

# AP9435GP-VB Datasheet

## P-Channel 30-V (D-S) MOSFET

### PRODUCT SUMMARY

$V_{DS}$	-30	V
$R_{DS(on)} V_{GS} = 10\text{ V}$	8	$m\Omega$
$R_{DS(on)} V_{GS} = 4.5\text{ V}$	11	$m\Omega$
$I_D$	-70	A
Configuration	Single	

### FEATURES

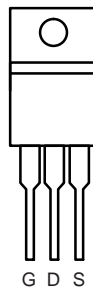
- Halogen-free
- Trench Power MOSFET
- 100 %  $R_g$  Tested
- 100 % UIS Tested


**RoHS**  
 COMPLIANT

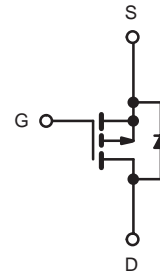
### APPLICATIONS

- Load Switch
- Notebook Adaptor Switch

TO-220AB



Top View



P-Channel MOSFET

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	- 30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 150\text{ }^\circ\text{C}$ )	$T_C = 25\text{ }^\circ\text{C}$	- 70	A
	$T_C = 70\text{ }^\circ\text{C}$	- 55	
	$T_A = 25\text{ }^\circ\text{C}$	- 55	
	$T_A = 70\text{ }^\circ\text{C}$	-45	
Pulsed Drain Current	$I_{DM}$	- 200	
Continuous Source-Drain Diode Current	$T_C = 25\text{ }^\circ\text{C}$	- 50	
	$T_A = 25\text{ }^\circ\text{C}$	- 50	
Avalanche Current	$I_{AS}$	- 20	
Single-Pulse Avalanche Energy	$E_{AS}$	20	mJ
Maximum Power Dissipation	$T_C = 25\text{ }^\circ\text{C}$	50	W
	$T_C = 70\text{ }^\circ\text{C}$	32	
	$T_A = 25\text{ }^\circ\text{C}$	$7^{a, b}$	
	$T_A = 70\text{ }^\circ\text{C}$	$5^{a, b}$	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 150	$^\circ\text{C}$

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>a, c</sup>	$R_{thJA}$	38	46	$^\circ\text{C/W}$
Maximum Junction-to-Foot	$R_{thJF}$	20	25	

Notes:

a. Surface mounted on 1" x 1" FR4 board.

b.  $t = 10\text{ s}$ .c. Maximum under Steady State conditions is  $85\text{ }^\circ\text{C/W}$ .d. Based on  $T_C = 25\text{ }^\circ\text{C}$ .

<b>SPECIFICATIONS</b> $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}$ , $I_D = -250\text{ }\mu\text{A}$	- 30			V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		- 34		mV/ $^{\circ}\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			5.3		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = -250\text{ }\mu\text{A}$	- 1.0		- 2.5	V
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 25\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -30\text{ V}$ , $V_{GS} = 0\text{ V}$			- 1	$\mu\text{A}$
		$V_{DS} = -30\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 55\text{ }^{\circ}\text{C}$			- 5	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq -10\text{ V}$ , $V_{GS} = -10\text{ V}$	- 30			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -10\text{ V}$ , $I_D = -10\text{ A}$		8		m $\Omega$
		$V_{GS} = -4.5\text{ V}$ , $I_D = -8\text{ A}$		11		
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -10\text{ V}$ , $I_D = -10\text{ A}$		28		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = -15\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$		3950		pF
Output Capacitance	$C_{oss}$			455		
Reverse Transfer Capacitance	$C_{rss}$			390		
Total Gate Charge	$Q_g$	$V_{DS} = -15\text{ V}$ , $V_{GS} = -10\text{ V}$ , $I_D = -10\text{ A}$		57	86	nC
Gate-Source Charge	$Q_{gs}$	$V_{DS} = -15\text{ V}$ , $V_{GS} = -4.5\text{ V}$ , $I_D = -10\text{ A}$		29.5	45	
Gate-Drain Charge	$Q_{gd}$			8		
Gate Resistance	$R_g$			22		
Turn-On Delay Time	$t_{d(on)}$	$f = 1\text{ MHz}$	0.5	2.2	4.4	$\Omega$
Rise Time	$t_r$			13	25	ns
Turn-Off Delay Time	$t_{d(off)}$			12	24	
Fall Time	$t_f$			40	70	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -15\text{ V}$ , $R_L = 1.5\text{ }\Omega$ $I_D \cong -10\text{ A}$ , $V_{GEN} = -10\text{ V}$ , $R_g = 1\text{ }\Omega$		9	18	
Rise Time	$t_r$			48	80	
Turn-Off Delay Time	$t_{d(off)}$			92	160	
Fall Time	$t_f$			34	60	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -15\text{ V}$ , $R_L = 1.5\text{ }\Omega$ $I_D \cong -10\text{ A}$ , $V_{GEN} = -4.5\text{ V}$ , $R_g = 1\text{ }\Omega$		19	35	
Turn-Off Delay Time	$t_{d(off)}$					
Fall Time	$t_f$					
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^{\circ}\text{C}$			- 4.1	A
Pulse Diode Forward Current	$I_{SM}$				- 60	
Body Diode Voltage	$V_{SD}$	$I_S = -3\text{ A}$ , $V_{GS} = 0\text{ V}$		- 0.75	- 1.2	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = -10\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $T_J = 25\text{ }^{\circ}\text{C}$		27	45	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			16	27	nC
Reverse Recovery Fall Time	$t_a$			12		ns
Reverse Recovery Rise Time	$t_b$			15		

