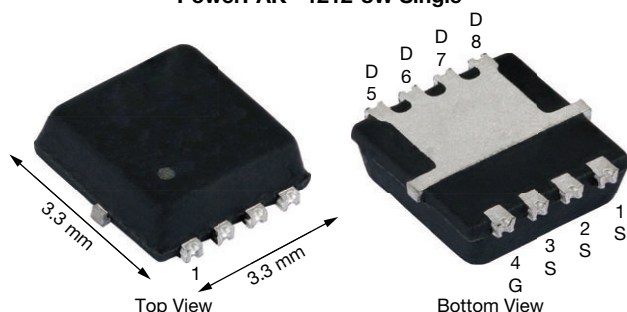


Automotive P-Channel 60 V (D-S) 175 °C MOSFET

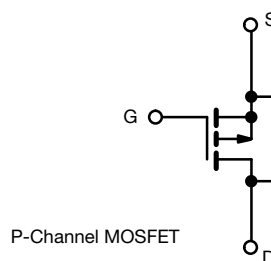
PowerPAK® 1212-8W Single

Marking code: Q021

PRODUCT SUMMARY	
V_{DS} (V)	-60
$R_{DS(on)}$ (Ω) at $V_{GS} = -10$ V	0.065
$R_{DS(on)}$ (Ω) at $V_{GS} = -4.5$ V	0.090
I_D (A)	-16
Configuration	Single
Package	PowerPAK 1212-8W

FEATURES

- TrenchFET® power MOSFET
- Low thermal resistance PowerPAK® 1212-8W package with 1.07 mm profile
- AEC-Q101 qualified
- Wettable flank terminals
- 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


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	
Continuous drain current	$T_C = 25$ °C ^a	I_D	-16	A
	$T_C = 125$ °C		-11	
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}	-23	mJ
Single pulse avalanche energy		E_{AS}	26	
Maximum power dissipation ^b	$T_C = 25$ °C	P_D	53	W
	$T_C = 125$ °C		17	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +175	°C
Soldering recommendations (peak temperature) ^d			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}	2.8	

