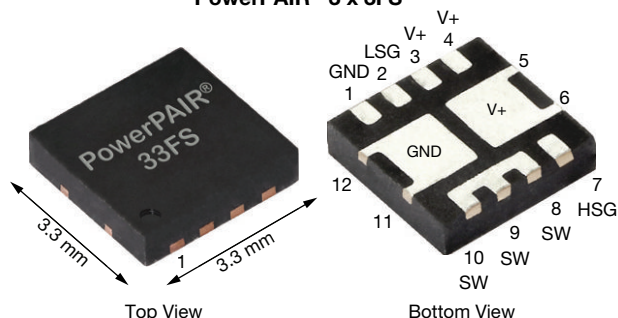


Dual N-Channel 40 V (D-S) MOSFET

PowerPAIR® 3 x 3FS


FEATURES

- TrenchFET® Gen IV power MOSFET
- Symmetric dual n-channel
- Flip chip technology optimal thermal design
- High side and low side MOSFETs form optimized combination for 50 % duty cycle
- Optimized $R_{DS(on)}$ - Q_g and $R_{DS(on)}$ - Q_{gd} FOM elevates efficiency for high frequency switching
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

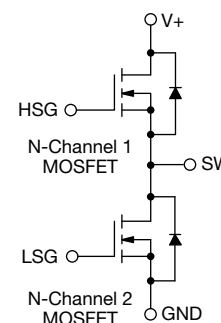

RoHS
COMPLIANT
HALOGEN
FREE

PRODUCT SUMMARY

V_{DS} (V)	40
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 10$ V	0.0053
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 4.5$ V	0.0072
Q_g typ. (nC)	8.0
I_D (A)	77.1 ^a
Configuration	Dual

APPLICATIONS

- Synchronous buck
- Computer / server peripherals
- Half bridge
- POL
- Telecom DC/DC



ORDERING INFORMATION

Package	PowerPAIR 3 x 3FS
Lead (Pb)-free and halogen-free	SiZF4412DT-T1-GE3

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 / -16	
Continuous drain current ($V_{GS} = 10$ V, $T_J = 150$ °C)	$T_C = 25$ °C	77.1	A
	$T_C = 70$ °C	61.7	
	$T_A = 25$ °C	21.6 ^{b, c}	
	$T_A = 70$ °C	17.3 ^{b, c}	
Pulsed drain current ($V_{GS} = 10$ V, $t = 100$ μ s)	I_{DM}	150	mJ
Continuous source current (MOSFET diode conduction)	$T_C = 25$ °C	47.3	
	$T_A = 25$ °C	3.7 ^{b, c}	
Single pulse avalanche current	$L = 0.1$ mH	15	
Single pulse avalanche energy	E_{AS}	11.25	W
Maximum power dissipation	$T_C = 25$ °C	56.8	
	$T_C = 70$ °C	36.4	
	$T_A = 25$ °C	4.5 ^{b, c}	
	$T_A = 70$ °C	2.9 ^{b, c}	
Operating junction and storage temperature range	T_J, T_{stg}	-55 to +150	°C
Soldering recommendations (peak temperature)		260	

Notes

- $T_C = 25$ °C
- Surface mounted on 1" x 1" FR4 board
- $t = 10$ s

**THERMAL RESISTANCE RATINGS**

PARAMETER		SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient ^{a, b}	$t \leq 10$ s	R_{thJA}	22	28	°C/W
Maximum junction-to-case (drain)	Steady state	R_{thJC}	1.7	2.2	

