

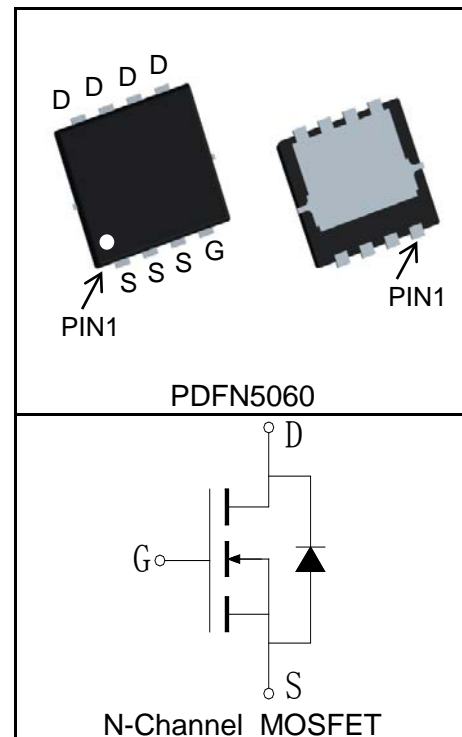
### Features

- 40V/120A,  
 $R_{DS(ON)} = 2.7m\Omega(Typ.)@V_{GS}=10V$
- Super High Dense Cell Design
- Ultra Low On-Resistance
- Fast Switching Speed
- 100% avalanche tested
- Lead Free and Green Devices Available (RoHS Compliant)

### Applications

- DC/DC Converters
- Power Supply

### Pin Description



### Absolute Maximum Ratings

Symbol	Parameter		Rating	Unit
Common Ratings (T <sub>C</sub> =25°C Unless Otherwise Noted)				
V <sub>DSS</sub>	Drain-Source Voltage		40	V
V <sub>GSS</sub>	Gate-Source Voltage		±20	
T <sub>J</sub>	Maximum Junction Temperature		150	°C
T <sub>STG</sub>	Storage Temperature Range		-55 to 150	°C
I <sub>S</sub>	Diode Continuous Forward Current	T <sub>C</sub> =25°C	50	A
Mounted on Large Heat Sink				
I <sub>DP</sub> <sup>①</sup>	300μs Pulse Drain Current Tested	T <sub>C</sub> =25°C	480	A
I <sub>D</sub> <sup>②</sup>	Continuous Drain Current@T <sub>C</sub> (V <sub>GS</sub> =10V)	T <sub>C</sub> =25°C	120	A
		T <sub>C</sub> =100°C	75	
	Continuous Drain Current@T <sub>A</sub> (V <sub>GS</sub> =10V) <sup>③</sup>	T <sub>A</sub> =25°C	21	
		T <sub>A</sub> =70°C	17	
P <sub>D</sub>	Maximum Power Dissipation@T <sub>C</sub>	T <sub>C</sub> =25°C	96	W
		T <sub>C</sub> =100°C	38	
	Maximum Power Dissipation@T <sub>A</sub> <sup>③</sup>	T <sub>A</sub> =25°C	4.2	
		T <sub>A</sub> =70°C	2.7	

Symbol	Parameter	Rating	Unit
$R_{\theta JC}$	Thermal Resistance-Junction to Case	1.3	°C/W
$R_{\theta JA}^{(3)}$	Thermal Resistance-Junction to Ambient	30	°C/W
<b>Drain-Source Avalanche Ratings</b>			
$E_{AS}^{(4)}$	Avalanche Energy, Single Pulsed	400	mJ

