

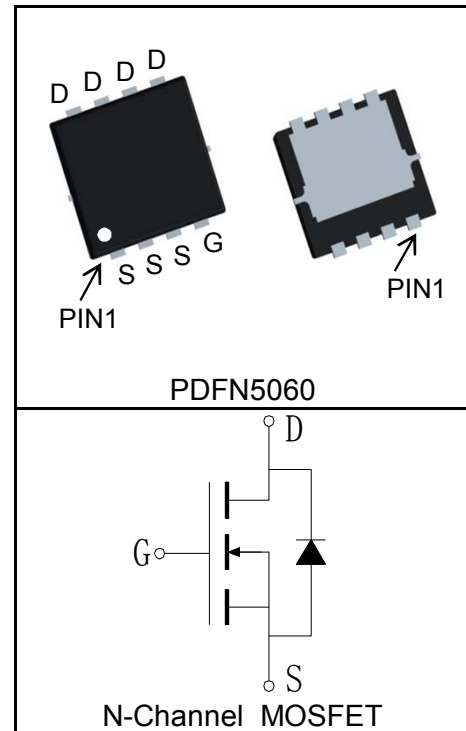
### Features

- 40V/130A,
- $R_{DS(ON)} = 1.9m\Omega(Typ.)@V_{GS}=10V$
- $R_{DS(ON)} = 2.7m\Omega(Typ.)@V_{GS}=4.5V$
- Ultra Low On-Resistance
- Fast Switching Speed
- 100% avalanche tested
- Lead Free and Green Devices Available (RoHS Compliant)

### Applications

- DC/DC Converters
- On board power for server
- Synchronous rectification

### Pin Description



### Absolute Maximum Ratings

| Symbol   | Parameter                                       | Rating                        | Unit             |
|--|---|-------------------------------|------------------|
| <b>Common Ratings</b> ( $T_C=25^\circ\text{C}$ Unless Otherwise Noted) |   |                               |                  |
| $V_{DSS}$  | Drain-Source Voltage                            | 40                            | V                |
| $V_{GSS}$  | Gate-Source Voltage                             | $\pm 20$                      |                  |
| $T_J$  | Maximum Junction Temperature                    | 150                           | $^\circ\text{C}$ |
| $T_{STG}$  | Storage Temperature Range                       | -55 to 150                    | $^\circ\text{C}$ |
| $I_S$  | Diode Continuous Forward Current                | $T_C=25^\circ\text{C}$<br>50  | A                |
| <b>Mounted on Large Heat Sink</b>                                      |   |                               |                  |
| $I_{DP}^{①}$   | 300 $\mu\text{s}$ Pulse Drain Current Tested    | $T_C=25^\circ\text{C}$<br>480 | A                |
| $I_D^{②}$  | Continuous Drain Current@ $T_C(V_{GS}=10V)$     | $T_C=25^\circ\text{C}$<br>130 | A                |
|  |   | $T_C=100^\circ\text{C}$<br>81 |                  |
|  | Continuous Drain Current@ $T_A(V_{GS}=10V)^{③}$ | $T_A=25^\circ\text{C}$<br>26  |                  |
|  |   | $T_A=70^\circ\text{C}$<br>21  |                  |
| $P_D$  | Maximum Power Dissipation@ $T_C$                | $T_C=25^\circ\text{C}$<br>104 | W                |
|  |   | $T_C=100^\circ\text{C}$<br>42 |                  |
|  | Maximum Power Dissipation@ $T_A^{③}$            | $T_A=25^\circ\text{C}$<br>4.2 |                  |
|  |   | $T_A=70^\circ\text{C}$<br>2.7 |                  |

| Symbol                                | Parameter                              | Rating | Unit |
|---------------------------------------|--|--------|------|
| $R_{\theta JC}$                       | Thermal Resistance-Junction to Case    | 1.2    | °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        | 306    | mJ   |