Notes

a. Surface mounted on 1" x 1" FR4 board

b. Maximum under steady state conditions is 64 °C/W

SPECIFICATIONS ($T_J = 25$ °C, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$	40	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	$I_D = 10\text{ mA}$	-	30	-	mV/°C
$V_{GS(th)}$ temperature coefficient	$\Delta V_{GS(th)}/T_J$	$I_D = 250\text{ }\mu\text{A}$	-	4.3	-	mV/°C
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}	$V_{DS} = 0\text{ V}$, $V_{GS} = +20\text{ V}$ / -16 V	-	-	± 100	nA
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 40\text{ V}$, $V_{GS} = 0\text{ V}$	-	-	1	μA
		$V_{DS} = 40\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 75\text{ }^{\circ}\text{C}$	-	-	10	
Drain-source on-state resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$, $I_D = 10\text{ A}$	-	0.0042	0.0053	Ω
		$V_{GS} = 4.5\text{ V}$, $I_D = 10\text{ A}$	-	0.0060	0.0072	
Forward transconductance ^a	g_{fs}	$V_{DS} = 10\text{ V}$, $I_D = 10\text{ A}$	-	55	-	S
Dynamic ^b						
Input capacitance	C_{iss}	$V_{DS} = 20\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$	-	1380	-	pF
Output capacitance	C_{oss}		-	272	-	
Reverse transfer capacitance	C_{rss}		-	24	-	
Output charge	Q_{oss}	$V_{DS} = 20\text{ V}$, $V_{GS} = 0\text{ V}$	-	10.4	-	nC
Total gate charge	Q_g	$V_{DS} = 20\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 10\text{ A}$	-	17.4	26.5	nC
		$V_{DS} = 20\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 10\text{ A}$	-	8	12	
Gate-source charge	Q_{gs}		-	4.1	-	
Gate-drain charge	Q_{gd}		-	1.1	-	
Gate resistance	R_g	$f = 1\text{ MHz}$	1.4	2.9	5.0	Ω
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 20\text{ V}$, $R_L = 2\text{ }\Omega$, $I_D \cong 15\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\text{ }\Omega$	-	9	18	ns
Rise time	t_r		-	4	8	
Turn-off delay time	$t_{d(off)}$		-	20	40	
Fall time	t_f		-	4	8	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 20\text{ V}$, $R_L = 2\text{ }\Omega$, $I_D \cong 15\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 1\text{ }\Omega$	-	18	36	
Rise time	t_r		-	70	140	
Turn-off delay time	$t_{d(off)}$		-	20	40	
Fall time	t_f		-	9	18	
Drain-source Body Diode Characteristics						
Continuous source-drain diode current	I_S	$T_C = 25^{\circ}\text{C}$	-	-	47.3	A
Pulse diode forward current	I_{SM}		-	-	150	
Body diode voltage	V_{SD}	$I_S = 5\text{ A}$, $V_{GS} = 0\text{ V}$	-	0.74	1.2	V
Body diode reverse recovery time	t_{rr}	$I_F = 10\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^{\circ}\text{C}$	-	20	40	ns
Body diode reverse recovery charge	Q_{rr}		-	8	16	nC
Reverse recovery fall time	t_a		-	9	-	ns
Reverse recovery rise time	t_b		-	11	-	

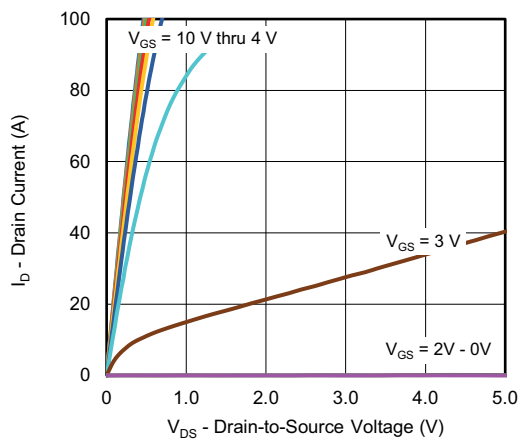
Notesa. Pulse test; pulse width ≤ 300 μ s, duty cycle ≤ 2 %

b. Guaranteed by design, not subject to production testing

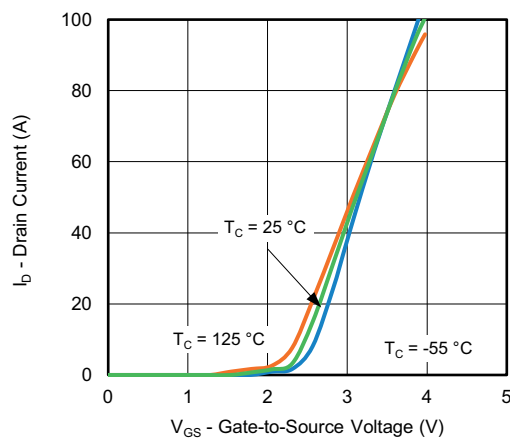
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



