

## CML456P-VB Datasheet

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

#### PRODUCT SUMMARY

$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)	$Q_g$ (Typ.)
- 30	0.043 at $V_{GS} = -10$ V	-8 <sup>a</sup>	15 nC
	0.046 at $V_{GS} = -4.5$ V	-7 <sup>a</sup>	

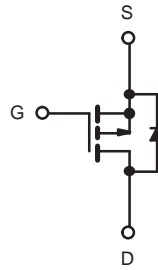
#### FEATURES

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


**RoHS**  
 COMPLIANT

#### APPLICATIONS

- DC/DC Converter
- Load Switch
- Adaptor Switch



P-Channel MOSFET

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	- 30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 150^\circ\text{C}$ )	$T_C = 25^\circ\text{C}$	- 8 <sup>a</sup>	A
	$T_C = 85^\circ\text{C}$	- 6	
	$T_A = 25^\circ\text{C}$	- 7 <sup>a, b, c</sup>	
	$T_A = 85^\circ\text{C}$	- 6.2 <sup>b, c</sup>	
Pulsed Drain Current	$I_{DM}$	-20	A
Continuous Source-Drain Diode Current	$T_C = 25^\circ\text{C}$	- 5.3	
	$T_A = 25^\circ\text{C}$	- 2.1 <sup>b, c</sup>	
Maximum Power Dissipation	$T_C = 25^\circ\text{C}$	6.3	W
	$T_C = 85^\circ\text{C}$	3.3	
	$T_A = 25^\circ\text{C}$	2.5 <sup>b, c</sup>	
	$T_A = 85^\circ\text{C}$	1.3 <sup>b, c</sup>	
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	$t \leq 5$ s	$R_{thJA}$	40	50	$^\circ\text{C/W}$
Maximum Junction-to-Foot (Drain)	Steady State	$R_{thJF}$	15	20	

Notes:

a. Package limited.

b. Surface Mounted on 1" x 1" FR4 board.