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

| Symbol  | Parameter                        | Test Condition  | RUH40130M |      |           | Unit      |
|---|----------------------------------|---|-----------|------|-----------|-----------|
|   |                                  |   | Min.      | Typ. | Max.      |           |
| <b>Static Characteristics</b>                     |                                  |   |           |      |           |           |
| $BV_{DSS}$  | Drain-Source Breakdown Voltage   | $V_{GS}=0V, I_{DS}=250\mu A$                              | 40        |      |           | V         |
| $I_{DSS}$   | Zero Gate Voltage Drain Current  | $V_{DS}=40V, V_{GS}=0V$                                   |           |      | 1         | $\mu A$   |
|   |                                  | $T_J=125^\circ C$   |           |      | 30        |           |
| $V_{GS(th)}$                                      | Gate Threshold Voltage           | $V_{DS}=V_{GS}, I_{DS}=250\mu A$                          | 1         |      | 3         | V         |
| $I_{GSS}$   | Gate Leakage Current             | $V_{GS}=\pm 20V, V_{DS}=0V$                               |           |      | $\pm 100$ | nA        |
| $R_{DS(ON)}^{(5)}$                                | Drain-Source On-state Resistance | $V_{GS}=4.5V, I_{DS}=35A$                                 |           | 2.7  | 3.4       | $m\Omega$ |
|   |                                  | $V_{GS}=10V, I_{DS}=50A$                                  |           | 1.9  | 2.5       | $m\Omega$ |
| <b>Diode Characteristics</b>                      |                                  |   |           |      |           |           |
| $V_{SD}^{(5)}$                                    | Diode Forward Voltage            | $I_{SD}=50A, V_{GS}=0V$                                   |           |      | 1.2       | V         |
| $t_{rr}$  | Reverse Recovery Time            | $I_{SD}=50A, di_{SD}/dt=100A/\mu s$                       |           | 11   |           | ns        |
| $Q_{rr}$  | Reverse Recovery Charge          |   |           | 17   |           | nC        |
| <b>Dynamic Characteristics</b> <sup>(6)</sup>     |                                  |   |           |      |           |           |
| $R_G$   | Gate Resistance                  | $V_{GS}=0V, V_{DS}=0V, F=1MHz$                            |           | 1.1  |           | $\Omega$  |
| $C_{iss}$   | Input Capacitance                | $V_{GS}=0V,$<br>$V_{DS}=20V,$<br>Frequency=1.0MHz         |           | 4450 |           | pF        |
| $C_{oss}$   | Output Capacitance               |   |           | 2150 |           |           |
| $C_{rss}$   | Reverse Transfer Capacitance     |   |           | 54   |           |           |
| $t_{d(ON)}$                                       | Turn-on Delay Time               | $V_{DD}=20V, I_{DS}=50A,$<br>$V_{GEN}=10V, R_G=4.7\Omega$ |           | 18   |           | ns        |
| $t_r$   | Turn-on Rise Time                |   |           | 29   |           |           |
| $t_{d(OFF)}$                                      | Turn-off Delay Time              |   |           | 106  |           |           |
| $t_f$   | Turn-off Fall Time               |   |           | 25   |           |           |
| <b>Gate Charge Characteristics</b> <sup>(6)</sup> |                                  |   |           |      |           |           |
| $Q_g$   | Total Gate Charge                | $V_{DS}=32V, V_{GS}=10V,$<br>$I_{DS}=50A$                 |           | 87   |           | nC        |
| $Q_{gs}$  | Gate-Source Charge               |   |           | 11   |           |           |
| $Q_{gd}$  | Gate-Drain Charge                |   |           | 23   |           |           |

