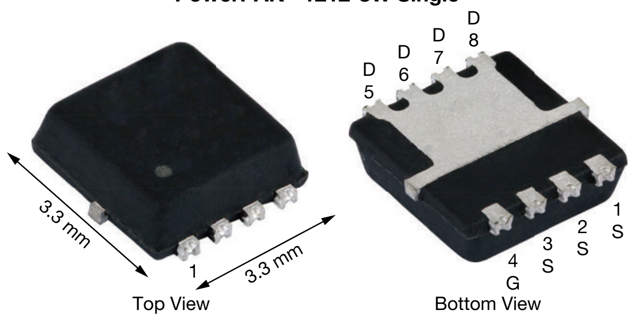
Automotive P-Channel 40 V (D-S) 175 °C MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	-40
$R_{DS(on)}$ (Ω) at V_{GS} = -10 V	0.029
$R_{DS(on)}$ (Ω) at V_{GS} = -4.5 V	0.047
I_D (A)	-16
Configuration	Single
Package	PowerPAK 1212-8W

PowerPAK® 1212-8W Single

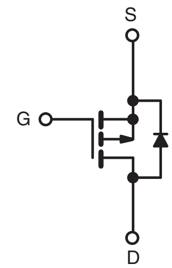


Marking Code: Q023

FEATURES

- TrenchFET® power MOSFET
- AEC-Q101 qualified [d]
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE
Pb-free
RoHS COMPLIANT
HALOGEN FREE



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)				
PARAMETER		**SYMBOL**	**LIMIT**	**UNIT**
Drain-Source Voltage		V_{DS}	-40	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current [a]	T_C = 25 °C	I_D	-16	A
	T_C = 125 °C		-16	
Continuous Source Current (Diode Conduction) [a]		I_S	-16	
Pulsed Drain Current [b]		I_{DM}	-64	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	-26	
Single Pulse Avalanche Energy		E_{AS}	33.8	mJ
Maximum Power Dissipation [b]	T_C = 25 °C	P_D	62.5	W
	T_C = 125 °C		20	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to +175	°C
Soldering Recommendations (Peak Temperature) [e, f]			260	

THERMAL RESISTANCE RATINGS				
PARAMETER		**SYMBOL**	**LIMIT**	**UNIT**
Junction-to-Ambient	PCB Mount [c]	R_{thJA}	81	°C/W
Junction-to-Case (Drain)		R_{thJC}	2.4	

Notes

a. Package limited.
b. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
c. When mounted on 1" square PCB (FR4 material).
d. Parametric verification ongoing.
e. See solder profile (*www.vishay.com/doc?73257*). The PowerPAK 1212-8W 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.
f. Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.

SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)

