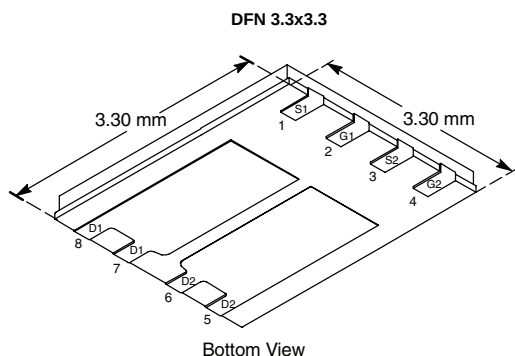


VS4640DE-VB Datasheet

Dual N-Channel 30-V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ.)
30	0.016 at $V_{GS} = 10$ V	26	4.1 nC
	0.020 at $V_{GS} = 4.5$ V	23	



FEATURES

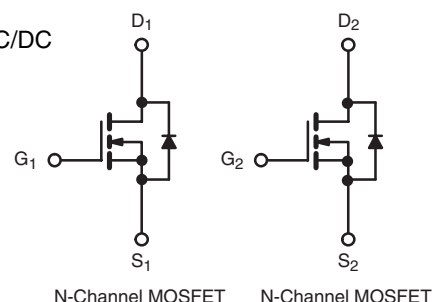
- Halogen-free According to IEC 61249-2-21 Definition
- Trench Power MOSFET
- 100 % R_g Tested
- 100 UIS Tested
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Synchronous Rectification
- Notebook System Power
- POL
- Low Current DC/DC



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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 150^\circ\text{C}$)	I_D	$T_C = 25^\circ\text{C}$	26
		$T_C = 70^\circ\text{C}$	21
		$T_A = 25^\circ\text{C}$	8.8 ^{a, b}
		$T_A = 70^\circ\text{C}$	7 ^{a, b}
Pulsed Drain Current	I_{DM}	80	A
Continuous Source-Drain Diode Current	I_S	$T_C = 25^\circ\text{C}$	19
		$T_A = 25^\circ\text{C}$	2.2 ^{a, b}
Single Pulse Avalanche Current	I_{AS}	14	
Single Pulse Avalanche Energy	E_{AS}	9.8	mJ
Maximum Power Dissipation	P_D	$T_C = 25^\circ\text{C}$	23
		$T_C = 70^\circ\text{C}$	14.8
		$T_A = 25^\circ\text{C}$	2.6 ^{a, b}
		$T_A = 70^\circ\text{C}$	1.7 ^{a, b}
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	$^\circ\text{C}$
Soldering Recommendations (Peak Temperature) ^{c, d}		260	

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient	R_{thJA}	38	48	$^\circ\text{C/W}$
Maximum Junction-to-Case (Drain)	R_{thJC}	4.3	5.4	

Notes:

- Package limited, $T_C = 25^\circ\text{C}$.
- Surface Mounted on 1" x 1" FR4 board.
- $t = 10$ s.
- Maximum under Steady State conditions is 110°C/W .

