

Features

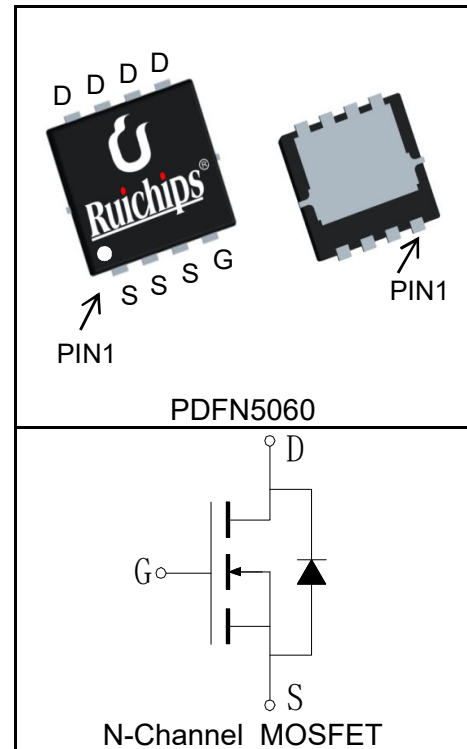
- 120V/90A,
 $R_{DS(ON)} = 6.2m\Omega(Typ.)@V_{GS}=10V$
 $R_{DS(ON)} = 7m\Omega(Typ.)@V_{GS}=4.5V$
- Ultra Low On-Resistance
- Fast Switching Speed
- 100% avalanche tested
- Uses Ruichips advanced RUISGT™ technology
- Lead Free and Green Devices Available (RoHS Compliant)



Applications

- Synchronous Rectification for Flyback Converters
- PD Adaptors
- Charger for Mobile

Pin Description



Absolute Maximum Ratings

| Symbol | Parameter | Rating | Unit | |
|--|---|-------------------|------------|---|
| Common Ratings ($T_C=25^\circ C$ Unless Otherwise Noted) | | | | |
| V_{DSS} | Drain-Source Voltage | 120 | V | |
| V_{GSS} | Gate-Source Voltage | ± 20 | | |
| T_J | Maximum Junction Temperature | 150 | $^\circ C$ | |
| T_{STG} | Storage Temperature Range | -55 to 150 | $^\circ C$ | |
| I_S | Diode Continuous Forward Current | $T_C=25^\circ C$ | 50 | A |
| Mounted on Large Heat Sink | | | | |
| $I_{DP}^{①}$ | 300 μs Pulse Drain Current Tested | $T_C=25^\circ C$ | 360 | A |
| $I_D^{②}$ | Continuous Drain Current@ $T_C(V_{GS}=10V)$ | $T_C=25^\circ C$ | 90 | A |
| | | $T_C=100^\circ C$ | 57 | |
| | Continuous Drain Current@ $T_A(V_{GS}=10V)^{③}$ | $T_A=25^\circ C$ | 14 | |
| | | $T_A=70^\circ C$ | 11 | |
| P_D | Maximum Power Dissipation@ T_C | $T_C=25^\circ C$ | 74 | W |
| | | $T_C=100^\circ C$ | 30 | |
| | Maximum Power Dissipation@ $T_A^{③}$ | $T_A=25^\circ C$ | 2.2 | |
| | | $T_A=70^\circ C$ | 1.4 | |

| Symbol | Parameter | Rating | Unit |
|---------------------------------------|--|--------|------|
| $R_{\theta JC}$ | Thermal Resistance-Junction to Case | 1.67 | °C/W |
| $R_{\theta JA}^{(3)}$ | Thermal Resistance-Junction to Ambient | 56 | °C/W |
| Drain-Source Avalanche Ratings | | | |
| $E_{AS}^{(4)}$ | Avalanche Energy, Single Pulsed | 484 | mJ |

