

MMFTP2456

P-Channel 40 V (D-S) MOSFET

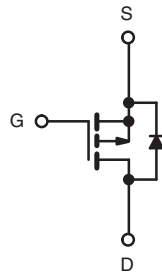
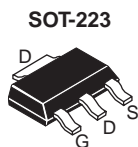
PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^d	Q_g (Typ.)
- 40	0.056 at $V_{GS} = - 10$ V	- 6.2	9.8 nC
	0.062 at $V_{GS} = - 4.5$ V	- 5.1	

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

APPLICATIONS

- Load Switches, Adaptor Switch
- Notebook PCs



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_A = 25$ °C, unless otherwise noted)				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	- 40	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}	$t \leq 10$ 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.

MMFTP2456

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}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	- 40			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}	$V_{DS} = -40\text{ V}, V_{GS} = 0\text{ V}$			- 1	μA
		$V_{DS} = -40\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			- 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	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -5\text{ A}$		0.056		Ω
		$V_{GS} = -4.5\text{ V}, I_D = -4\text{ A}$		0.062		
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			

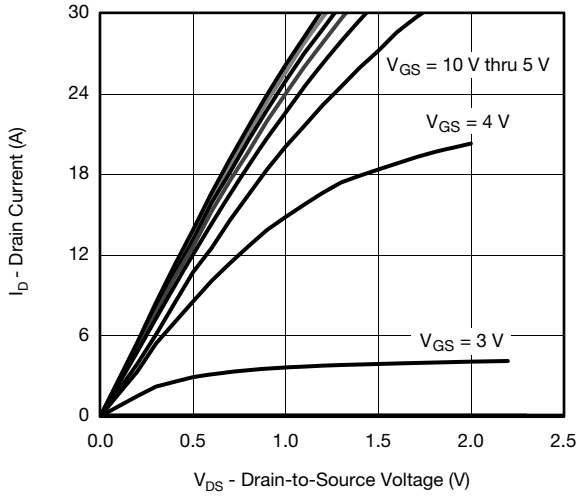
Notes:

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

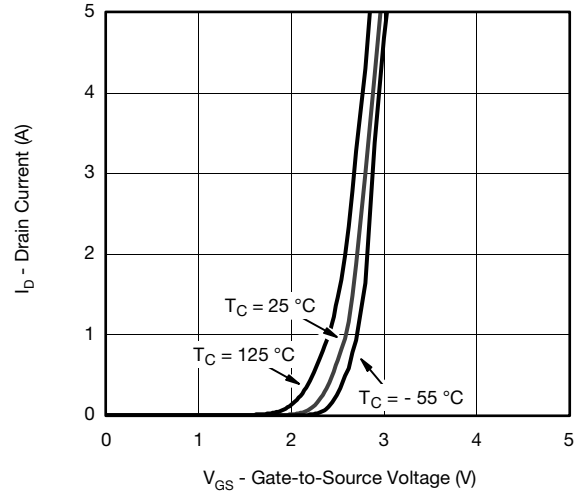
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

MMFTP2456

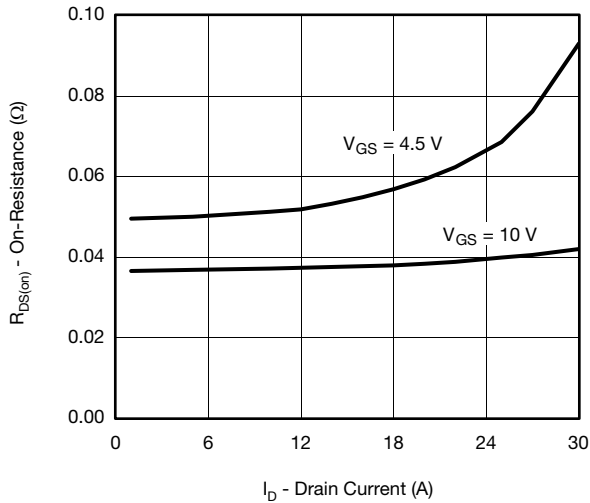
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