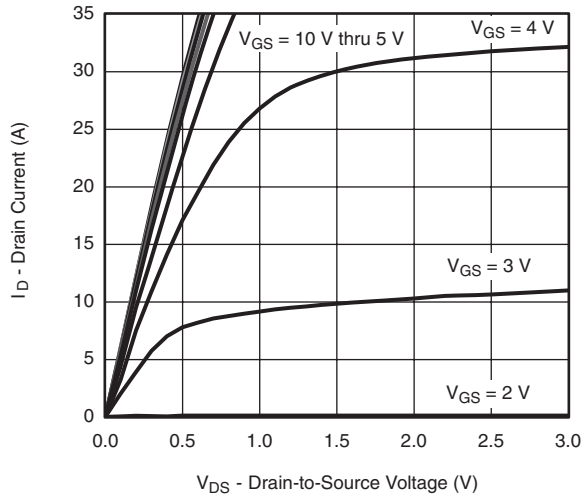
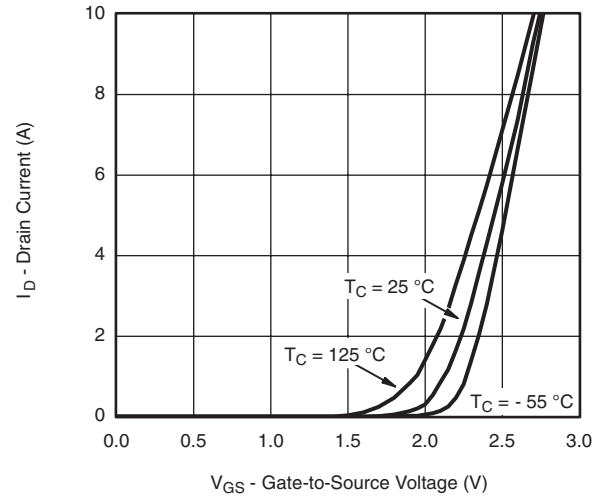
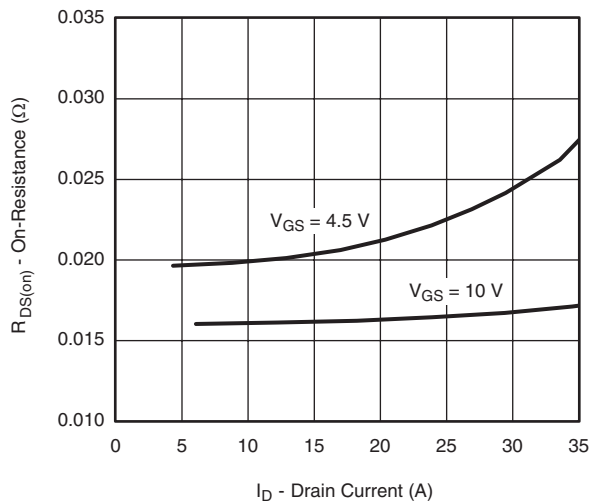
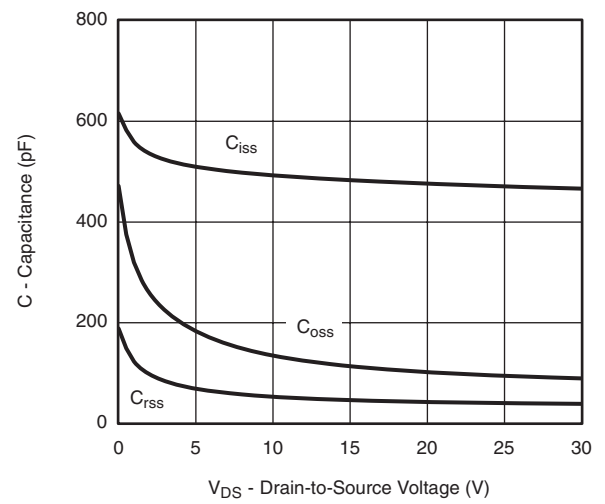
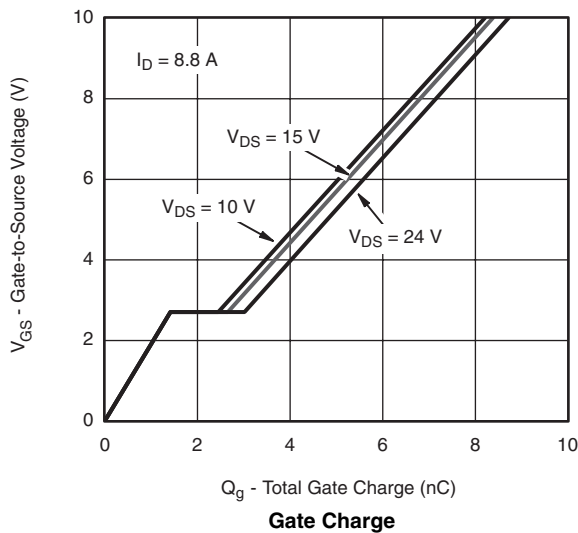
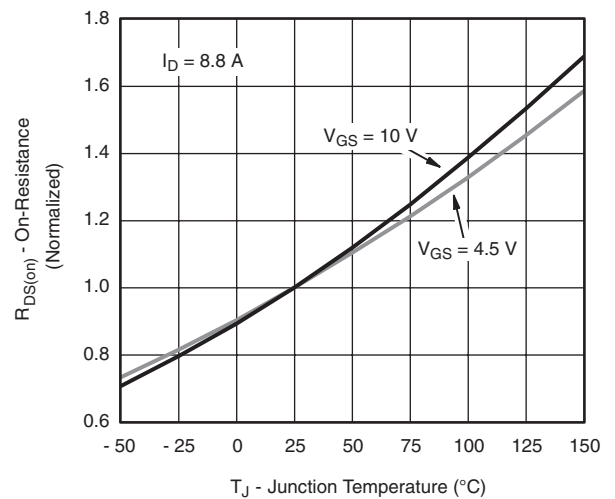
SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted							
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
Static							
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	30			V	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		34		mV/ $^{\circ}\text{C}$	
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 5			
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1		2.5	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}	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$			1	μA	
		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^{\circ}\text{C}$			10		
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	20			A	
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 8.8\text{ A}$		0.016		Ω	
		$V_{GS} = 4.5\text{ V}, I_D = 7.8\text{ A}$		0.020			
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 8.8\text{ A}$		20		S	
Dynamic ^b							
Input Capacitance	C_{iss}	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		480		pF	
Output Capacitance	C_{oss}			115			
Reverse Transfer Capacitance	C_{rss}			46			