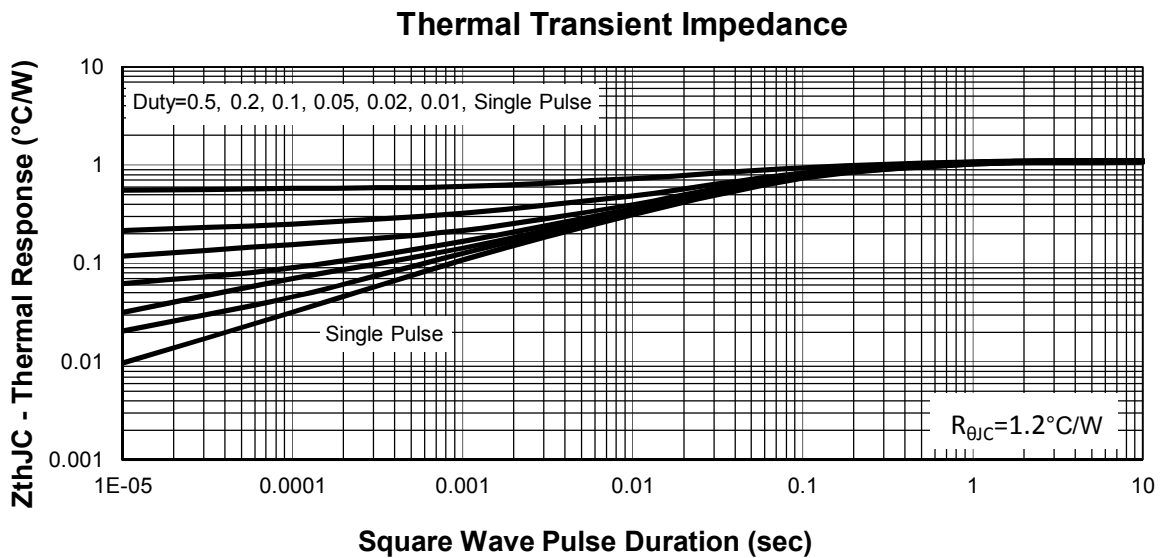
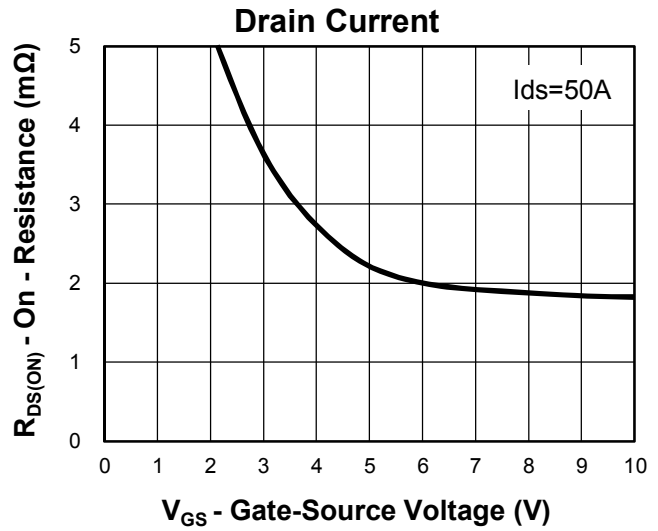
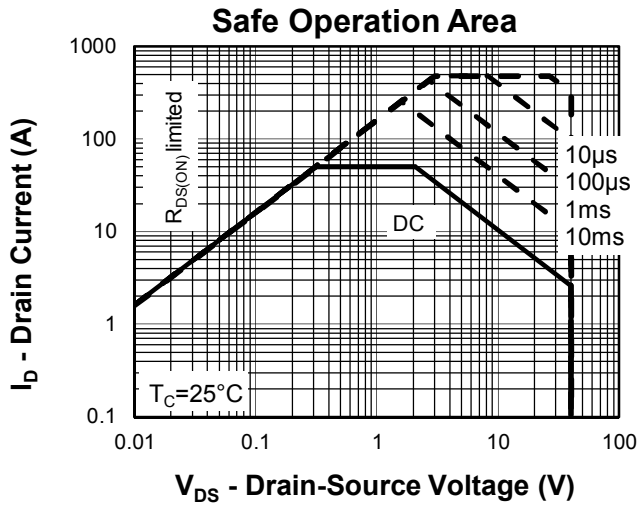