**Electrical Characteristics** ( $T_C=25^\circ\text{C}$  Unless Otherwise Noted)

Symbol	Parameter	Test Condition	RU40120M			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>DS</sub> =250μA	40			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =40V, V <sub>GS</sub> =0V			1	μA
			T <sub>J</sub> =125°C		30	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250μA	2		4	V
I <sub>GSS</sub>	Gate Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V			±100	nA
R <sub>DS(ON)</sub> ⑤	Drain-Source On-state Resistance	V <sub>GS</sub> =10V, I <sub>DS</sub> =60A		2.7	4.5	mΩ
Diode Characteristics						
V <sub>SD</sub> ⑤	Diode Forward Voltage	I <sub>SD</sub> =60A, V <sub>GS</sub> =0V			1.2	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> =60A, dI <sub>SD</sub> /dt=100A/μs		33		ns
Q <sub>rr</sub>	Reverse Recovery Charge			30		nC
Dynamic Characteristics ⑥						
R <sub>G</sub>	Gate Resistance	V <sub>GS</sub> =0V,V <sub>DS</sub> =0V,F=1MHz		1.8		Ω
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =20V, Frequency=1.0MHz		3700		pF
C <sub>oss</sub>	Output Capacitance			680		
C <sub>rss</sub>	Reverse Transfer Capacitance			345		
t <sub>d(ON)</sub>	Turn-on Delay Time	V <sub>DD</sub> =20V,I <sub>DS</sub> =60A, V <sub>GEN</sub> =10V,R <sub>G</sub> =4.7Ω		36		ns
t <sub>r</sub>	Turn-on Rise Time			205		
t <sub>d(OFF)</sub>	Turn-off Delay Time			85		
t <sub>f</sub>	Turn-off Fall Time			45		
Gate Charge Characteristics ⑥						
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =32V, V <sub>GS</sub> =10V, I <sub>DS</sub> =60A		90		nC
Q <sub>gs</sub>	Gate-Source Charge			32		
Q <sub>gd</sub>	Gate-Drain Charge			37		