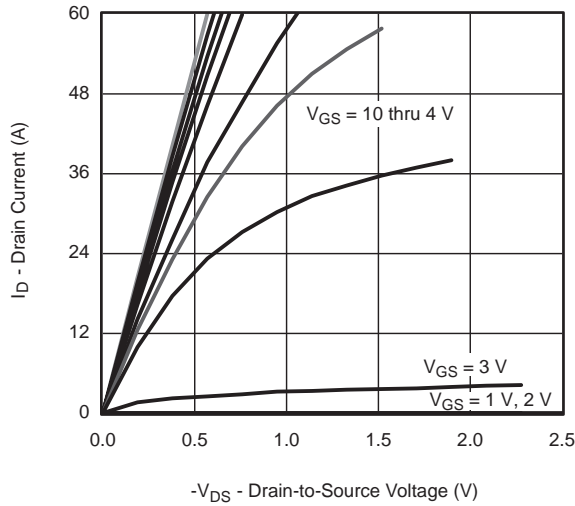
Notes:

a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

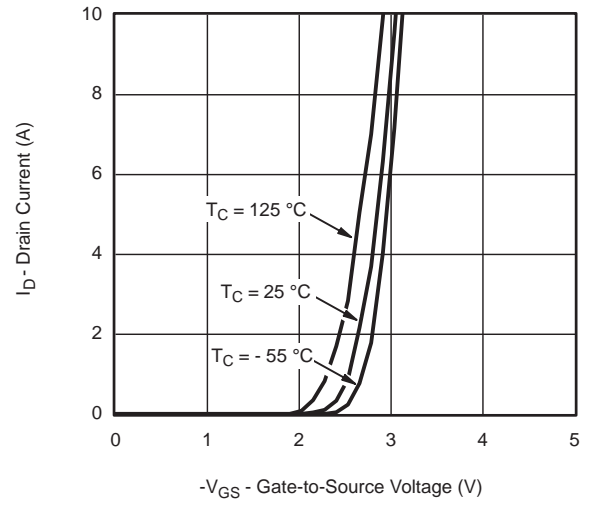
b. Guaranteed by design, not subject to production testing.

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.

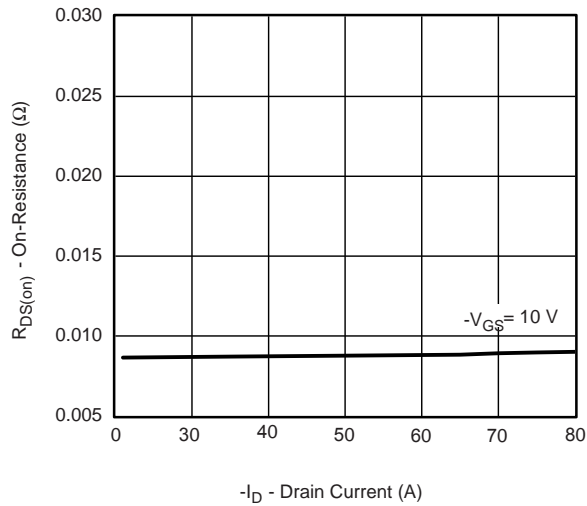
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