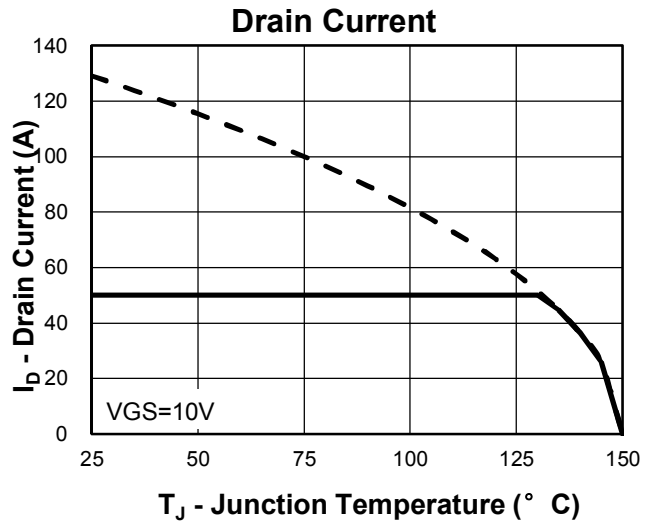
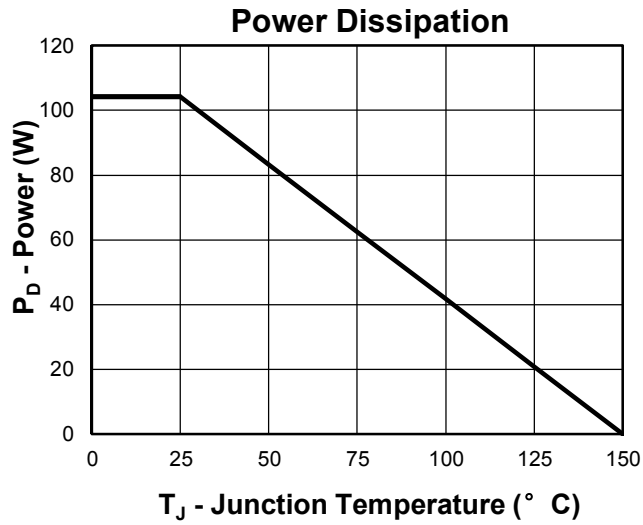
**Notes:**

