

AP9435K-VB Datasheet

P-Channel 35 V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^d	Q _g (Typ.)
- 35	0.040 at V _{GS} = - 10 V	- 6.2	9.8 nC
	0.048 at V _{GS} = - 4.5 V	- 5.1	

FEATURES

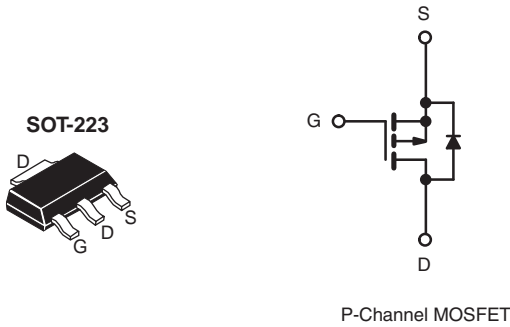
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET[®] Power MOSFET
- 100 % R_g Tested
- 100 % UIS Tested
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Load Switches, Adaptor Switch
- Notebook PCs



ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C, unless otherwise noted)				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V _{DS}	- 35	V
Gate-Source Voltage		V _{GS}	± 20	
Continuous Drain Current (T _J = 150 °C)	T _C = 25 °C	I _D	- 6.2	A
	T _C = 70 °C		- 4.8	
	T _A = 25 °C		- 4.5 ^{a, b}	
	T _A = 70 °C		- 3.4 ^{a, b}	
Pulsed Drain Current		I _{DM}	- 20	
Continuous Source-Drain Diode Current	T _C = 25 °C	I _S	- 3.5	
	T _A = 25 °C		- 2.1 ^{a, b}	
Avalanche Current		I _{AS}	- 10	
Single-Pulse Avalanche Energy	L = 0.1 mH	E _{AS}	5	mJ
Maximum Power Dissipation	T _C = 25 °C	P _D	4.2	W
	T _C = 70 °C		2.7	
	T _A = 25 °C		2.5 ^{a, b}	
	T _A = 70 °C		1.6 ^{a, b}	
Operating Junction and Storage Temperature Range		T _J , T _{stg}	- 55 to 150	°C

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{a, c}	t ≤ 10 s	R _{thJA}	40	50	°C/W
Maximum Junction-to-Foot	Steady State	R _{thJF}	24	30	

Notes:

- Surface mounted on 1" x 1" FR4 board.
- t = 10 s.
- Maximum under steady state conditions is 85 °C/W.
- Based on T_C = 25 °C.

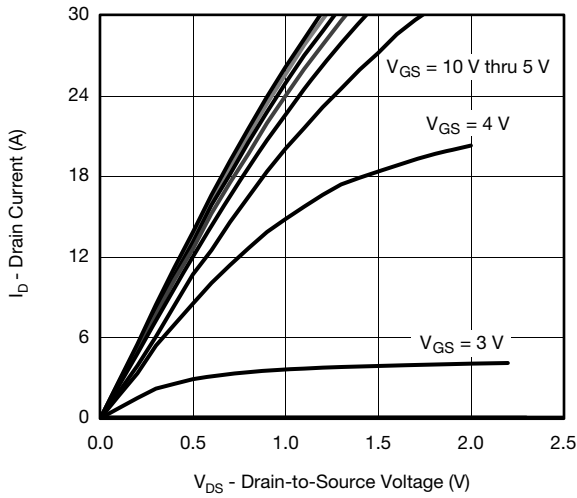
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-35			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		-42		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		4.6			
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-0.6		-1.8	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}	$V_{DS} = -35\text{ V}, V_{GS} = 0\text{ V}$			-1	μA
		$V_{DS} = -35\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			-5	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq -10\text{ V}, V_{GS} = -10\text{ V}$	-10			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -5\text{ A}$		0.040		Ω
		$V_{GS} = -4.5\text{ V}, I_D = -4\text{ A}$		0.048		
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10\text{ V}, I_D = -5\text{ A}$		14		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		970		pF
Output Capacitance	C_{oss}		120			
Reverse Transfer Capacitance	C_{rss}		95			
Total Gate Charge	Q_g	$V_{DS} = -20\text{ V}, V_{GS} = -10\text{ V}, I_D = -5\text{ A}$		23	35	nC
		$V_{DS} = -20\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -5\text{ A}$		9.8	16	
Gate-Source Charge	Q_{gs}			3		
Gate-Drain Charge	Q_{gd}		5.2			
Gate Resistance	R_g	$f = 1\text{ MHz}$	1.0	5.5	11	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -20\text{ V}, R_L = 4\text{ }\Omega$ $I_D \cong -5\text{ A}, V_{GEN} = -10\text{ V}, R_g = 1\text{ }\Omega$		7	14	ns
Rise Time	t_r			12	24	
Turn-Off Delay Time	$t_{d(off)}$			30	60	
Fall Time	t_f			9	18	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -20\text{ V}, R_L = 4\text{ }\Omega$ $I_D \cong -5\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$		44	80	
Rise Time	t_r			33	60	
Turn-Off Delay Time	$t_{d(off)}$			28	55	
Fall Time	t_f			13	25	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			-3.5	A
Pulse Diode Forward Current	I_{SM}				-20	
Body Diode Voltage	V_{SD}	$I_S = -2\text{ A}, V_{GS} = 0\text{ V}$		-0.76	-1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -2\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		27	50	ns
Body Diode Reverse Recovery Charge	Q_{rr}			19	35	nC
Reverse Recovery Fall Time	t_a			14		ns
Reverse Recovery Rise Time	t_b			13		

