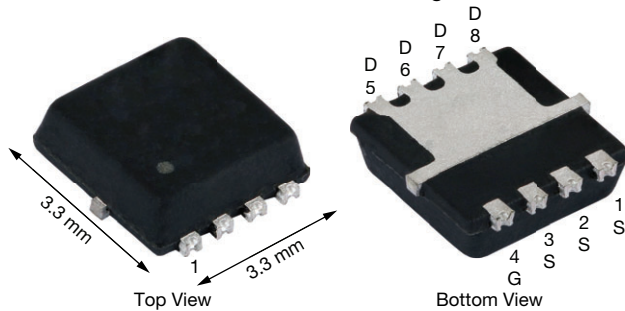


Automotive N-Channel 60 V (D-S) 175 °C MOSFET

PowerPAK® 1212-8W Single


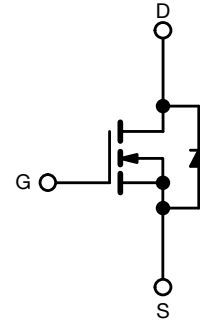
Marking code: Q051

PRODUCT SUMMARY	
V_{DS} (V)	60
$R_{DS(on)}$ (Ω) at $V_{GS} = 10$ V	0.0112
$R_{DS(on)}$ (Ω) at $V_{GS} = 4.5$ V	0.0160
I_D (A)	18
Configuration	Single

FEATURES

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

AUTOMOTIVE GRADE


RoHS
 COMPLIANT
 HALOGEN
FREE


N-Channel MOSFET

ORDERING INFORMATION	
Package	PowerPAK 1212-8W
Lead (Pb)-free and halogen-free	SQS660CENW (for detailed order number please see www.vishay.com/doc?79776)

ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)					
PARAMETER	SYMBOL	LIMIT	UNIT		
Drain-source voltage	V_{DS}	60	V		
Gate-source voltage	V_{GS}	± 20			
Continuous drain current ^a	I_D	$T_C = 25$ °C	18	A	
		$T_C = 125$ °C	18		
Continuous source current (diode conduction) ^a	I_S	18			
Pulsed drain current ^b	I_{DM}	72			
Single pulse avalanche current	I_{AS}	L = 0.1 mH	24.5		mJ
Single pulse avalanche energy			E_{AS}	30	
Maximum power dissipation	P_D	$T_C = 25$ °C	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) ^{d, e}		260			

THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	LIMIT	UNIT	
Junction-to-ambient	R_{thJA}	81	°C/W	
Junction-to-case (drain)				

Notes

- Package limited
- Pulse test; pulse width ≤ 300 μ s, duty cycle ≤ 2 %
- When mounted on 1" square PCB (FR4 material)
- 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
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components



SPECIFICATIONS ($T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Static							
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0, I_D = 250\text{ }\mu\text{A}$	60	-	-	V	
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.5	2.0	2.5		
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}	$V_{GS} = 0\text{ V}$	$V_{DS} = 60\text{ V}$	-	-	1	μA
		$V_{GS} = 0\text{ V}$	$V_{DS} = 60\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	-	50	
		$V_{GS} = 0\text{ V}$	$V_{DS} = 60\text{ V}, T_J = 175\text{ }^\circ\text{C}$	-	-	150	
On-state drain current ^a	$I_{D(on)}$	$V_{GS} = 10\text{ V}$	$V_{DS} \geq 5\text{ V}$	15	-	-	A
Drain-source on-state resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 7\text{ A}$	-	0.0091	0.0112	Ω
		$V_{GS} = 10\text{ V}$	$I_D = 7\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	-	0.0175	
		$V_{GS} = 10\text{ V}$	$I_D = 7\text{ A}, T_J = 175\text{ }^\circ\text{C}$	-	-	0.0207	
		$V_{GS} = 4.5\text{ V}$	$I_D = 5\text{ A}$	-	0.0129	0.0160	
Forward transconductance ^b	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 7\text{ A}$		-	26	-	S
Dynamic ^b							
Input capacitance	C_{iss}	$V_{GS} = 0\text{ V}$	$V_{DS} = 25\text{ V}, f = 1\text{ MHz}$	-	1363	1950	pF
Output capacitance	C_{oss}			-	565	800	
Reverse transfer capacitance	C_{rss}			-	22	31	
Total gate charge ^c	Q_g	$V_{GS} = 10\text{ V}$	$V_{DS} = 30\text{ V}, I_D = 4\text{ A}$	-	17.4	26	nC
Gate-source charge ^c	Q_{gs}			-	4.8	-	
Gate-drain charge ^c	Q_{gd}			-	1.1	-	
Gate resistance	R_g	$f = 1\text{ MHz}$		0.27	0.54	0.81	Ω
Turn-on delay time ^c	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 7.5\text{ }\Omega$ $I_D \cong 4\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		-	12	20	ns
Rise time ^c	t_r			-	4	10	
Turn-off delay time ^c	$t_{d(off)}$			-	20	35	
Fall time ^c	t_f			-	5	10	
Source-Drain Diode Ratings and Characteristic ^b							
Pulsed current ^a	I_{SM}			-	-	72	A
Forward voltage	V_{SD}	$I_F = 7\text{ A}, V_{GS} = 0\text{ V}$		-	0.8	1.1	V
Body diode reverse recovery time	t_{rr}	$I_F = 5\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		-	27	55	ns
Body diode reverse recovery charge	Q_{rr}			-	21	45	nC
Reverse recovery fall time	t_a			-	14	-	ns
Reverse recovery rise time	t_b			-	13	-	
Body diode peak reverse recovery current	$I_{RM(REC)}$			-	-1.4	-	A

