

N-Channel 60-V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^a	Q _g (Typ.)
60	0.075 at V _{GS} = 10 V	6	13 nC
	0.085 at V _{GS} = 4.5 V	6	

FEATURES

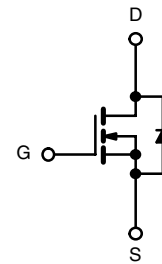
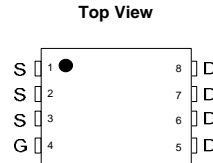
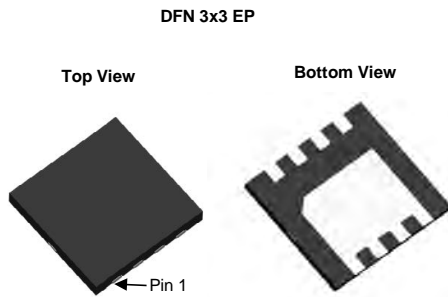
- Halogen-free According to IEC 61249-2-21 Available
- TrenchFET[®] Power MOSFET
- Low Thermal Resistance PowerPAK[®] Package with Small Size and Low 1.07 mm Profile



RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- CCFL Inverter
- Class-D Amp



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted						
Parameter	Symbol	Limit	Unit			
Drain-Source Voltage	V _{DS}	60	V			
Gate-Source Voltage	V _{GS}	± 20				
Continuous Drain Current (T _J = 150 °C)	I _D	T _C = 25 °C	6 ^a			
		T _C = 70 °C	6 ^a			
		T _A = 25 °C	5.4 ^{b, c}			
		T _A = 70 °C	4.3 ^{b, c}			
Pulsed Drain Current (10 μs Width)	I _{DM}	20	A			
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			6 ^a	
		T _A = 25 °C			2.7 ^{b, c}	
Avalanche Current	I _{AS}	11	mJ			
Single-Pulse Avalanche Energy	E _{AS}	6.1				
Maximum Power Dissipation	P _D	T _C = 25 °C	19.8			
		T _C = 70 °C	12.7			
		T _A = 25 °C	3.2 ^{b, c}			
		T _A = 70 °C	2.1 ^{b, c}			
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 ^{b, f}	R _{thJA}	31	39	°C/W
Maximum Junction-to-Case (Drain)	R _{thJC}	5	6.3	

Notes:

- Package limited.
- Surface Mounted on 1" x 1" FR4 board.
- t = 10 s.
- The DFN 3x3 EP 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 81 °C/W.

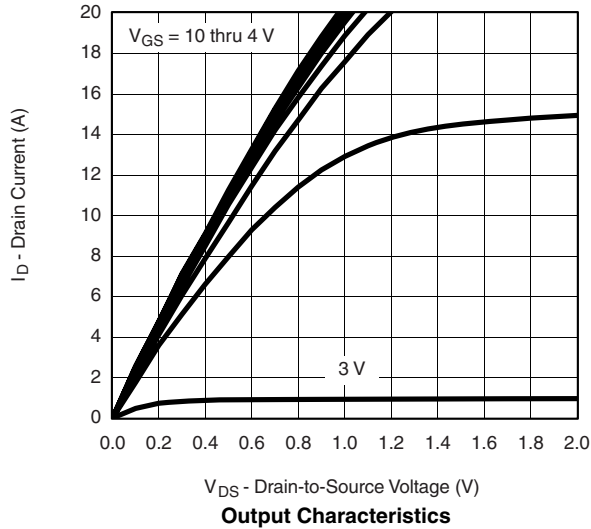
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	60			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		55		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			-6		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1		3	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$			100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$			10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	20			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 5.4\text{ A}$		0.075		Ω
		$V_{GS} = 4.5\text{ V}, I_D = 4.8\text{ A}$		0.085		
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 5.4\text{ A}$		15		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		665		pF
Output Capacitance	C_{oss}			75		
Reverse Transfer Capacitance	C_{rss}			40		
Total Gate Charge	Q_g	$V_{DS} = 30\text{ V}, V_{GS} = 10\text{ V}, I_D = 5.4\text{ A}$		13	20	nC
		$V_{DS} = 30\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 5.4\text{ A}$		6	9	
Gate-Source Charge	Q_{gs}	$V_{DS} = 30\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 5.4\text{ A}$		2.3		
Gate-Drain Charge	Q_{gd}			2.6		
Gate Resistance	R_g	$f = 1\text{ MHz}$		2		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 7\text{ }\Omega$ $I_D \cong 4.3\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		15	25	ns
Rise Time	t_r			65	100	
Turn-Off Delay Time	$t_{d(off)}$			15	25	
Fall Time	t_f			10	15	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 7\text{ }\Omega$ $I_D \cong 4.3\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		10	15	
Rise Time	t_r			15	25	
Turn-Off Delay Time	$t_{d(off)}$			20	30	
Fall Time	t_f			10	15	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			6	A
Pulse Diode Forward Current	I_{SM}				20	
Body Diode Voltage	V_{SD}	$I_S = 1.7\text{ A}, V_{GS} = 0\text{ V}$		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 4.3\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		30	60	ns
Body Diode Reverse Recovery Charge	Q_{rr}			32	50	nC
Reverse Recovery Fall Time	t_a			25		ns
Reverse Recovery Rise Time	t_b			5		

