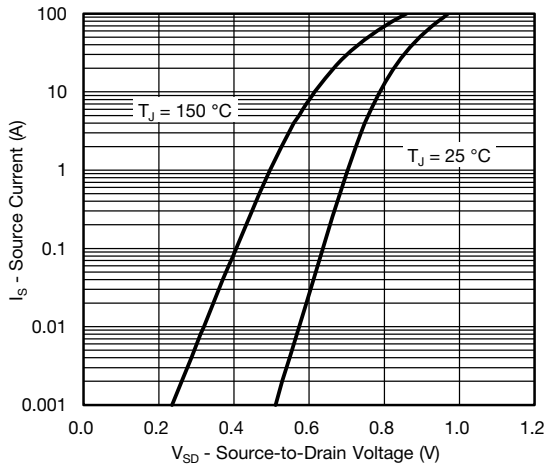


Gate Charge

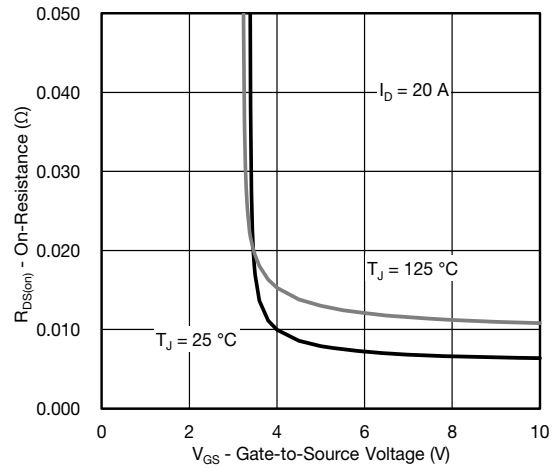


On-Resistance vs. Junction Temperature

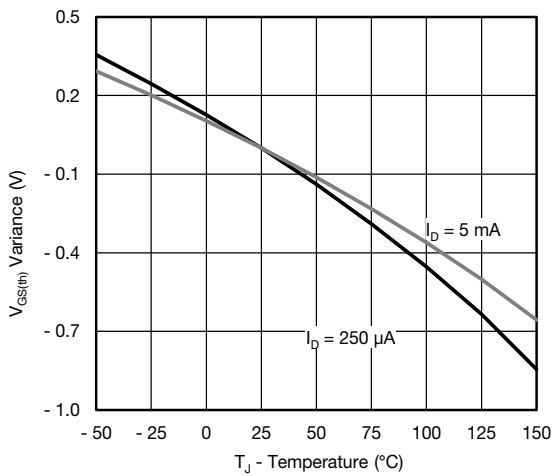
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



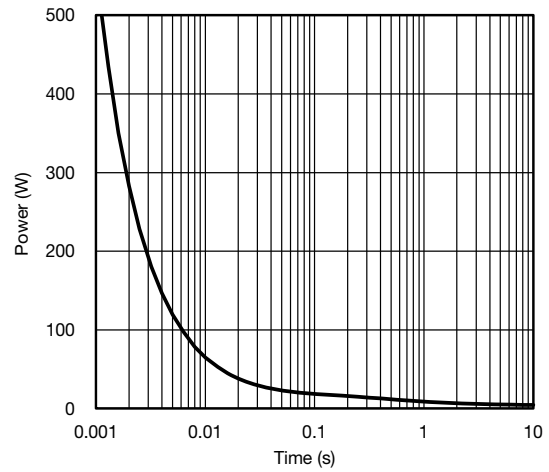
Source-Drain Diode Forward Voltage



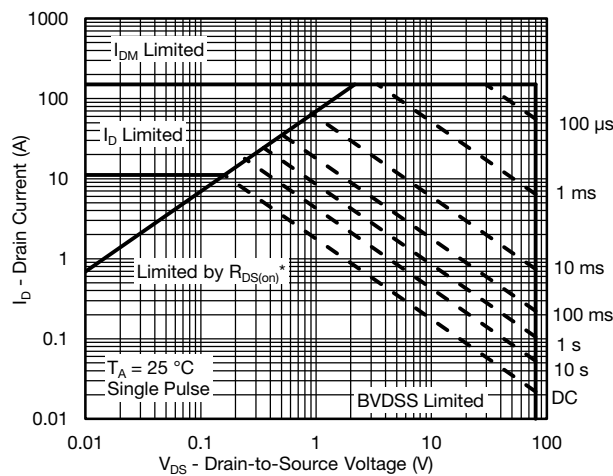
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