- 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  $T_{J\text{max}}$ ,  $I_{AS} = 35\text{A}$ ,  $V_{DD} = 24\text{V}$ ,  $R_G = 50\Omega$ , 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.

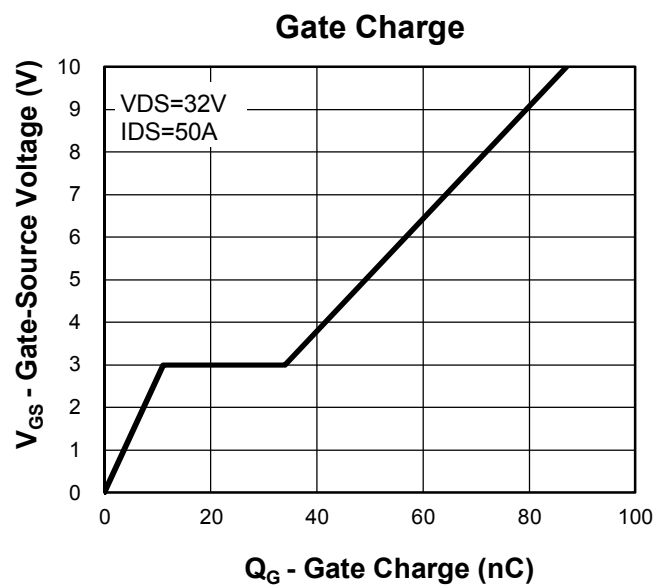