Notes:

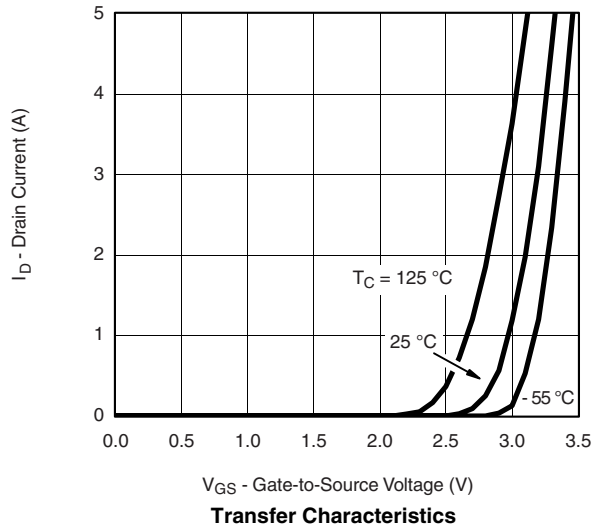
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 b. Guaranteed by design, not subject to production testing.

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.

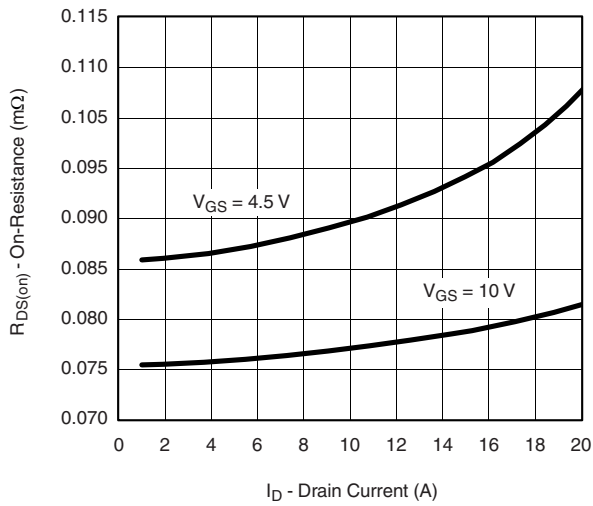
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