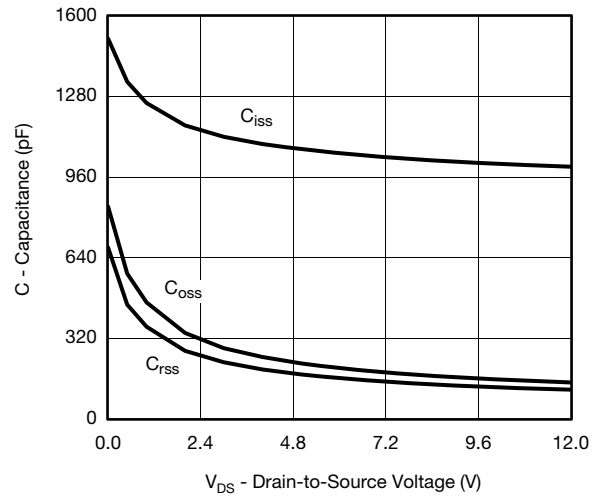
Output Characteristics



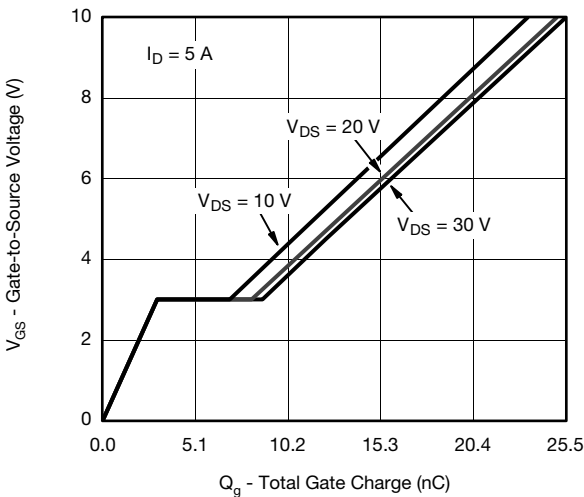
Transfer Characteristics



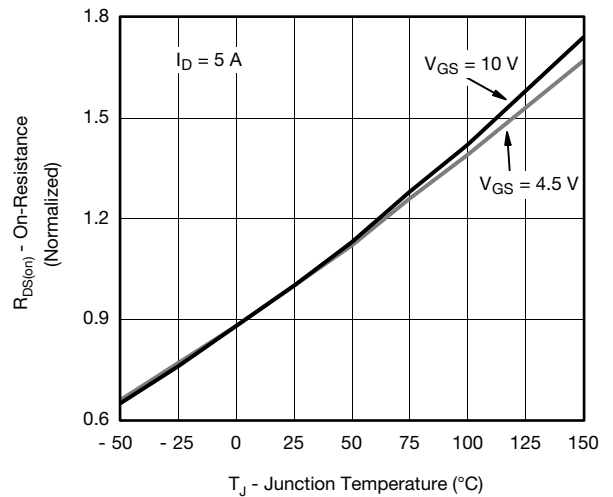
On-Resistance vs. Drain Current



Capacitance