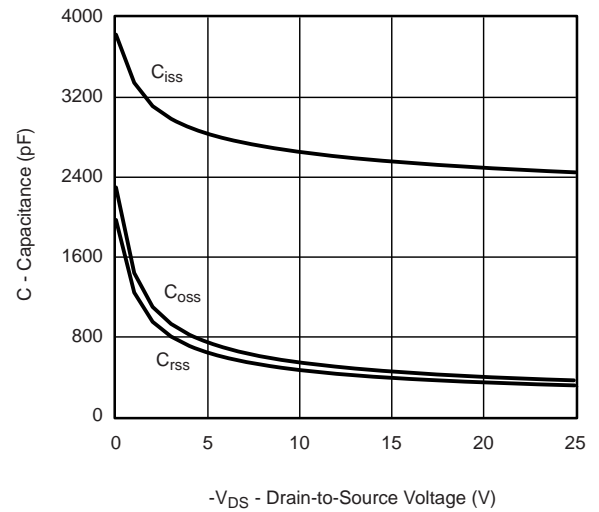
**Output Characteristics**



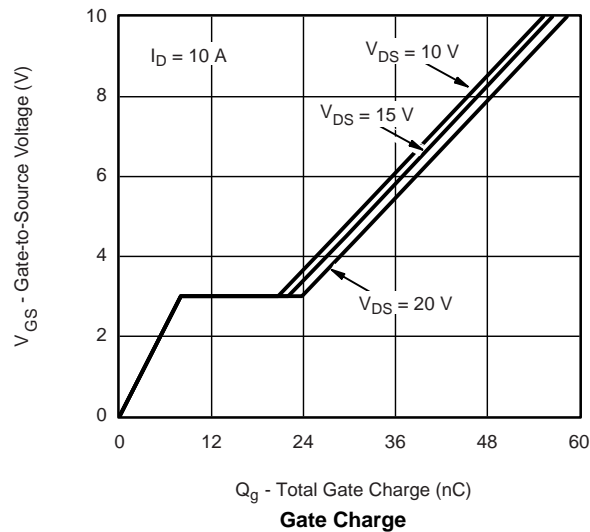
**Transfer Characteristics**



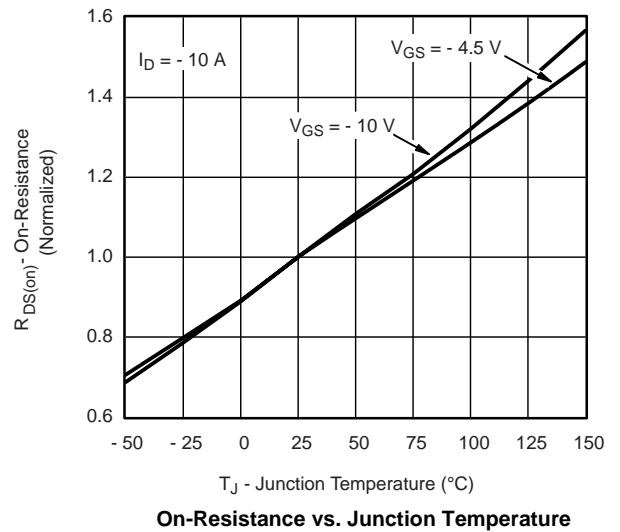
**On-Resistance vs. Drain Current**