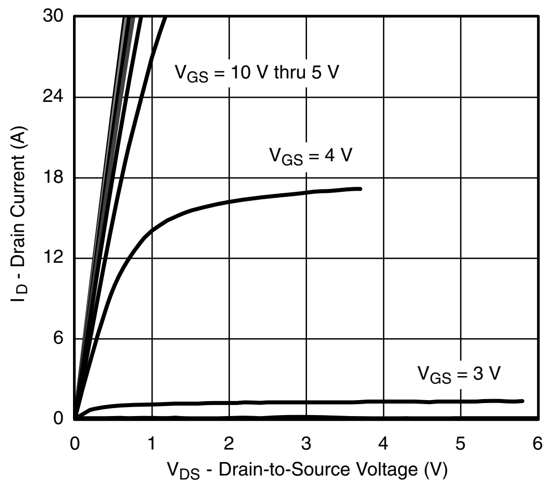
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0, I_D = -250 μA		-40	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = -250 μA		-1.5	-2.0	-2.5	
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V	V_{DS} = -40 V	-	-	-1	μA
		V_{GS} = 0 V	V_{DS} = -40 V, T_J = 125 °C	-	-	-50	
		V_{GS} = 0 V	V_{DS} = -40 V, T_J = 175 °C	-	-	-150	
On-State Drain Current [a]	$I_{D(on)}$	V_{GS} = -10 V	V_{DS} ≥ 5 V	-20	-	-	A
Drain-Source On-State Resistance [a]	$R_{DS(on)}$	V_{GS} = -10 V	I_D = -12 A	-	0.020	0.029	Ω
		V_{GS} = -10 V	I_D = -12 A, T_J = 125 °C	-	0.030	0.043	
		V_{GS} = -10 V	I_D = -12 A, T_J = 175 °C	-	0.040	0.051	
		V_{GS} = -4.5 V	I_D = -9 A	-	0.035	0.047	
Forward Transconductance [b]	g_{fs}	V_{DS} = -15 V, I_D = -7 A		-	12	-	S
Dynamic [b]							
Input Capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = -20 V, f = 1 MHz	-	1565	1875	pF
Output Capacitance	C_{oss}			-	245	295	
Reverse Transfer Capacitance	C_{rss}			-	170	205	
Total Gate Charge [c]	Q_g	V_{GS} = -4.5 V	V_{DS} = -20 V, I_D = -9.3 A	-	17.7	21.2	nC
Gate-Source Charge [c]	Q_{gs}			-	5.6	6.6	
Gate-Drain Charge [c]	Q_{gd}			-	8.1	9.7	
Gate Resistance	R_g	f = 1 MHz		1.1	1.95	2.8	Ω
Turn-On Delay Time [c]	$t_{d(on)}$	V_{DD} = -20 V, R_L = 14.2 Ω I_D ≅ -1.4 A, V_{GEN} = -10 V, R_g = 1 Ω		-	11	14	ns
Rise Time [c]	t_r			-	10	13	
Turn-Off Delay Time [c]	$t_{d(off)}$			-	36.5	44	
Fall Time [c]	t_f			-	10.2	13	
Source-Drain Diode Ratings and Characteristic [b]							
Pulsed Current [a]	I_{SM}			-	-	-64	A
Forward Voltage	V_{SD}	I_F = -8.8 A, V_{GS} = 0 V		-	-0.8	-1.1	V

Notes

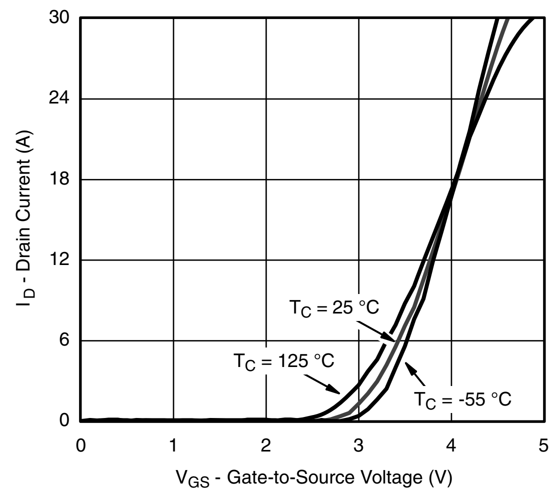
a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

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.

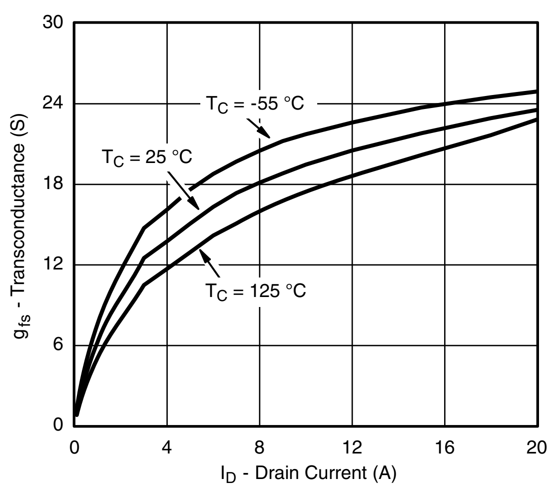
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