Total Gate Charge	Q_g	$V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}, I_D = 8.8\text{ A}$		8.5	13	nC	
Gate-Source Charge	Q_{gs}	$V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 8.8\text{ A}$		4.1	6.2		
Gate-Drain Charge	Q_{gd}			1.5			
Gate Resistance	R_g			1.3			
Turn-On Delay Time	$t_{d(on)}$	$f = 1\text{ MHz}$	0.6	3.2	6.4	Ω	
Rise Time	t_r		$V_{DD} = 15\text{ V}, R_L = 2.1\text{ }\Omega$ $I_D \cong 7\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		13	20	ns
Turn-Off Delay Time	$t_{d(off)}$				12	20	
Fall Time	t_f				12	20	
Turn-On Delay Time	$t_{d(on)}$			10	15		
Rise Time	t_r	$V_{DD} = 15\text{ V}, R_L = 2.1\text{ }\Omega$ $I_D \cong 7\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		5	10		
Turn-Off Delay Time	$t_{d(off)}$			10	15		
Fall Time	t_f			15	25		
Fall Time	t_f			10	15		
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^{\circ}\text{C}$			19	A	
Pulse Diode Forward Current	I_{SM}				35		
Body Diode Voltage	V_{SD}	$I_S = 7\text{ A}, V_{GS} = 0\text{ V}$		0.8	1.2	V	
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 7\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^{\circ}\text{C}$		20	30	ns	
Body Diode Reverse Recovery Charge	Q_{rr}			16	25	nC	
Reverse Recovery Fall Time	t_a			13		ns	
Reverse Recovery Rise Time	t_b			7			