**Capacitance**

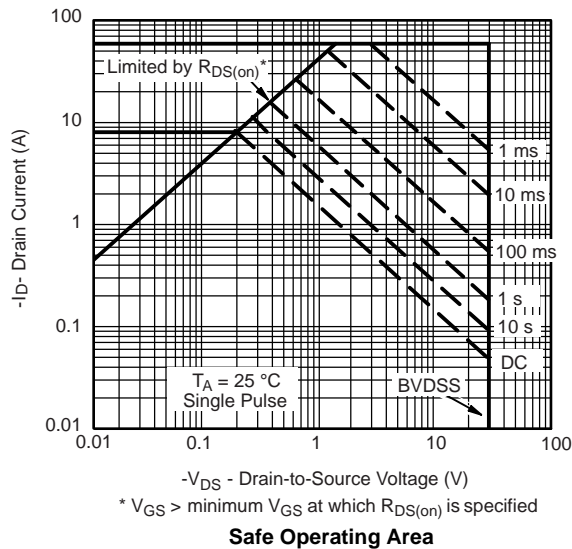
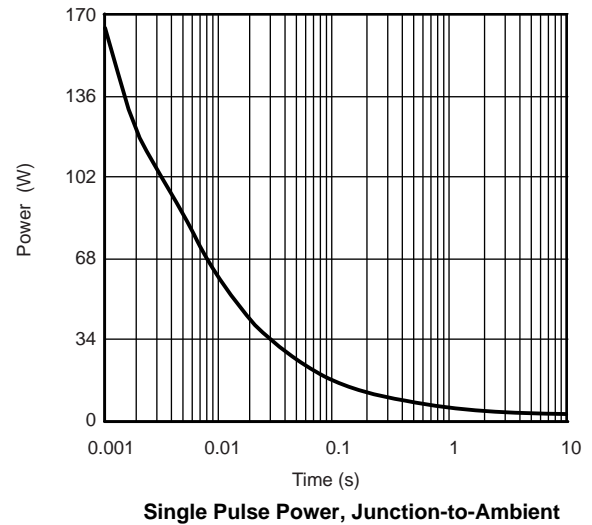
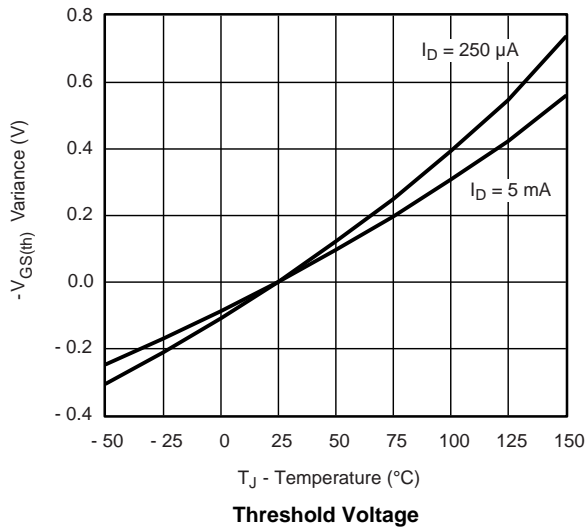
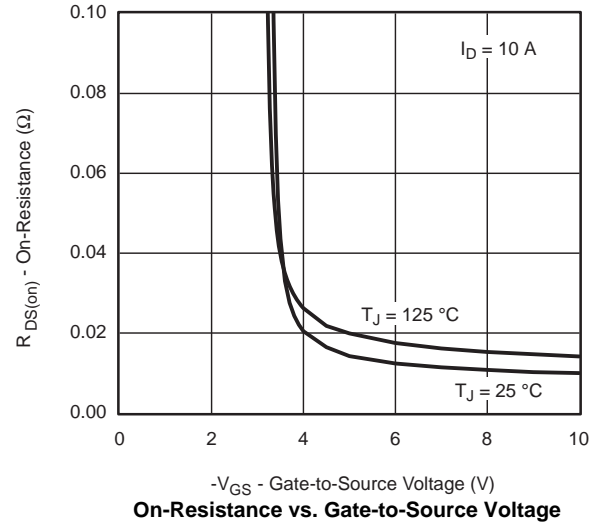
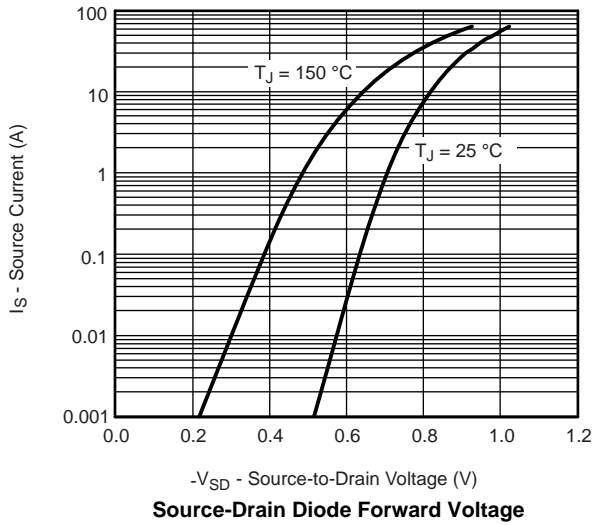