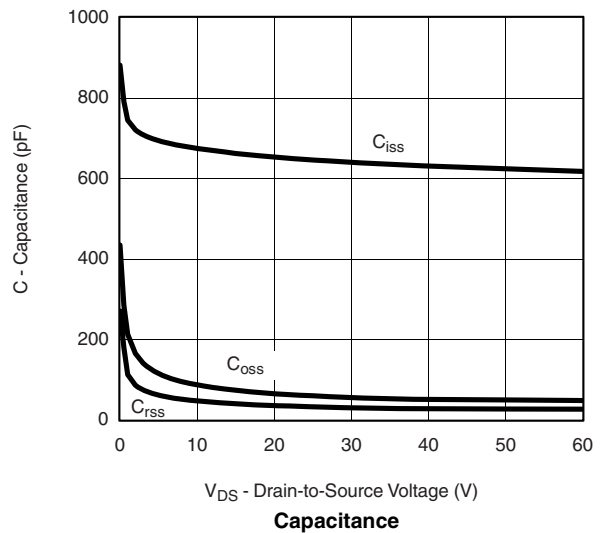
Output Characteristics



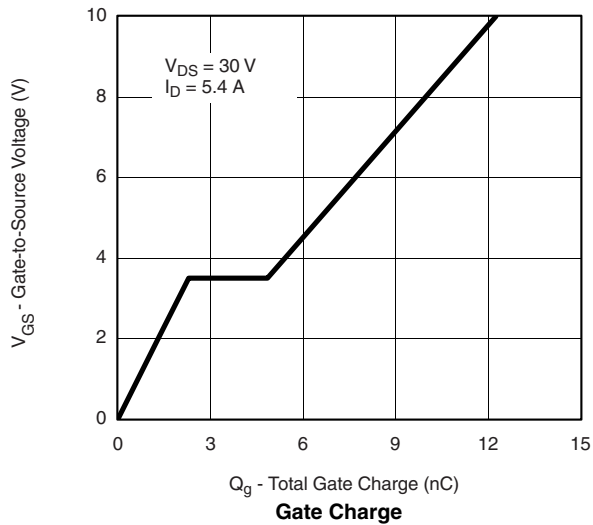
Transfer Characteristics



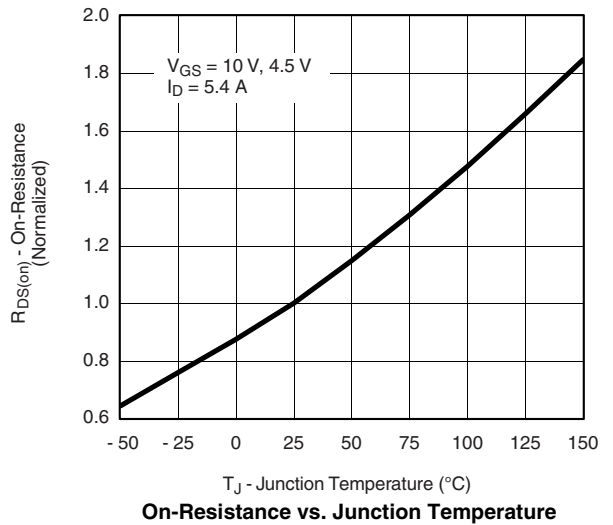
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

