

P-Channel 20 V (D-S) MOSFET



RoHS
COMPLIANT

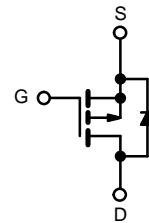
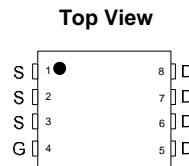
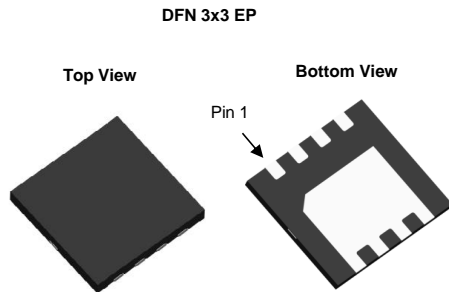
PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω) (Max.)	I _D (A)	Q _g (Typ.)
- 20	0.006 at V _{GS} = - 4.5 V	- 50 ^a	93 nC
	0.007 at V _{GS} = - 2.5 V	- 37 ^a	

FEATURES

- DT-Trench Power MOSFET
- Thermally Enhanced DFN3X3 Package
- Small Footprint Area
- Low On-Resistance

APPLICATIONS

- Load Switch, PA Switch, and Battery Switch for Portable Devices



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C, unless otherwise noted)			
Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V _{DS}	- 20	V
Gate-Source Voltage	V _{GS}	± 12	
Continuous Drain Current (T _J = 150 °C)	I _D	T _C = 25 °C	- 50 ^a
		T _C = 70 °C	- 39 ^a
		T _A = 25 °C	- 31 ^{b, c}
		T _A = 70 °C	- 25 ^{b, c}
Pulsed Drain Current (t = 300 μs)	I _{DM}	- 200	A
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	
		T _A = 25 °C	- 29 ^{b, c}
Maximum Power Dissipation	P _D	T _C = 25 °C	89
		T _C = 70 °C	33
		T _A = 25 °C	6.5 ^{b, c}
		T _A = 70 °C	4.2 ^{b, c}
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 150	°C
Soldering Recommendations (Peak Temperature) ^{d, e}		260	

THERMAL RESISTANCE RATINGS				
Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{b, f}	R _{thJA}	18	26	°C/W
Maximum Junction-to-Case (Drain)	R _{thJC}	1.3	1.5	

Notes:

- Package limited.
- Surface mounted on 1" x 1" FR4 board.
- t = 5 s.
- See solder profile The DFN3X3 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.
- Maximum under steady state conditions is 80 °C/W.