Notes:

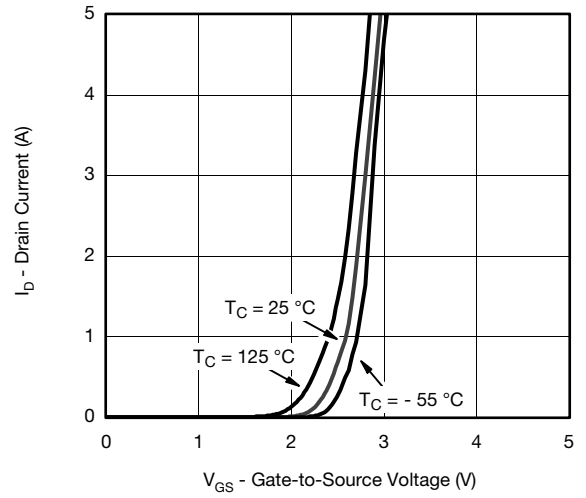
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 b. Guaranteed by design, not subject to production testing.

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.

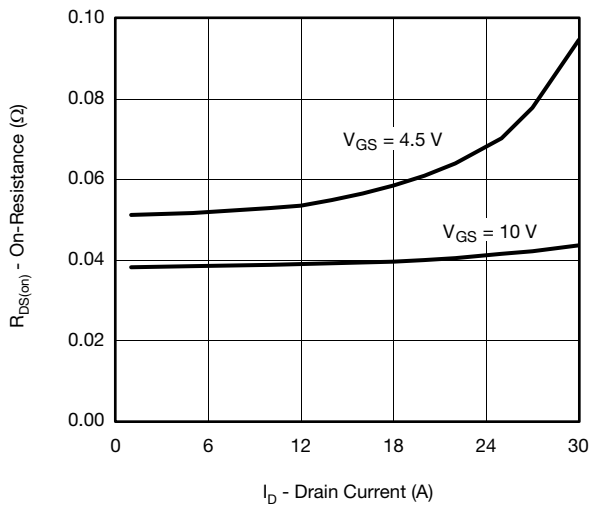
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