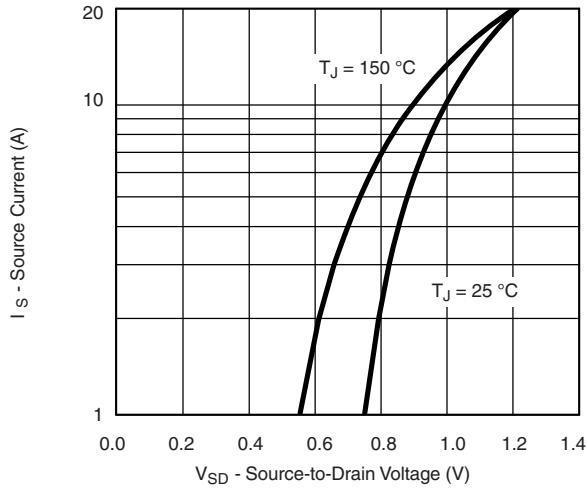


Gate Charge

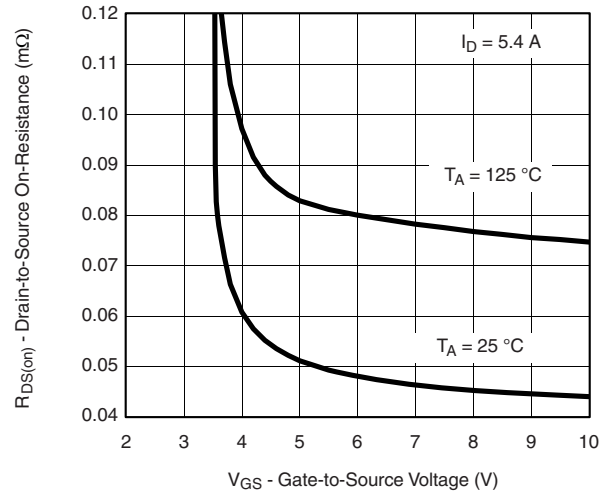


On-Resistance vs. Junction Temperature

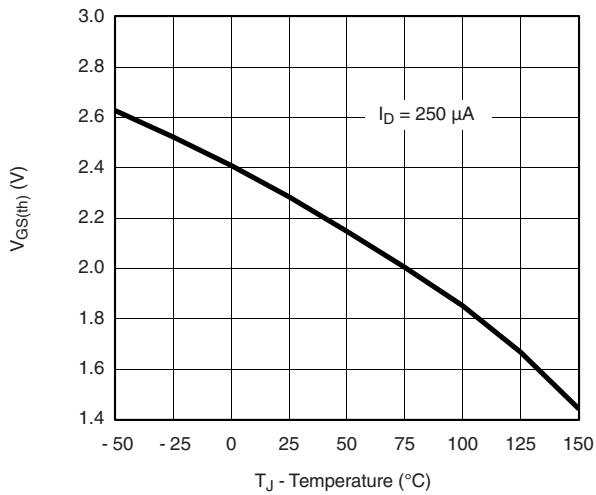
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



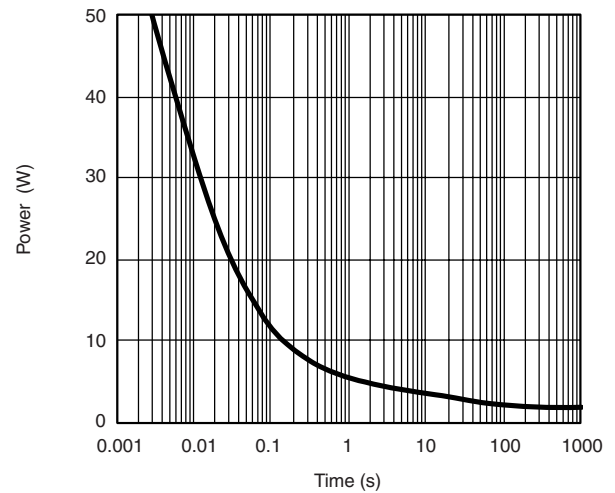
Source-Drain Diode Forward Voltage



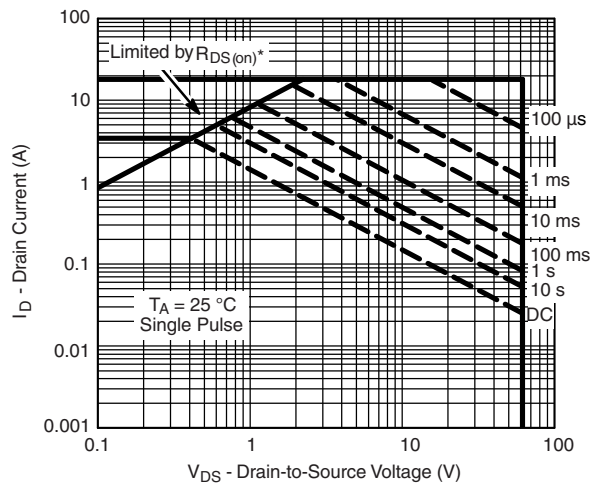
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



