

TMH2102M

P-CHANNEL POWER MOSFET

General Description

The TMH2102M uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

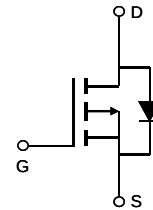
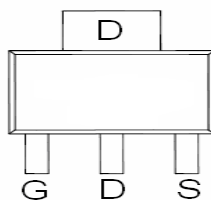
Product Summary

V_{DS}	-100V
I_D (at $V_{GS}=-10V$)	-3A
$R_{DS(ON)}$ (at $V_{GS}=-10V$)	< 0.200 Ω

100% UIS Tested
 100% R_g Tested



SOT-223
Top View



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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	- 100	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 150^\circ\text{C}$)	$T_C = 25^\circ\text{C}$	- 3.0	A
	$T_C = 70^\circ\text{C}$	-2.1	
	$T_A = 25^\circ\text{C}$	- 2 ^{a, b}	
	$T_A = 70^\circ\text{C}$	- 1.6 ^{a, b}	
Pulsed Drain Current	I_{DM}	- 12	
Continuous Source-Drain Diode Current	$T_C = 25^\circ\text{C}$	- 4.9	
	$T_A = 25^\circ\text{C}$	- 2.5 ^{a, b}	
Avalanche Current	I_{AS}	- 15	
Single-Pulse Avalanche Energy	E_{AS}	11.25	mJ
Maximum Power Dissipation	$T_C = 25^\circ\text{C}$	6.5	W
	$T_C = 70^\circ\text{C}$	4.8	
	$T_A = 25^\circ\text{C}$	3.1 ^{a, b}	
	$T_A = 70^\circ\text{C}$	2 ^{a, b}	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	$^\circ\text{C}$

Notes:

- a. Surface mounted on 1" x 1" FR4 board.
- b. $t = 10$ s.

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{a, b}	R_{thJA}	33	40	$^\circ\text{C/W}$
Maximum Junction-to-Foot (Drain)	R_{thJF}	17	21	

Notes:

- a. Surface mounted on 1" x 1" FR4 board.
- b. Maximum under steady state conditions is 80 $^\circ\text{C/W}$.

SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = - 250 μA	- 100			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = - 250 μA		- 165		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			- 6.6		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = - 250 μA	- 2		- 4	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = - 100 V, V _{GS} = 0 V			- 1	μA
		V _{DS} = - 100 V, V _{GS} = 0 V, T _J = 55 °C			- 10	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ - 5 V, V _{GS} = - 10 V	- 8			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = - 10 V, I _D = - 3 A		0.200		Ω
		V _{GS} = - 6 V, I _D = - 2 A		0.230		
Forward Transconductance ^a	g _{fs}	V _{DS} = - 15 V, I _D = 3 A		12		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = - 35 V, V _{GS} = 0 V, f = 1 MHz		819		pF
Output Capacitance	C _{oss}			51		
Reverse Transfer Capacitance	C _{rss}			32		
Total Gate Charge	Q _g	V _{DS} = - 50 V, V _{GS} = - 10 V, I _D = - 3 A		17.5	32	nC
Gate-Source Charge	Q _{gs}	V _{DS} = - 50 V, V _{GS} = - 6 V, I _D = - 3 A		13.2	25	
Gate-Drain Charge	Q _{gd}			3.4		
				6.4		
Gate Resistance	R _g	f = 1 MHz		6.1	9.2	Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = - 50 V, R _L = 25 Ω I _D ≅ - 3 A, V _{GEN} = - 6 V, R _g = 1 Ω		10	20	ns
Rise Time	t _r			55	95	
Turn-Off DelayTime	t _{d(off)}			20	40	
Fall Time	t _f			15	30	
Turn-On Delay Time	t _{d(on)}	V _{DD} = - 50 V, R _L = 25 Ω I _D ≅ - 3 A, V _{GEN} = - 10 V, R _g = 1 Ω		11	18	
Rise Time	t _r			18	32	
Turn-Off DelayTime	t _{d(off)}			32	58	
Fall Time	t _f			20	35	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			- 13	A
Pulse Diode Forward Current ^a	I _{SM}				- 15	
Body Diode Voltage	V _{SD}	I _S = - 3 A		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = - 3 A, di/dt = 100 A/μs, T _J = 25 °C		65	90	ns
Body Diode Reverse Recovery Charge	Q _{rr}			180	270	nC
Reverse Recovery Fall Time	t _a			45		ns
Reverse Recovery Rise Time	t _b			20		