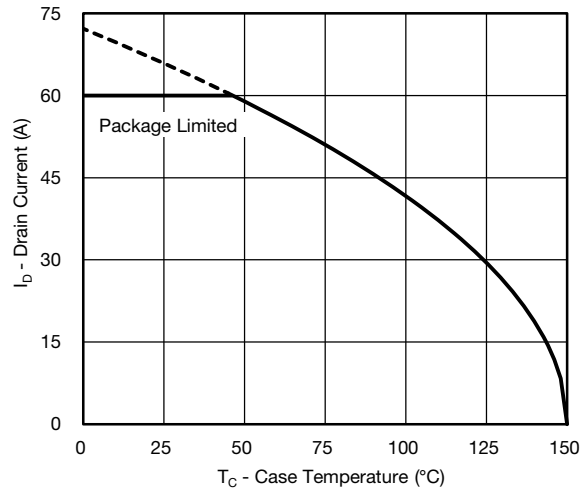
Single Pulse Power, Junction-to-Ambient



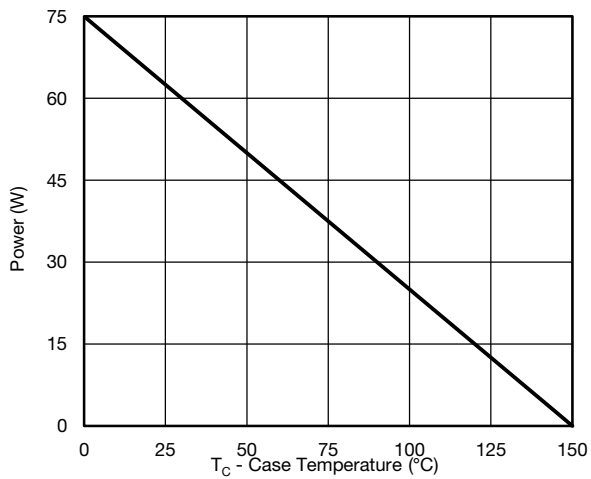
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

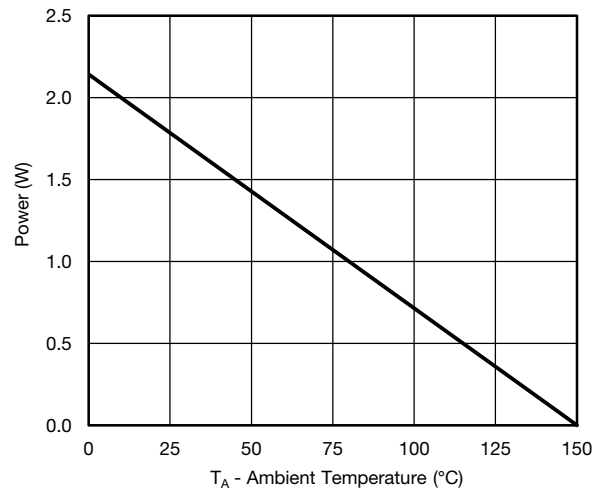
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating*