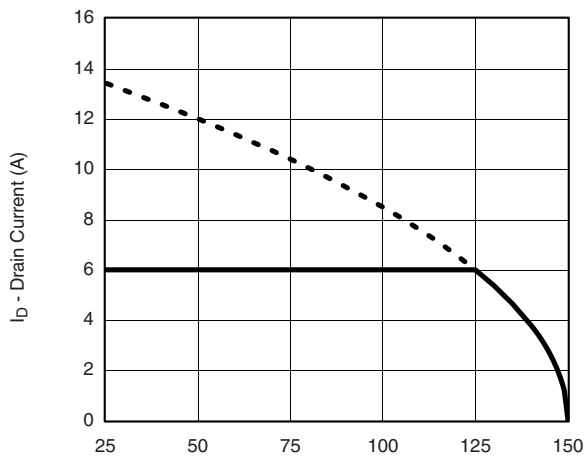
Single Pulse Power, Junction-to-Ambient



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

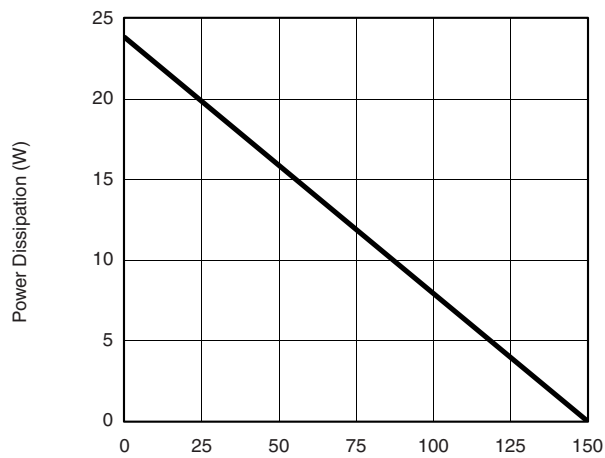
Safe Operating Area

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



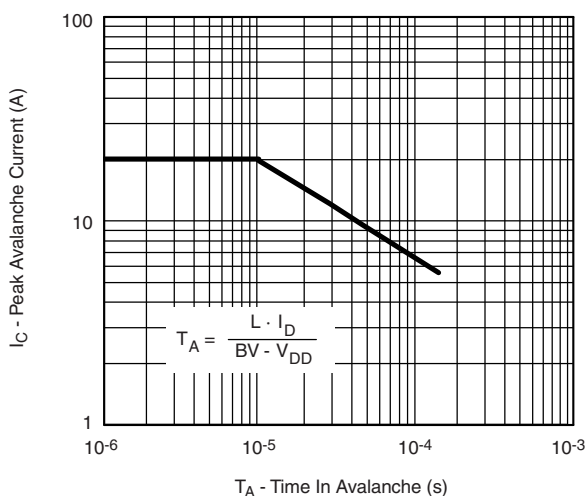
T_C - Case Temperature (°C)

Current Derating*



T_C - Case Temperature (°C)

