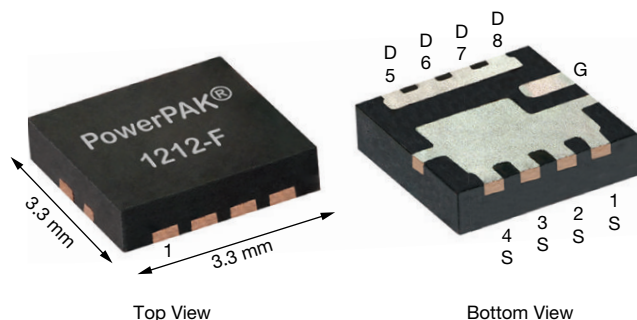


N-Channel 60 V (D-S) MOSFET

PowerPAK® 1212-F


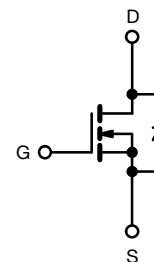
FEATURES

- TrenchFET® Gen IV power MOSFET
- Very low $R_{DS(on)}$ \times Q_g figure-of-merit (FOM)
- Source flip technology, enhance thermal performance
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- DC/DC converter
- Synchronous rectification
- Battery management
- Oring and load switch



N-Channel MOSFET

PRODUCT SUMMARY

V_{DS} (V)	60
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 10$ V	0.0034
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 4.5$ V	0.0051
Q_g typ. (nC)	20
I_D (A)	91 ^a
Configuration	Single

ORDERING INFORMATION

Package	PowerPAK 1212-F
Lead (Pb)-free and halogen-free	SiSD4604LDN-T1-UE3

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	V
Continuous drain current ($T_J = 150$ °C)	I_D	$T_C = 25$ °C	91
		$T_C = 70$ °C	73
		$T_A = 25$ °C	28 ^{b, c}
		$T_A = 70$ °C	23 ^{b, c}
Pulsed drain current ($t = 100$ μ s)	I_{DM}	350	A
Continuous source-drain diode current	I_S	$T_C = 25$ °C	52
		$T_A = 25$ °C	4.9 ^{b, c}
Single pulse avalanche current	I_{AS}	32	A
Single pulse avalanche energy	E_{AS}	50	mJ
Maximum power dissipation	P_D	$T_C = 25$ °C	57
		$T_C = 70$ °C	36
		$T_A = 25$ °C	5.4 ^{b, c}
		$T_A = 70$ °C	3.5 ^{b, c}
Operating junction and storage temperature range	T_J, T_{stg}	-55 to +150	°C
Soldering recommendations (peak temperature) ^{d, e}		260	°C

THERMAL RESISTANCE RATINGS

PARAMETER	SMYBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient ^{b, f}	R_{thJA}	18	23	°C/W
Maximum junction-to-case (source)	R_{thJC}	1.7	2.2	°C/W