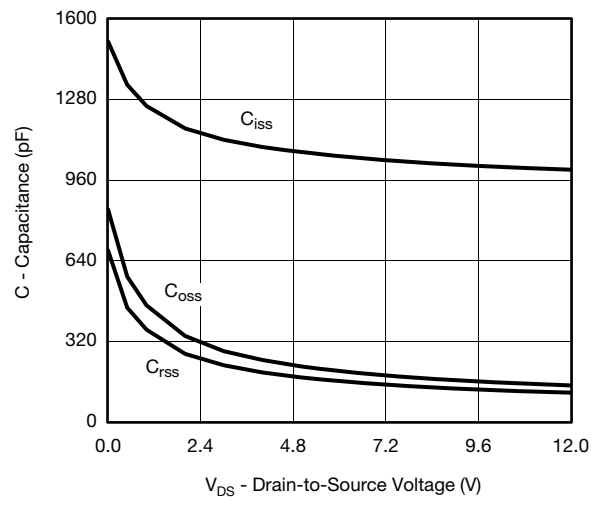
Output Characteristics



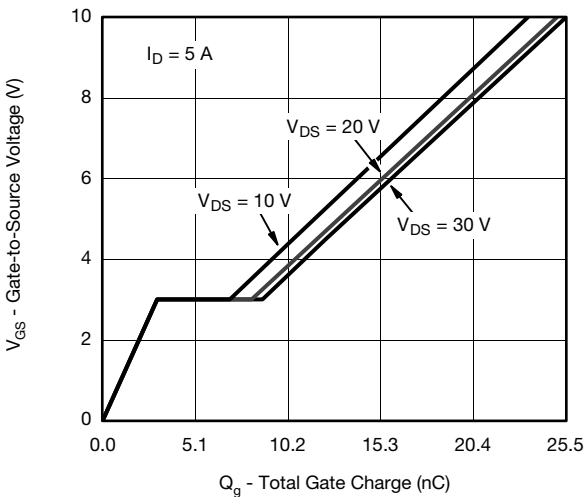
Transfer Characteristics



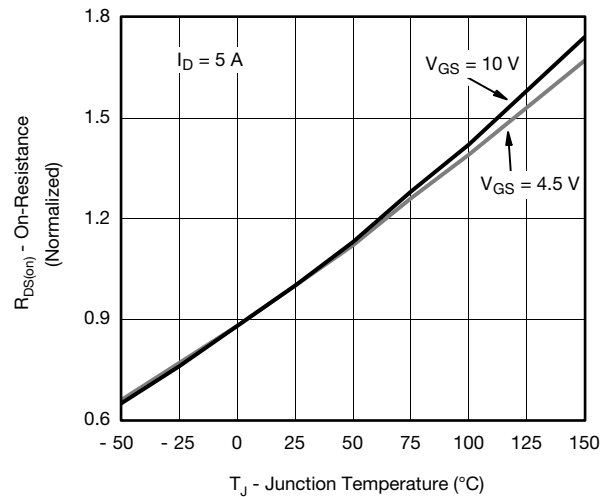
On-Resistance vs. Drain Current