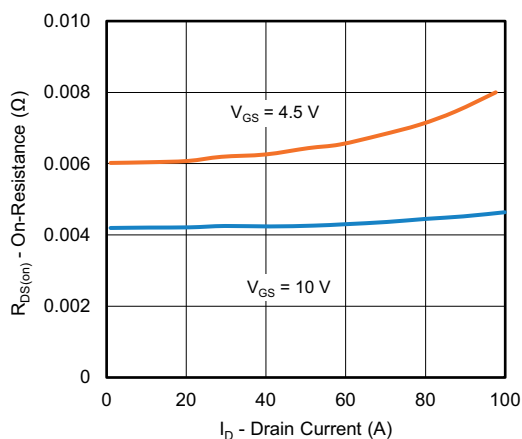
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



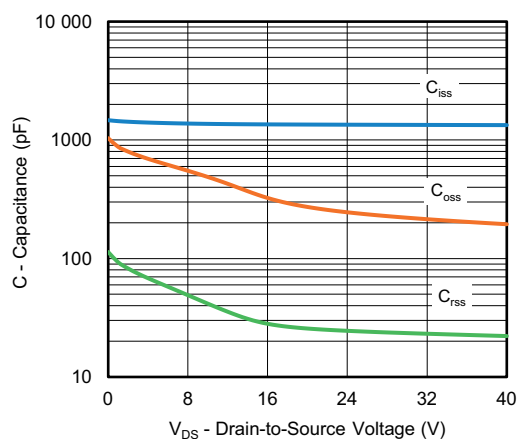
Output Characteristics



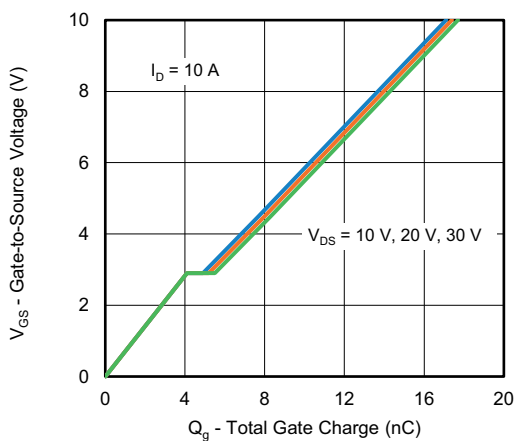
Transfer Characteristics



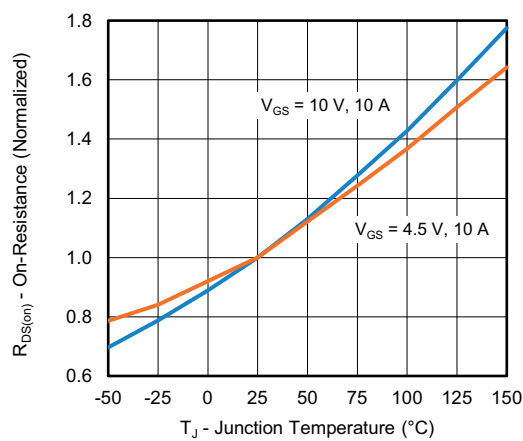
On-Resistance vs. Drain Current and Gate