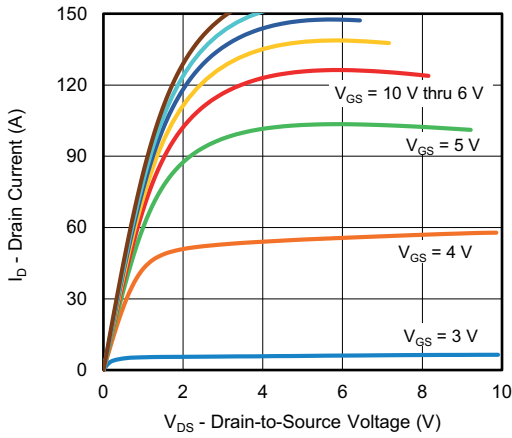
Notes

- 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. Independent of operating temperature

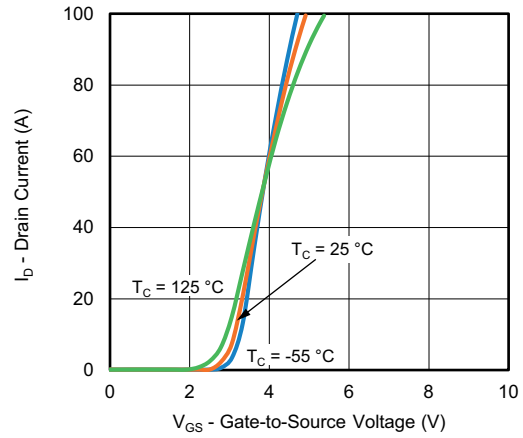
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



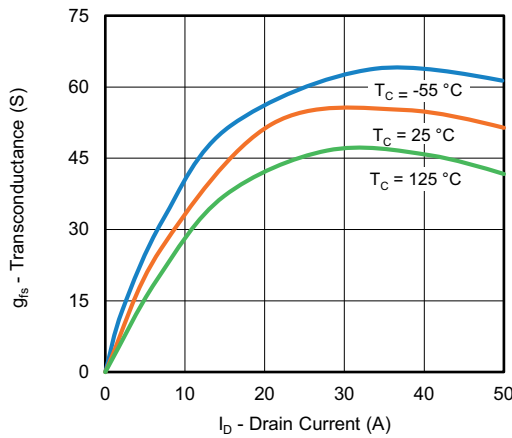
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