Capacitance

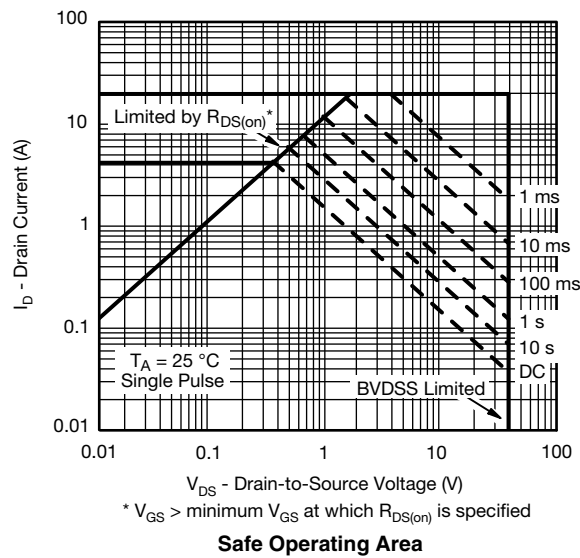
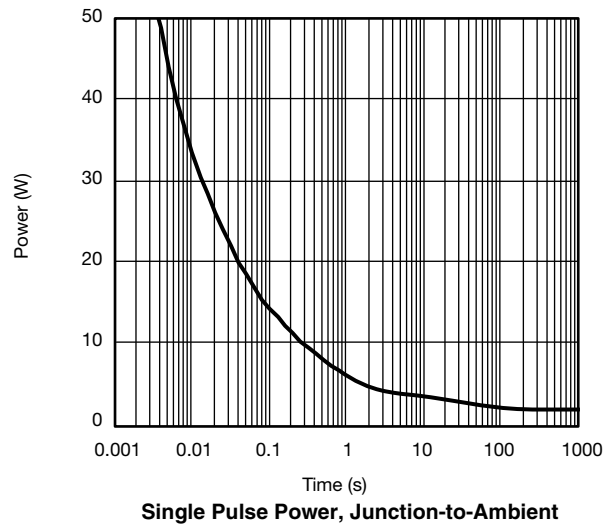
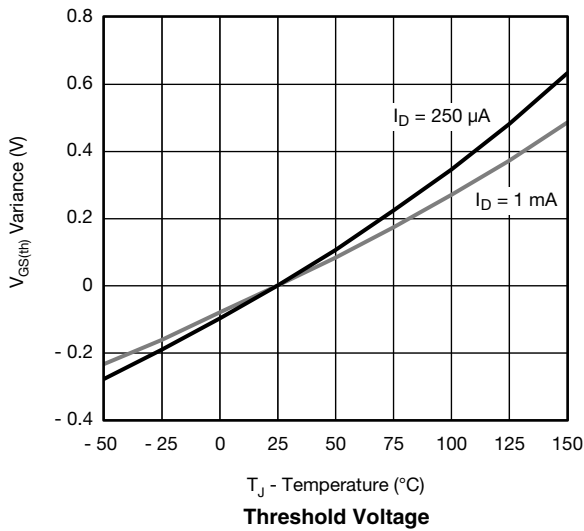
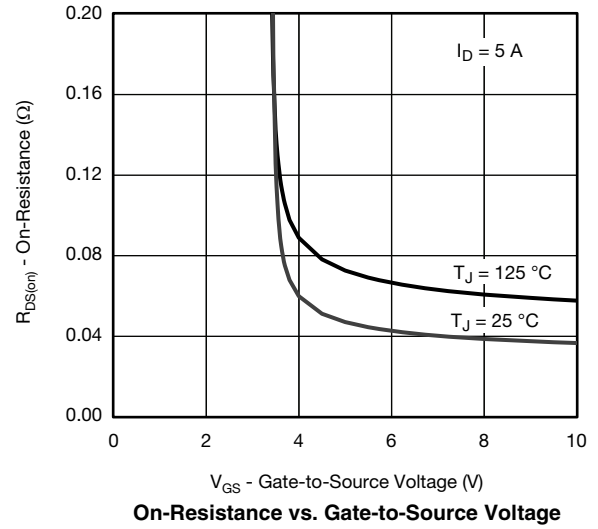
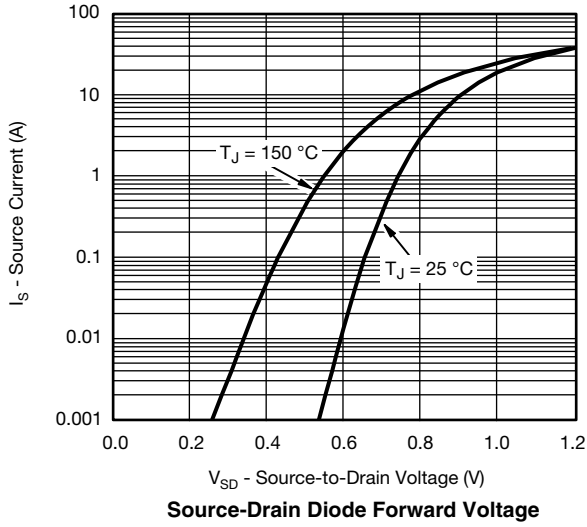


