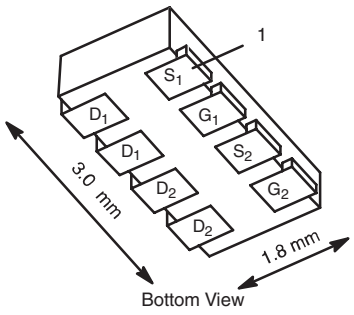
ECH8654-VB Datasheet

Dual P-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ.)
- 20	0.083 at V_{GS} = - 4.5 V	- 4[g]	6.2 nC
	0.100 at V_{GS} = - 2.5 V	- 4[g]	
	0.130 at V_{GS} = - 1.8 V	- 3.8	

DFN 3x2



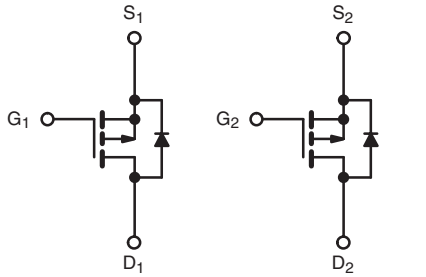
FEATURES

- **Halogen-free According to IEC 61249-2-21 Definition**
- Trench Power MOSFETs
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC

Pb-free
RoHS COMPLIANT
HALOGEN FREE Available

APPLICATIONS

- Load Switch for Portable Devices
- Battery Switch



P-Channel MOSFET 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}	± 8	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	- 4[g]	A
	T_C = 70 °C		- 3.8	
	T_A = 25 °C		- 3.1[b, c]	
	T_A = 70 °C		- 2.5[b, c]	
Pulsed Drain Current		I_{DM}	- 10	
Source Drain Current Diode Current	T_C = 25 °C	I_S	- 2.6	
	T_A = 25 °C		- 1.7[b, c]	
Maximum Power Dissipation	T_C = 25 °C	P_D	3.1	W
	T_C = 70 °C		2.0	
	T_A = 25 °C		1.3[b, c]	
	T_A = 70 °C		0.8[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**	**Typ.**	**Max.**	**Unit**
Maximum Junction-to-Ambient[b, f]	t ≤ 5 s	R_{thJA}	77	95	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	33	40	

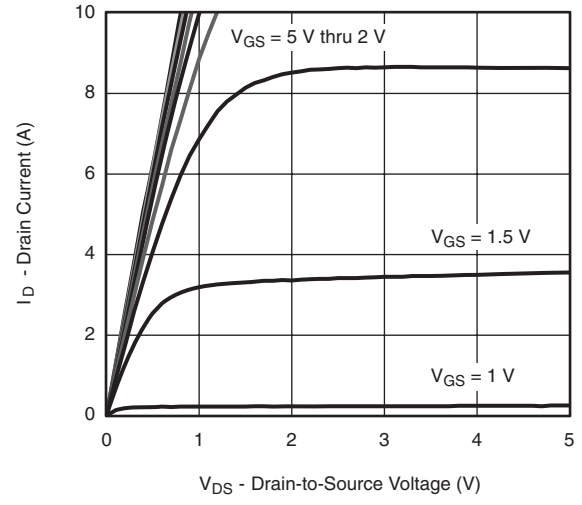
Notes:
a. Based on T_C = 25 °C.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 5 s.
d. See Reliability Manual for profile. The DFN3X2 is a leadless package. The end of t he lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.
e. Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.
f. Maximum under steady state conditions is 130 °C/W.
g. Package limited.