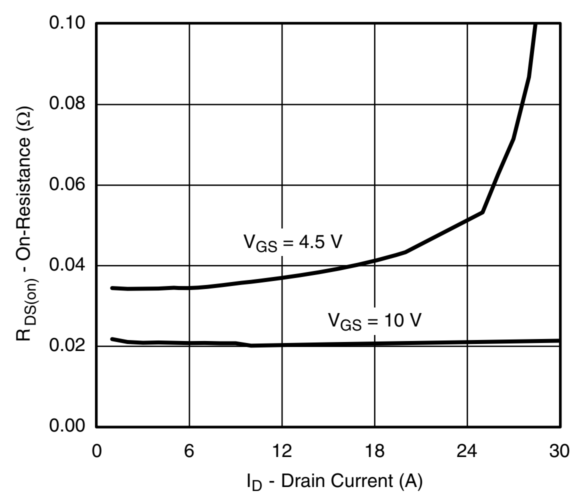
Output Characteristics



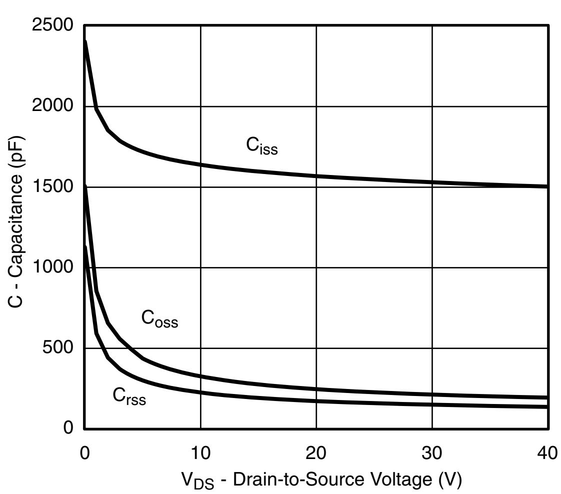
Transfer Characteristics



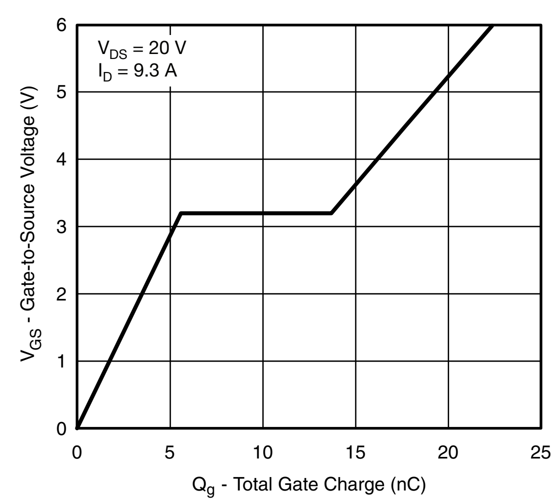
Transconductance



On-Resistance vs. Drain Current

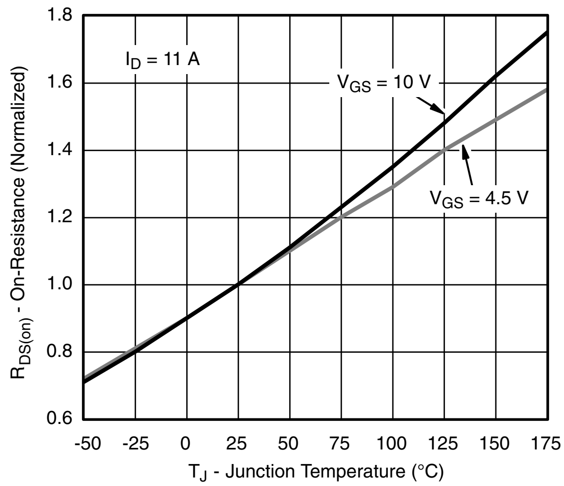


Capacitance

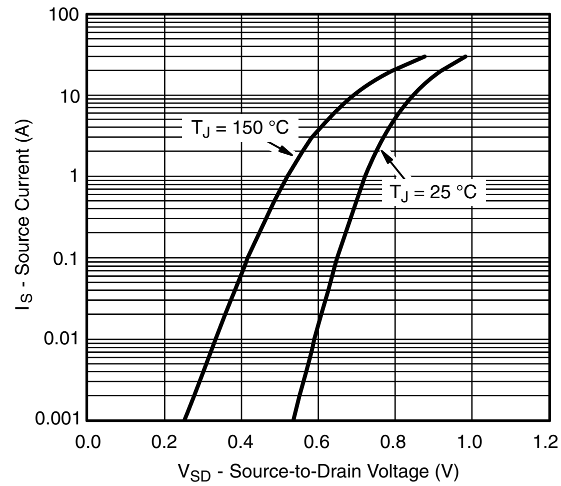