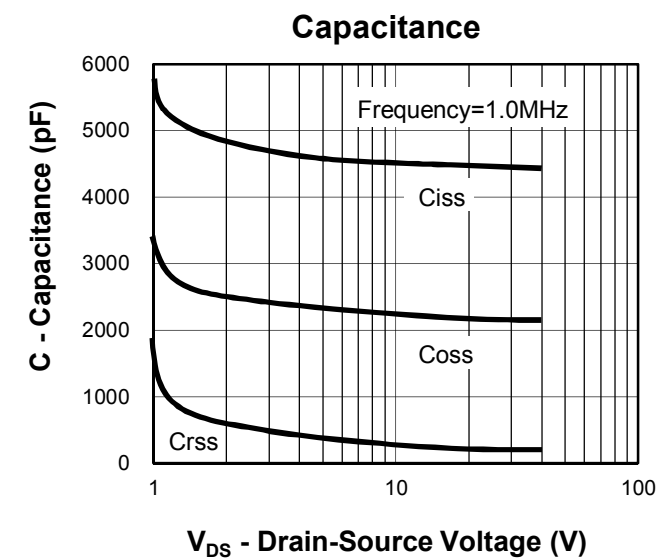
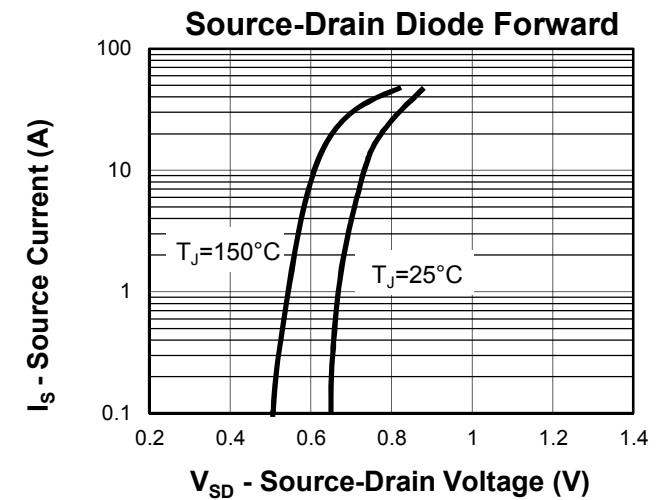
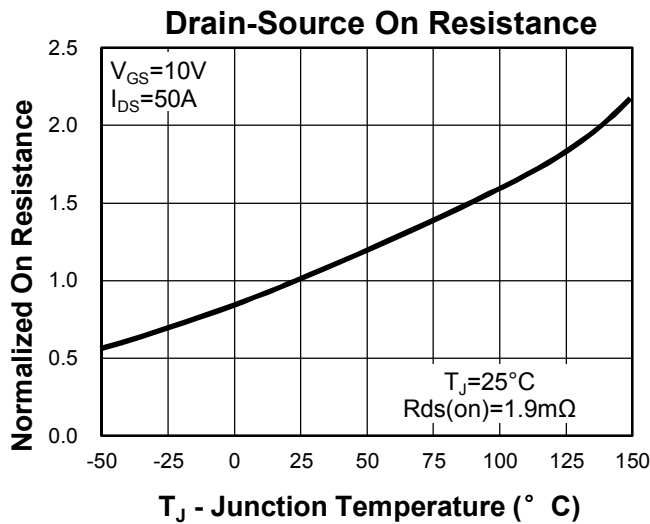
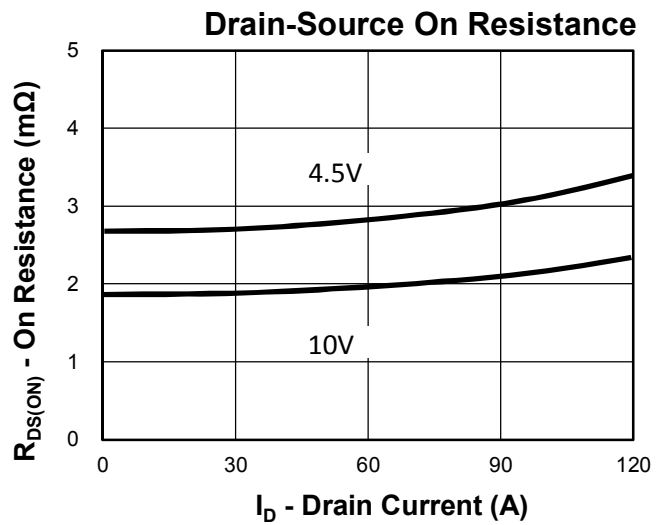
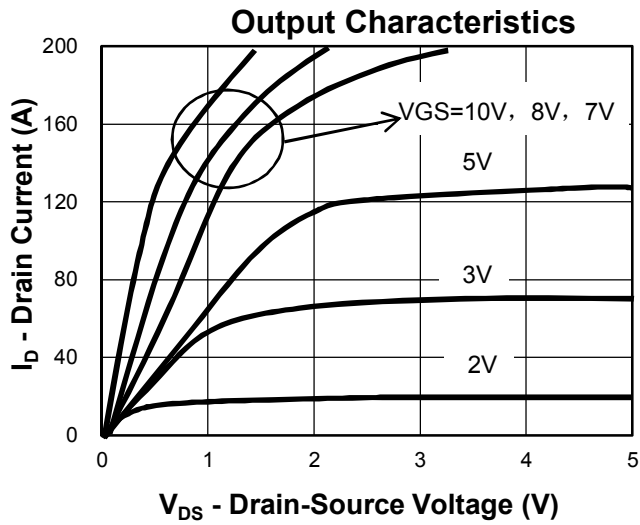
**Ordering and Marking Information**