Notes:

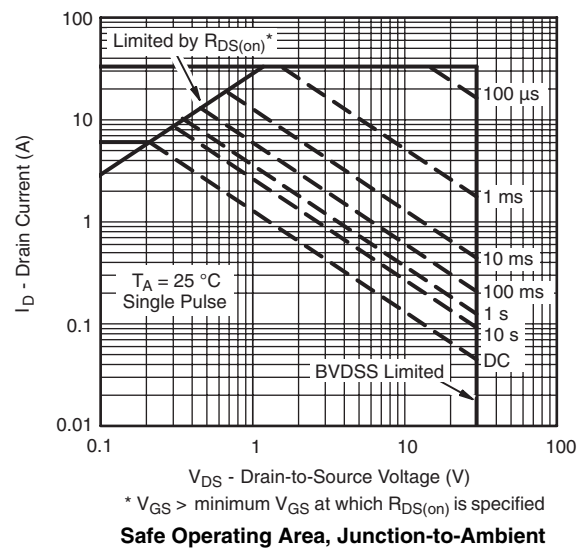
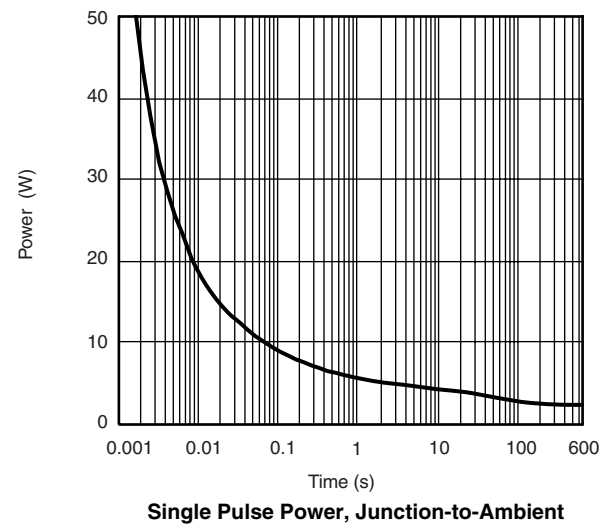
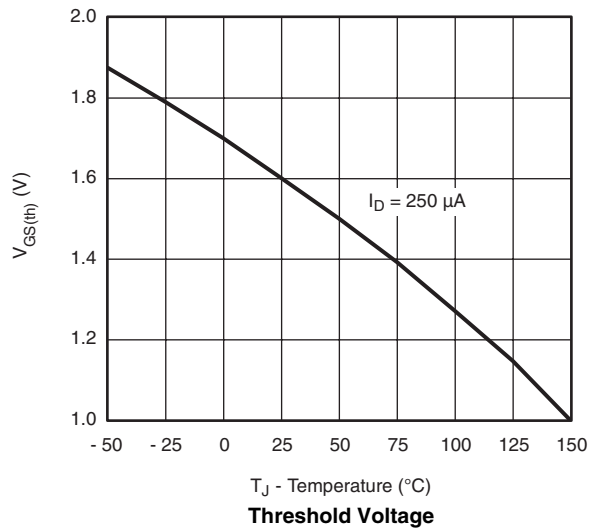
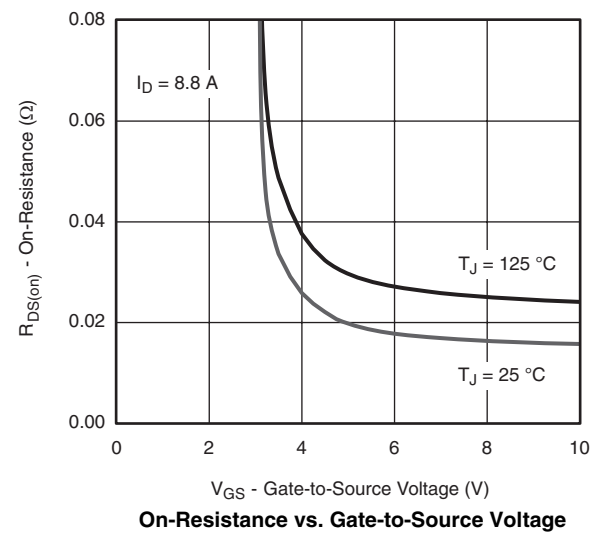
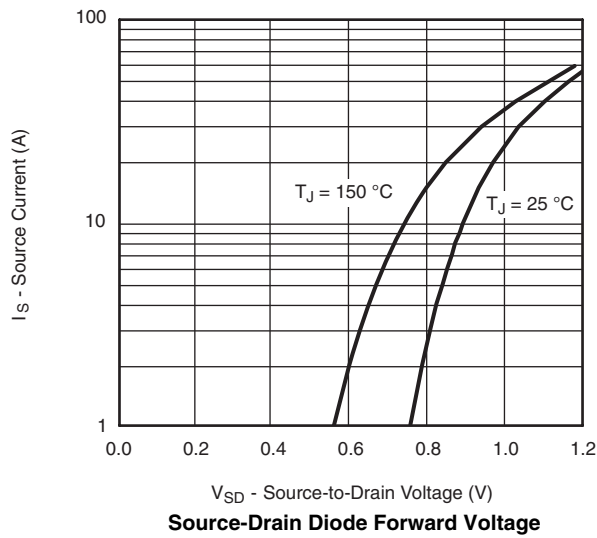
a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$