Notes

- Based on $T_C = 25$ °C
- Surface mounted on 1" x 1" FR4 board
- $t = 10$ s
- See solder profile (www.vishay.com/doc?73257). The PowerPAK 1212-F 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 56 °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 V, I _D = 250 μA	60	-	-	V
V _{DS} temperature coefficient	ΔV _{DS} /T _J	I _D = 10 mA	-	32	-	mV/°C
V _{GS(th)} temperature coefficient	ΔV _{GS(th)} /T _J	I _D = 250 μA	-	-5.2	-	
Gate-source threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1	-	2.4	V
Gate-source leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V	-	-	± 100	nA
Zero gate voltage drain current	I _{DSS}	V _{DS} = 60 V, V _{GS} = 0 V	-	-	1	μA
		V _{DS} = 60 V, V _{GS} = 0 V, T _J = 55 °C	-	-	10	
Drain-source on-state resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 15 A	-	0.0025	0.0034	Ω
		V _{GS} = 4.5 V, I _D = 10 A	-	0.0036	0.0051	
Forward transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 20 A	-	115	-	S
Dynamic ^b						
Input capacitance	C _{iss}	V _{DS} = 30 V, V _{GS} = 0 V, f = 1 MHz	-	2600	-	pF
Output capacitance	C _{oss}		-	575	-	
Reverse transfer capacitance	C _{rss}		-	28	-	
C _{rss} /C _{iss} ratio			-	0.011	0.022	
Total gate charge	Q _g	V _{DS} = 30 V, V _{GS} = 20 V, I _D = 15 A	-	42	63	nC
		V _{DS} = 30 V, V _{GS} = 4.5 V, I _D = 15 A	-	20	30	
Q _{gs}	-		8.5	-		
Q _{gd}	-		5.5	-		
Output charge	Q _{oss}	V _{DS} = 30 V, V _{GS} = 0 V	-	37	-	
Gate resistance	R _g	f = 1 MHz	0.12	0.6	1.3	Ω
Turn-on delay time	t _{d(on)}	V _{DD} = 30 V, R _L = 3 Ω I _D ≅ 10 A, V _{GEN} = 10 V, R _g = 1 Ω	-	11	25	ns
Rise time	t _r		-	5	10	
Turn-off delay time	t _{d(off)}		-	25	50	
Fall time	t _f		-	5	10	
Turn-on delay time	t _{d(on)}	V _{DD} = 30 V, R _L = 3 Ω I _D ≅ 10 A, V _{GEN} = 4.5 V, R _g = 1 Ω	-	23	50	
Rise time	t _r		-	62	125	
Turn-off delay time	t _{d(off)}		-	28	60	
Fall time	t _f		-	8	20	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I _S	T _C = 25 °C	-	-	52	A
Pulse diode forward current ^a	I _{SM}		-	-	350	
Body diode voltage	V _{SD}	I _S = 10 A	-	0.77	1.1	V
Body diode reverse recovery time	t _{rr}	I _F = 10 A, di/dt = 100 A/μs, T _J = 25 °C	-	36	70	ns
Body diode reverse recovery charge	Q _{rr}		-	26	55	nC
Reverse recovery fall time	t _a		-	16	-	ns
Reverse recovery rise time	t _b		-	20	-	

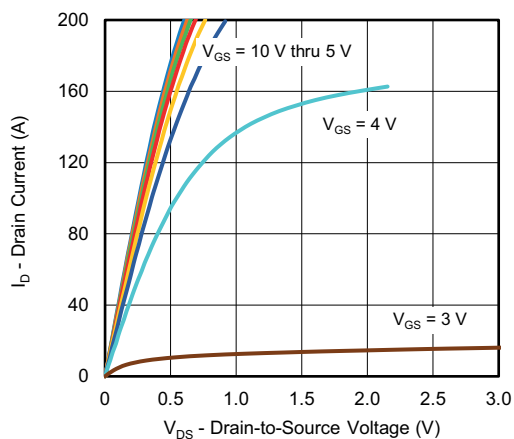
Notes

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

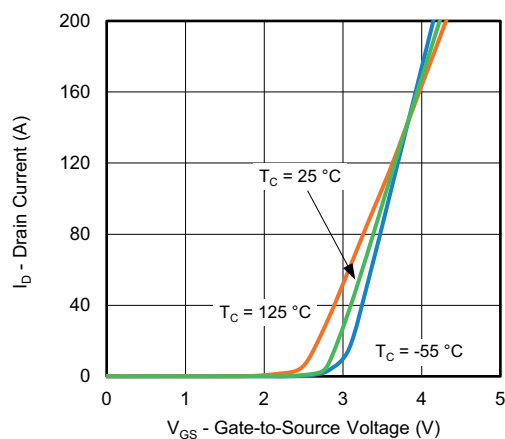
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



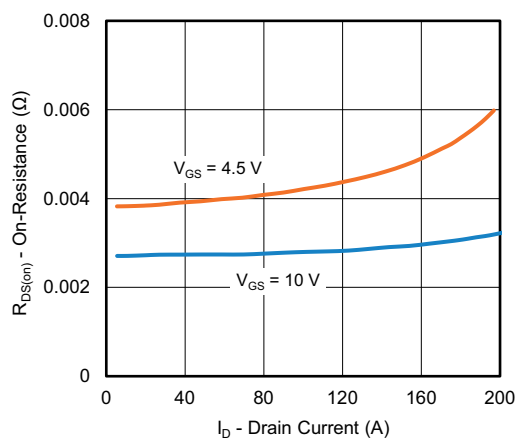
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