Gate Charge

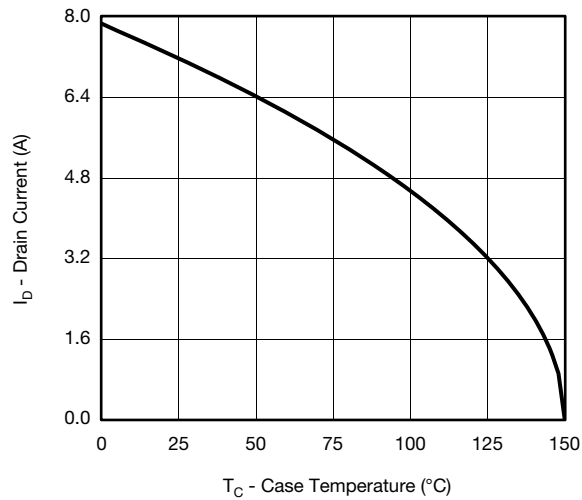


On-Resistance vs. Junction Temperature

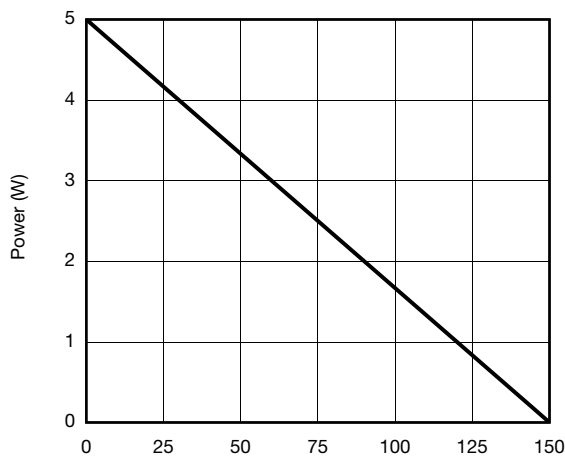
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



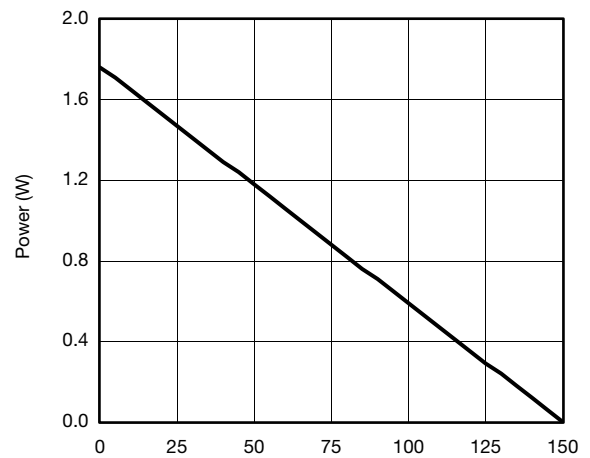
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating*



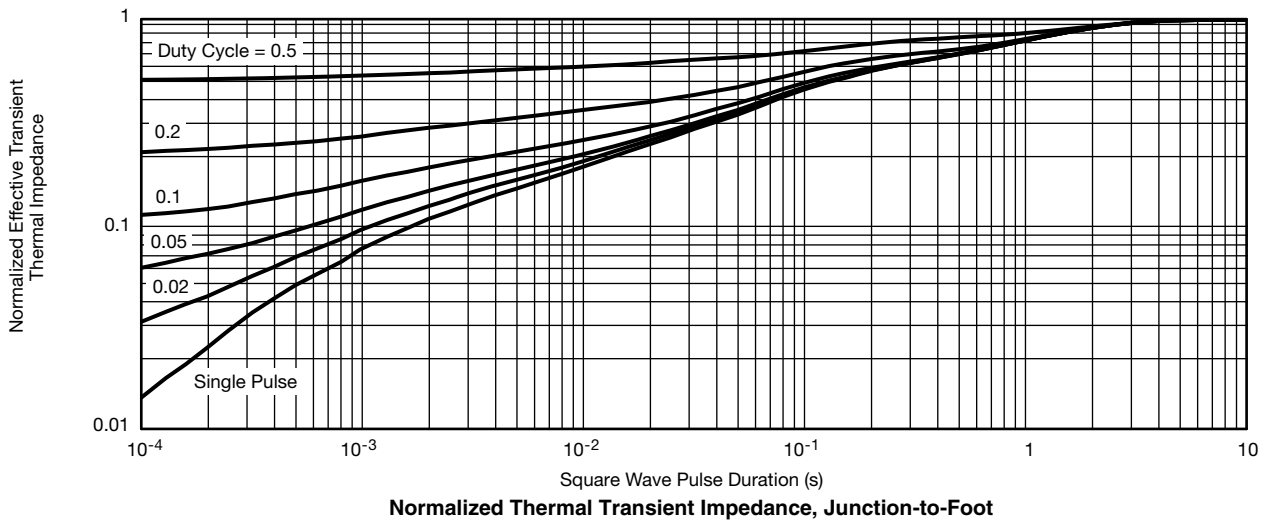
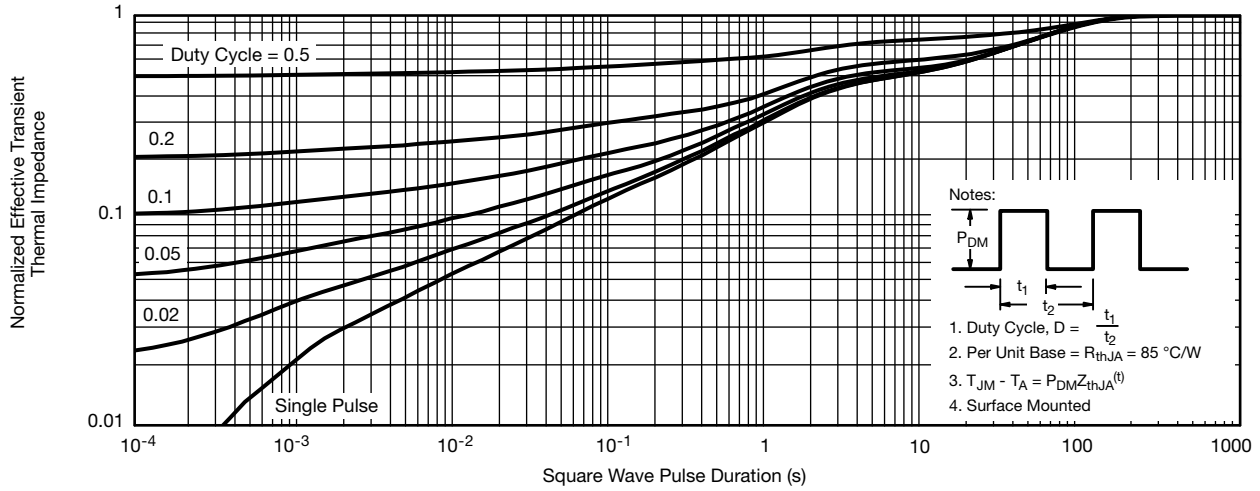
Power, Junction-to-Foot