Notes

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

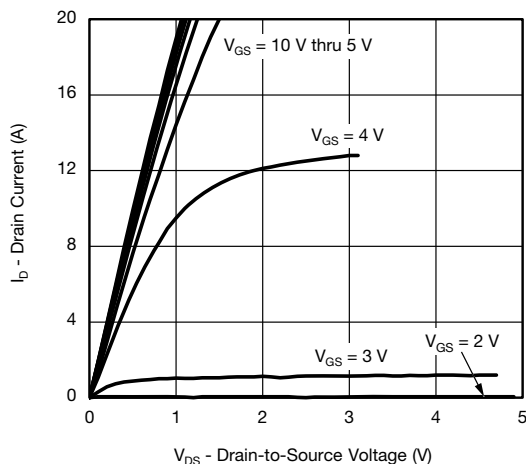
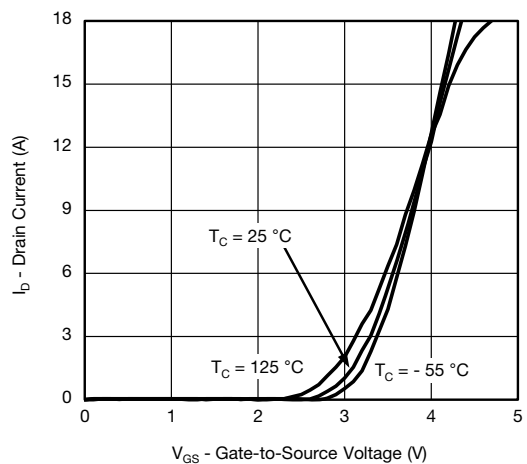
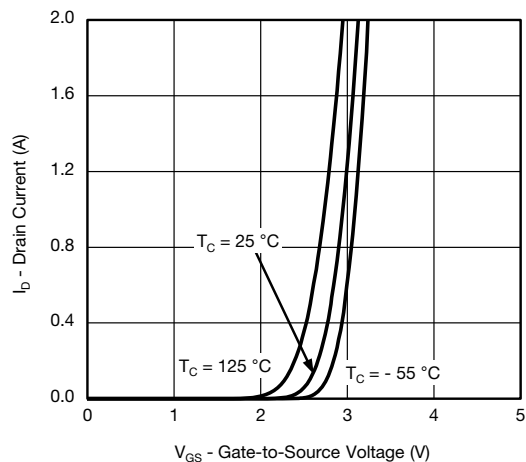
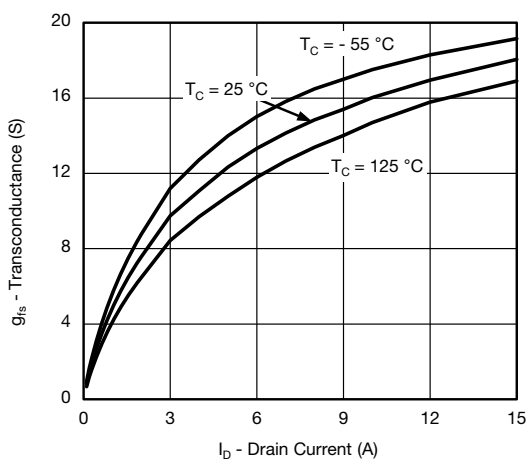
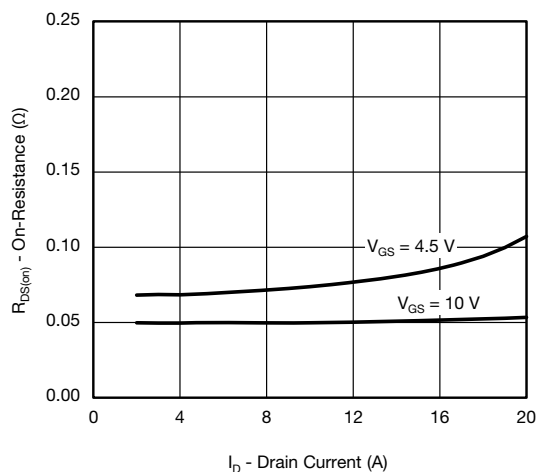
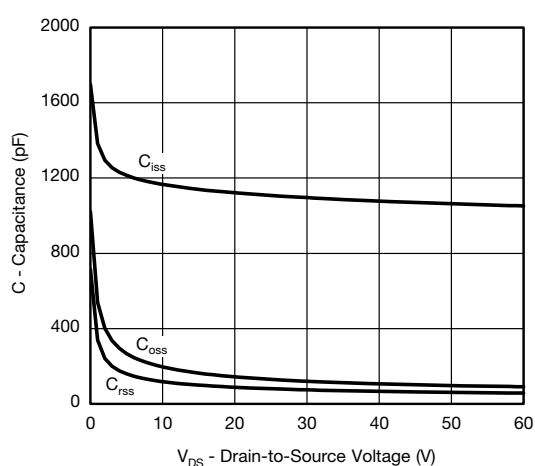


SPECIFICATIONS (T _C = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V _{DS}	V _{GS} = 0 V, I _D = -250 μA		-60	-	-	V
Gate-source threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = -250 μA		-1.5	-2.0	-2.5	
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} = -60 V	-	-	-1	μA
		V _{GS} = 0 V	V _{DS} = -60 V, T _J = 125 °C	-	-	-50	
		V _{GS} = 0 V	V _{DS} = -60 V, T _J = 175 °C	-	-	-150	
On-state drain current ^a	I _{D(on)}	V _{GS} = -10 V	V _{DS} ≤ -5 V	-15	-	-	A
Drain-source on-state resistance ^a	R _{DS(on)}	V _{GS} = -10 V	I _D = -5.7 A	-	0.050	0.065	Ω
		V _{GS} = -10 V	I _D = -5.7 A, T _J = 125 °C	-	-	0.112	
		V _{GS} = -10 V	I _D = -5.7 A, T _J = 175 °C	-	-	0.138	
		V _{GS} = -4.5 V	I _D = -4.4 A,	-	0.070	0.090	
Forward transconductance ^b	g _{fs}	V _{DS} = -15 V, I _D = -5.7 A		-	13	-	S
Dynamic ^b							
Input capacitance	C _{iss}	V _{GS} = 0 V	V _{DS} = -25 V, f = 1 MHz	-	1108	1385	pF
Output capacitance	C _{oss}			-	132	165	
Reverse transfer capacitance	C _{rss}			-	84	105	
Total gate charge ^c	Q _g	V _{GS} = -10 V	V _{DS} = -30 V, I _D = -5.7 A	-	25.5	38	nC
Gate-source charge ^c	Q _{gs}			-	3.6	-	
Gate-drain charge ^c	Q _{gd}			-	6.7	-	
Gate resistance	R _g	f = 1 MHz		3	6	9	Ω
Turn-on delay time ^c	t _{d(on)}	V _{DD} = -30 V, R _L = 30 Ω I _D ≅ -1 A, V _{GEN} = -10 V, R _g = 1 Ω		-	9	14	ns
Rise time ^c	t _r			-	9	14	
Turn-off delay time ^c	t _{d(off)}			-	37	56	
Fall time ^c	t _f			-	8	12	
Source-drain diode ratings and characteristics ^b							
Pulsed current ^a	I _{SM}			-	-	-64	A
Forward voltage	V _{SD}	I _F = -6 A, V _{GS} = 0 V		-	-0.85	-1.2	V