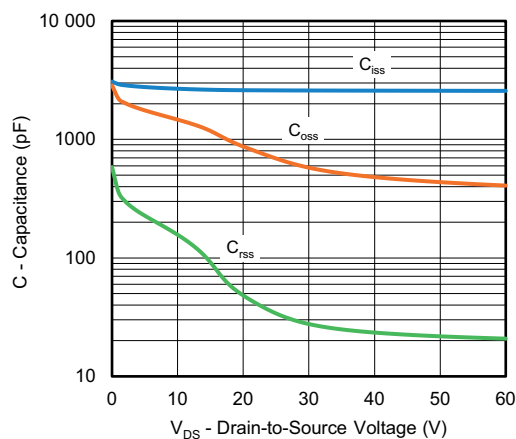
Output Characteristics



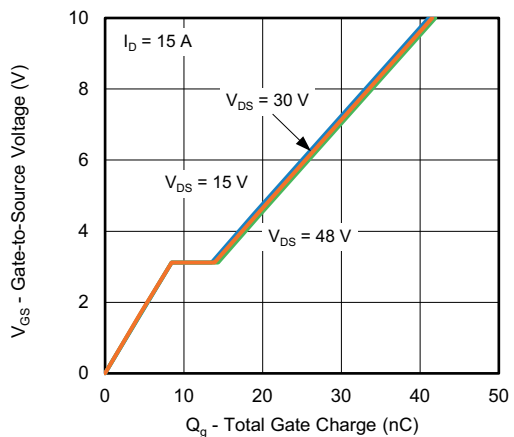
Transfer Characteristics



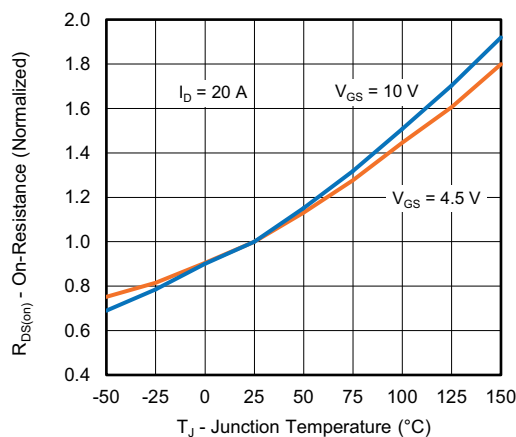
On-Resistance vs. Drain Current



Capacitance



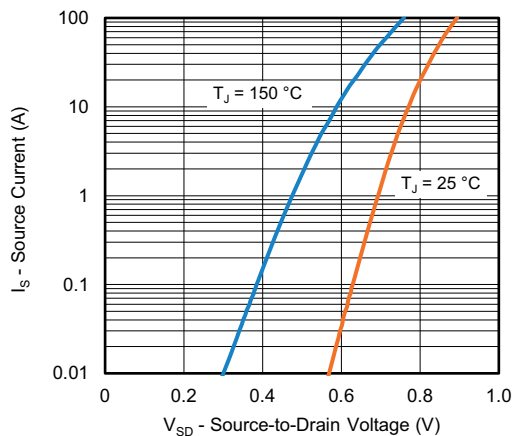
Gate Charge



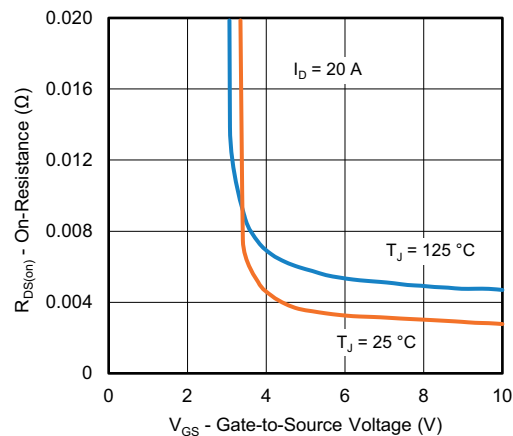
On-Resistance vs. Junction Temperature