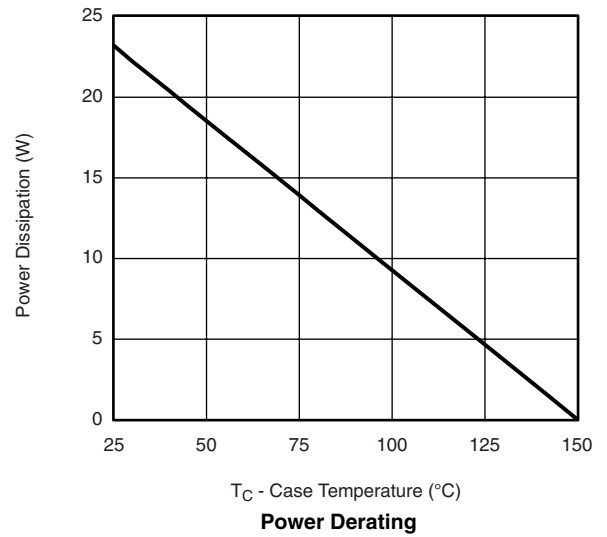
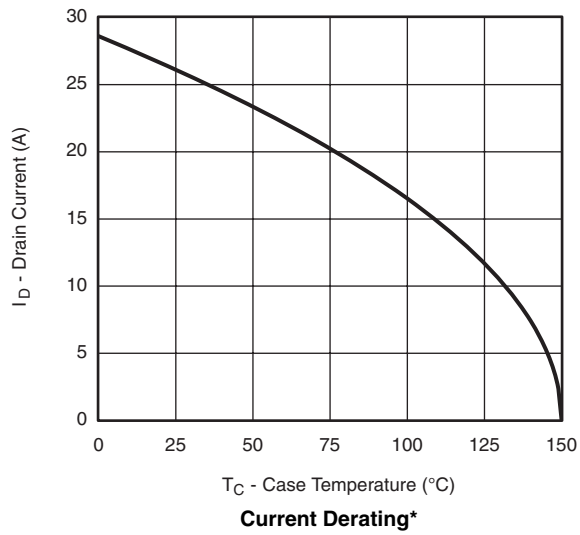
b. Guaranteed by design, not subject to production testing.

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.