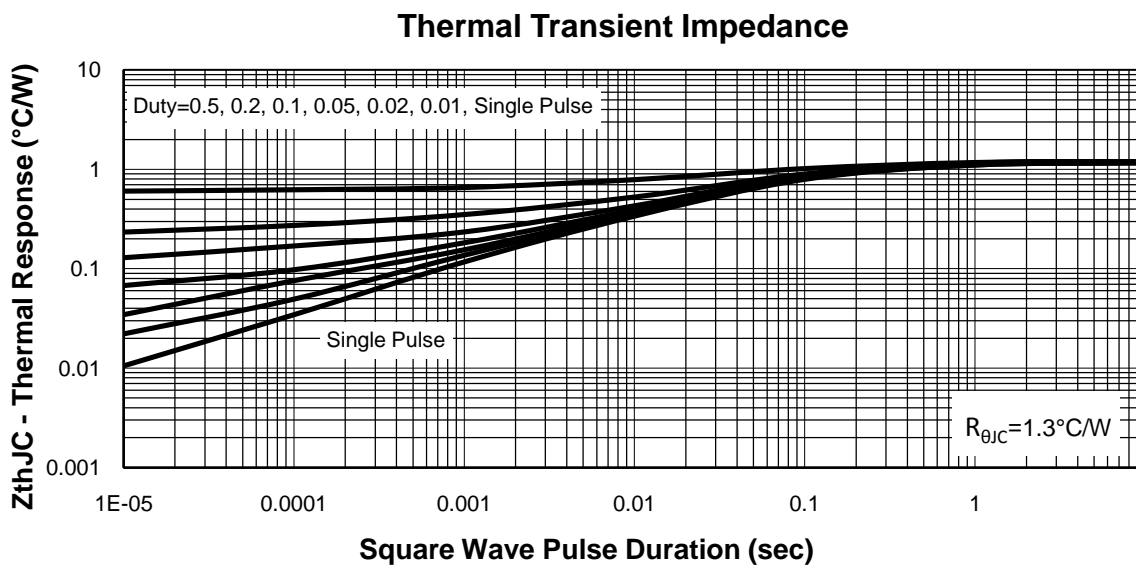
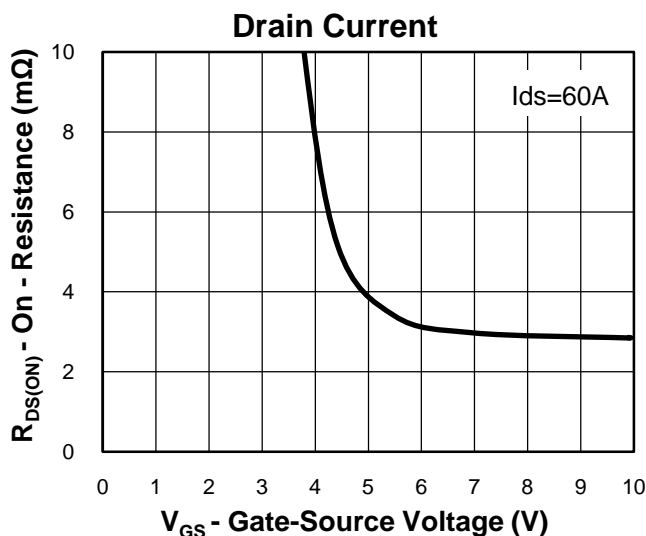
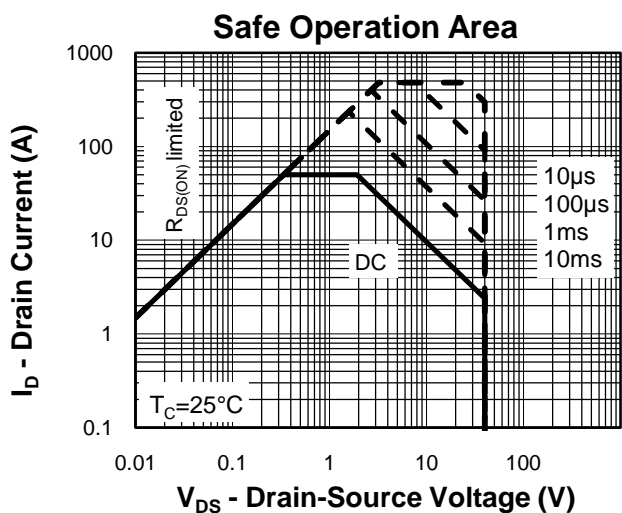
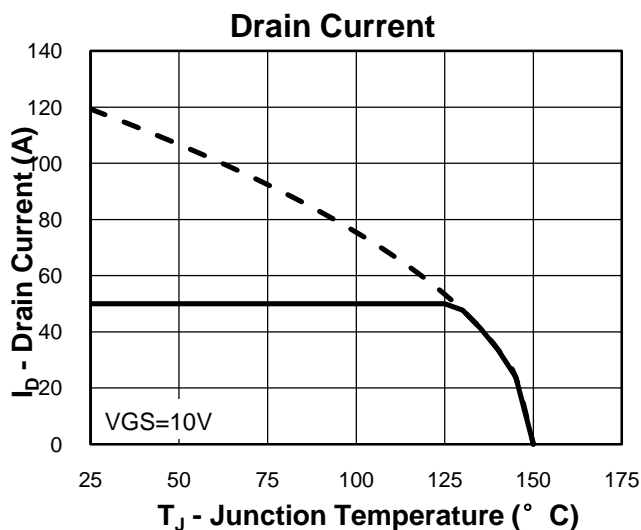
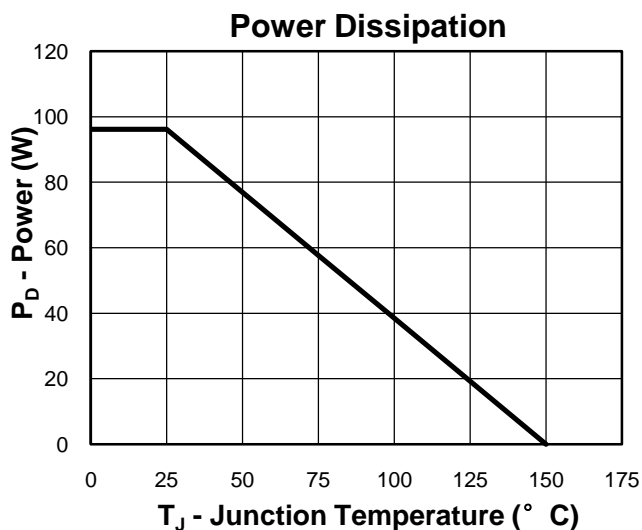
**Notes:**

- ①Pulse width limited by safe operating area.
- ②Calculated continuous current based on maximum allowable junction temperature. The package limitation current is 50A.
- ③When mounted on 1 inch square copper board,  $t \leq 10\text{sec}$ .
- ④Limited by  $T_{J\text{max}}$ ,  $I_{AS} = 40\text{A}$ ,  $V_{DD} = 32\text{V}$ ,  $R_G = 50\Omega$ , Starting  $T_J = 25^\circ\text{C}$ .
- ⑤Pulse test;Pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- ⑥Guaranteed by design, not subject to production testing.