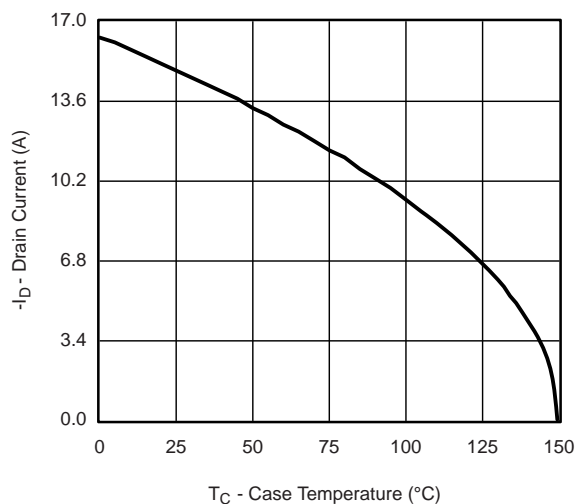
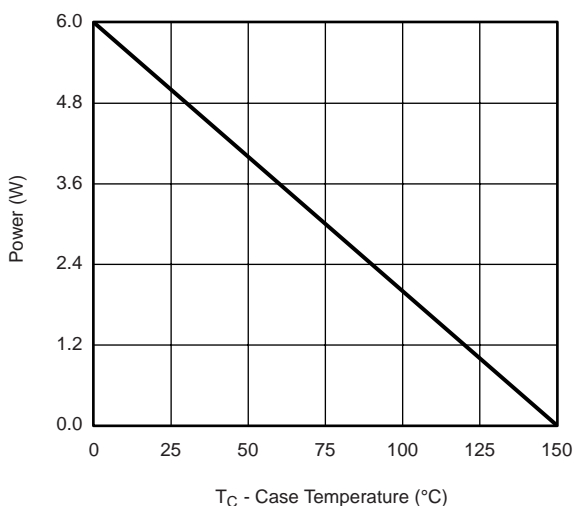
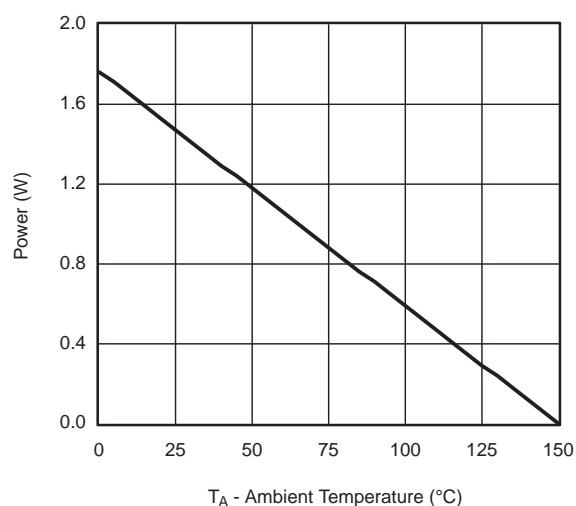
**Gate Charge**