| Device    | Marking   | Package  | Packaging | Quantity | Reel Size | Tape width |
|-----------|-----------|----------|-----------|----------|-----------|------------|
| RUH40130M | RUH40130M | PDFN5060 | Tape&Reel | 3000     | 13"       | 12mm       |

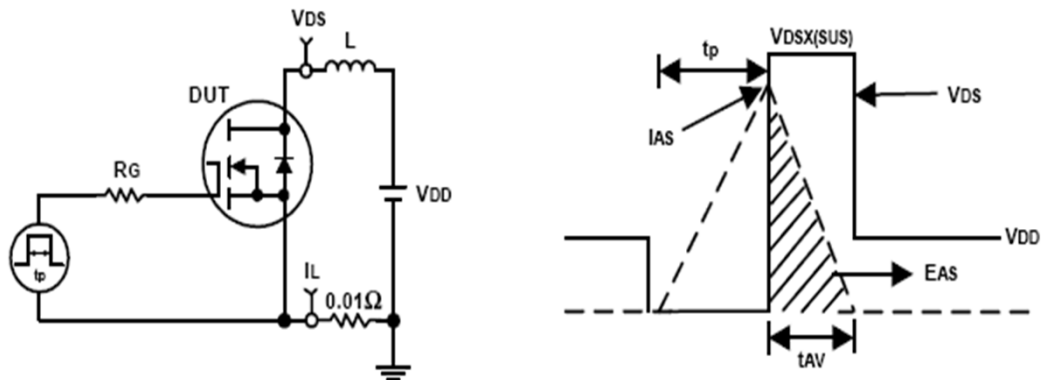
**Typical Characteristics**



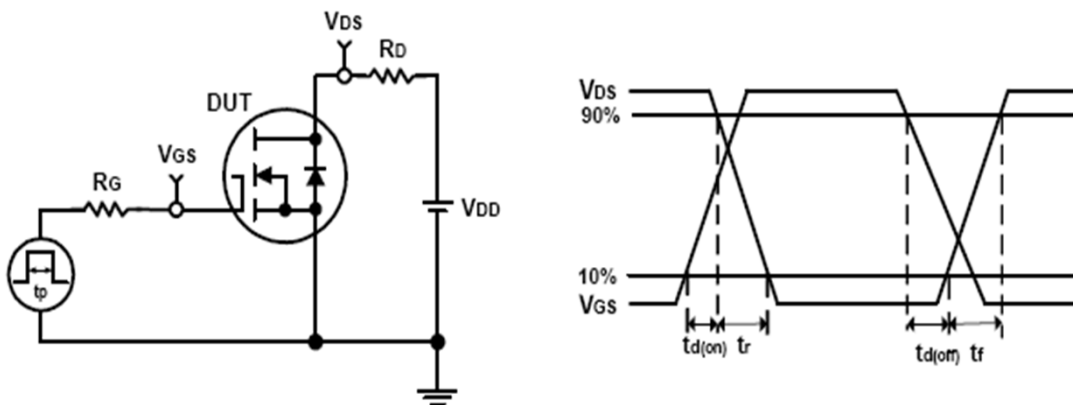
**Typical Characteristics**



**Avalanche Test Circuit and Waveforms**

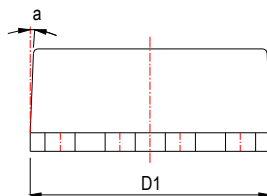
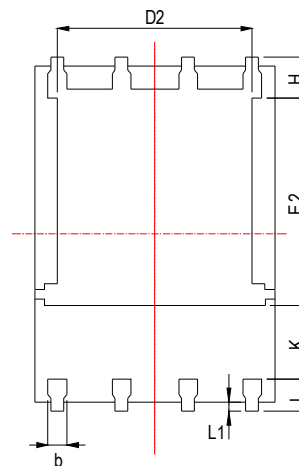
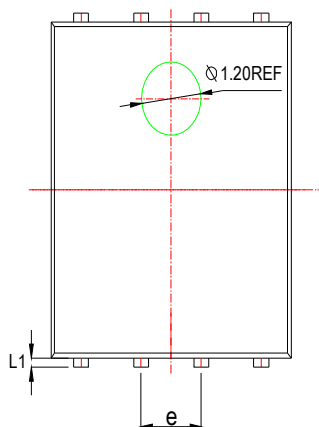
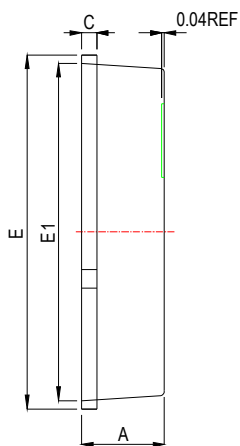


**Switching Time Test Circuit and Waveforms**

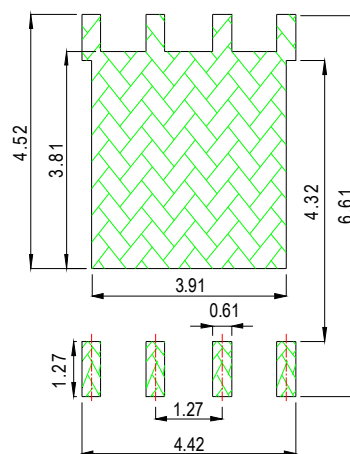


**Package Information**

**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°   |

**Customer Service****Worldwide Sales and Service:**

Sales@ruichips.com

**Technical Support:**

Technical@ruichips.com

**Investor Relations Contacts:**

Investor@ruichips.com

**Marcom Contact:**

Marcom@ruichips.com

**Editorial Contact:**

Editorial@ruichips.com

**HR Contact:**

HR@ruichips.com

**Legal Contact:**

Legal@ruichips.com

**Shen Zhen City RUICHIPS Semiconductor CO., LTD**

4th Floor, Block 8, Changyuan New Material Port, Keyuan Middle Road, Science & Industry Park,  
Nanshan District, Shenzhen, CHINA

**TEL:** (86-755) 8311-5334**FAX:** (86-755) 8311-4278**E-mail:** Sales-SZ@ruichips.com