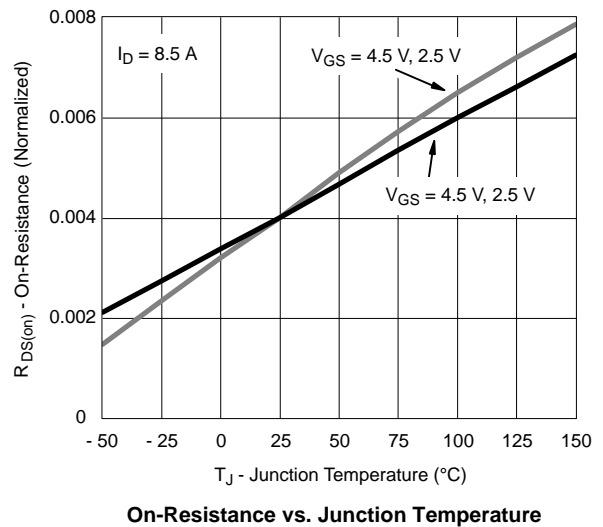
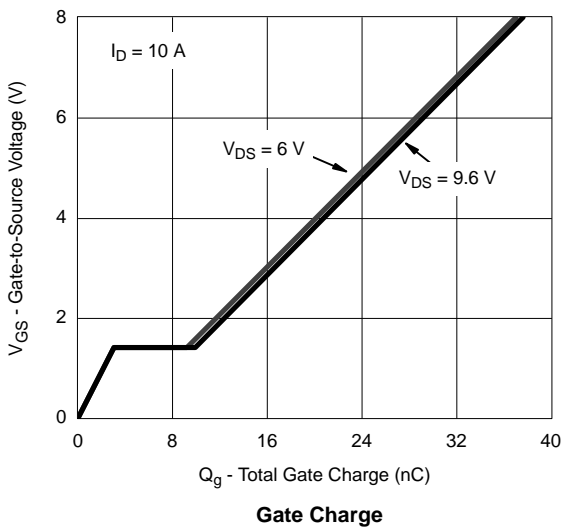
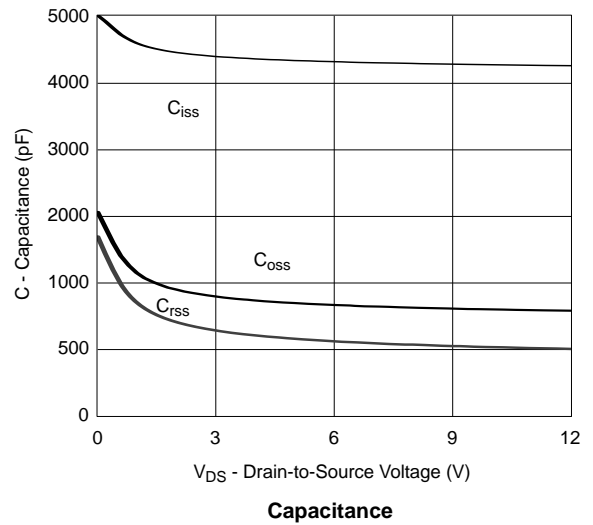
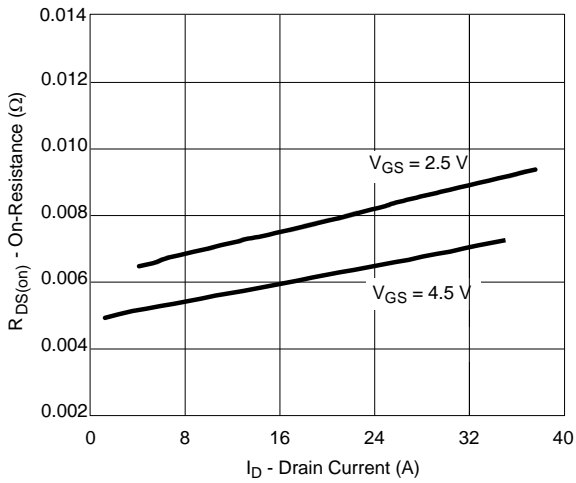
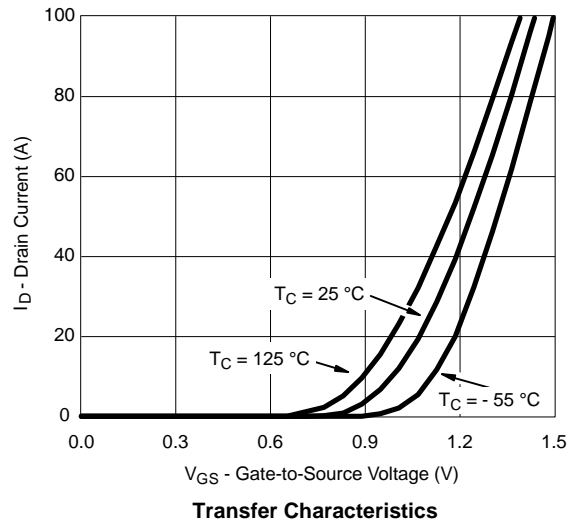
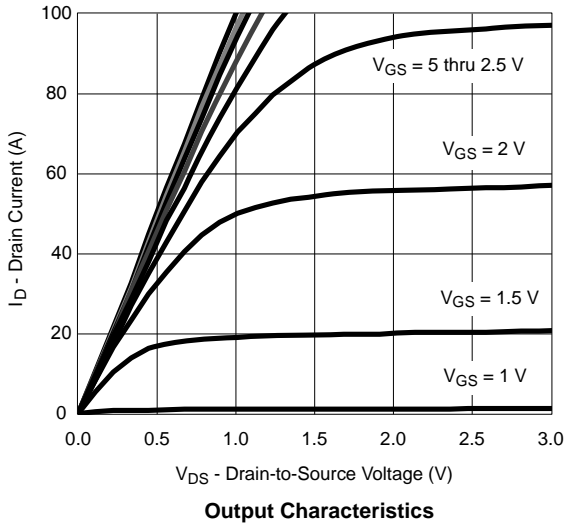
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		-11		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			2.7		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-0.8		-2	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -12\text{ V}, V_{GS} = 0\text{ V}$			-1	μA
		$V_{DS} = -12\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			-10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq -5\text{ V}, V_{GS} = -4.5\text{ V}$	-20			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -5.3\text{ A}$		0.006	0.007	Ω
		$V_{GS} = -4.5\text{ V}, I_D = -8.1\text{ A}$		0.0065	0.008	
		$V_{GS} = -2.5\text{ V}, I_D = -5.3\text{ A}$		0.007	0.008	
		$V_{GS} = -2.5\text{ V}, I_D = -6\text{ A}$		0.0054	0.009	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10\text{ V}, I_D = -18.5\text{ A}$		94		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		4800		pF
Output Capacitance	C_{oss}			850		
Reverse Transfer Capacitance	C_{rss}			590		
Total Gate Charge	Q_g	$V_{DS} = -6\text{ V}, V_{GS} = -8\text{ V}, I_D = -10\text{ A}$		58	97	nC
		$V_{DS} = -6\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -10\text{ A}$		33	65	
Gate-Source Charge	Q_{gs}			7		
Gate-Drain Charge	Q_{gd}			15.5		
Gate Resistance	R_g	$f = 1\text{ MHz}$		5		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -6\text{ V}, R_L = 0.75\text{ }\Omega$ $I_D \cong -8\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$		20	30	ns
Rise Time	t_r			40	60	
Turn-Off Delay Time	$t_{d(off)}$			65	100	
Fall Time	t_f			40	60	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -6\text{ V}, R_L = 0.75\text{ }\Omega$ $I_D \cong -8\text{ A}, V_{GEN} = -8\text{ V}, R_g = 1\text{ }\Omega$		10	15	
Rise Time	t_r			12	20	
Turn-Off Delay Time	$t_{d(off)}$			70	105	
Fall Time	t_f			40	60	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			-50	A
Pulse Diode Forward Current	I_{SM}				200	
Body Diode Voltage	V_{SD}	$I_S = -8\text{ A}, V_{GS} = 0\text{ V}$		-0.57	-1.1	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -8\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		40	60	ns
Body Diode Reverse Recovery Charge	Q_{rr}			20	30	nC
Reverse Recovery Fall Time	t_a			14		ns
Reverse Recovery Rise Time	t_b			26		