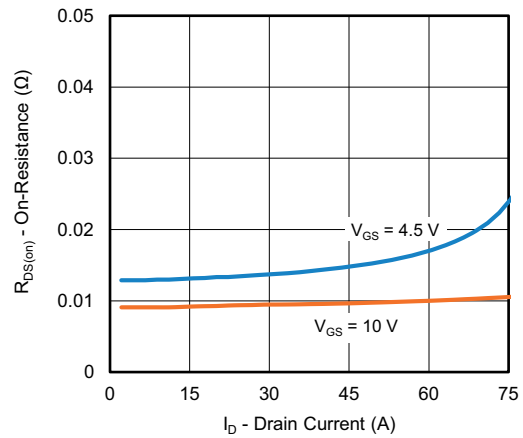
Output Characteristics



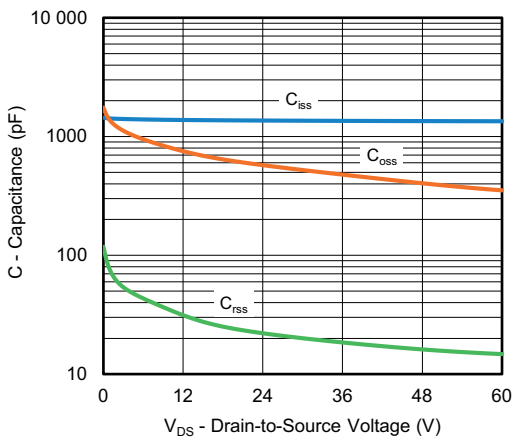
Transfer Characteristics



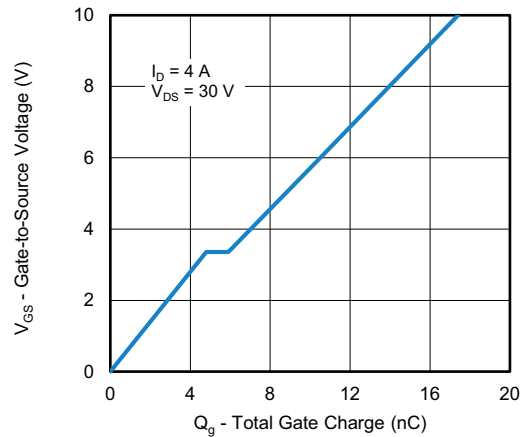
Transconductance



On-Resistance vs. Drain Current



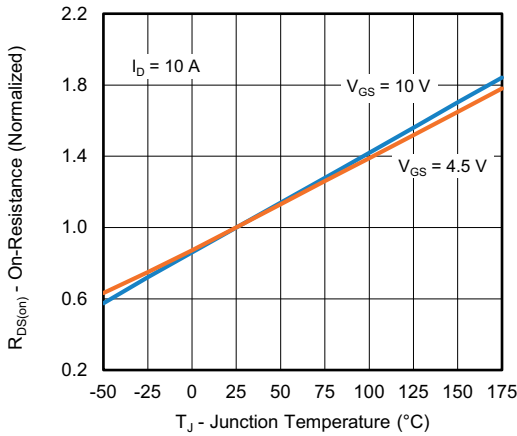
Capacitance



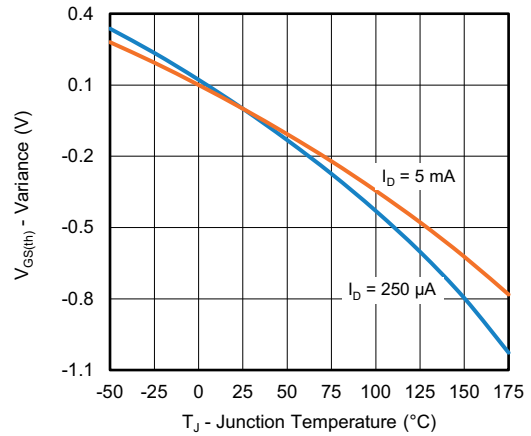
Gate Charge



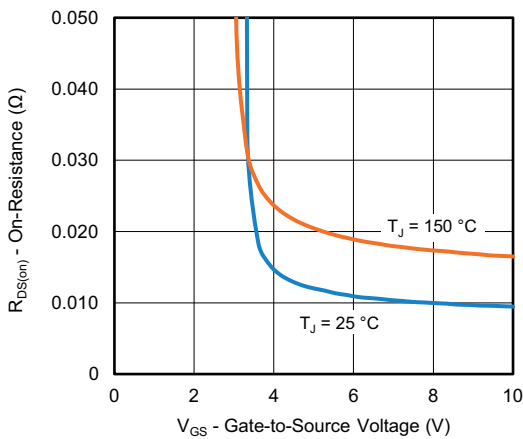
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