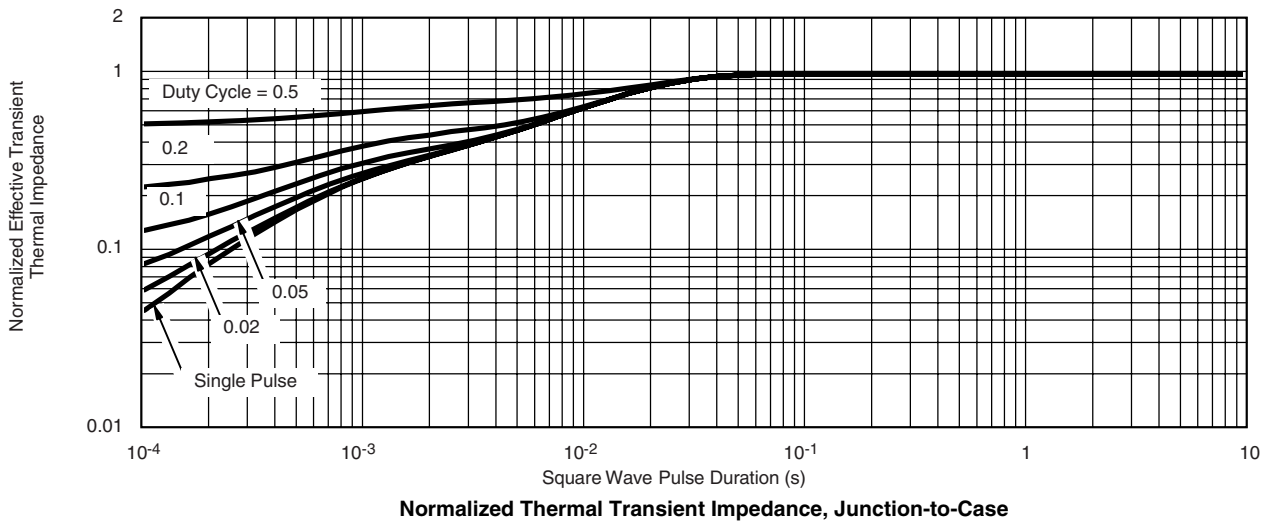
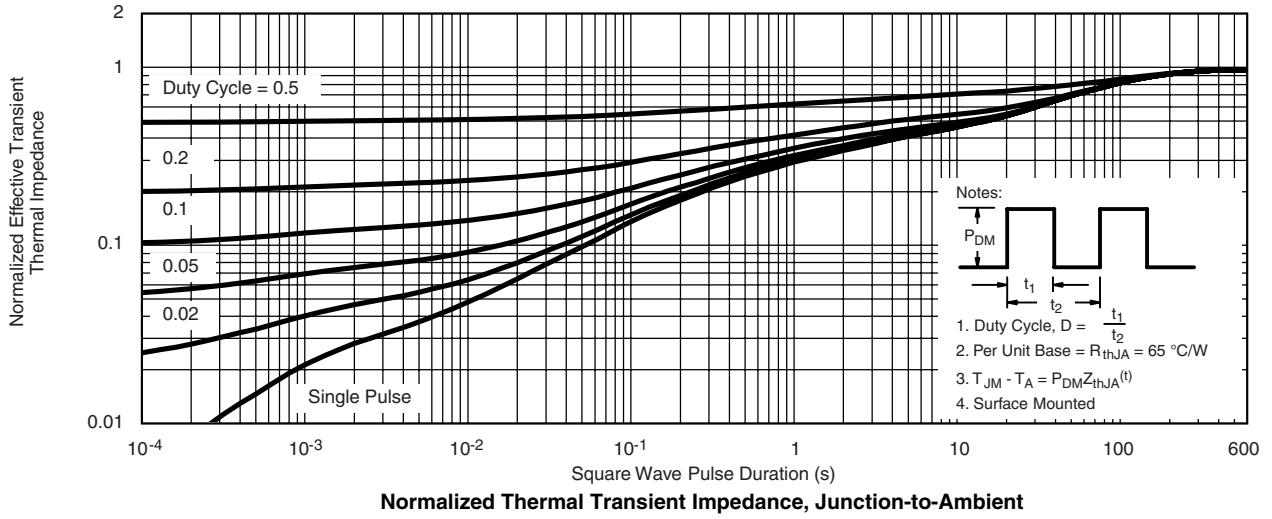
Power Derating