Notes:

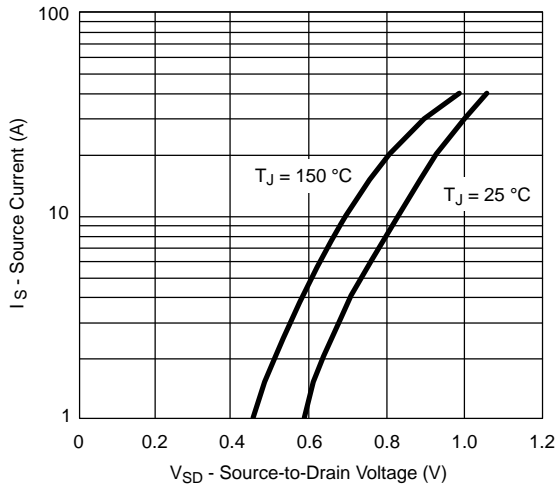
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 b. Guaranteed by design, not subject to production testing.

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.

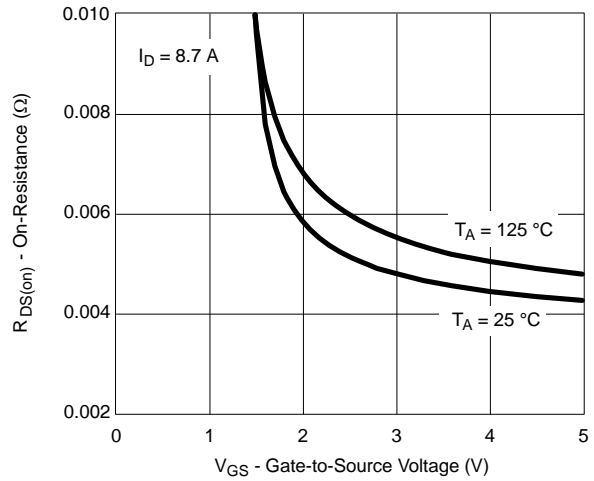
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