Notes

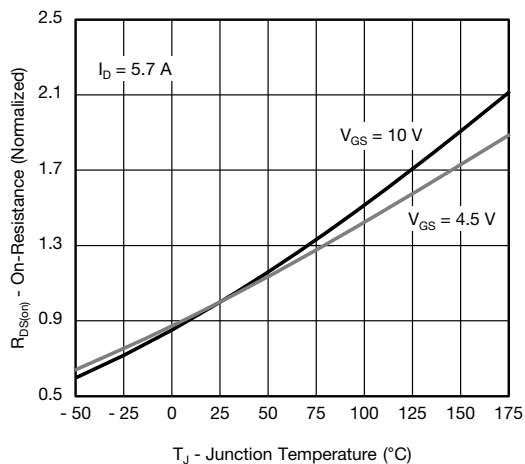
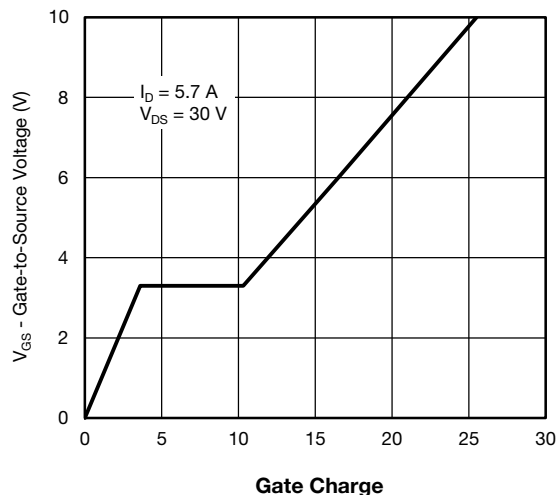
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
b. Guaranteed by design, not subject to production testing
c. Independent of operating temperature

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.

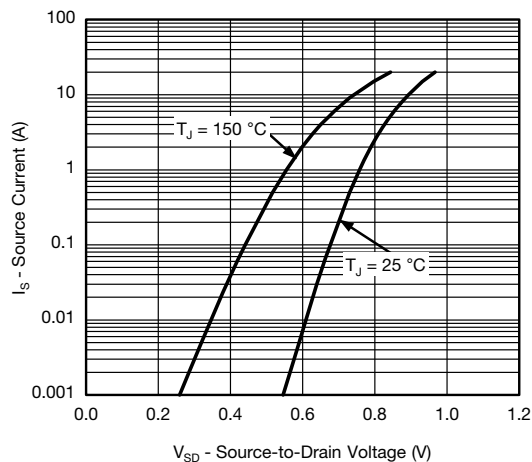
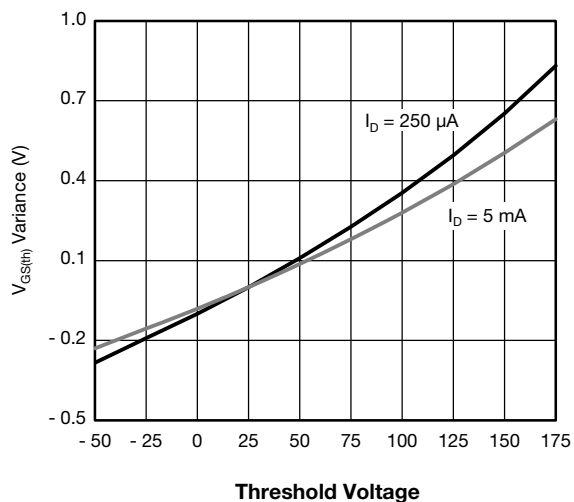
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