Capacitance



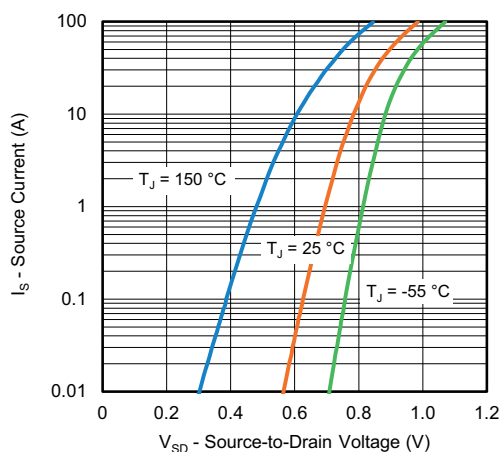
Gate Charge



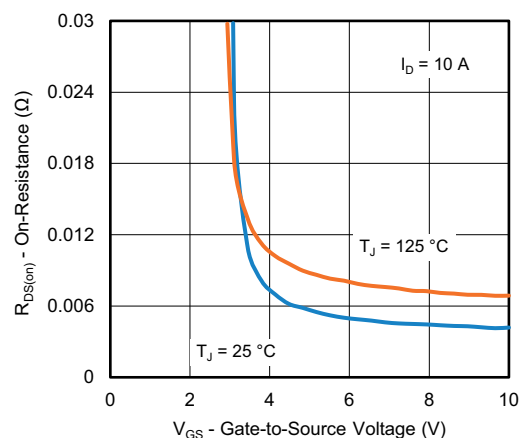
On-Resistance vs. Junction Temperature



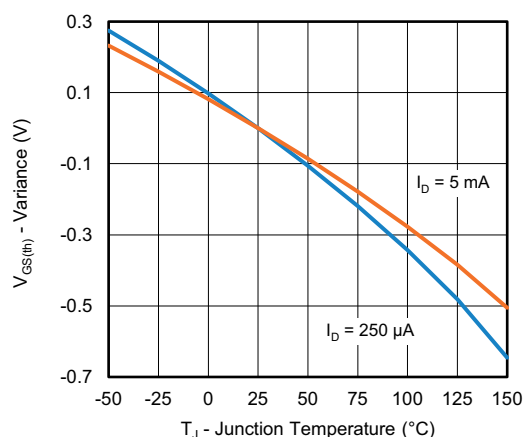
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



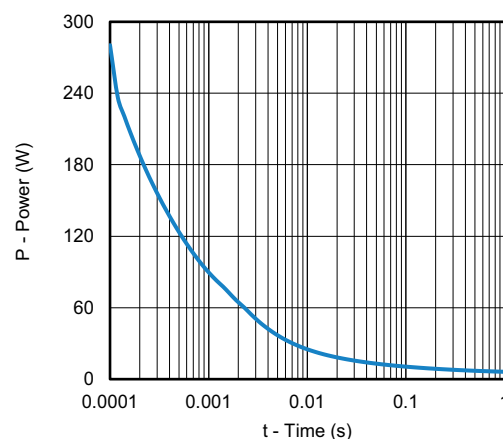
Source-Drain Diode Forward Voltage



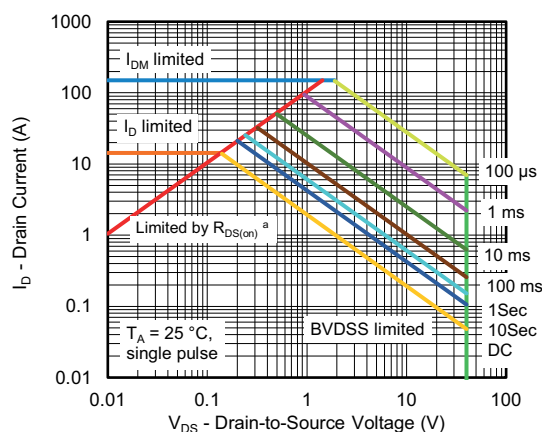
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power



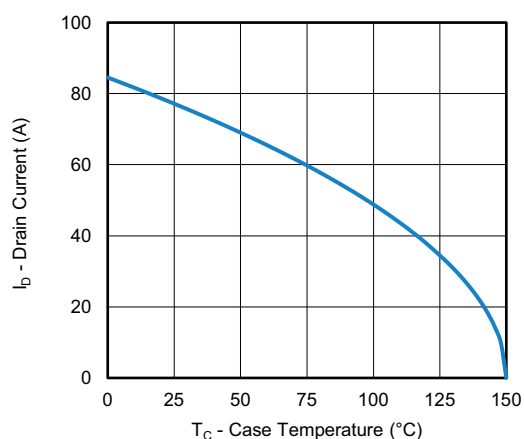
Safe Operating Area, Junction to Ambient

Note

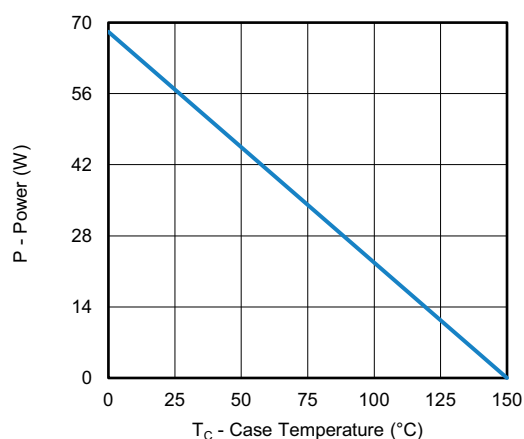
a. $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified