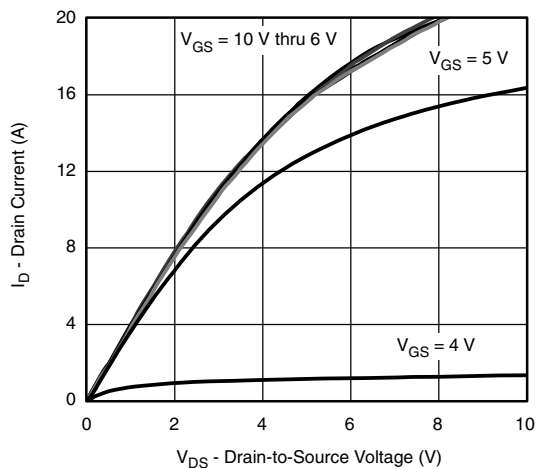
Notes:

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

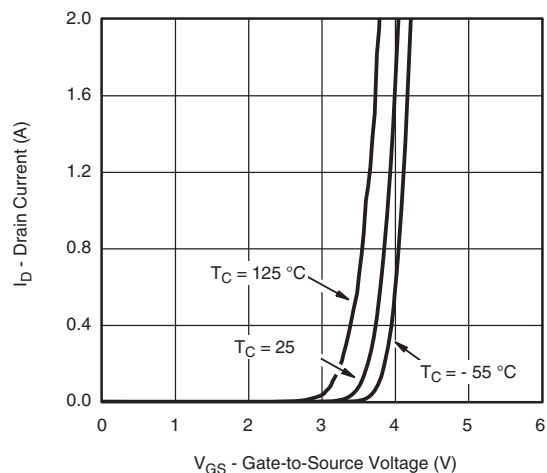
b. Guaranteed by design, not subject to production testing.

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.

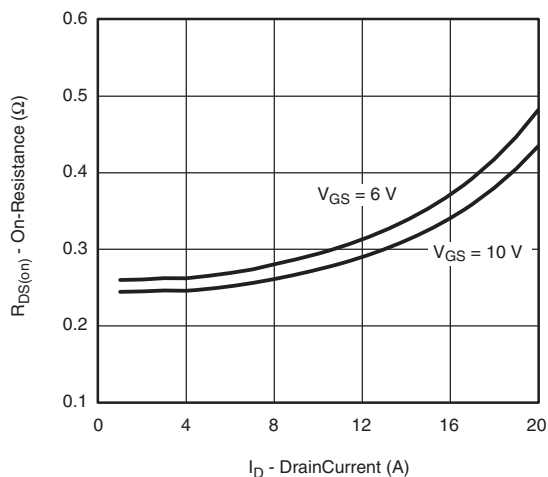
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