Output Characteristics

Transfer Characteristics

Transfer Characteristics

Transconductance

On-Resistance vs. Drain Current

Capacitance



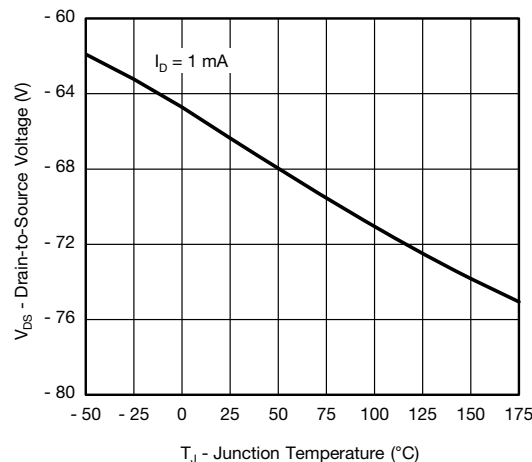
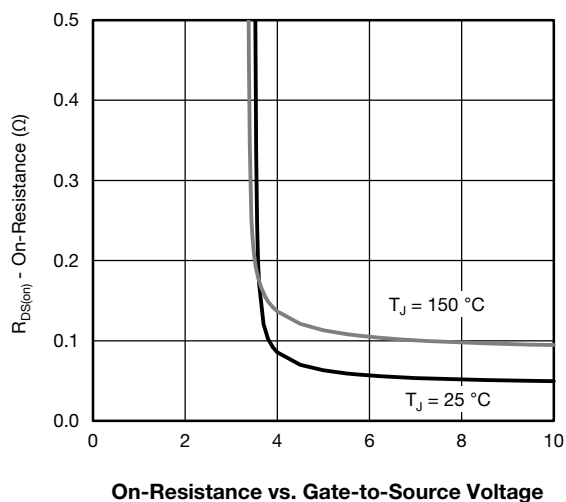
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