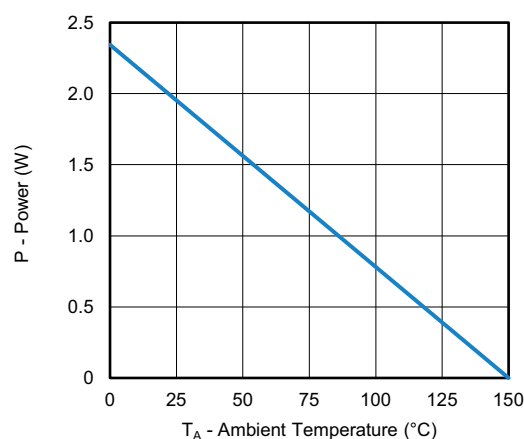
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating ^a



Power, Junction-to-Case



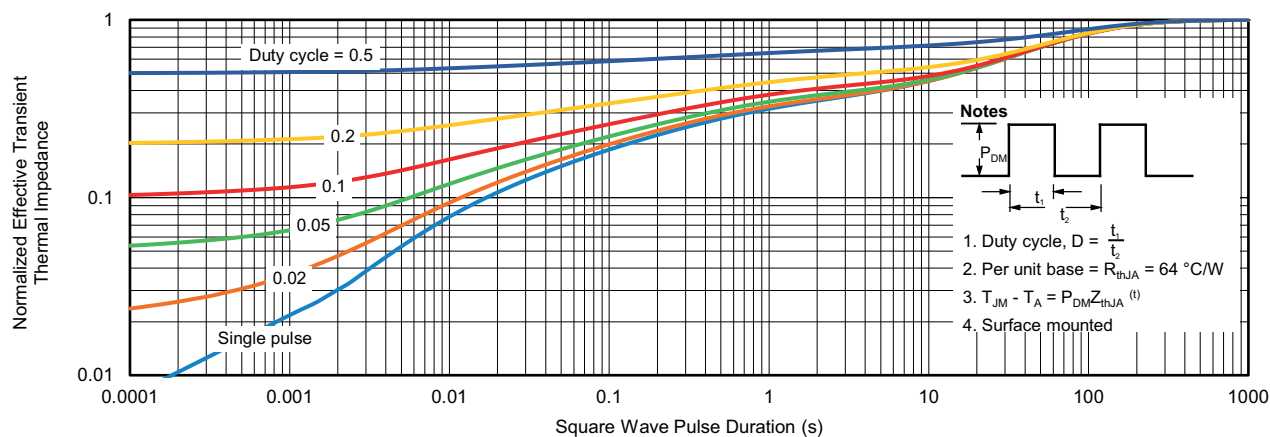
Power, Junction-to-Ambient

Notes

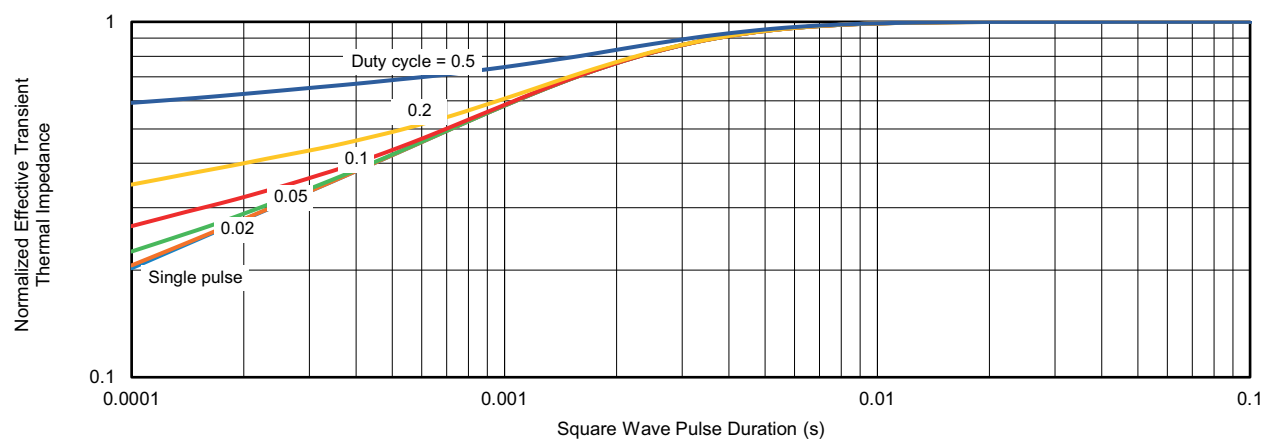
- The power dissipation P_D is based on T_J max. = 150 °C, using junction-to-ambient thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit
- $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