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

| Symbol | Parameter | Test Condition | RUH120N90M | | | Unit |
|---|----------------------------------|---|------------|------|-----------|-----------|
| | | | Min. | Typ. | Max. | |
| Static Characteristics | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS}=0V, I_{DS}=250\mu A$ | 120 | | | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS}=120V, V_{GS}=0V$ | | | 1 | μA |
| | | $T_J=125^\circ C$ | | | 30 | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}=V_{GS}, I_{DS}=250\mu A$ | 1.2 | 1.8 | 2.5 | V |
| I_{GSS} | Gate Leakage Current | $V_{GS}=\pm 25V, V_{DS}=0V$ | | | ± 100 | nA |
| $R_{DS(ON)}^{(5)}$ | Drain-Source On-state Resistance | $V_{GS}=4.5V, I_{DS}=28A$ | | 7 | 8.5 | $m\Omega$ |
| | | $V_{GS}=10V, I_{DS}=28A$ | | 6.2 | 7 | $m\Omega$ |
| | | $T_J=125^\circ C$ | | 10.7 | 12.8 | $m\Omega$ |
| Diode Characteristics | | | | | | |
| $V_{SD}^{(5)}$ | Diode Forward Voltage | $I_{SD}=28A, V_{GS}=0V$ | | 0.9 | 1.2 | V |
| g_{FS} | Forward Transconductance | $V_{DS}=5V, I_D=28A$ | | 128 | | S |
| t_{rr} | Reverse Recovery Time | $I_{SD}=28A, dI_{SD}/dt=100A/\mu s$ | | 60 | | ns |
| Q_{rr} | Reverse Recovery Charge | | | 156 | | nC |
| Dynamic Characteristics ⁽⁶⁾ | | | | | | |
| R_G | Gate Resistance | $V_{GS}=0V, V_{DS}=0V, F=1MHz$ | | 0.8 | | Ω |
| C_{iss} | Input Capacitance | $V_{GS}=0V,$ $V_{DS}=60V,$ Frequency=1.0MHz | | 4250 | | pF |
| C_{oss} | Output Capacitance | | | 265 | | |
| C_{rss} | Reverse Transfer Capacitance | | | 16 | | |
| $t_{d(ON)}$ | Turn-on Delay Time | $V_{DD}=60V, I_{DS}=28A,$ $V_{GEN}=10V, R_G=1.2\Omega$ | | 17 | | ns |
| t_r | Turn-on Rise Time | | | 47 | | |
| $t_{d(OFF)}$ | Turn-off Delay Time | | | 51 | | |
| t_f | Turn-off Fall Time | | | 28 | | |
| Gate Charge Characteristics ⁽⁶⁾ | | | | | | |
| Q_g | Total Gate Charge | $V_{DS}=60V, V_{GS}=10V,$ $I_{DS}=28A$ | | 80 | | nC |
| Q_{gs} | Gate-Source Charge | | | 20 | | |
| Q_{gd} | Gate-Drain Charge | | | 5.5 | | |

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 $T_{J\text{max}}$, $I_{AS} = 44\text{A}$, $V_{DD} = 60\text{V}$, $R_G = 50\Omega$, 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 |
|------------|------------|----------|-----------|----------|-----------|------------|
| RUH120N90M | RUH120N90M | PDFN5060 | Tape&Reel | 5000 | 13" | 12mm |

① The following characters could be different and means:



1st line: Part Number (RUH120N90M)

2nd line: Ruichips Company Logo

3rd line: Date code (XXYWWLLL)