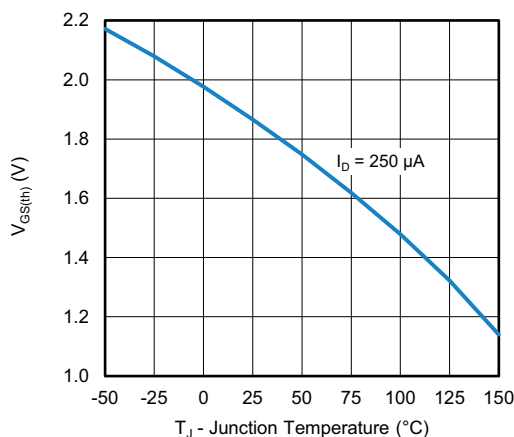
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



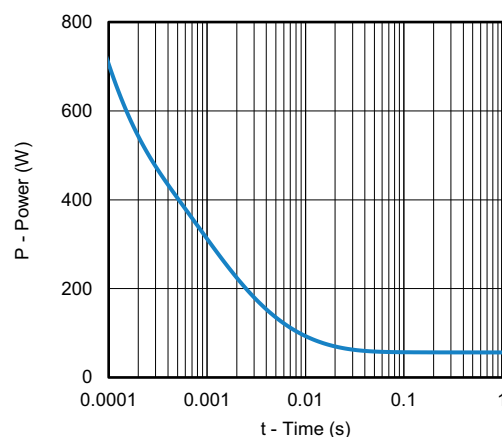
Source-Drain Diode Forward Voltage



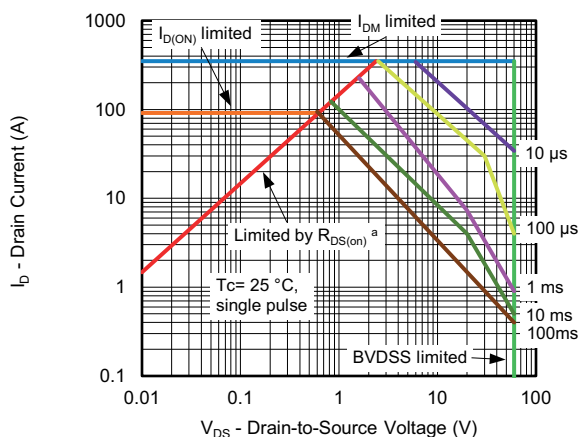
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power, Junction-to-Case



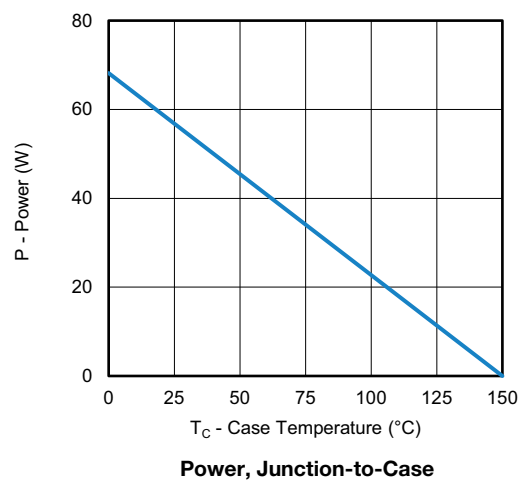
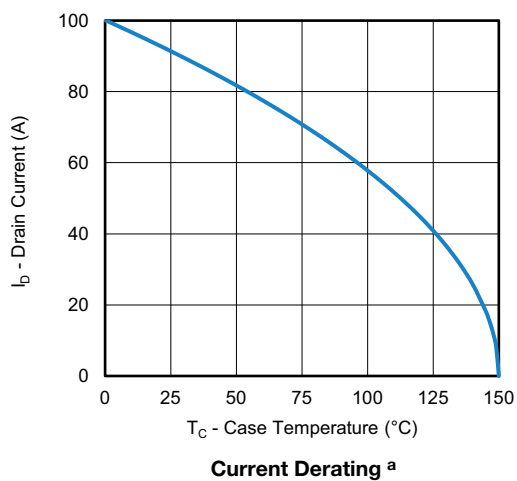
Safe Operating Area