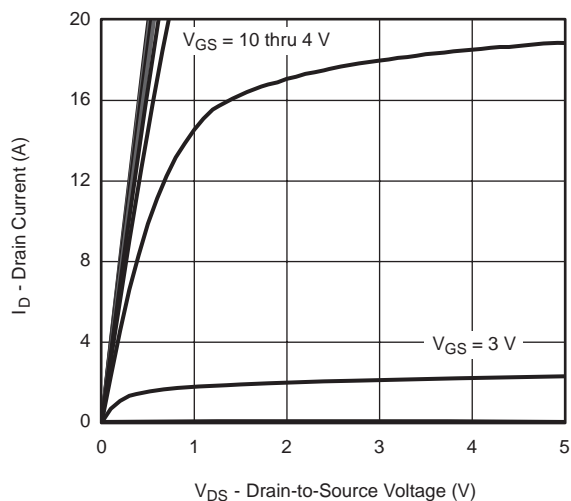
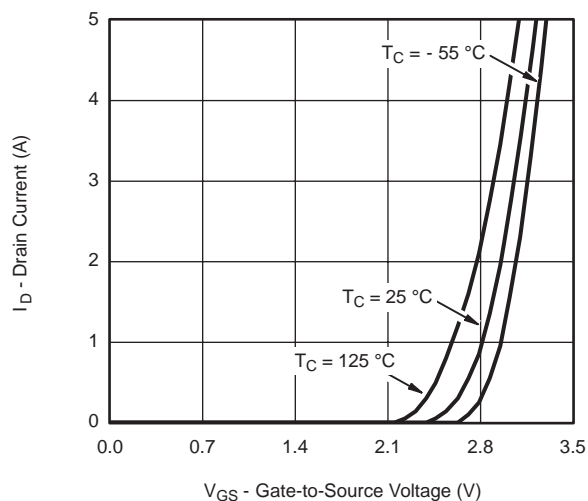
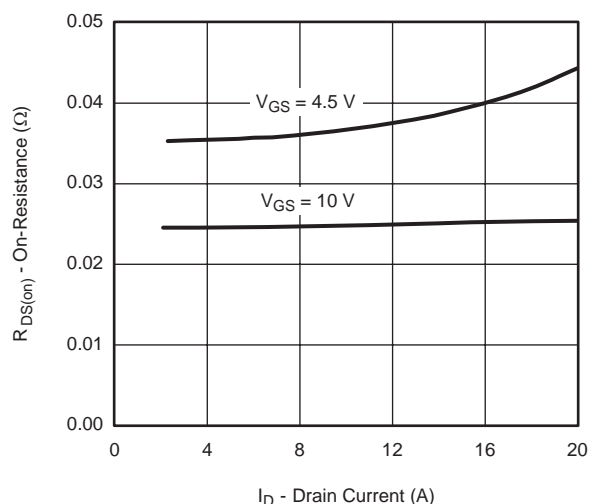
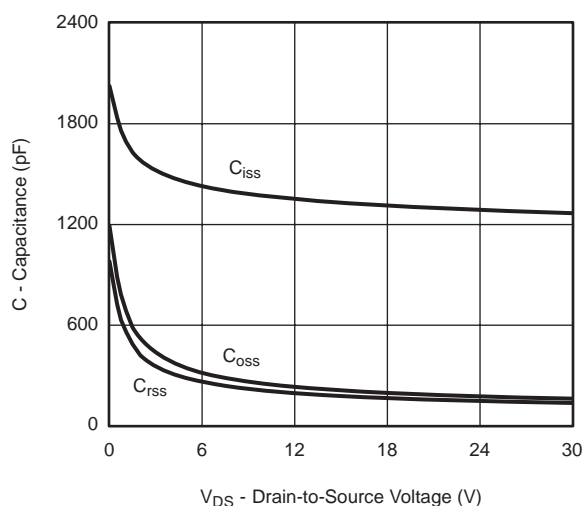
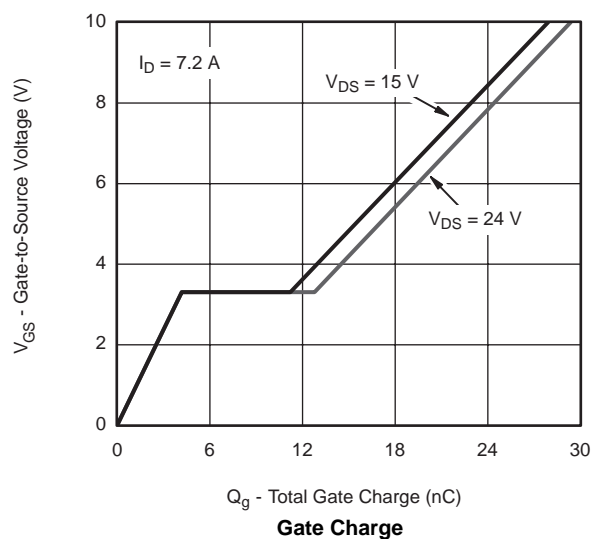
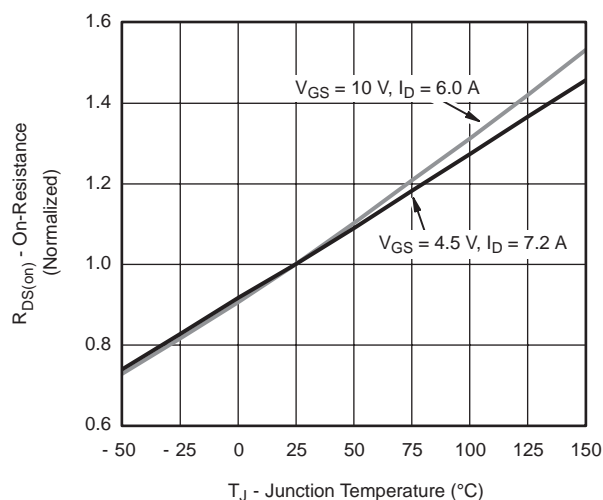
 c.  $t = 5$  s.