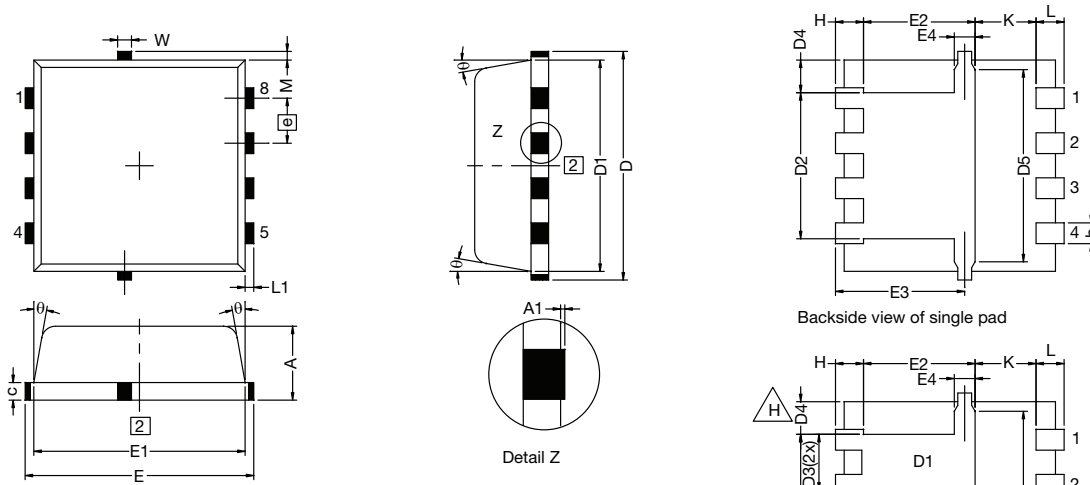
Single Pulse Avalanche Capability

* 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



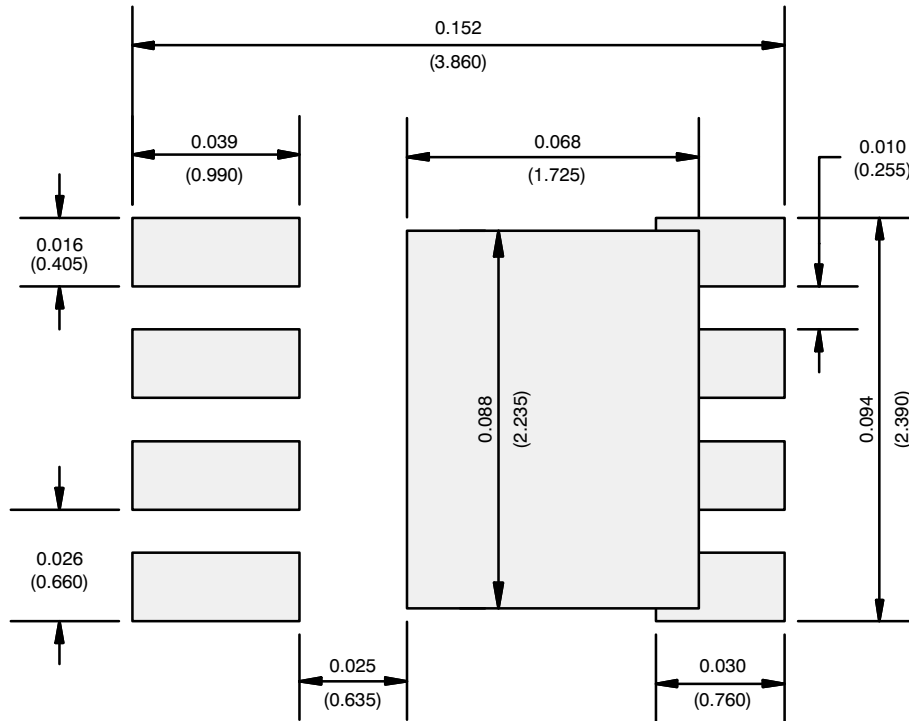
DFN3x3 PACKAGE OUTLINE



- Notes**
 1. Inch will govern
 [2] Dimensions exclusive of mold gate burrs
 3. Dimensions exclusive of mold flash and cutting burrs

DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.97	1.04	1.12	0.038	0.041	0.044
A1	0.00	-	0.05	0.000	-	0.002
b	0.23	0.30	0.41	0.009	0.012	0.016
c	0.23	0.28	0.33	0.009	0.011	0.013
D	3.20	3.30	3.40	0.126	0.130	0.134
D1	2.95	3.05	3.15	0.116	0.120	0.124
D2	1.98	2.11	2.24	0.078	0.083	0.088
D3	0.48	-	0.89	0.019	-	0.035
D4	0.47 typ.			0.0185 typ		
D5	2.3 typ.			0.090 typ		
E	3.20	3.30	3.40	0.126	0.130	0.134
E1	2.95	3.05	3.15	0.116	0.120	0.124
E2	1.47	1.60	1.73	0.058	0.063	0.068
E3	1.75	1.85	1.98	0.069	0.073	0.078
E4	0.034 typ.			0.013 typ.		
e	0.65 BSC			0.026 BSC		
K	0.86 typ.			0.034 typ.		
K1	0.35	-	-	0.014	-	-
H	0.30	0.41	0.51	0.012	0.016	0.020
L	0.30	0.43	0.56	0.012	0.017	0.022
L1	0.06	0.13	0.20	0.002	0.005	0.008
θ	0°	-	12°	0°	-	12°
W	0.15	0.25	0.36	0.006	0.010	0.014
M	0.125 typ.			0.005 typ.		
ECN: S16-2667-Rev. M, 09-Jan-17						
DWG: 5882						

RECOMMENDED MINIMUM PADS



Recommended Minimum Pads
Dimensions in Inches/(mm)

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