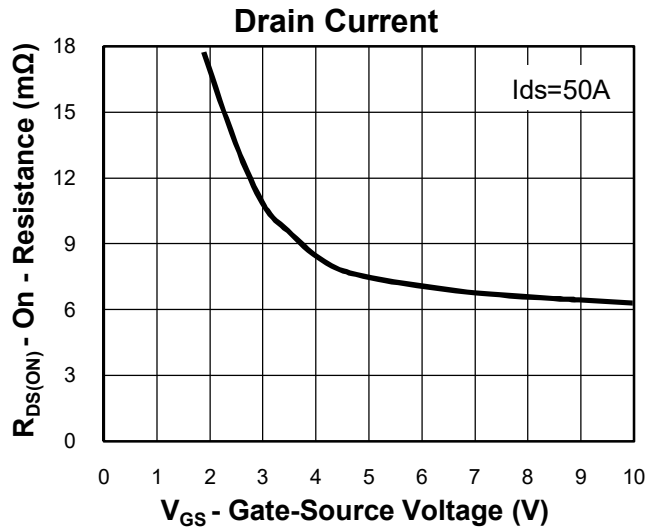
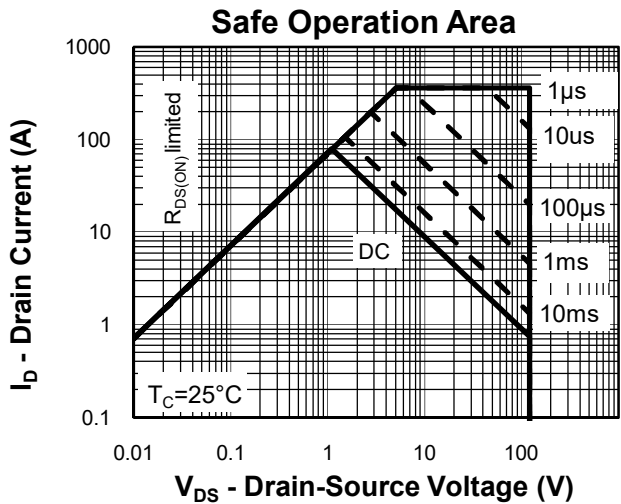
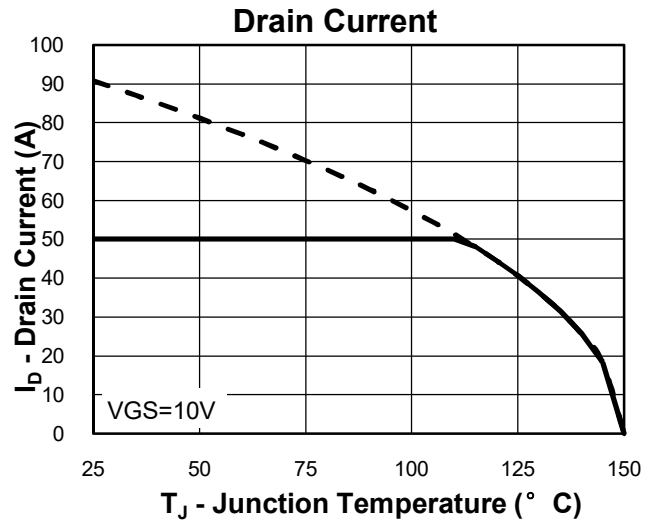
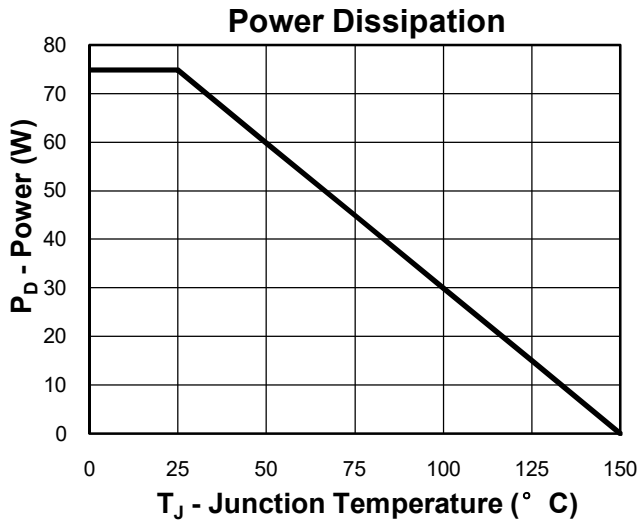
XX =Assembly site code