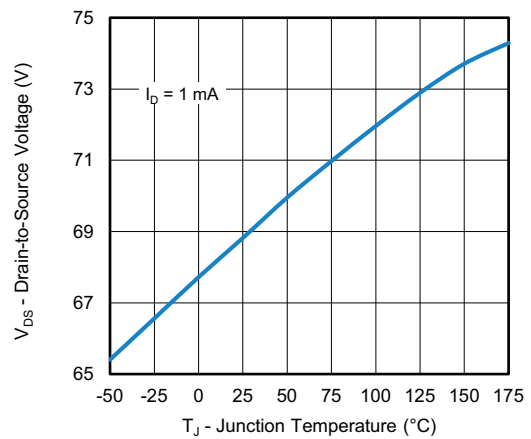
On-Resistance vs. Junction Temperature



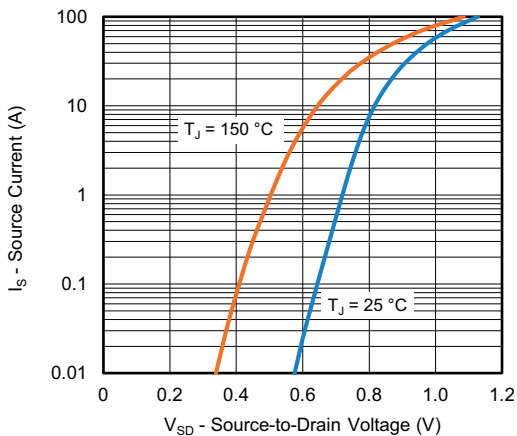
Threshold Voltage



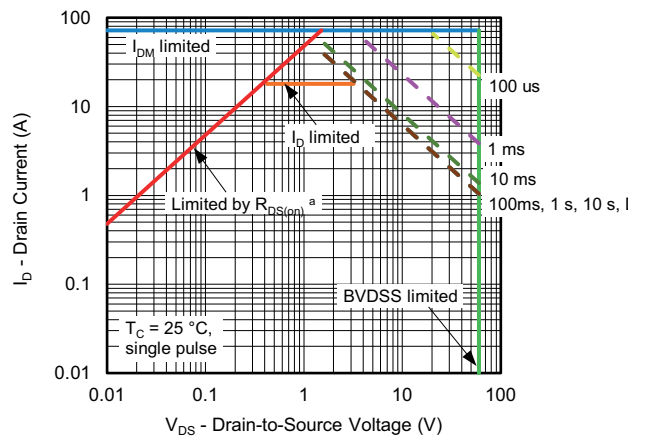
On-Resistance vs. Gate-to-Source Voltage