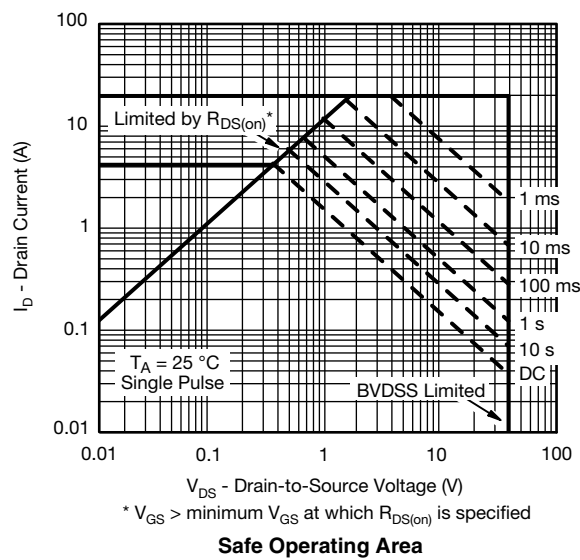
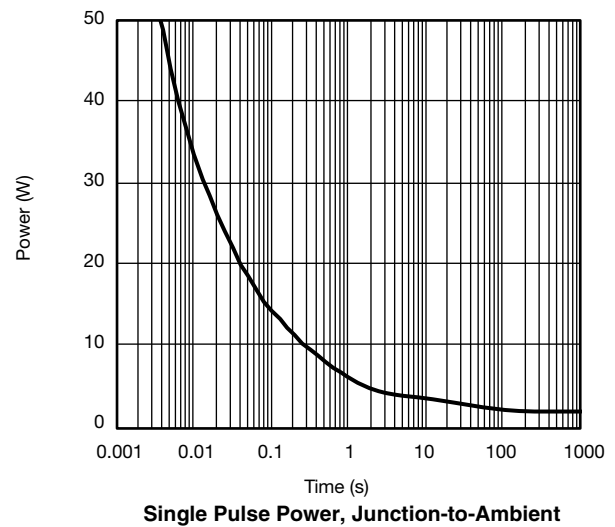
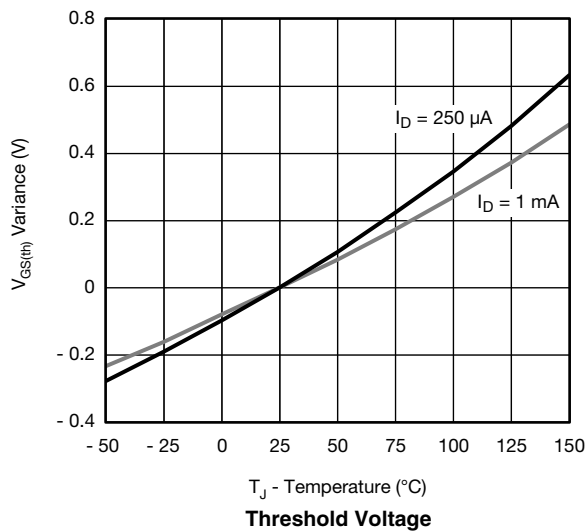
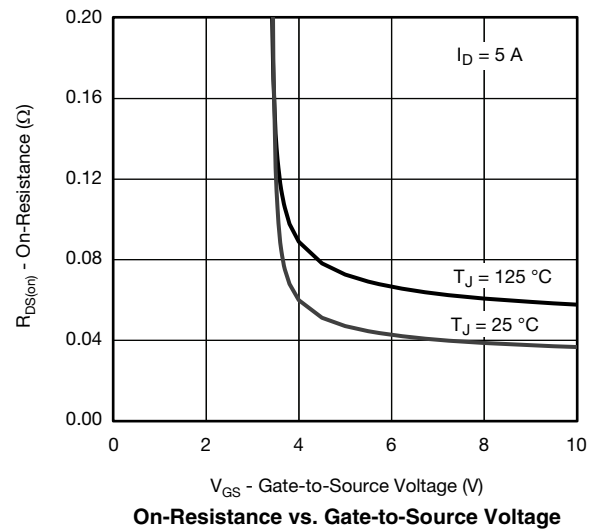
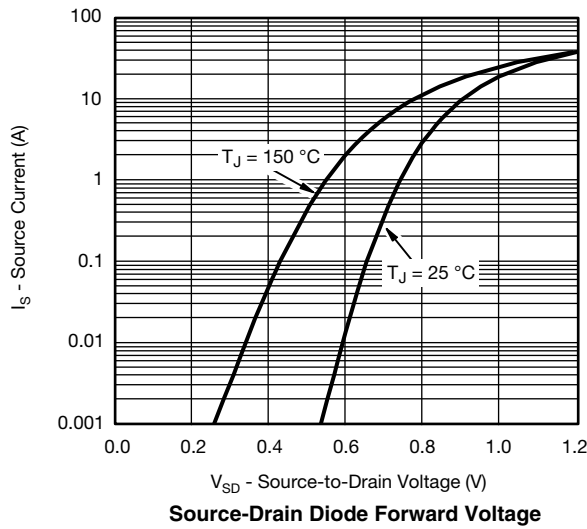
Gate Charge