Gate Charge

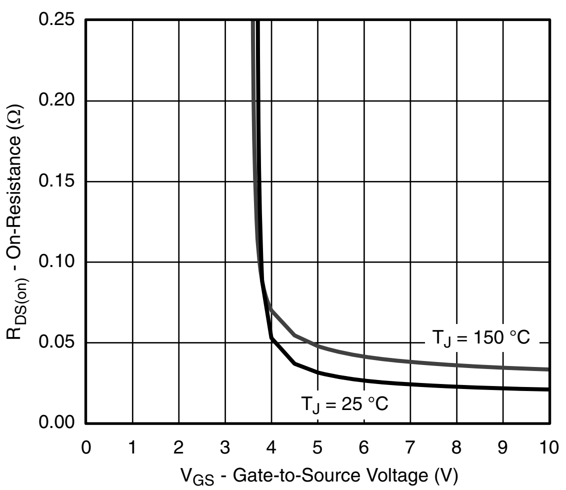
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



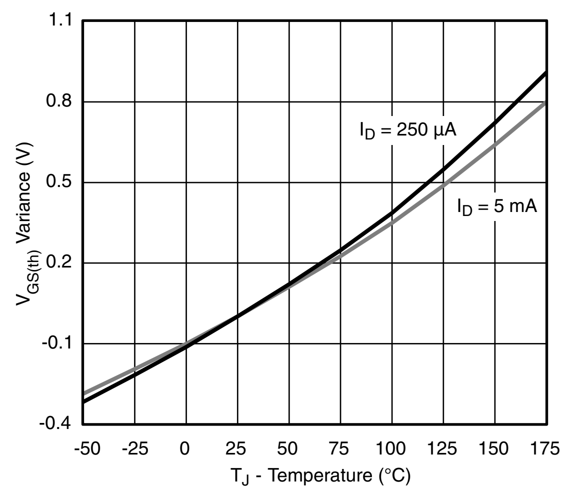
On-Resistance vs. Junction Temperature



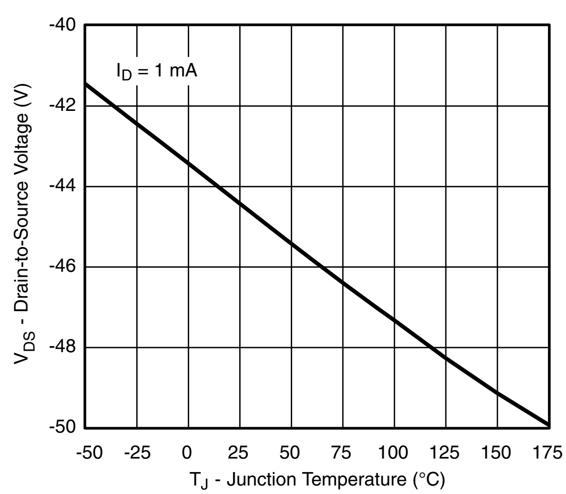
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