Drain Source Breakdown vs. Junction Temperature



Source Drain Diode Forward Voltage

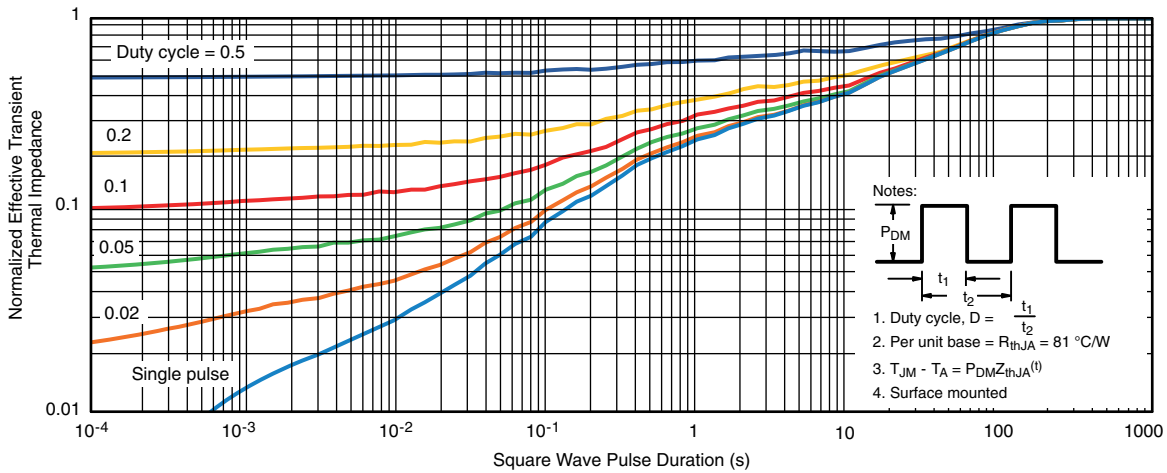


Safe Operating Area

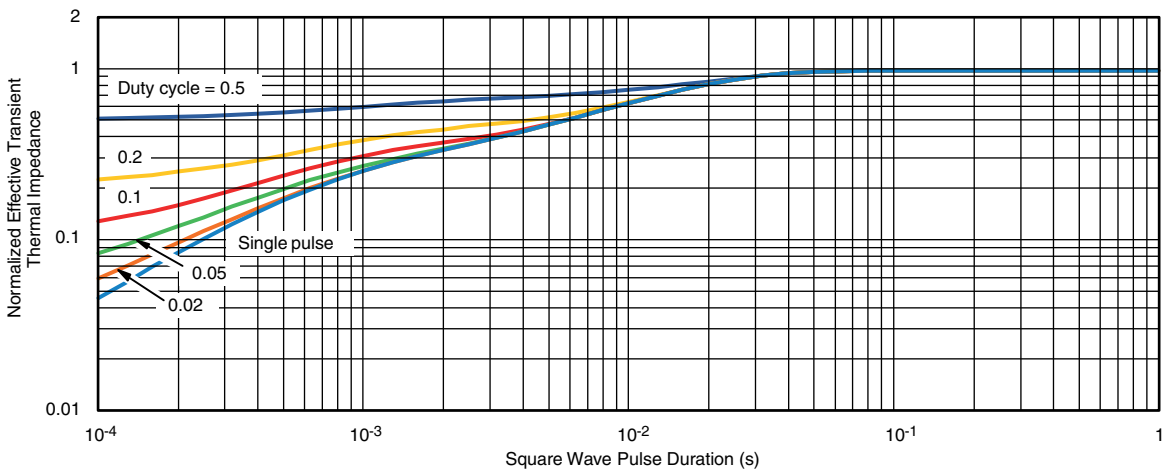
Note

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

THERMAL RATINGS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



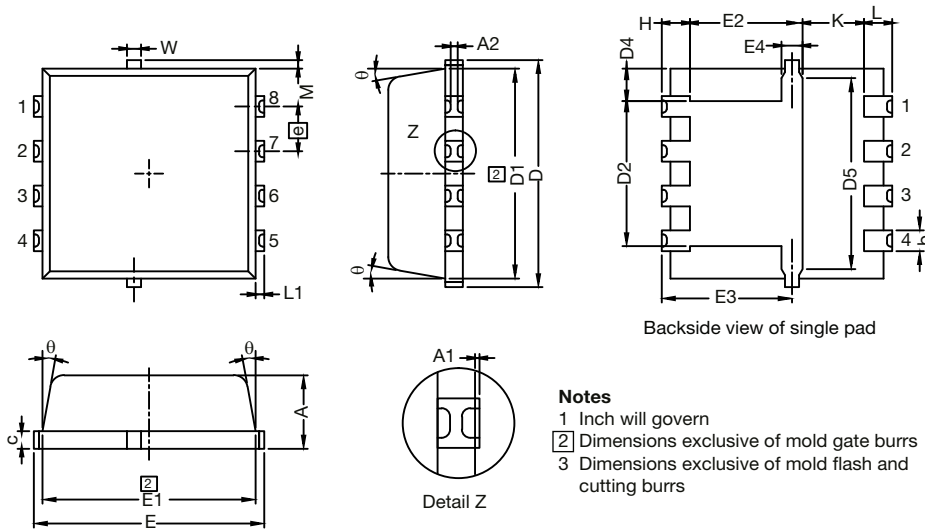
Normalized Thermal Transient Impedance, Junction-to-Case

Note

- The characteristics shown in the two graphs
 - Normalized Transient Thermal Impedance Junction-to-Ambient ($25\text{ }^\circ\text{C}$)
 - Normalized Transient Thermal Impedance Junction-to-Case ($25\text{ }^\circ\text{C}$)
 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



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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