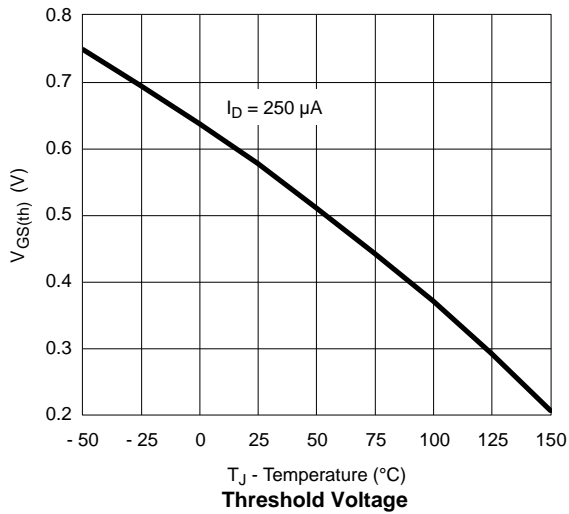
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



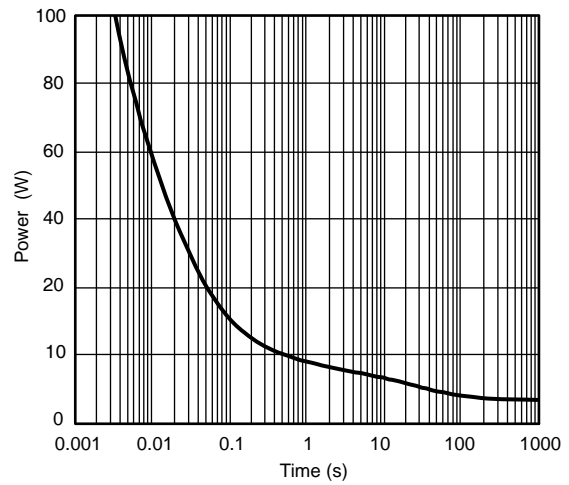
Source-Drain Diode Forward Voltage



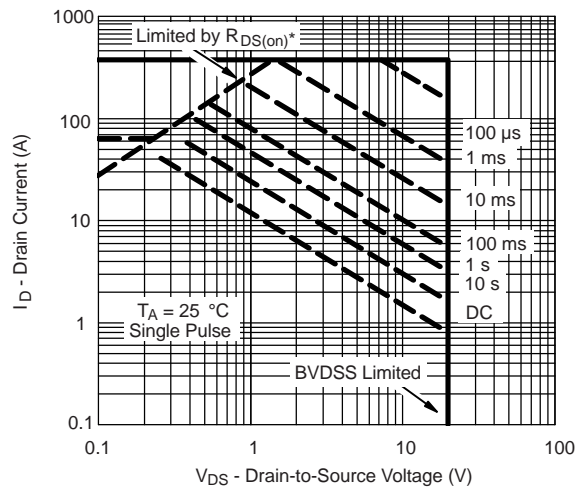
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