Note

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



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

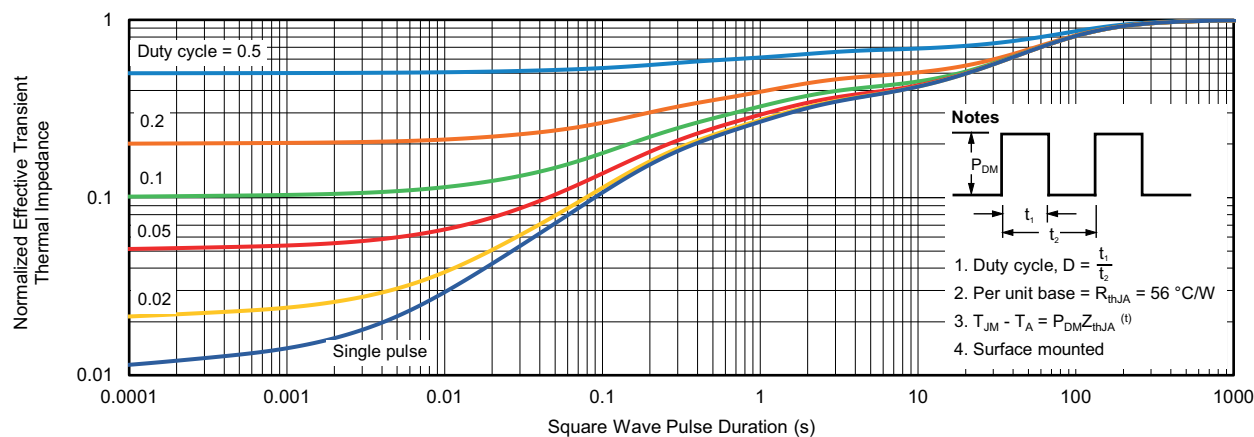


Note

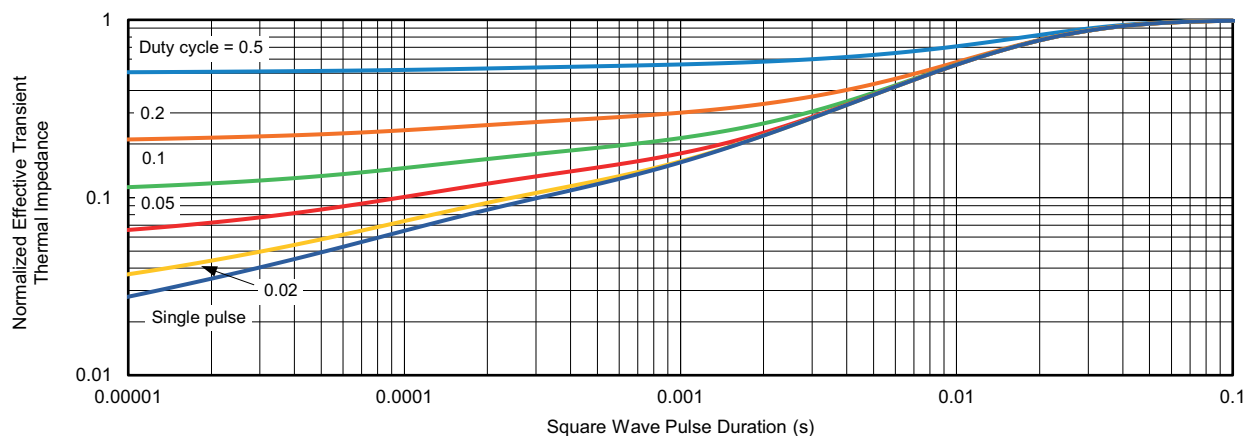
- a. The power dissipation P_D is based on T_J max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