SPECIFICATIONS T <sub>J</sub> = 25 °C, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = - 250 μA	- 30			V
V <sub>DS</sub> Temperature Coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	I <sub>D</sub> = - 250 μA		- 30		mV/°C
V <sub>GS(th)</sub> Temperature Coefficient	ΔV <sub>GS(th)</sub> /T <sub>J</sub>			5		
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = - 250 μA	- 0.7		- 3	V
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = - 30 V, V <sub>GS</sub> = 0 V			- 1	μA
		V <sub>DS</sub> = - 30 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 85 °C			- 5	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> ≤ - 5 V, V <sub>GS</sub> = - 10 V	- 20			A
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = - 10 V, I <sub>D</sub> = - 7.2 A		0.043		Ω
		V <sub>GS</sub> = - 4.5 V, I <sub>D</sub> = - 6.0 A		0.046		
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = - 15 V, I <sub>D</sub> = - 7.2 A		18		S
Dynamic <sup>b</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = - 15 V, V <sub>GS</sub> = 0 V, f = 1 MHz		1340		pF
Output Capacitance	C <sub>oss</sub>			215		
Reverse Transfer Capacitance	C <sub>rss</sub>			185		
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = - 15 V, V <sub>GS</sub> = - 10 V, I <sub>D</sub> = - 7.2 A		28	42	nC
		V <sub>DS</sub> = - 15 V, V <sub>GS</sub> = - 4.5 V, I <sub>D</sub> = - 7.2 A		15	23	
Gate-Source Charge	Q <sub>gs</sub>			4.5		
Gate-Drain Charge	Q <sub>gd</sub>			7.2		
Gate Resistance	R <sub>g</sub>	f = 1 MHz	1.2	6	12	Ω
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = - 15 V, R <sub>L</sub> = 2.6 Ω I <sub>D</sub> ≅ - 5.8 A, V <sub>GEN</sub> = - 4.5 V, R <sub>g</sub> = 1 Ω		50	75	ns
Rise Time	t <sub>r</sub>			140	210	
Turn-Off Delay Time	t <sub>d(off)</sub>			30	45	
Fall Time	t <sub>f</sub>			18	27	
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = - 15 V, R <sub>L</sub> = 2.6 Ω I <sub>D</sub> ≅ - 5.8 A, V <sub>GEN</sub> = - 10 V, R <sub>g</sub> = 1 Ω		11	17	
Rise Time	t <sub>r</sub>			11	17	
Turn-Off Delay Time	t <sub>d(off)</sub>			37	56	
Fall Time	t <sub>f</sub>			12	18	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C			- 5.3	A
Pulse Diode Forward Current	I <sub>SM</sub>				- 20	
Body Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = - 5.8 A, V <sub>GS</sub> = 0 V		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = - 5.8 A, di/dt = - 100 A/μs, T <sub>J</sub> = 25 °C		22	33	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			15	25	nC
Reverse Recovery Fall Time	t <sub>a</sub>			13		ns
Reverse Recovery Rise Time	t <sub>b</sub>			9		

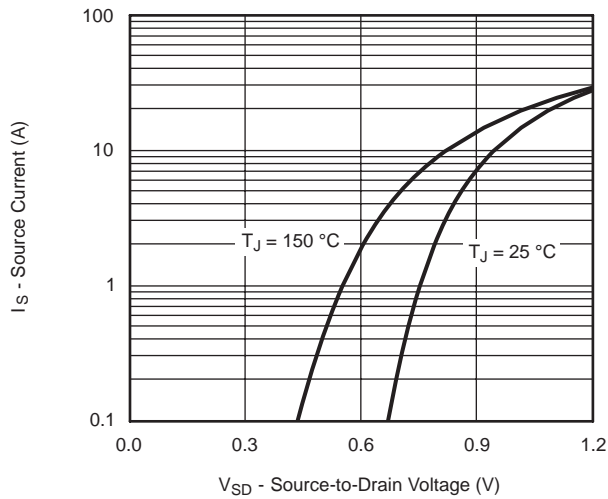
Notes:

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

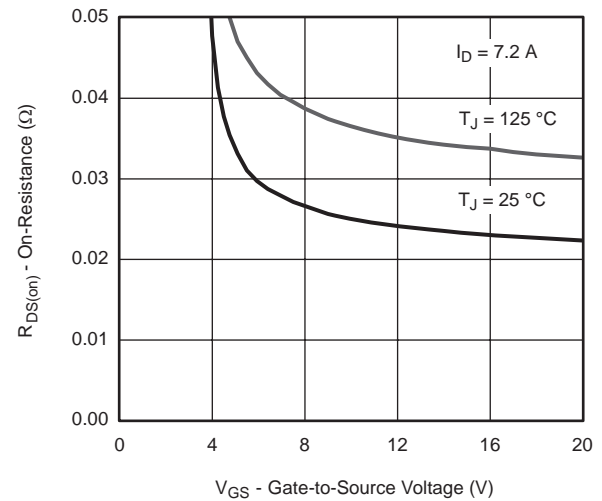
b. Guaranteed by design, not subject to production testing.