On-Resistance vs. Junction Temperature

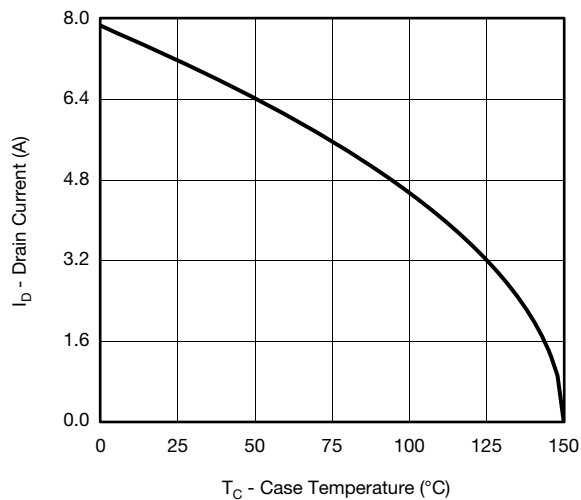
MMFTP2456

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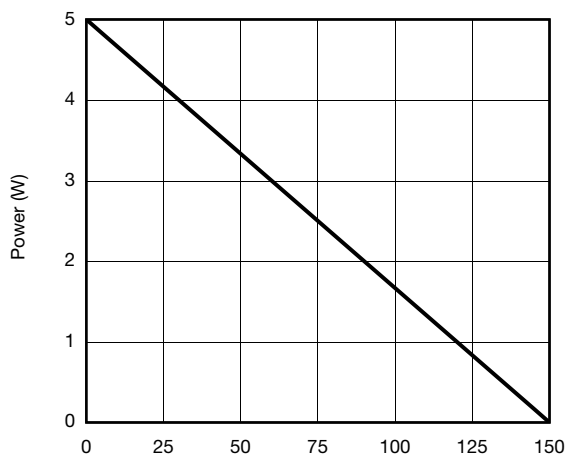


MMFTP2456

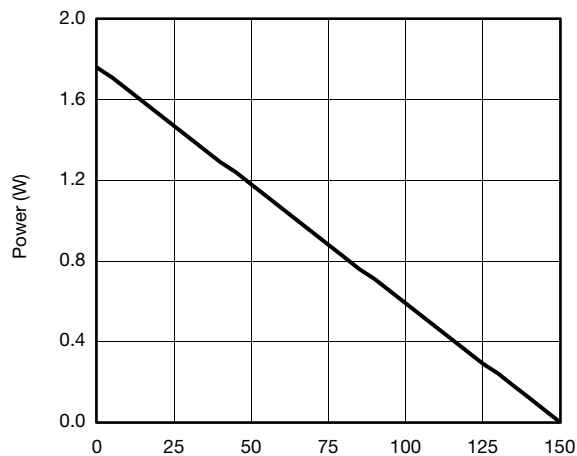
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating*