SPECIFICATIONS T_J = 25 °C, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.[a]**	**Max.**	**Unit**
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = - 250 µA	- 20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = - 250 µA		- 19		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	I_D = - 250 µA		2.5		
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = - 250 µA	- 0.4		- 1.0	V
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 8 V			- 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = - 20 V, V_{GS} = 0 V			- 1	µA
		V_{DS} = - 20 V, V_{GS} = 0 V, T_J = 55 °C			- 5	
On-State Drain Current[b]	$I_{D(on)}$	$V_{DS} \leq$ - 5 V, V_{GS} = - 4.5 V	- 10			A
Drain-Source On-State Resistance[b]	$R_{DS(on)}$	V_{GS} = - 4.5 V, I_D = - 3.1 A		0.083		Ω
		V_{GS} = - 2.5 V, I_D = - 2.8 A		0.100		
		V_{GS} = - 1.8 V, I_D = - 2.5 A		0.130		
Forward Transconductance[b]	g_{fs}	V_{DS} = - 10 V, I_D = - 3.1 A		9.5		S
Dynamic[a]						
Input Capacitance	C_{iss}	V_{DS} = - 10 V, V_{GS} = 0 V, f = 1 MHz		455		pF
Output Capacitance	C_{oss}			70		
Reverse Transfer Capacitance	C_{rss}			54		
Total Gate Charge	Q_g	V_{DS} = - 10 V, V_{GS} = - 5 V, I_D = - 3.1 A		7	11	nC
		V_{DS} = - 10 V, V_{GS} = - 4.5 V, I_D = - 3.1 A		6.2	9.3	
Gate-Source Charge	Q_{gs}			0.85		
Gate-Drain Charge	Q_{gd}			1.75		
Gate Resistance	R_g	f = 1 MHz	1.22	6.1	12.2	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 10 V, R_L = 4.2 Ω $I_D \cong$ - 2.4 A, V_{GEN} = - 8 V, R_g = 1 Ω		3	6	ns
Rise Time	t_r			11	17	
Turn-Off Delay Time	$t_{d(off)}$			21	32	
Fall Time	t_f			6	12	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 10 V, R_L = 4.2 Ω $I_D \cong$ - 2.4 A, V_{GEN} = - 4.5 V, R_g = 1 Ω		10	20	
Rise Time	t_r			32	48	
Turn-Off Delay Time	$t_{d(off)}$			25	38	
Fall Time	t_f			6	12	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			- 2.6	A
Pulse Diode Forward Current[a]	I_{SM}				- 10	
Body Diode Voltage	V_{SD}	I_S = - 2.4 A, V_{GS} = 0 V		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = - 2.4 A, dI/dt = 100 A/µs, T_J = 25 °C		21	32	ns
Body Diode Reverse Recovery Charge	Q_{rr}			13	20	nC
Reverse Recovery Fall Time	t_a			17		ns
Reverse Recovery Rise Time	t_b			4		

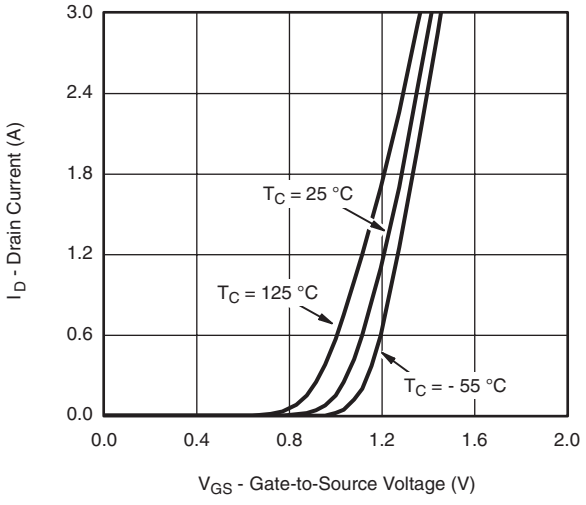
Notes:
a. Guaranteed by design, not subject to production testing.
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.

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.

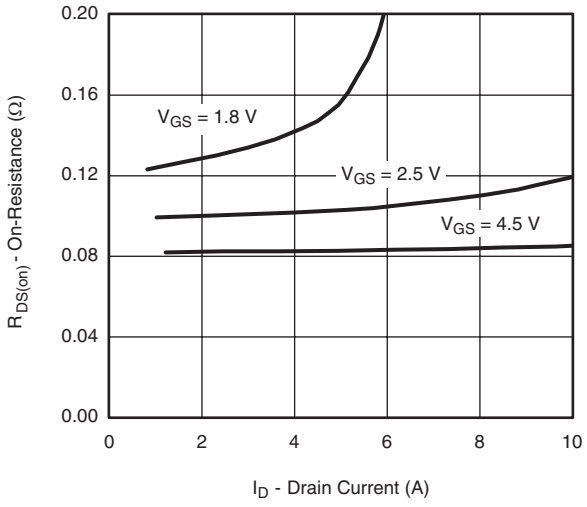
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