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

**Output Characteristics**

**Transfer Characteristics**

**On Resistance vs. Drain Current**

**Capacitance**

**Gate Charge**

**On-Resistance vs. Junction Temperature**

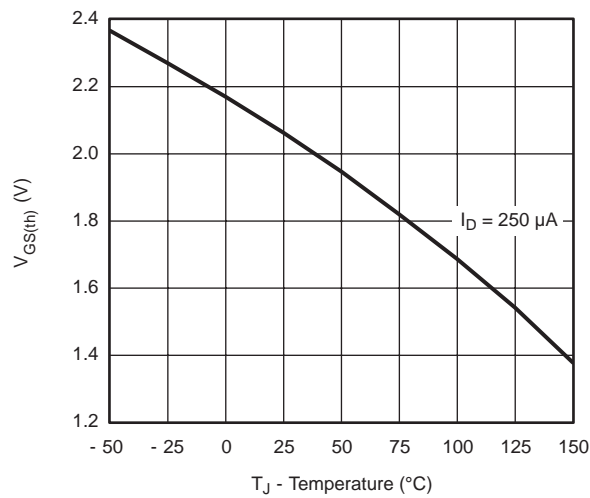
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



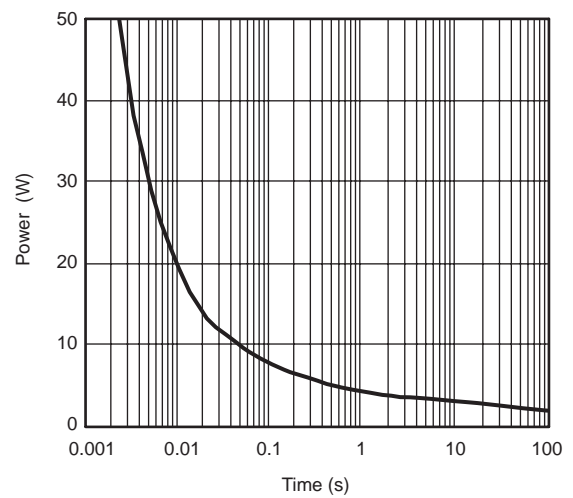
**Forward Diode Voltage vs. Temp.**



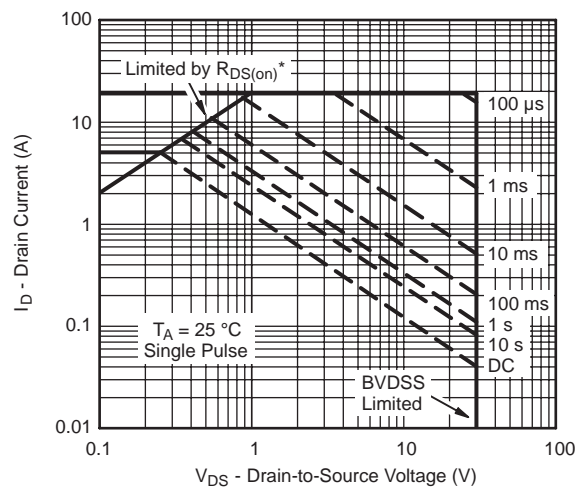
**On-Resistance vs. Gate-to-Source Voltage**