**On-Resistance vs. Junction Temperature**

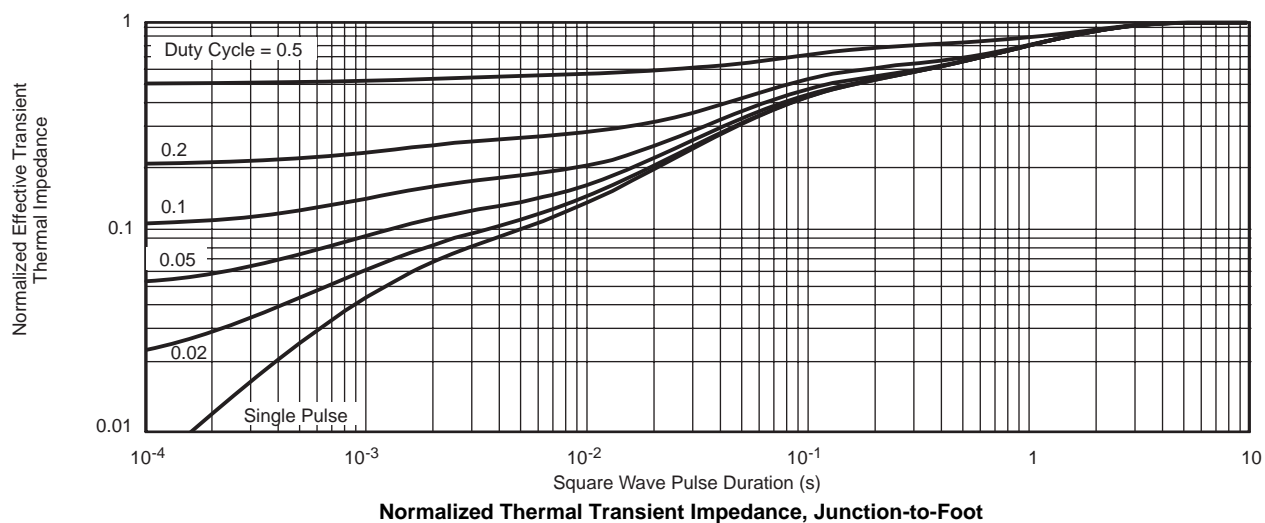
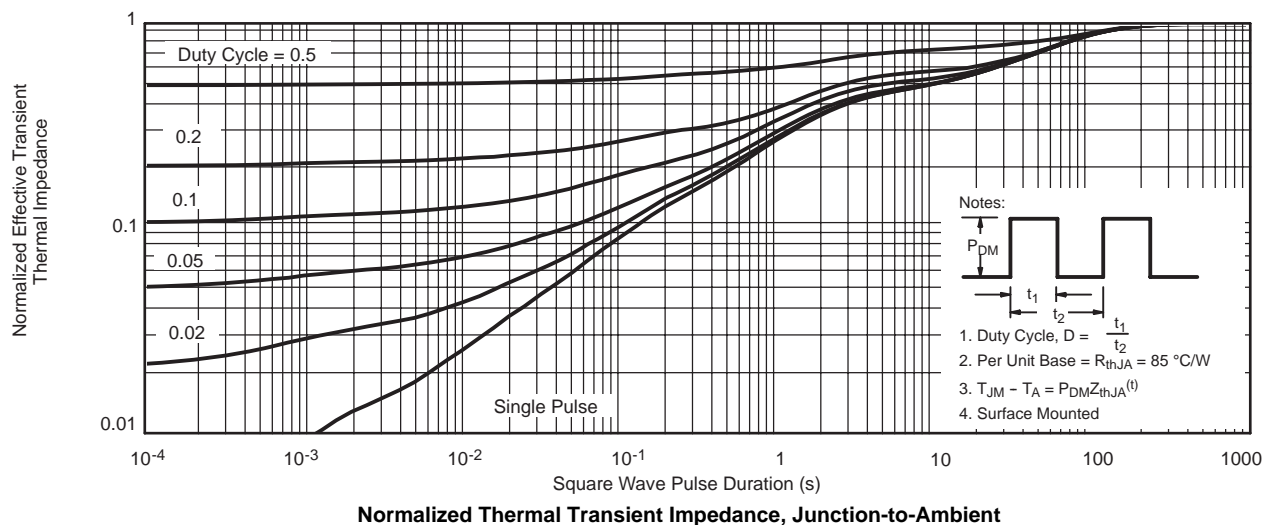
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



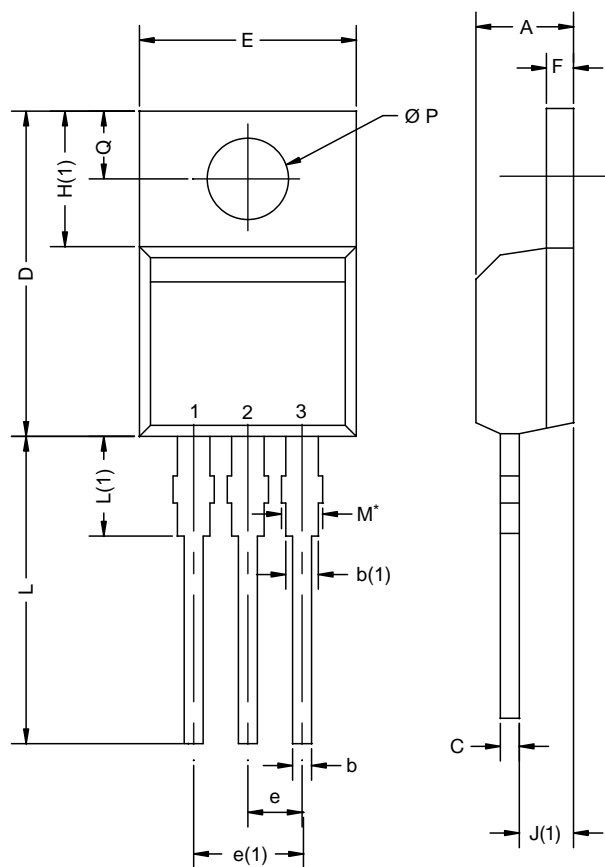
**MOSFET TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

**Current Derating\***

**Power, Junction-to-Foot**

**Power Derating, Junction-to-Ambient**

\* The power dissipation  $P_D$  is based on  $T_{J(max)} = 150$  °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



## 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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