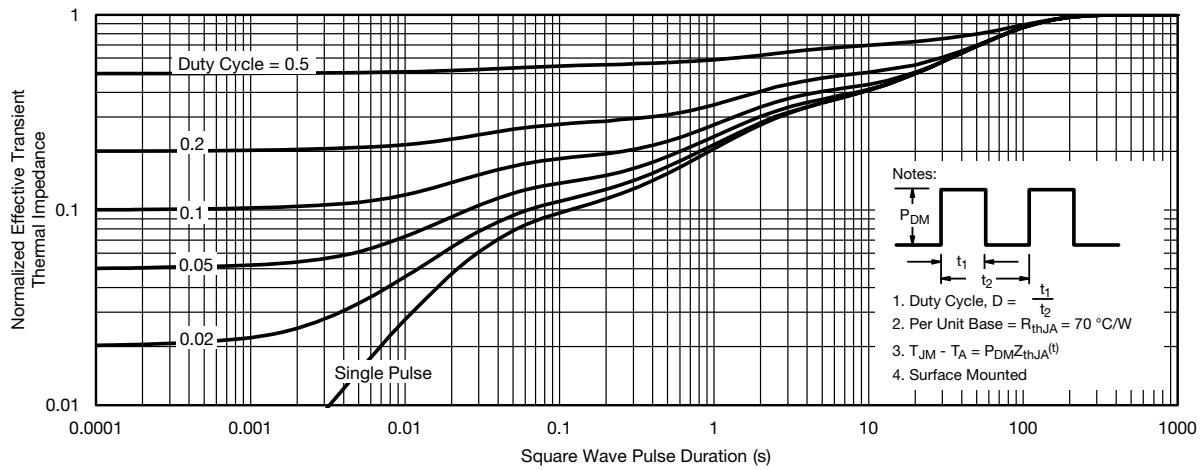
Power, Junction-to-Case



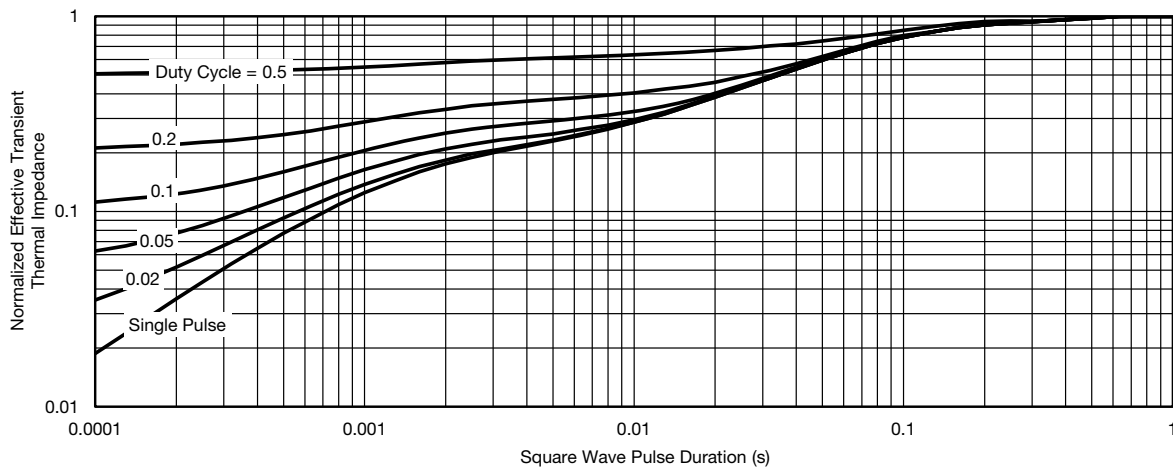
Power, Junction-to-Ambient

* The power dissipation P_D is based on $T_{J(max)} = 150\text{ }^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

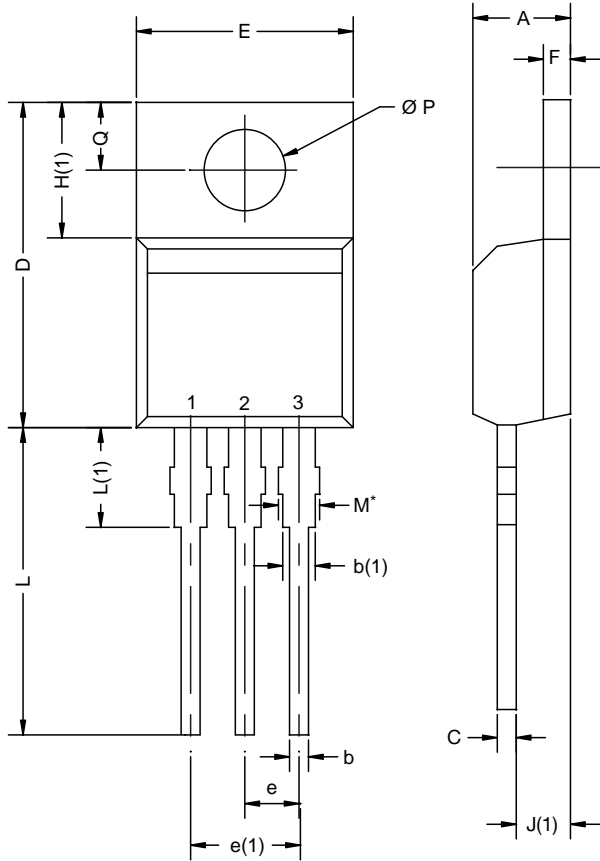


Normalized Thermal Transient Impedance, Junction-to-Ambient



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
Ø P	3.54	3.94	0.139	0.155
Q	2.60	3.00	0.102	0.118

ECN: X12-0208-Rev. N, 08-Oct-12
DWG: 5471

Notes

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

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