On-Resistance vs. Junction Temperature



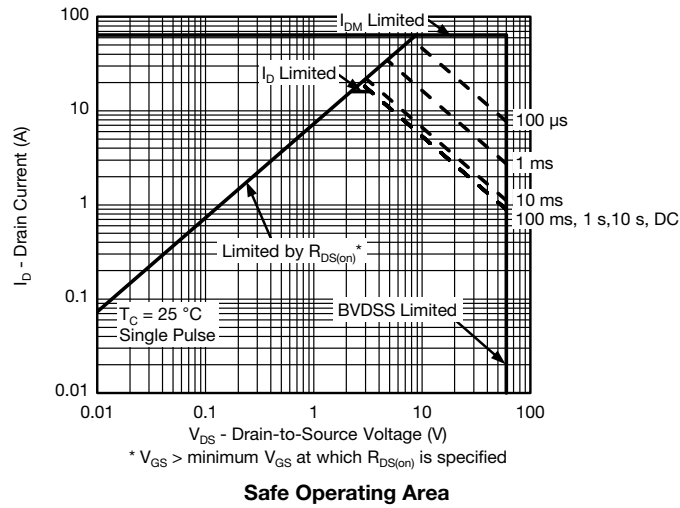
Source Drain Diode Forward Voltage

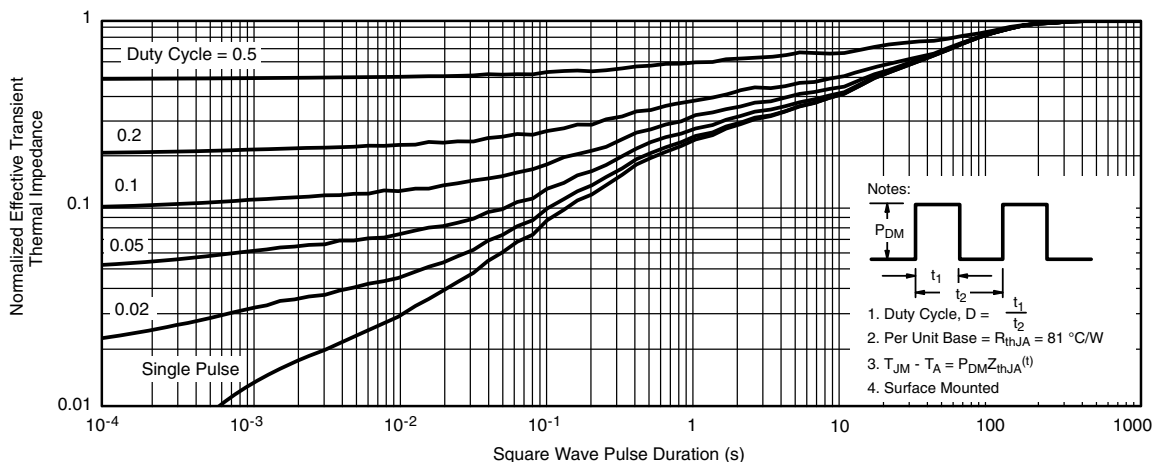
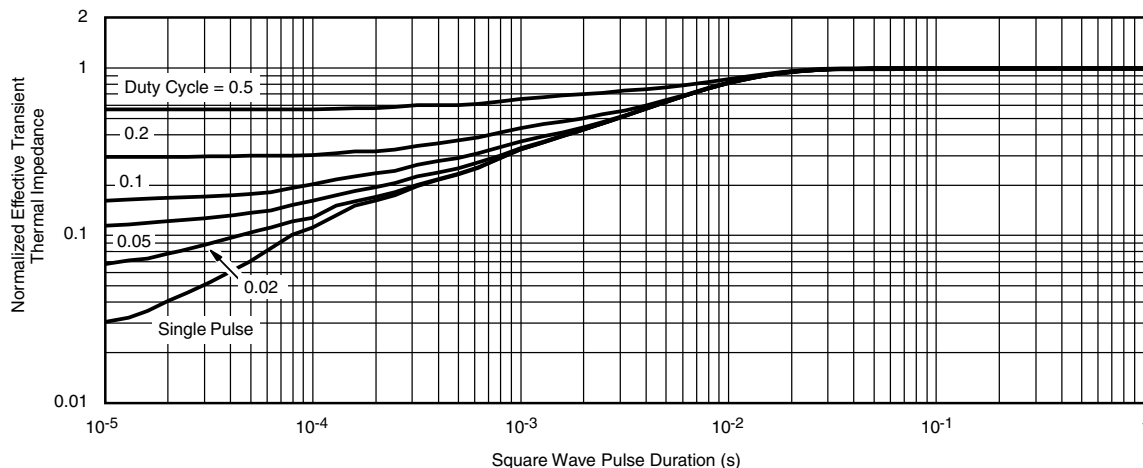


Drain Source Breakdown vs. Junction Temperature



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

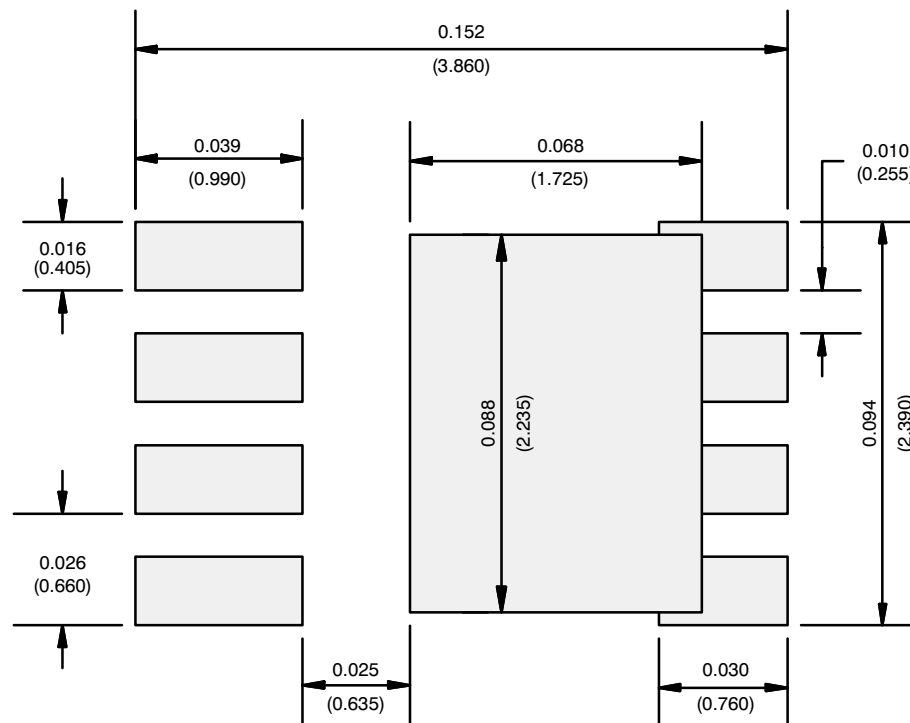



THERMAL RATINGS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

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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RECOMMENDED MINIMUM PADS FOR PowerPAK® 1212-8 Single



Recommended Minimum Pads
Dimensions in Inches/(mm)

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