**Threshold Voltage**



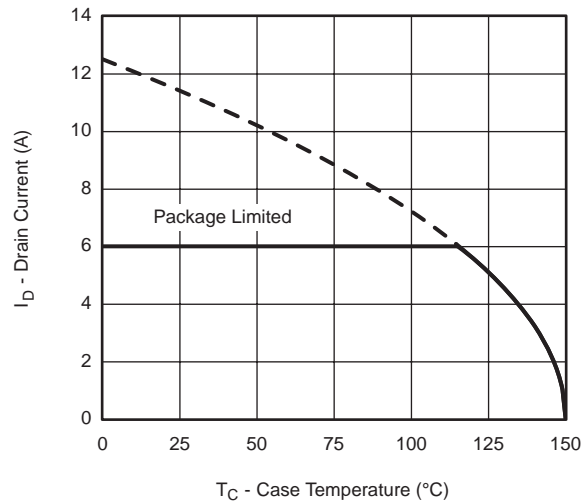
**Single Pulse Power**



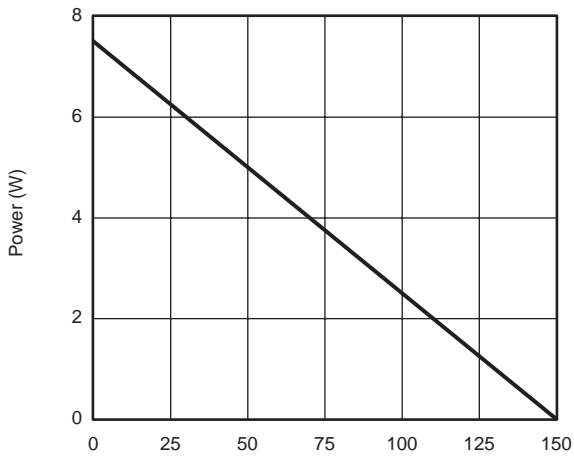
\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

**Safe Operating Area, Junction-to-Ambient**

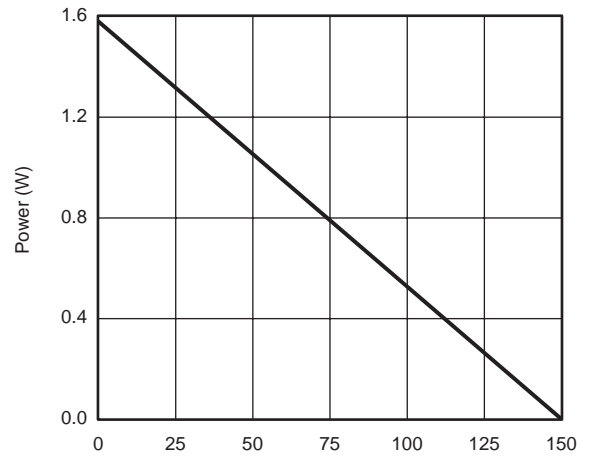
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