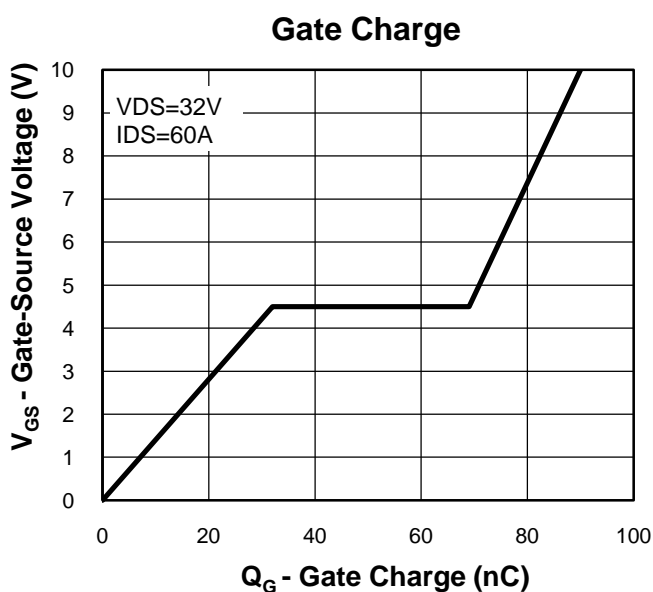
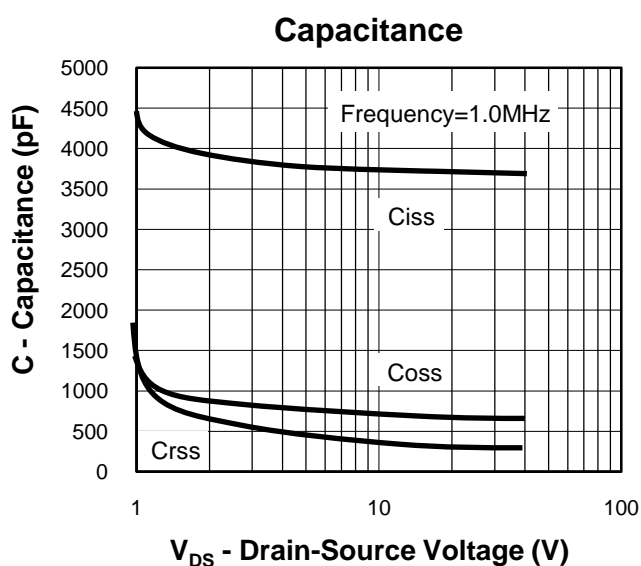
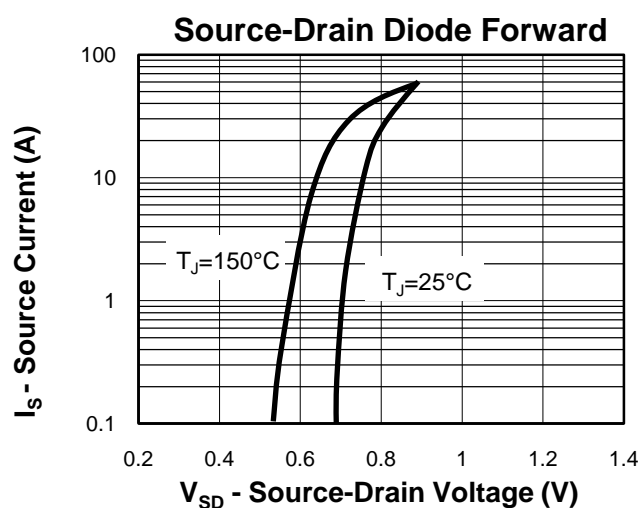
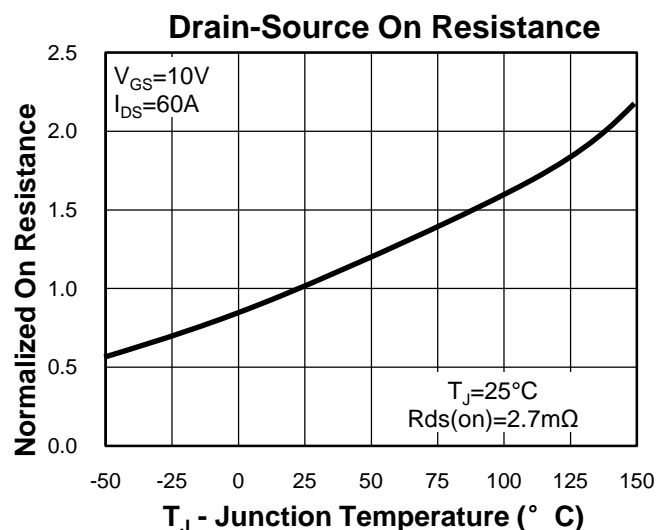
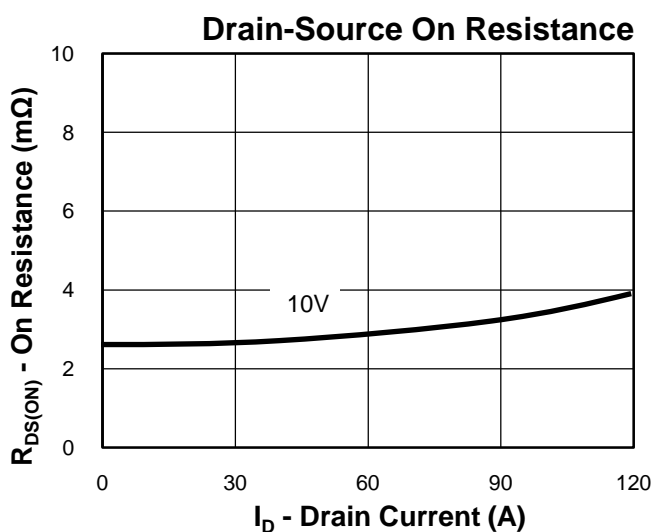
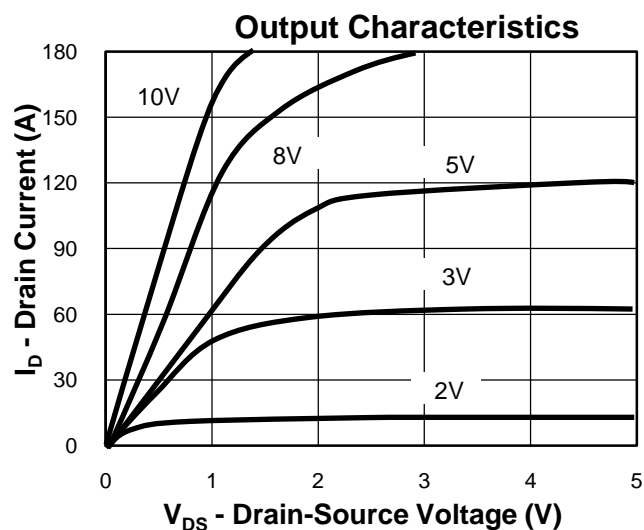
**Ordering and Marking Information**