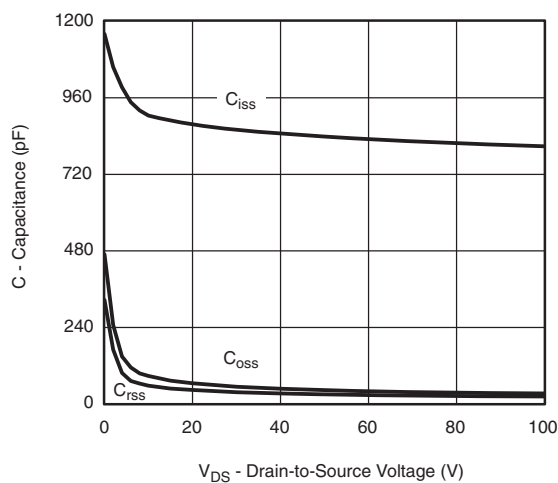
Output Characteristics



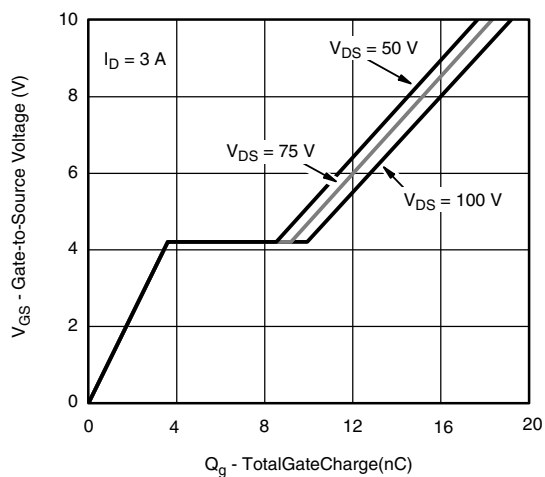
Transfer Characteristics



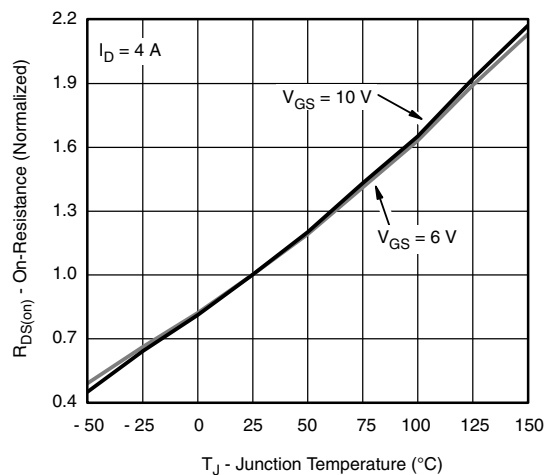
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

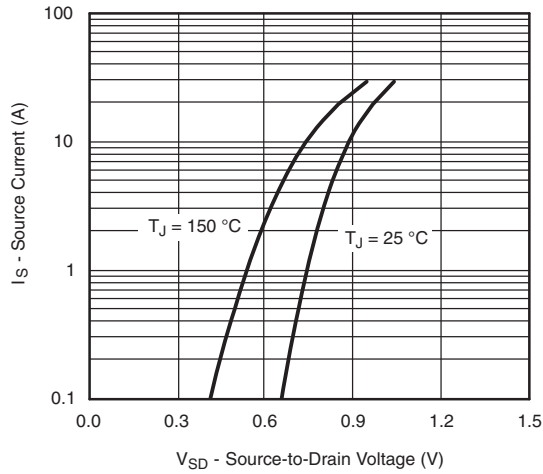


Gate Charge

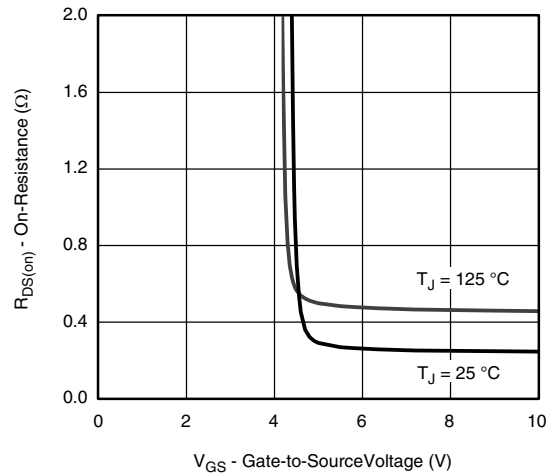


On-Resistance vs. Junction Temperature

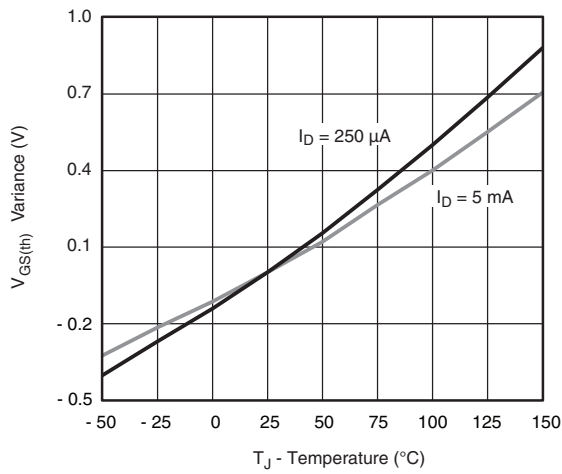
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