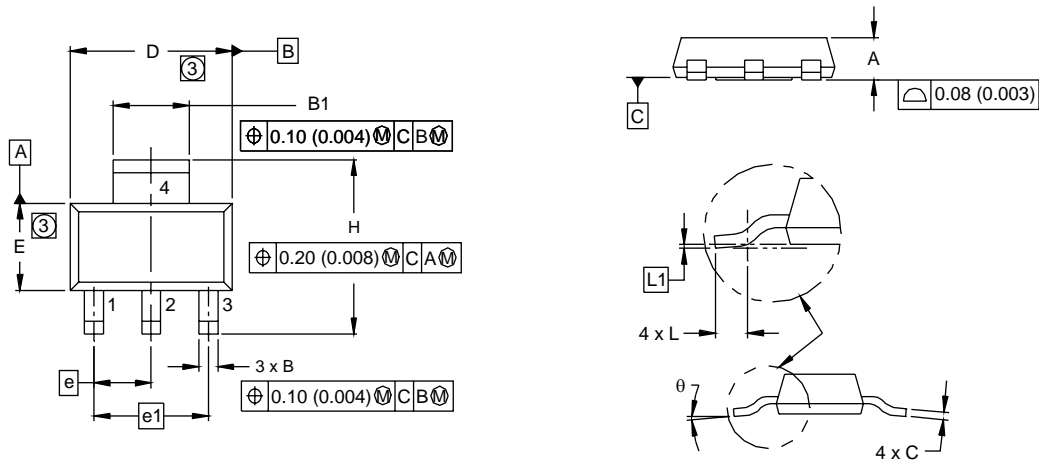
Power Derating, Junction-to-Ambient

* 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)



SOT-223 (HIGH VOLTAGE)



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	1.55	1.80	0.061	0.071
B	0.65	0.85	0.026	0.033
B1	2.95	3.15	0.116	0.124
C	0.25	0.35	0.010	0.014
D	6.30	6.70	0.248	0.264
E	3.30	3.70	0.130	0.146
e	2.30 BSC		0.0905 BSC	
e1	4.60 BSC		0.181 BSC	
H	6.71	7.29	0.264	0.287
L	0.91	-	0.036	-
L1	0.061 BSC		0.0024 BSC	
θ	-	10°	-	10°

ECN: S-82109-Rev. A, 15-Sep-08
DWG: 5969

Notes

1. Dimensioning and tolerancing per ASME Y14.5M-1994.
2. Dimensions are shown in millimeters (inches).
3. Dimension do not include mold flash.
4. Outline conforms to JEDEC outline TO-261AA.

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