Device	Marking	Package	Packaging	Quantity	Reel Size	Tape width
RU40120M	RU40120M	PDFN5060	Tape&Reel	3000	13"	12mm

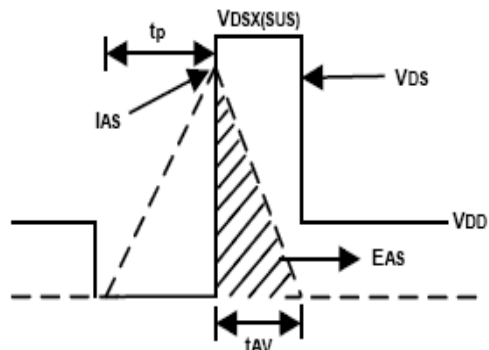
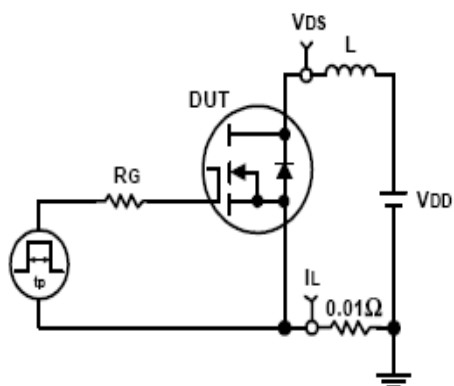
## Typical Characteristics