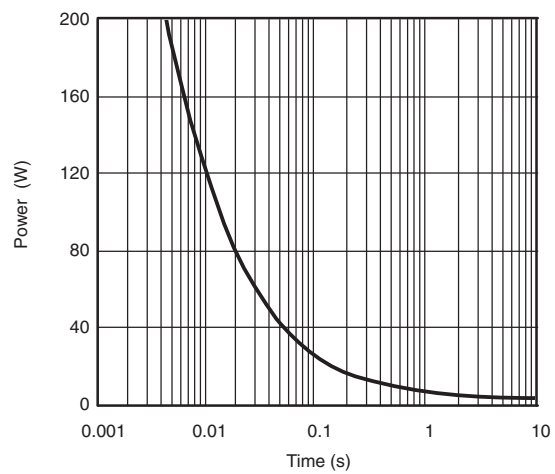
Source-Drain Diode Forward Voltage



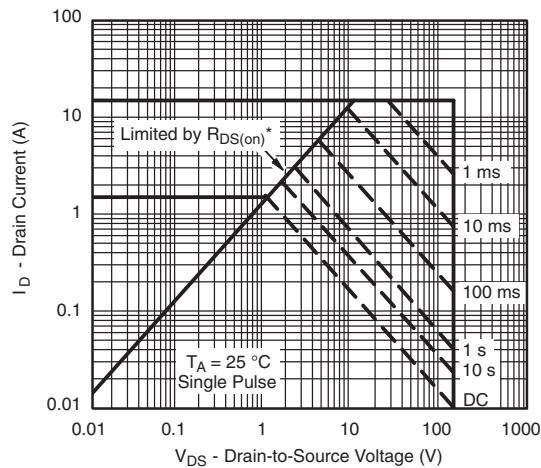
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



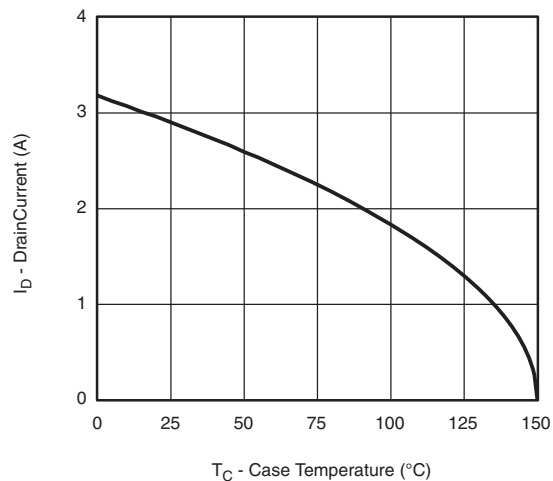
Single Pulse Power, Junction-to-Ambient



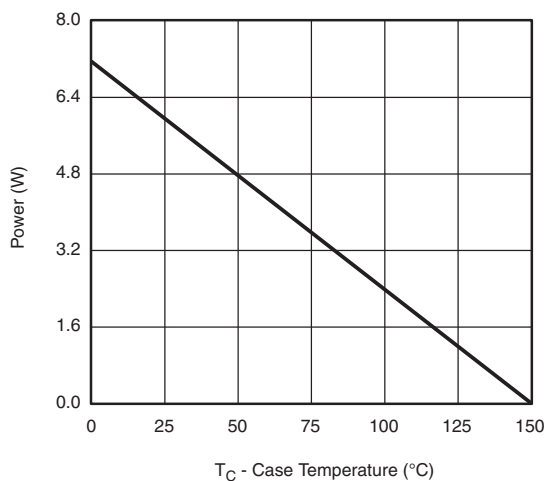
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

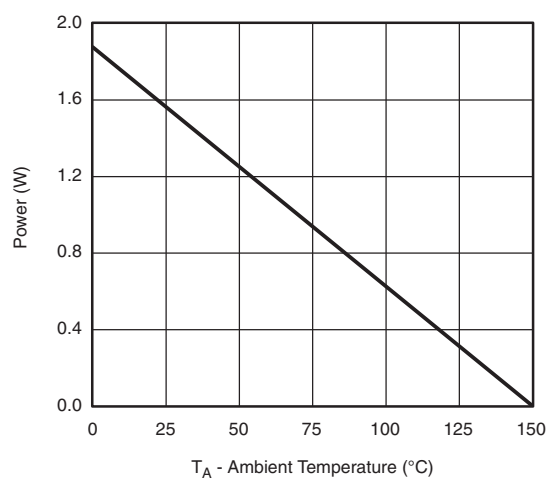
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating*