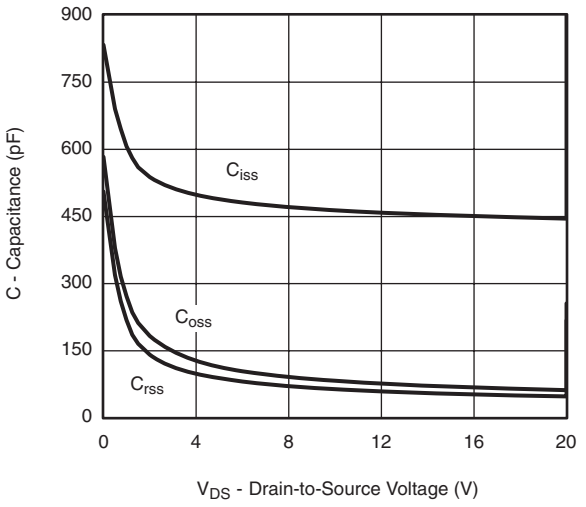
Output Characteristics



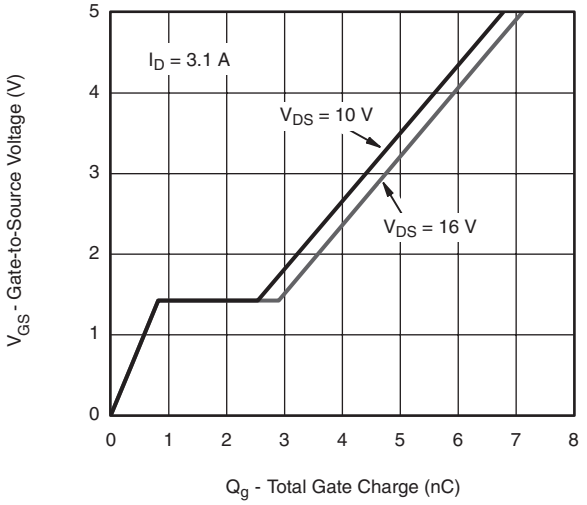
Transfer Characteristics



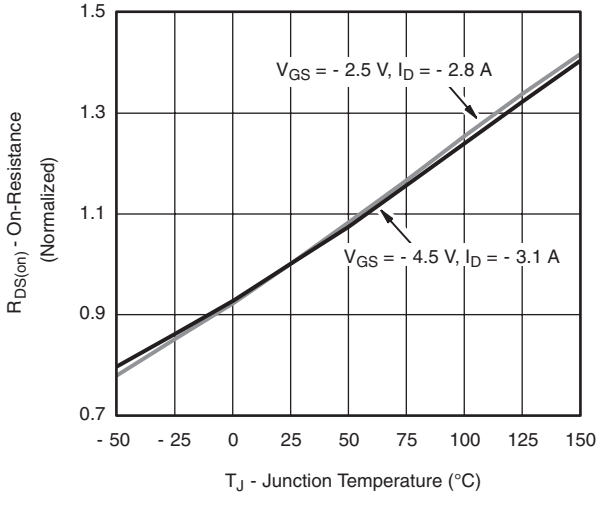
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