Y =Year

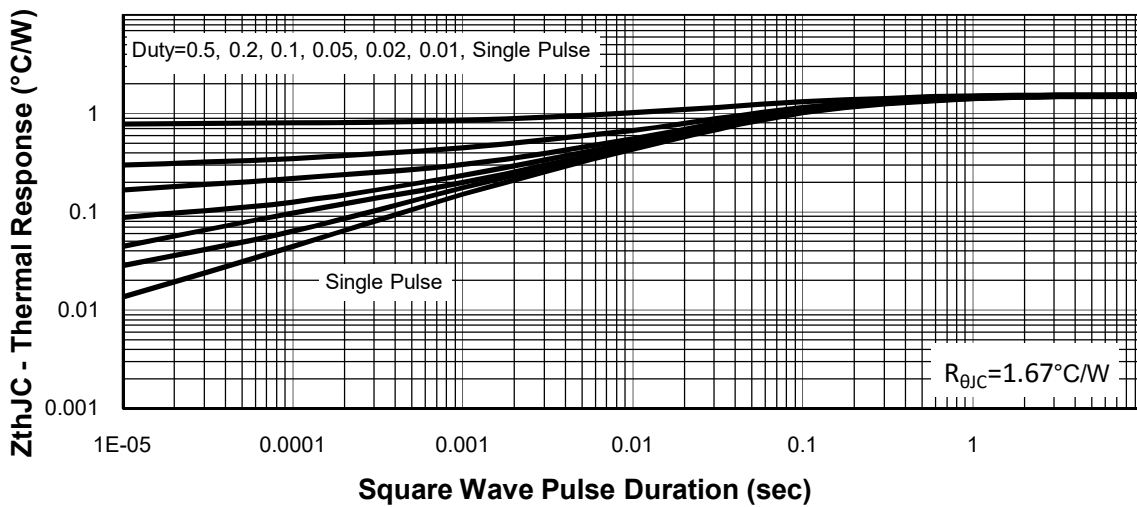
WW =Work Week

LLL =Wafer Lot Number

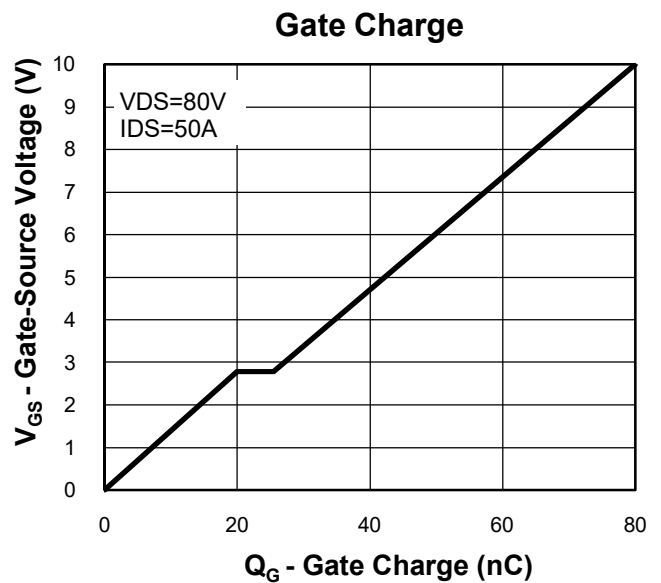
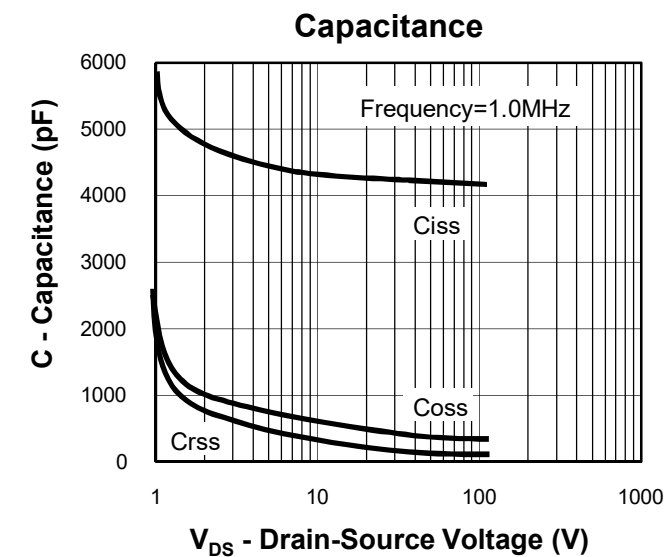