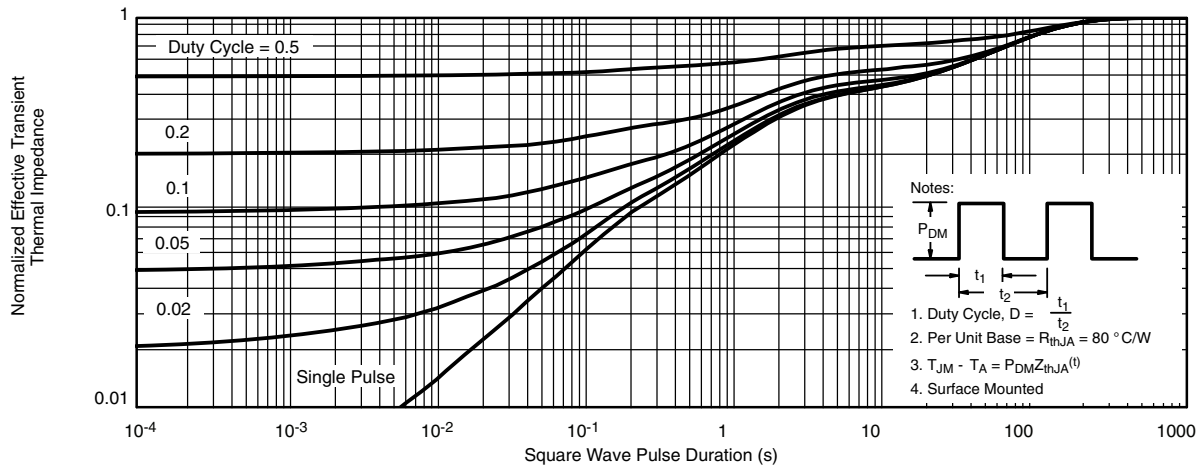
Power, Junction-to-Foot



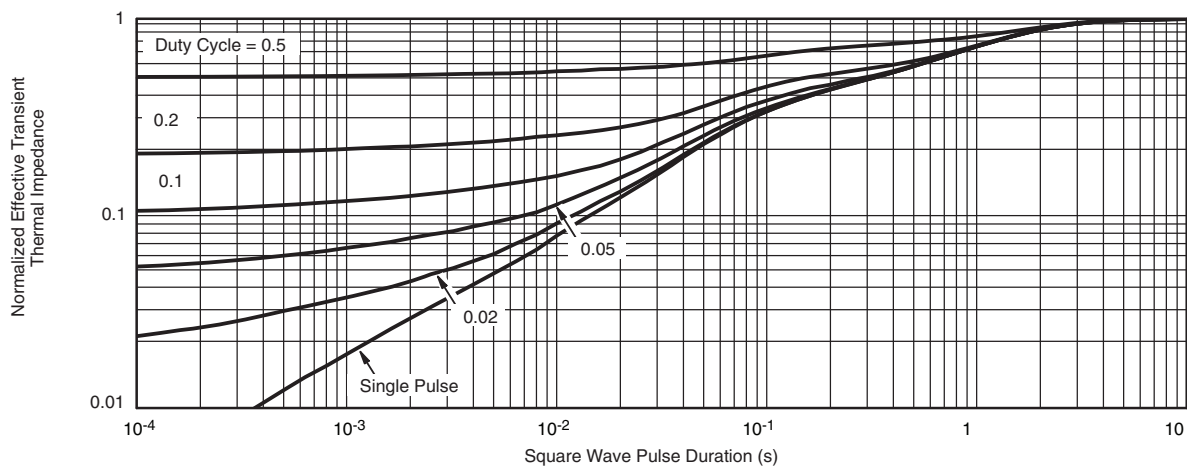
Power, Junction-to-Ambient

* 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)

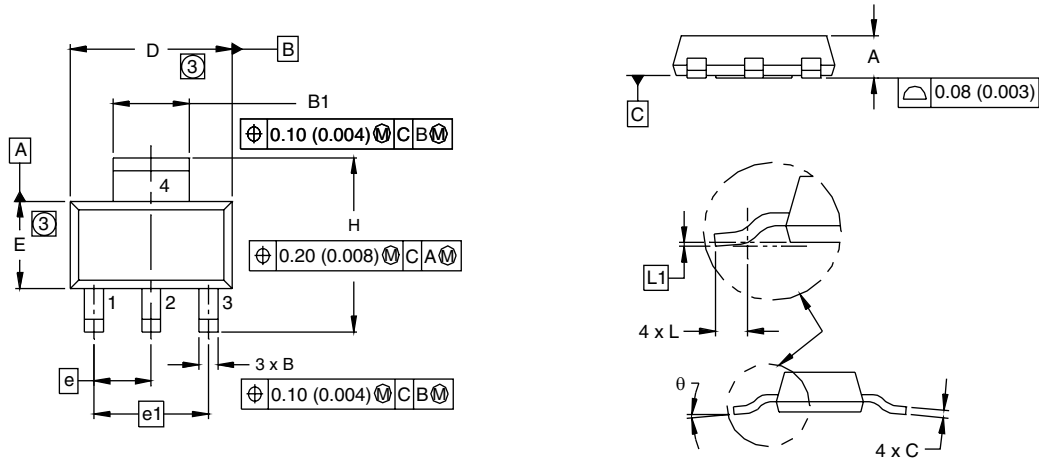


Normalized Thermal Transient Impedance, Junction-to-Ambient



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	
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.