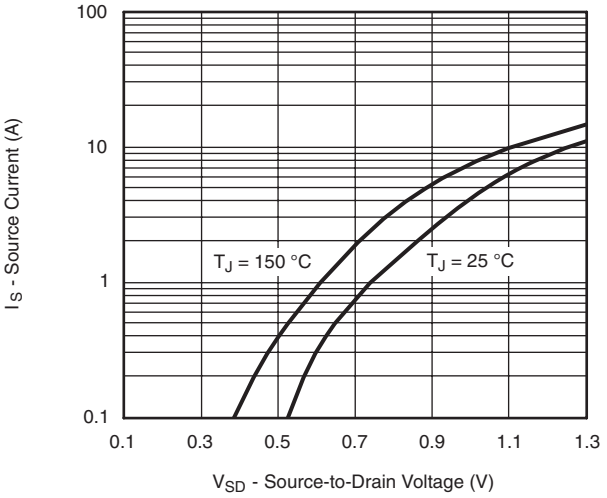


Gate Charge

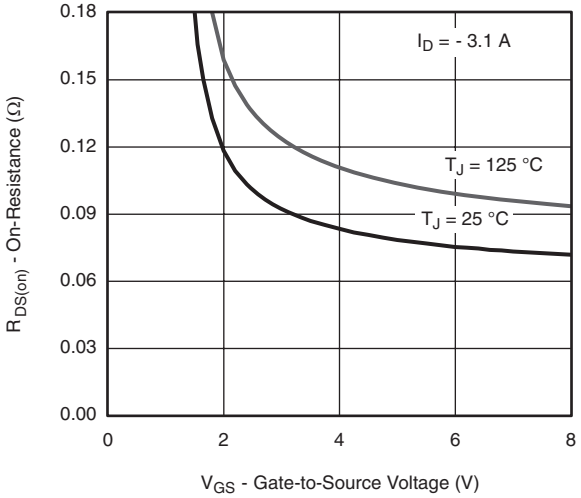


On-Resistance vs. Junction Temperature

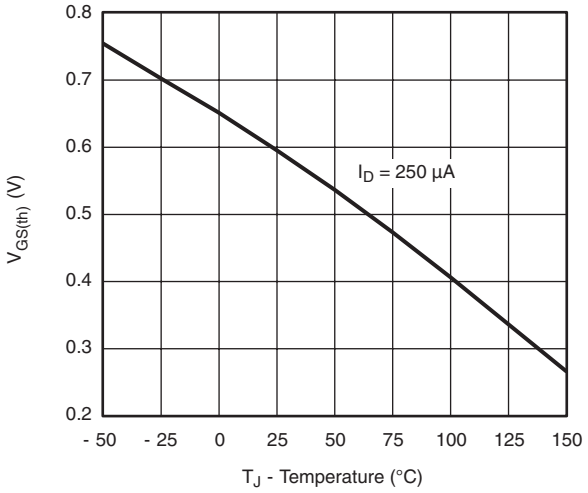
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



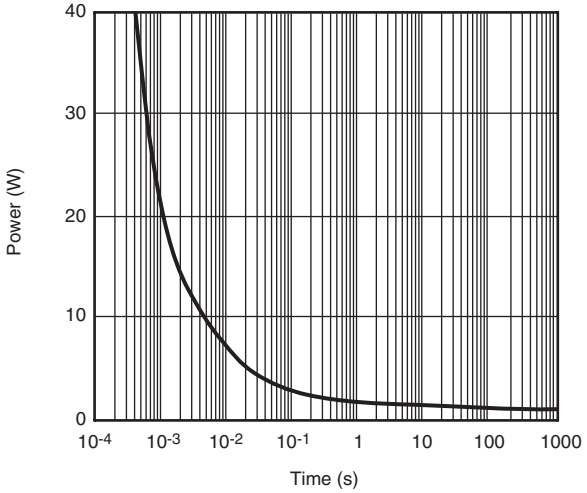
Source-Drain Diode Forward Voltage



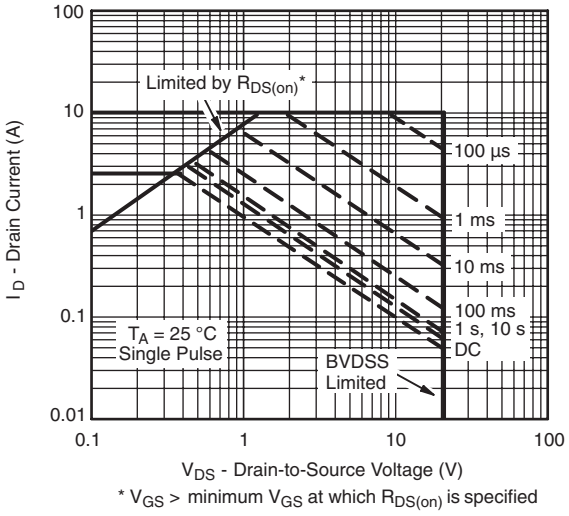
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