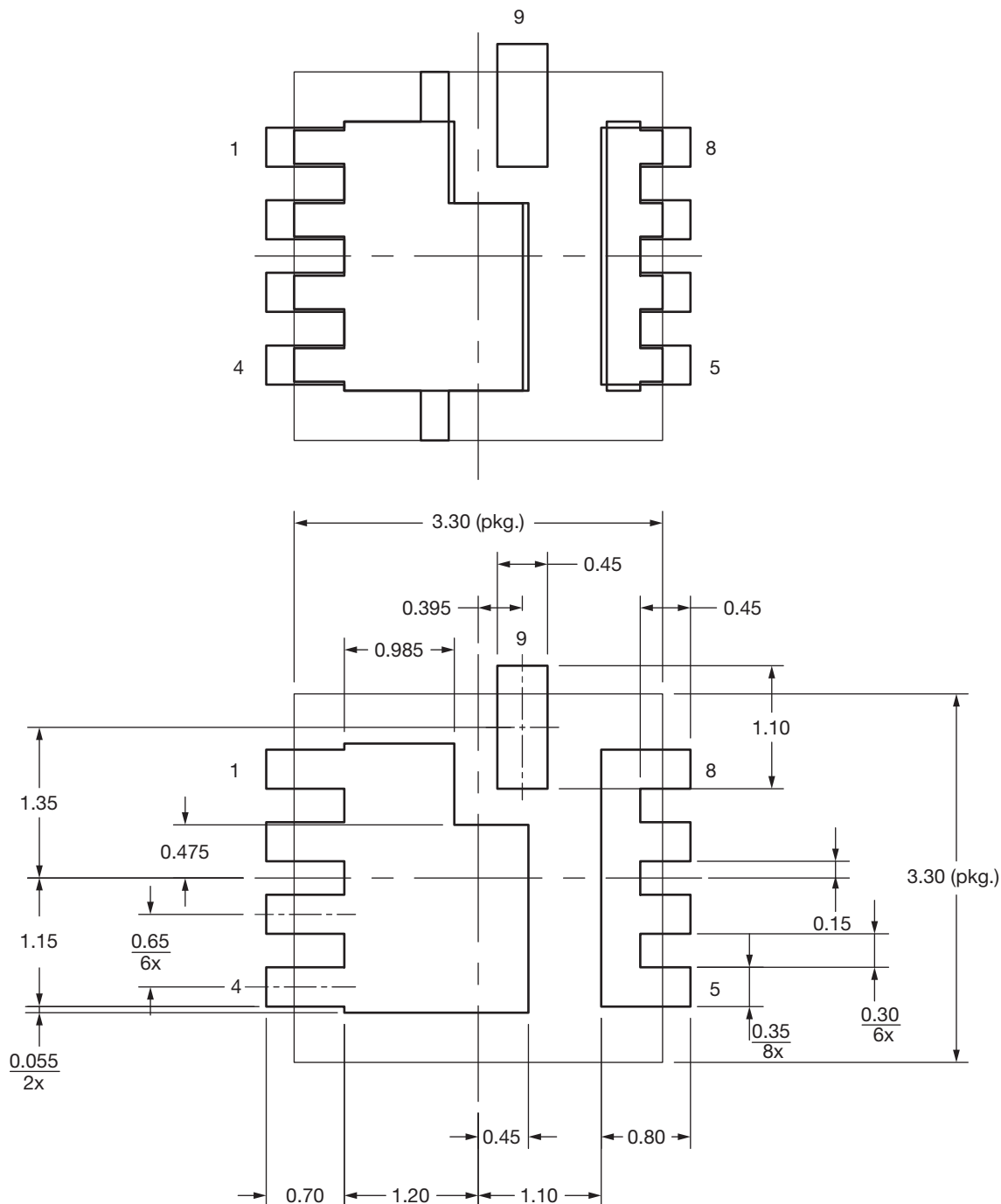
Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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Recommended Land Pattern PowerPAK® 1212-F



Note

- Dimensions in mm

ECN: T23-0022-Rev. A, 30-Jan-2023
DWG: 3017



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