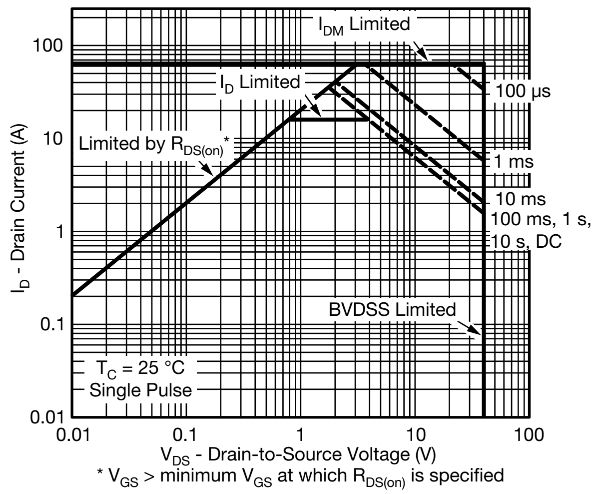


Threshold Voltage

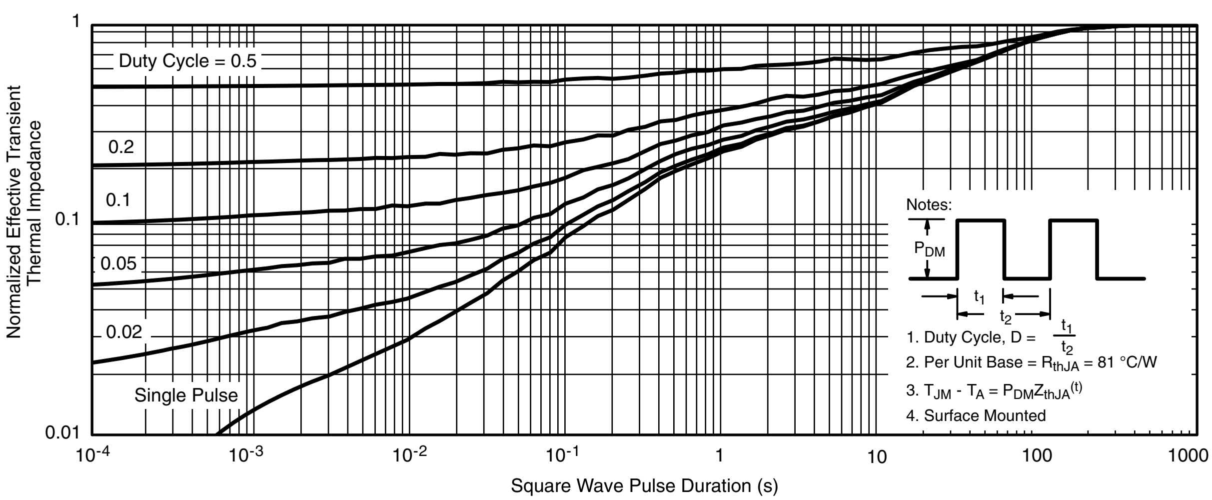


Drain Source Breakdown vs. Junction Temperature

THERMAL RATINGS (T_A = 25 °C, unless otherwise noted)

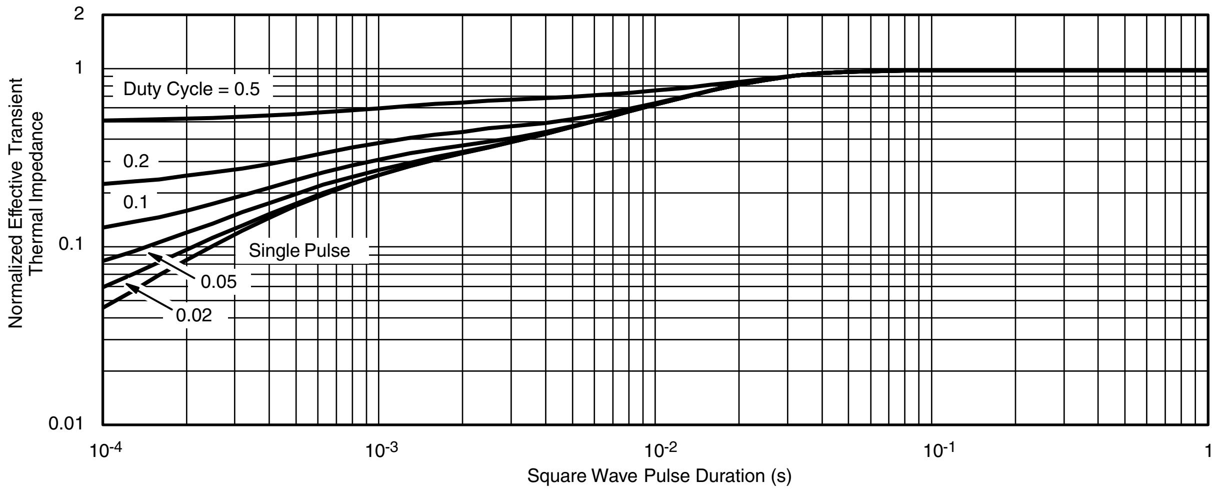


Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

THERMAL RATINGS (T_A = 25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Case

Note

- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)
  - Normalized Transient Thermal Impedance Junction-to-Case (25 °C)

  are given for general guidelines only to enable the user to get a "ball park" indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.