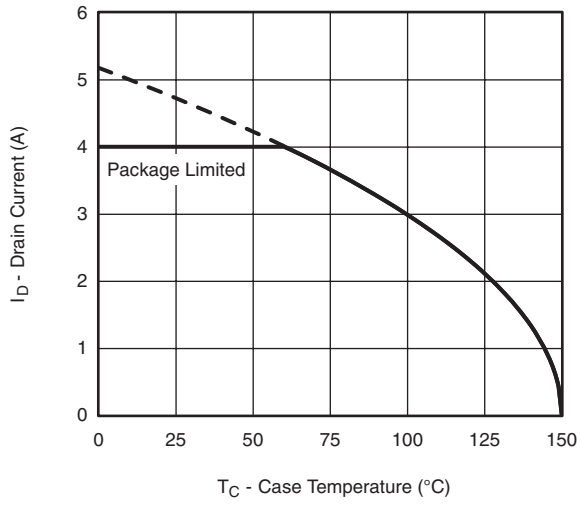
Single Pulse Power



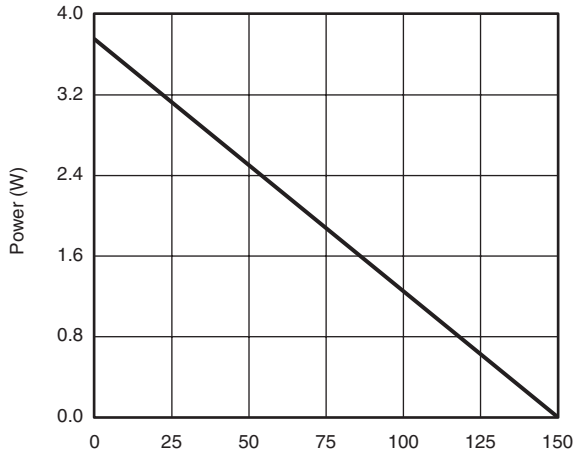
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Case

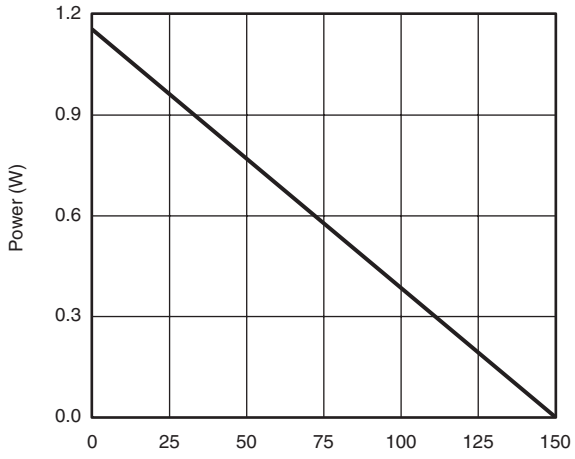
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Current Derating*