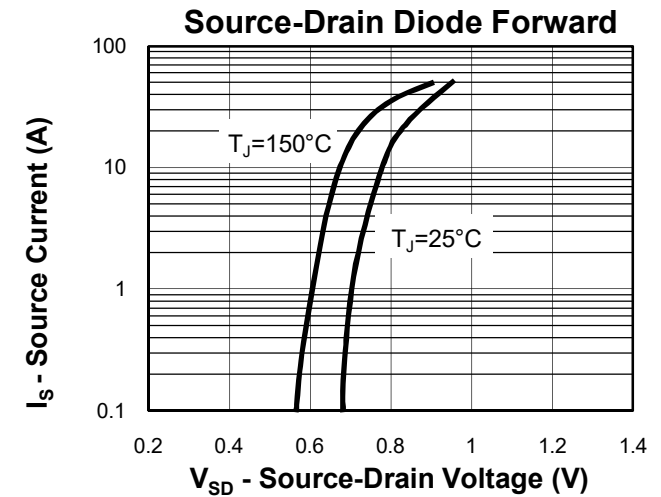
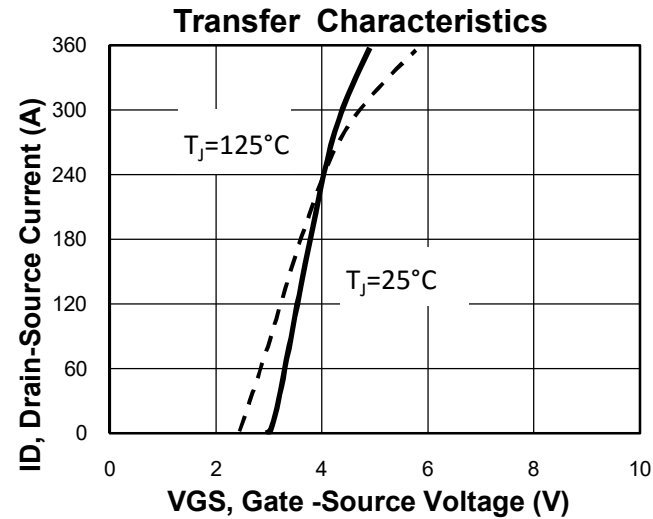
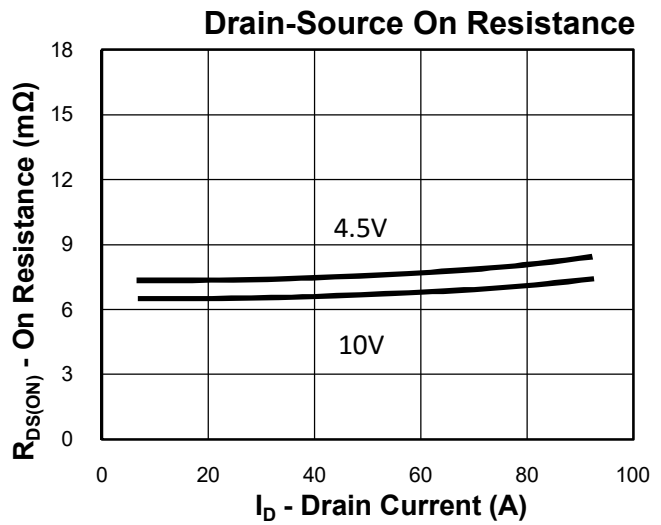
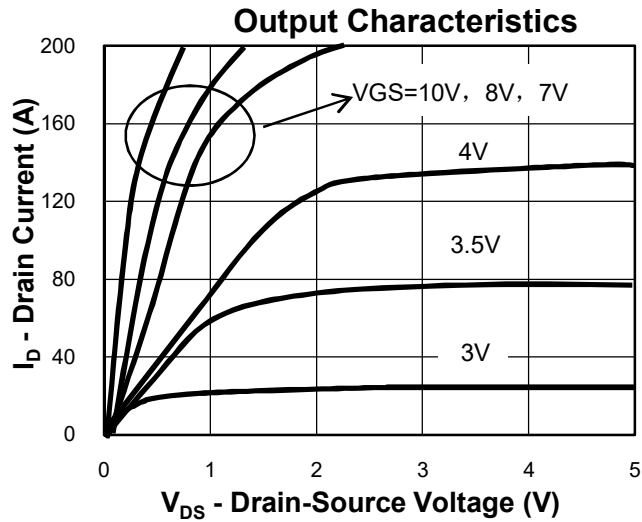
Typical Characteristics