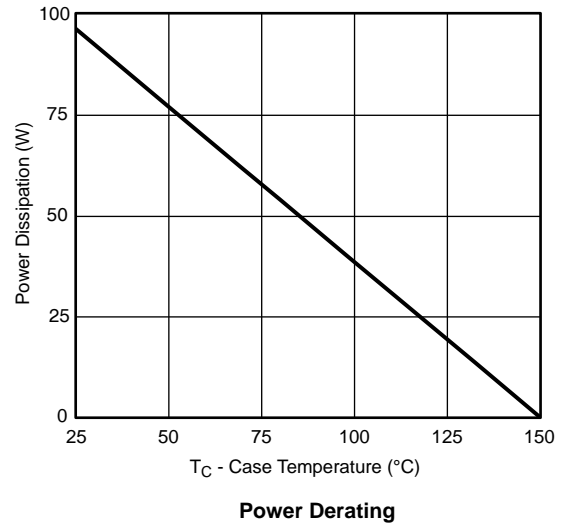
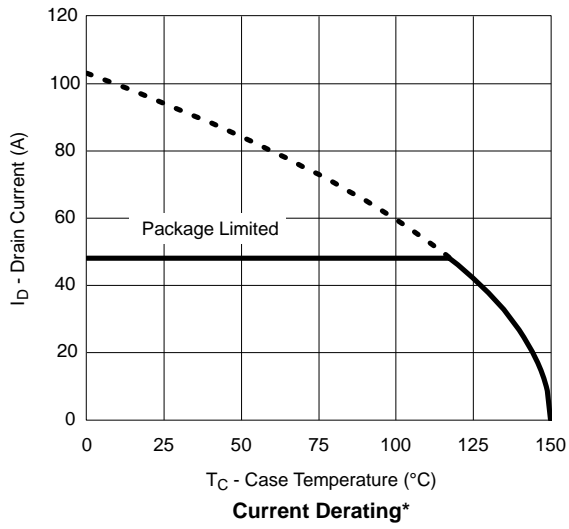


Single Pulse Power, Junction-to-Ambient



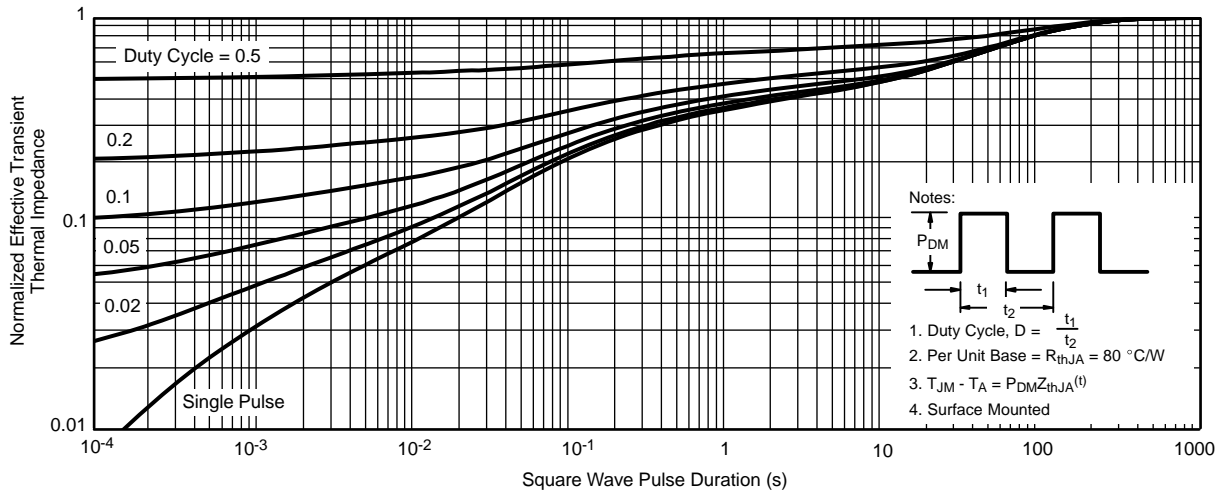
Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