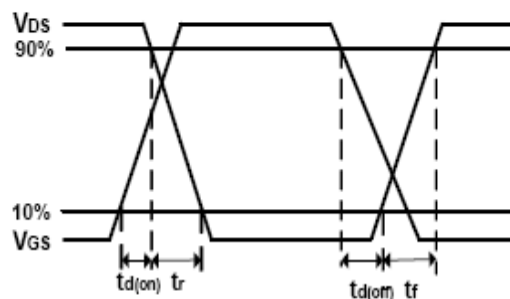
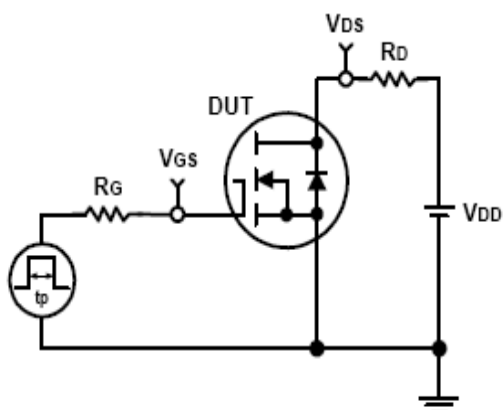
## Typical Characteristics



## Avalanche Test Circuit and Waveforms

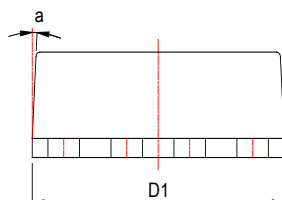
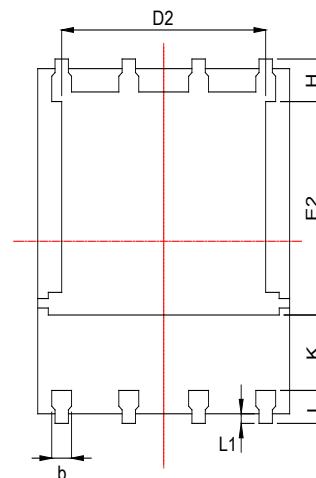
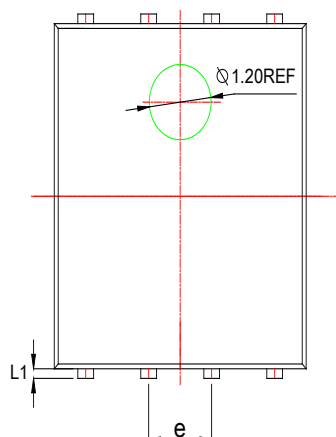
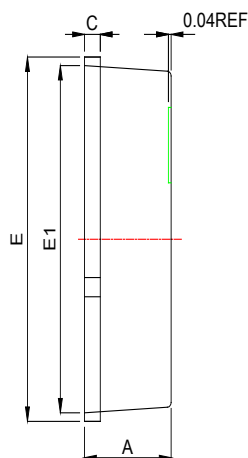


## Switching Time Test Circuit and Waveforms

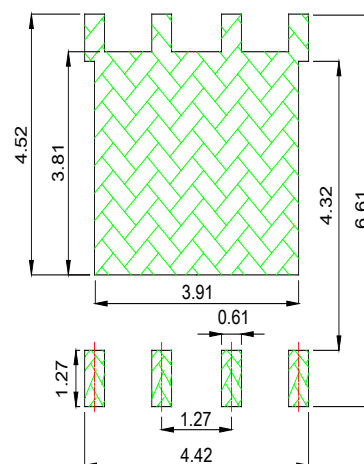


**Package Information**

**PDFN5060**



Land Pattern  
( Only for Reference)



SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.90	1.00	1.10	0.035	0.039	0.043
b	0.33	0.42	0.51	0.013	0.017	0.020
c	0.20	0.25	0.30	0.008	0.010	0.012
D1	4.80	4.90	5.00	0.189	0.193	0.197
D2	3.61	3.79	3.96	0.142	0.149	0.156
E	5.90	6.00	6.10	0.232	0.236	0.240
E1	5.65	5.75	5.85	0.222	0.226	0.230
E2	3.38	3.58	3.78	0.133	0.141	0.149
e	1.27 BSC			0.005 BSC		
H	0.41	0.51	0.61	0.016	0.020	0.024
k	1.10			0.043		
L	0.51	0.61	0.71	0.020	0.024	0.028
L1	0.06	0.13	0.20	0.002	0.005	0.008
a	0°		12°	0°		12°

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