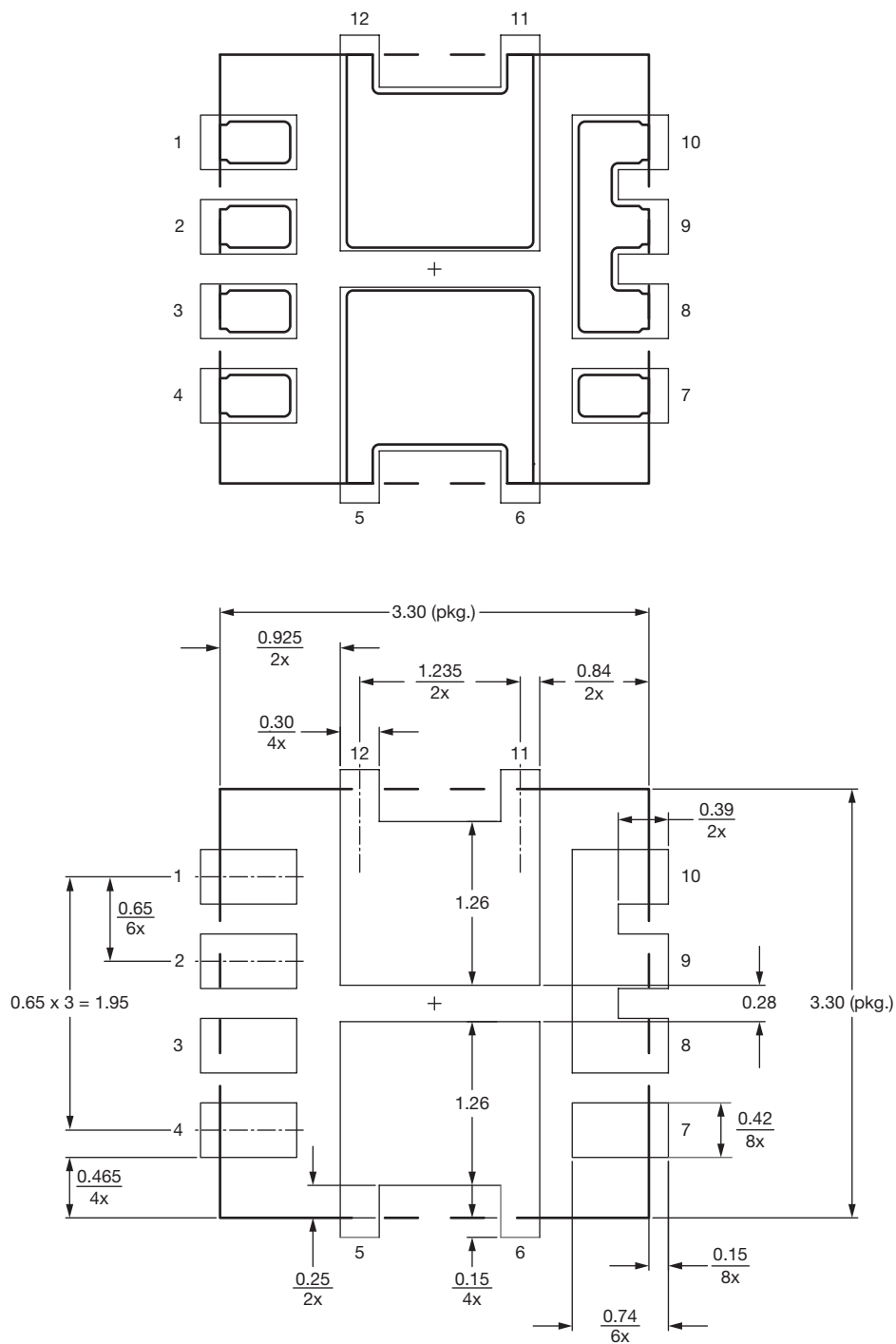
Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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Recommended Land Pattern PowerPAIR® 3 x 3FS BWL


Note

- Dimensions in mm

ECN: T23-0180-Rev. B, 16-May-2023
DWG: 3006



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