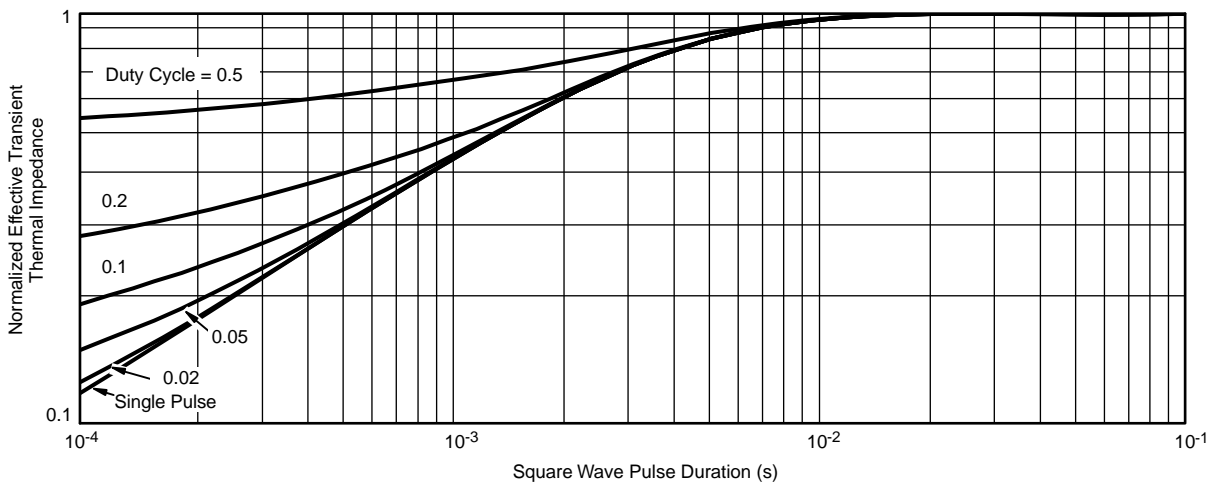


* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

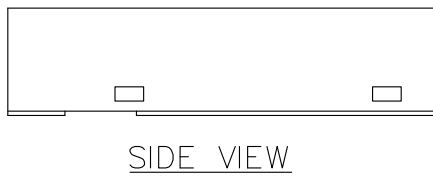
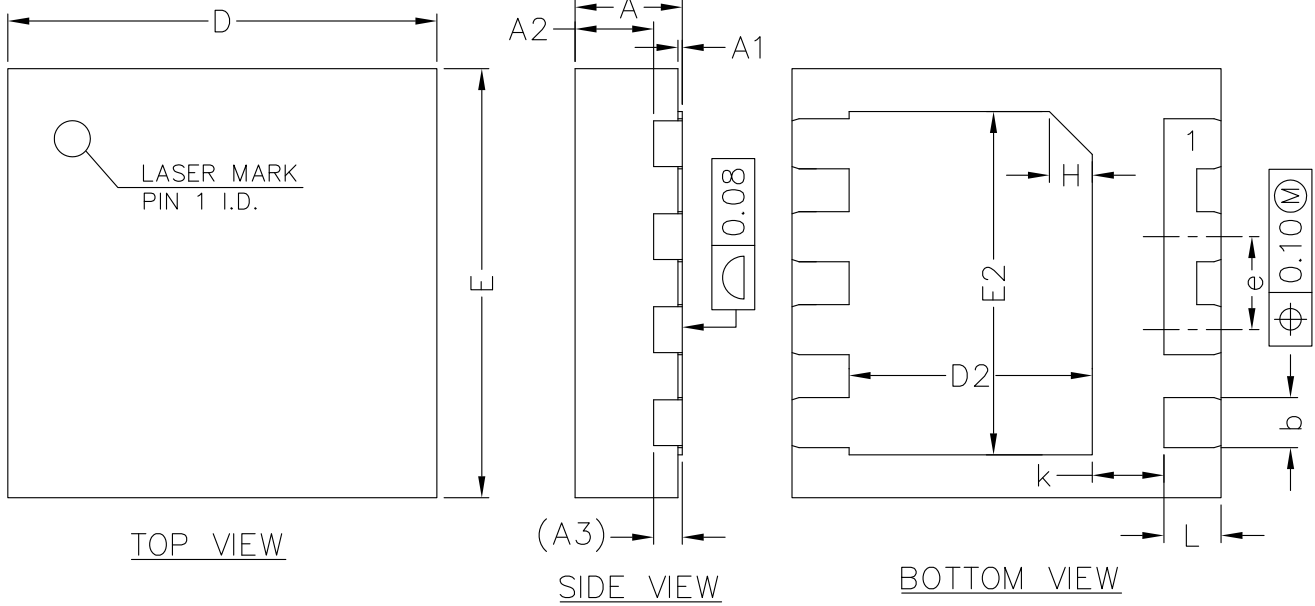
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A2	0.50	0.55	0.60
A3	0.20REF		
b	0.30	0.35	0.40
D	2.90	3.00	3.10
E	2.90	3.00	3.10
D2	1.60	1.70	1.80
E2	2.30	2.40	2.50
e	0.55	0.65	0.75
K	0.40	0.50	0.60
L	0.35	0.40	0.45

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