Power, Junction-to-Foot

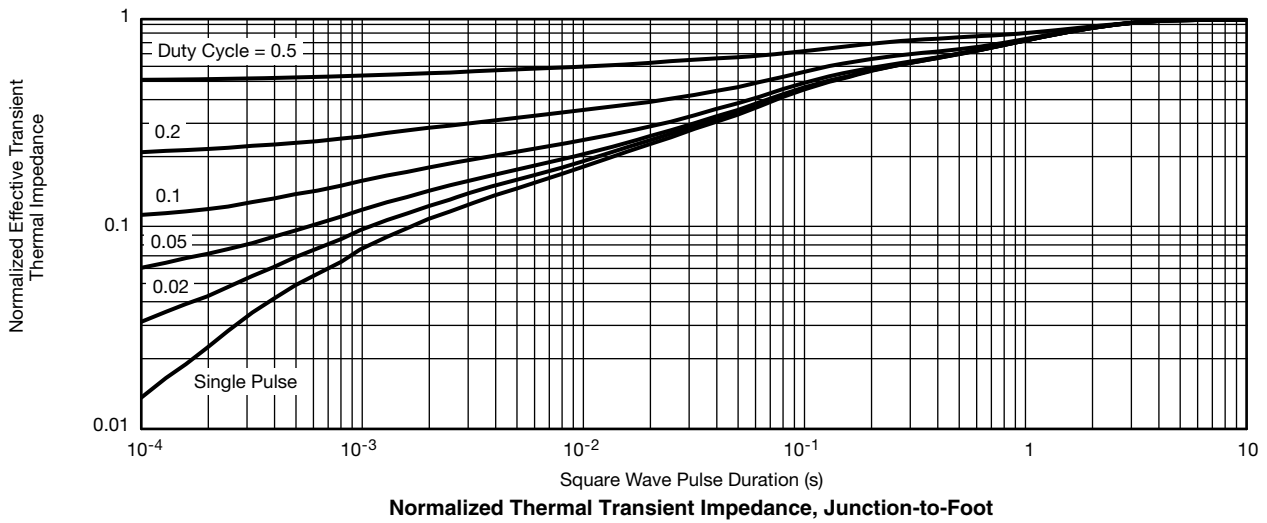
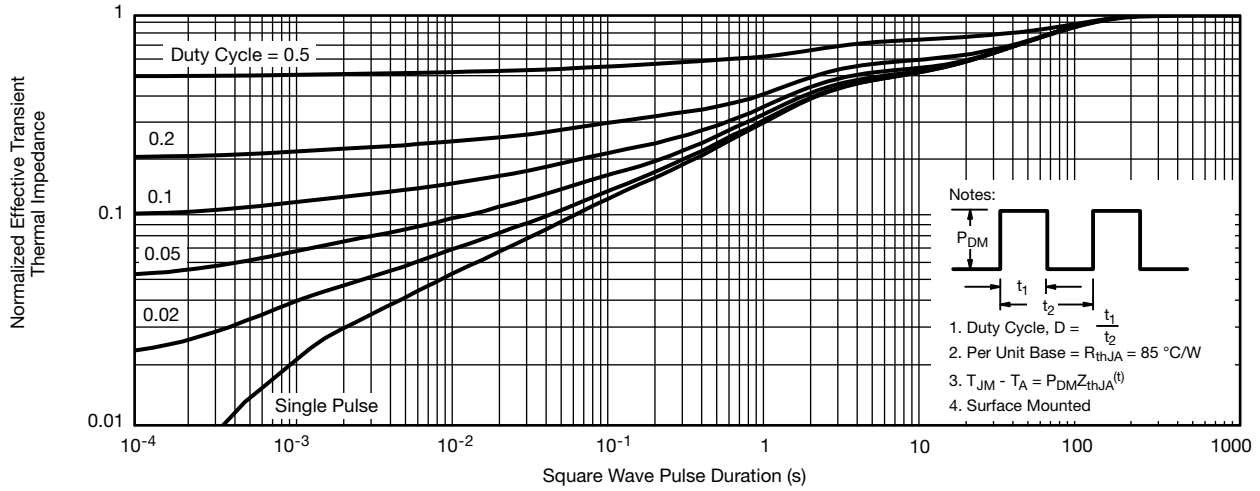


Power Derating, Junction-to-Ambient

* 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.

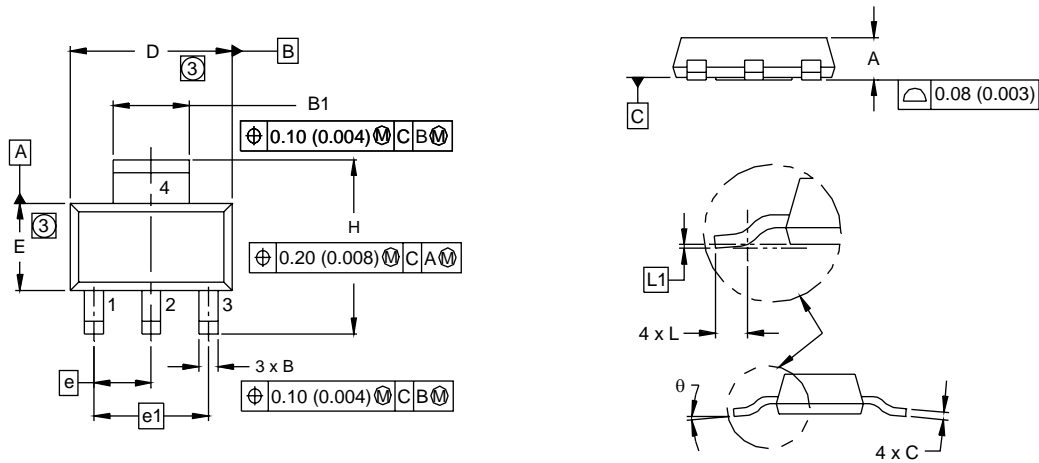
MMFTP2456

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



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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.