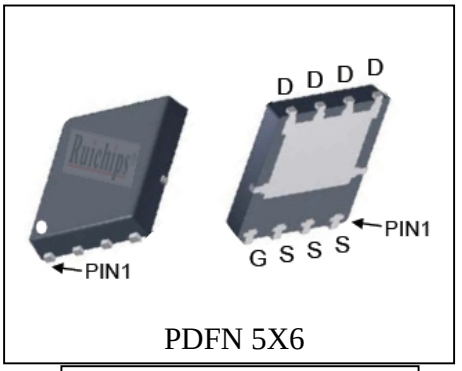
# RU2090M

## N-Channel Advanced Power MOSFET

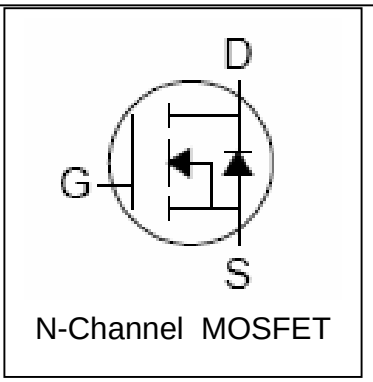
## Features

- 20V/99A,
  $R_{DS(ON)}$ =2.3mΩ(tpy.)@$V_{GS}$=10V
  $R_{DS(ON)}$ =4mΩ(tpy.)@$V_{GS}$=4.5V
- Super High Dense Cell Design
- Reliable and Rugged
- 100% avalanche tested
- Lead Free and Green Devices Available (RoHS Compliant)

## Pin Description




PDFN 5X6




N-Channel MOSFET

## Applications

- Rectification
- Switching Application

## Absolute Maximum Ratings

| Symbol | Parameter | | Rating | Unit |
|---|---|---|---|---|
| **Common Ratings** ($T_C$=25°C Unless Otherwise Noted) | | | | |
| $V_{DSS}$ | Drain-Source Voltage | | 20 | V |
| $V_{GSS}$ | Gate-Source Voltage | | ±12 | |
| $T_J$ | Maximum Junction Temperature | | 150 | °C |
| $T_{STG}$ | Storage Temperature Range | | -55 to 150 | °C |
| $I_S$ | Diode Continuous Forward Current | $T_C$=25°C | 50 | A |
| **Mounted on Large Heat Sink** | | | | |
| $I_{DP}$ | 300μs Pulse Drain Current Tested | $T_C$=25°C | 360② | A |
| $I_D$ | Continuous Drain Current($V_{GS}$=10V) | $T_C$=25°C | 99① | A |
| | | $T_C$=100°C | 66① | |
| | | $T_A$=25°C | 26③ | |
| | | $T_A$=70°C | 21③ | |
| $P_D$ | Maximum Power Dissipation | $T_C$=25°C | 66 | W |
| | | $T_C$=100°C | 26 | |
| | | $T_A$=25°C | 4.2③ | |
| | | $T_A$=70°C | 2.7③ | |

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| | | | |
|---|---|---|---|
| **Mounted on Large Heat Sink** | | | |
| $R_{\theta JC}$ | Thermal Resistance-Junction to Case | 1.9 | °C/W |
| $R_{\theta JA}$ ③ | Thermal Resistance-Junction to Ambient | 30 | °C/W |
| **Drain-Source Avalanche Ratings** | | | |
| $E_{AS}$ ④ | Avalanche Energy, Single Pulsed | 306 | mJ |