**Current Derating\***

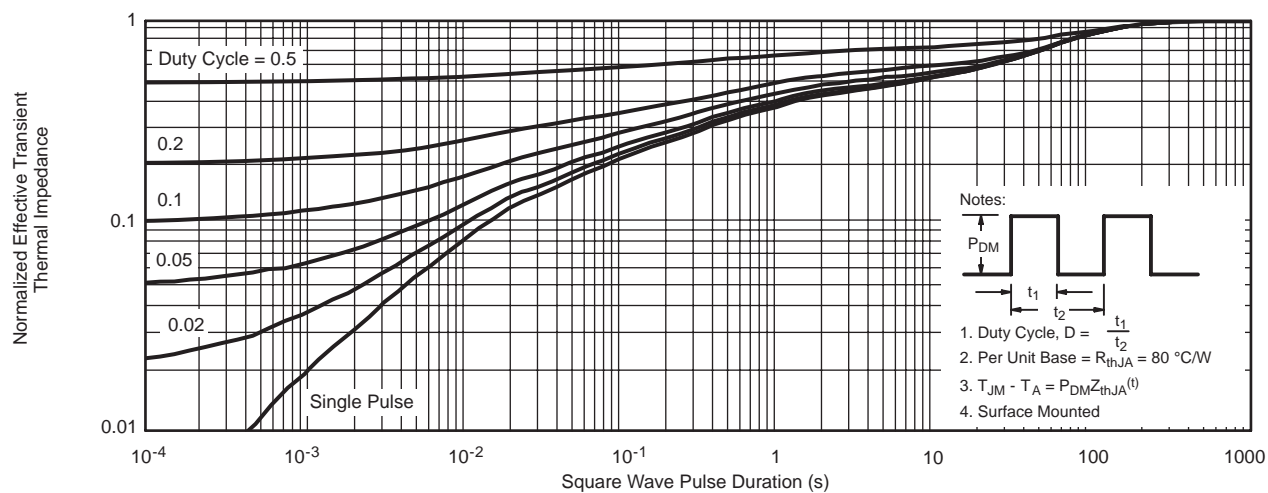
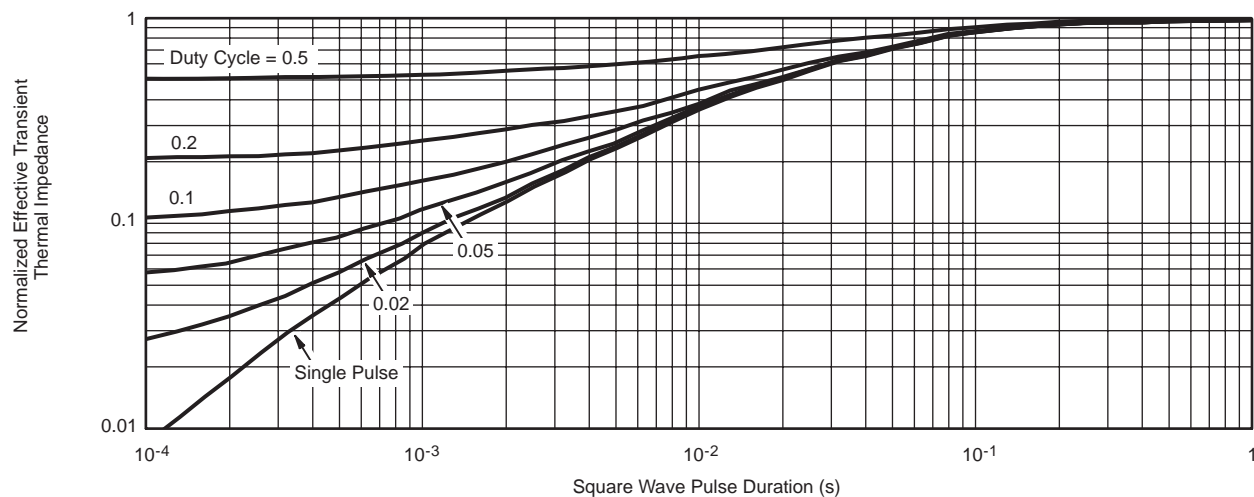


**Power, Junction-to-Case**

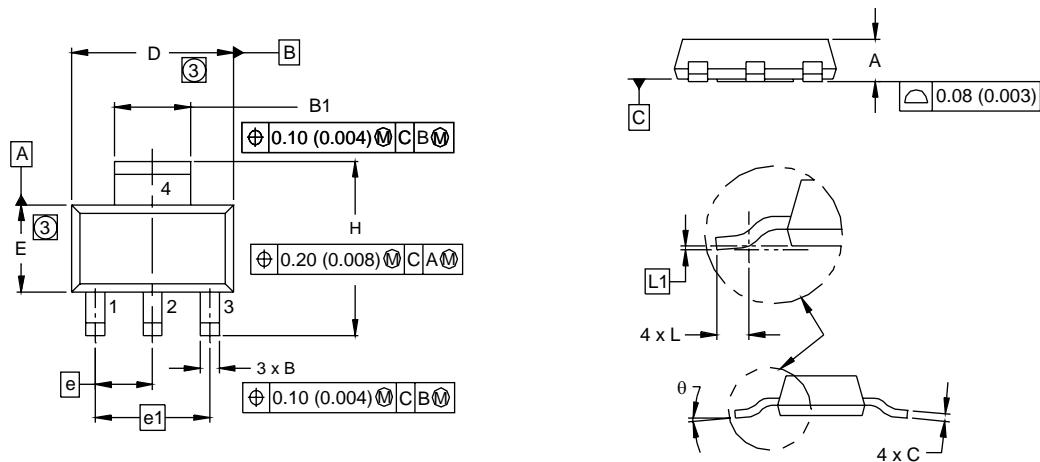


**Power, Junction-to-Ambient**

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

**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	
theta	-	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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