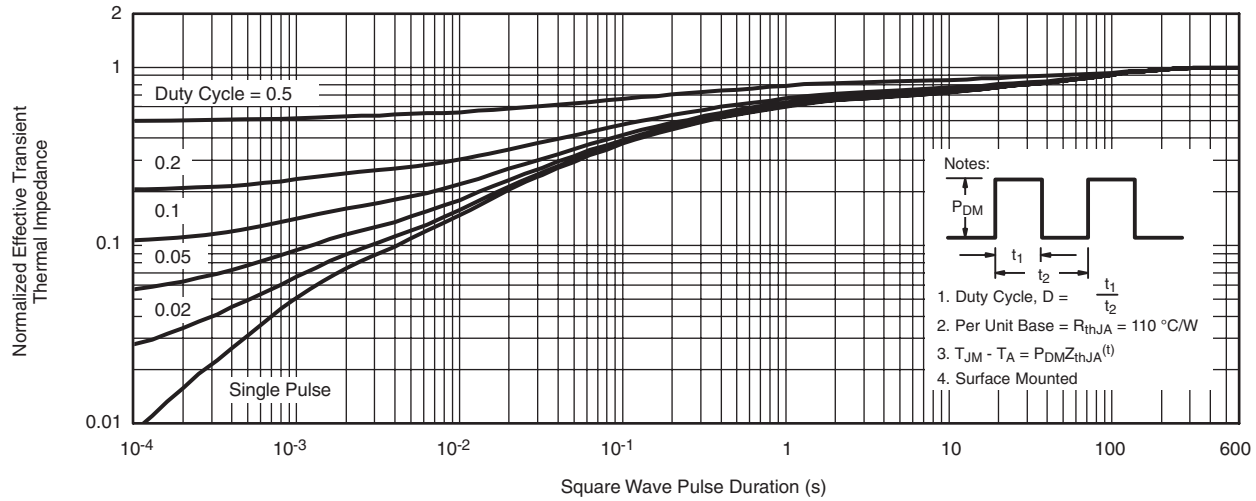
Power Derating, Junction-to-Foot



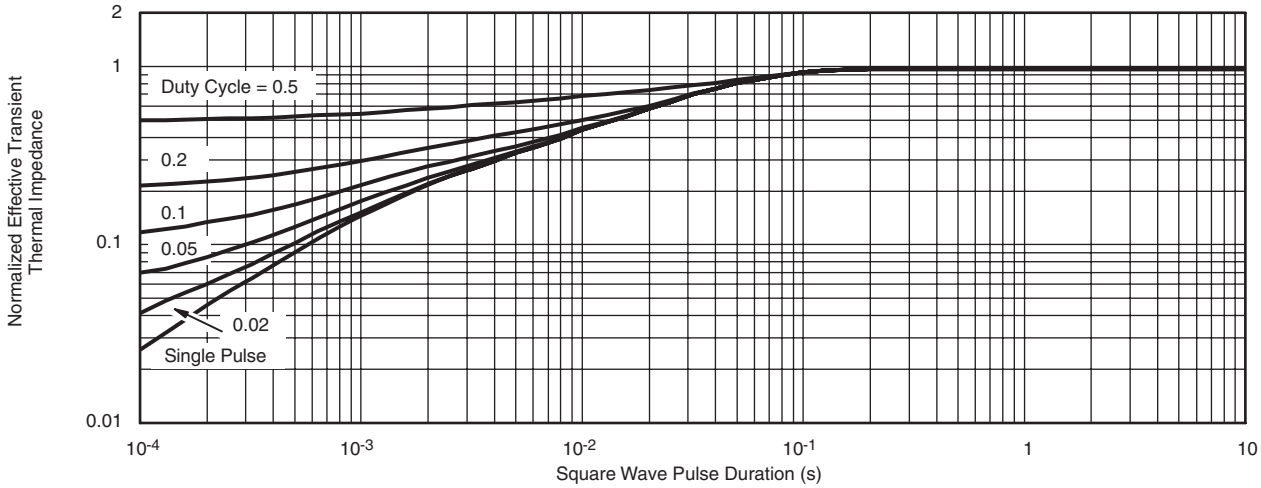
Power Derating, Junction-to-Ambient

* 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.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