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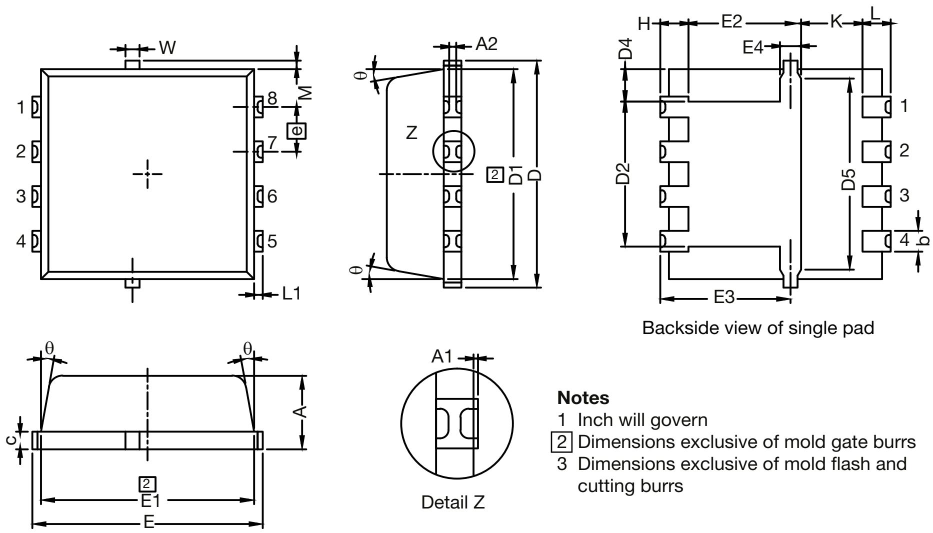
PowerPAK® 1212-8W Case Outline

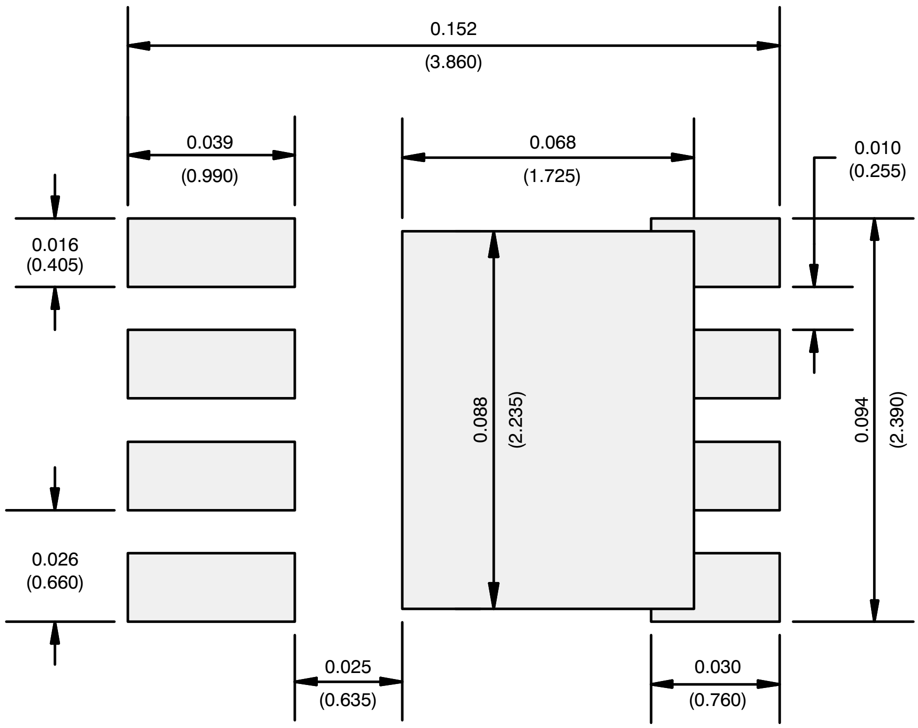


Notes
1 Inch will govern
2 Dimensions exclusive of mold gate burrs
3 Dimensions exclusive of mold flash and cutting burrs

DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.97	1.04	1.12	0.038	0.041	0.044
A1	0	-	0.05	0	-	0.002
A2	0	-	0.13	0	-	0.005
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
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	0.34 typ.			0.013 typ.		
e	0.65 BSC.			0.026 BSC		
K	0.86 typ.			0.034 typ.		
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: C15-1530-Rev. B, 16-Nov-15
DWG: 6032

RECOMMENDED MINIMUM PADS FOR PowerPAK® 1212-8 Single



Recommended Minimum Pads
Dimensions in Inches/(mm)

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