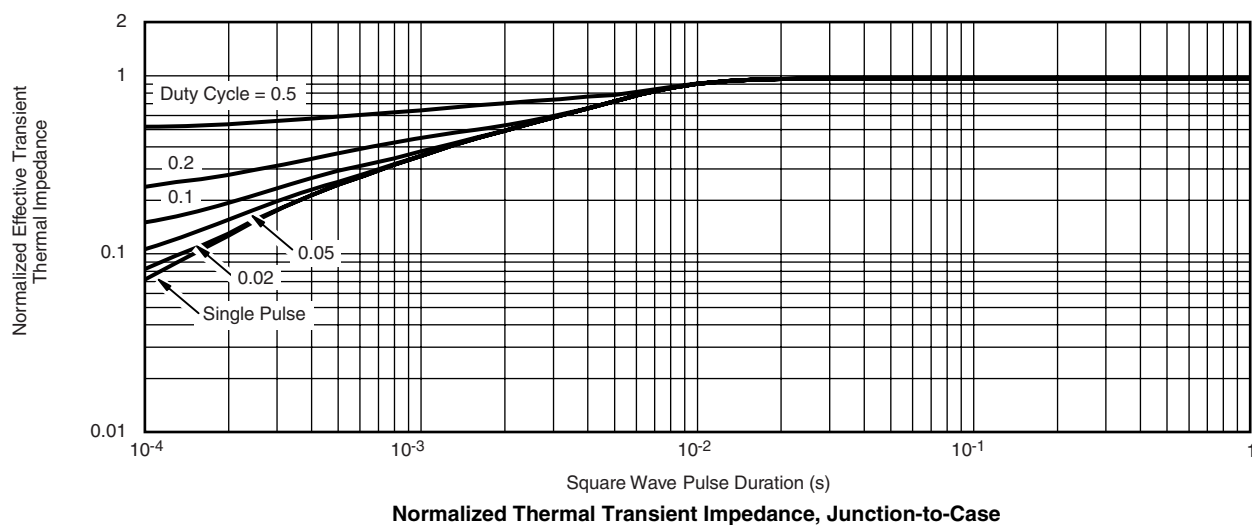
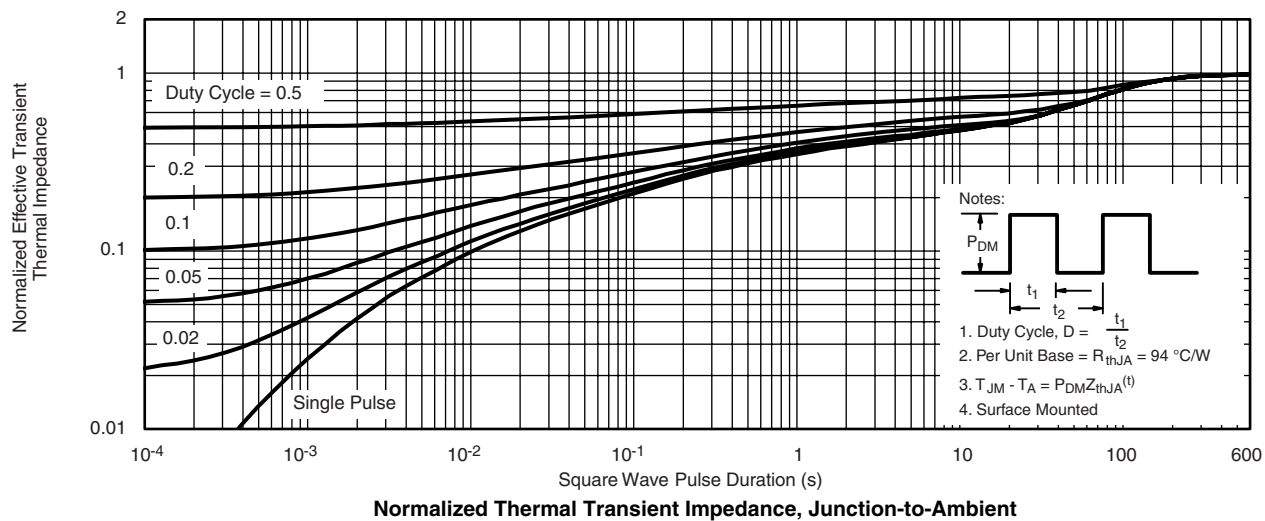
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

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

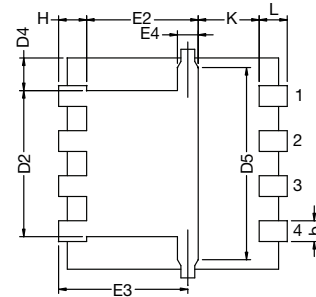
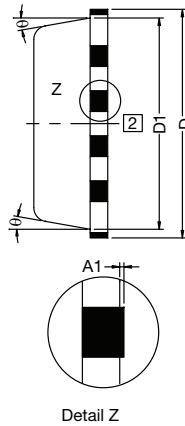
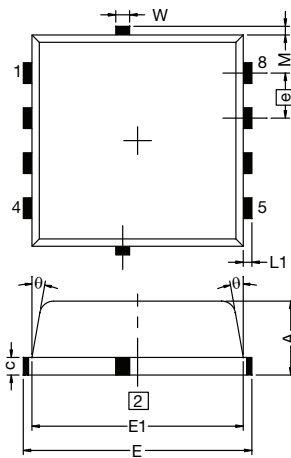


TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

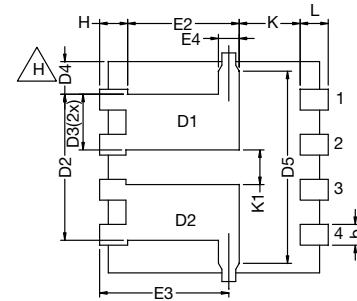
* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


DFN3.3X3.3 (Dual)



Backside view of single pad



Backside view of dual pad

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						

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