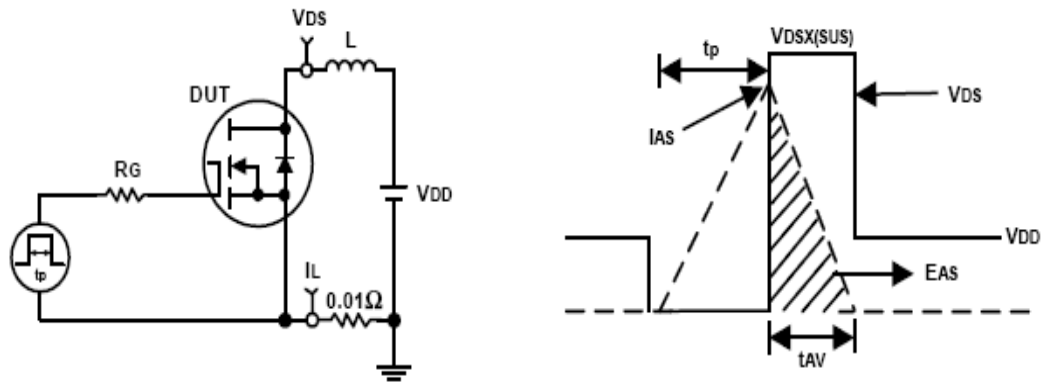
Thermal Transient Impedance



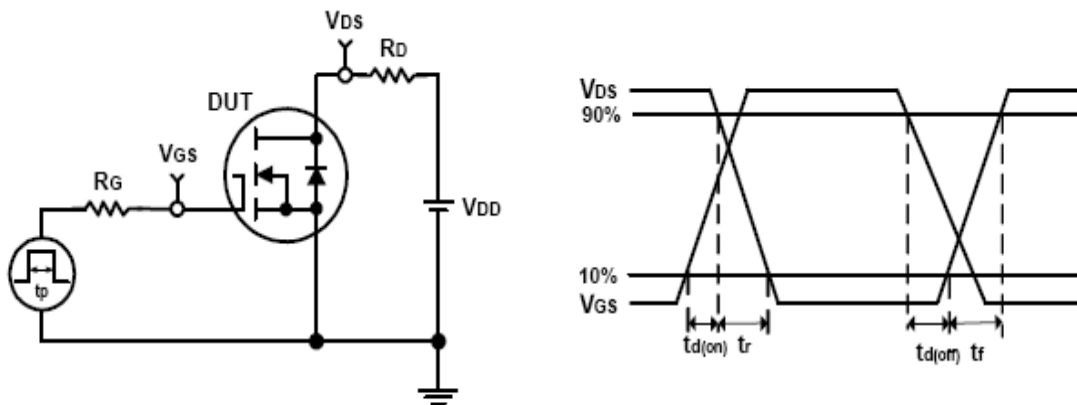
Typical Characteristics



Avalanche Test Circuit and Waveforms

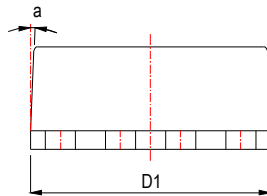
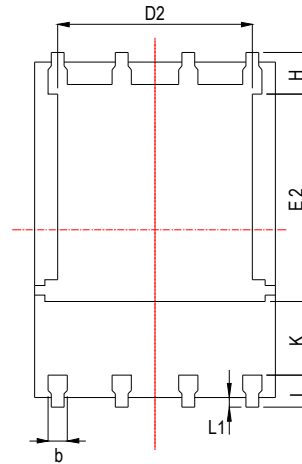
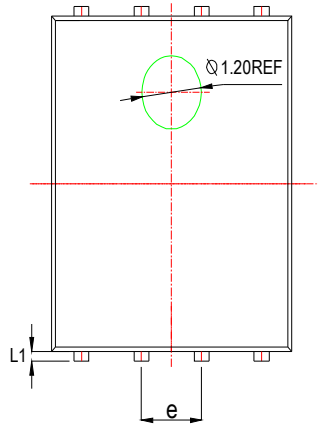
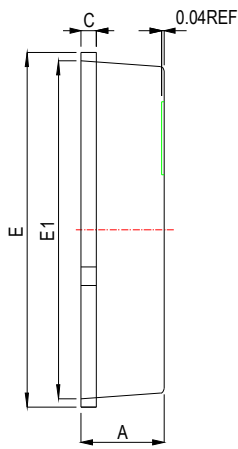


Switching Time Test Circuit and Waveforms

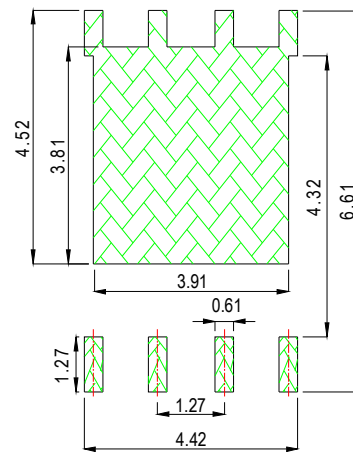


Package Information

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° |