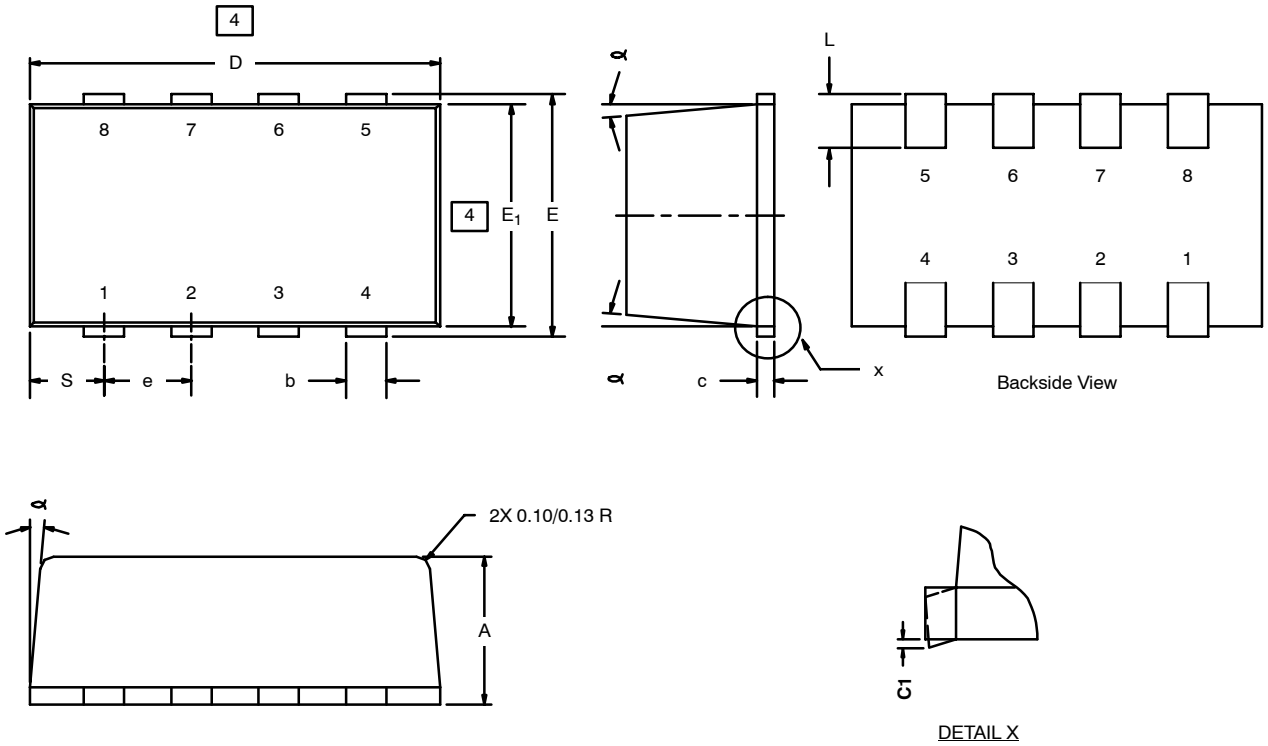


Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

DFN 3x2



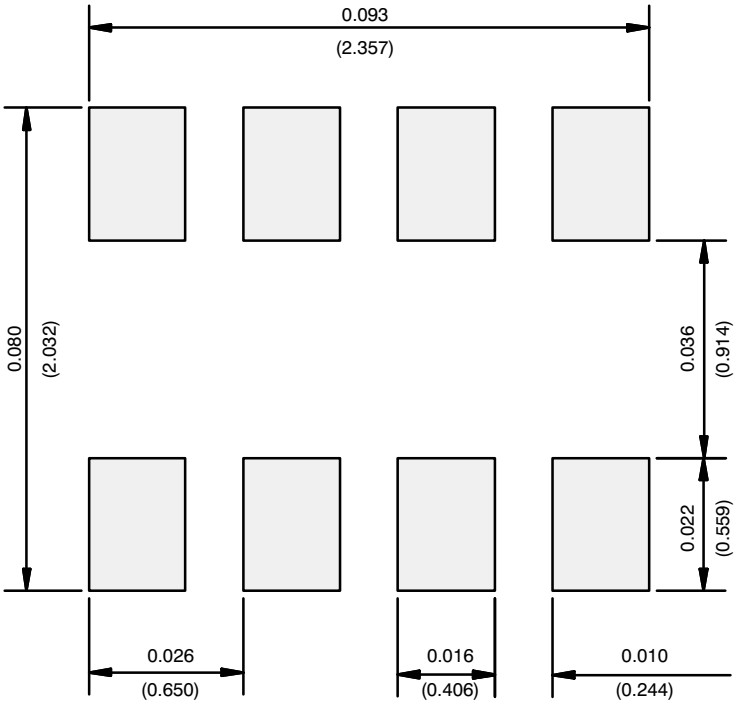
NOTES:

1. All dimensions are in millimeaters.
2. Mold gate burrs shall not exceed 0.13 mm per side.
3. Leadframe to molded body offset is horizontal and vertical shall not exceed 0.08 mm.
4. Dimensions exclusive of mold gate burrs.
5. No mold flash allowed on the top and bottom lead surface.

Dim	MILLIMETERS			INCHES		
	Min	Nom	Max	Min	Nom	Max
A	1.00	–	1.10	0.039	–	0.043
b	0.25	0.30	0.35	0.010	0.012	0.014
c	0.1	0.15	0.20	0.004	0.006	0.008
c1	0	–	0.038	0	–	0.0015
D	2.95	3.05	3.10	0.116	0.120	0.122
E	1.825	1.90	1.975	0.072	0.075	0.078
E_1	1.55	1.65	1.70	0.061	0.065	0.067
e	0.65 BSC			0.0256 BSC		
L	0.28	–	0.42	0.011	–	0.017
S	0.55 BSC			0.022 BSC		
α	5°Nom			5°Nom		

ECN: C-03528—Rev. F, 19-Jan-04
DWG: 5547

RECOMMENDED MINIMUM PADS



Recommended Minimum Pads
Dimensions in Inches/(mm)

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