## Electrical Characteristics ($T_C$=25°C Unless Otherwise Noted)

| Symbol | Parameter | Test Condition | RU2090M | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| **Static Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V, $I_{DS}$=250μA | 20 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=20V, $V_{GS}$=0V | | | 1 | μA |
| | | $T_J$=85°C | | | 30 | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$, $I_{DS}$=250μA | 1 | - | 2.5 | V |
| $I_{GSS}$ | Gate Leakage Current | $V_{GS}$=±12V, $V_{DS}$=0V | | | ±100 | nA |
| $R_{DS(ON)}$ ⑤ | Drain-Source On-state Resistance | $V_{GS}$=10V, $I_{DS}$=20A | | 2.3 | 3 | mΩ |
| | | $V_{GS}$=4.5V, $I_{DS}$=20A | | 4 | 6 | mΩ |
| **Diode Characteristics** | | | | | | |
| $V_{SD}$ ⑤ | Diode Forward Voltage | $I_{SD}$=20A, $V_{GS}$=0V | | | 1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_{SD}$=20A, $dI_{SD}/dt$=100A/μs | | 30 | | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | | 56 | | nC |
| **Dynamic Characteristics** ⑥ | | | | | | |
| $R_G$ | Gate Resistance | $V_{GS}$=0V,$V_{DS}$=0V,F=1MHz | | 1.9 | | Ω |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=10V, Frequency=1.0MHz | | 3300 | | pF |
| $C_{oss}$ | Output Capacitance | | | 820 | | |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 165 | | |
| $t_{d(ON)}$ | Turn-on Delay Time | $V_{DD}$=10V, $R_L$=0.5Ω, $I_{DS}$=20A, $V_{GEN}$=10V, $R_G$=1.6Ω | | 15 | | ns |
| $t_r$ | Turn-on Rise Time | | | 37 | | |
| $t_{d(OFF)}$ | Turn-off Delay Time | | | 55 | | |
| $t_f$ | Turn-off Fall Time | | | 19 | | |
| **Gate Charge Characteristics** ⑥ | | | | | | |
| $Q_g$ | Total Gate Charge | $V_{DS}$=16V, $V_{GS}$=10V, $I_{DS}$=20A | | 62 | | nC |
| $Q_{gs}$ | Gate-Source Charge | | | 15 | | |
| $Q_{gd}$ | Gate-Drain Charge | | | 21 | | |

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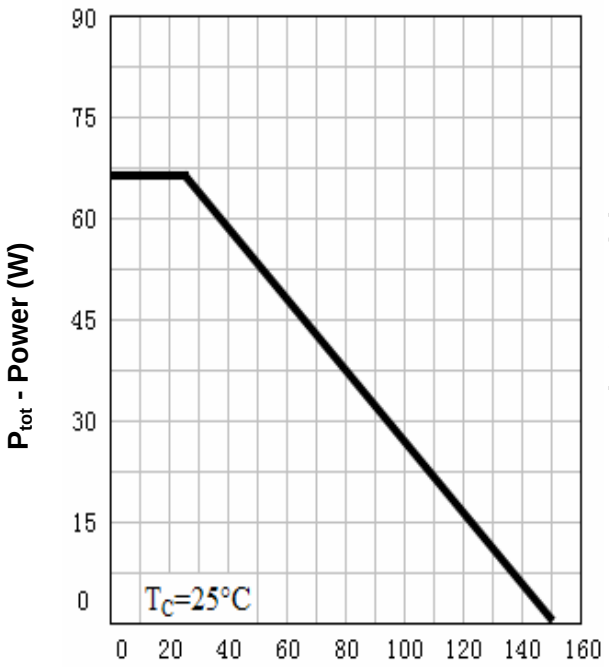
Notes: ① Max current is limited to 50A by the package.
② Pulse width limited by safe operating area.
③ When mounted on 1 inch square copper board, t ≤10sec.
④ Limited by $T_{Jmax}$, $I_{AS}$ =35A, $V_{DD}$ =16V, $R_G$ = 50Ω , Starting $T_J$ = 25°C.
⑤ Pulse test ; Pulse width≤300μs, duty cycle≤2%.
⑥ Guaranteed by design, not subject to production testing.

## Ordering and Marking Information

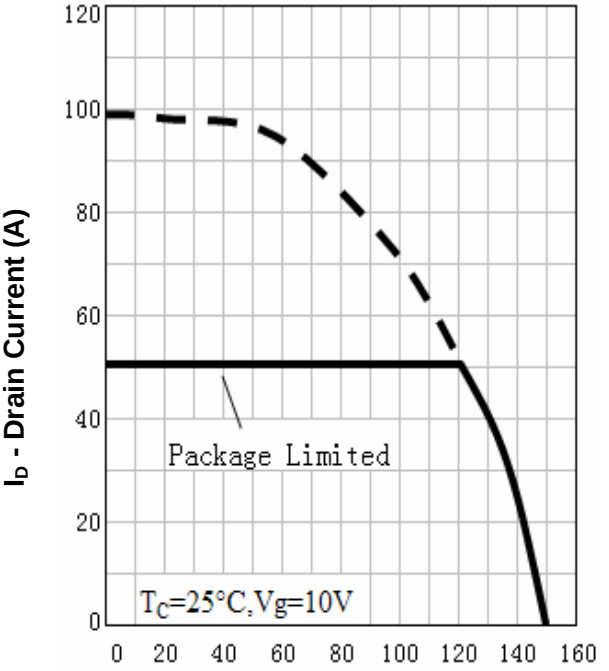
| Device | Marking | Package | Packaging | Quantity | Reel Size | Tape width |
|---|---|---|---|---|---|---|
| RU2090M | RU2090M | PDFN 5X6 | Tape&Reel | 3000 | 13'' | 12mm |

## Typical Characteristics

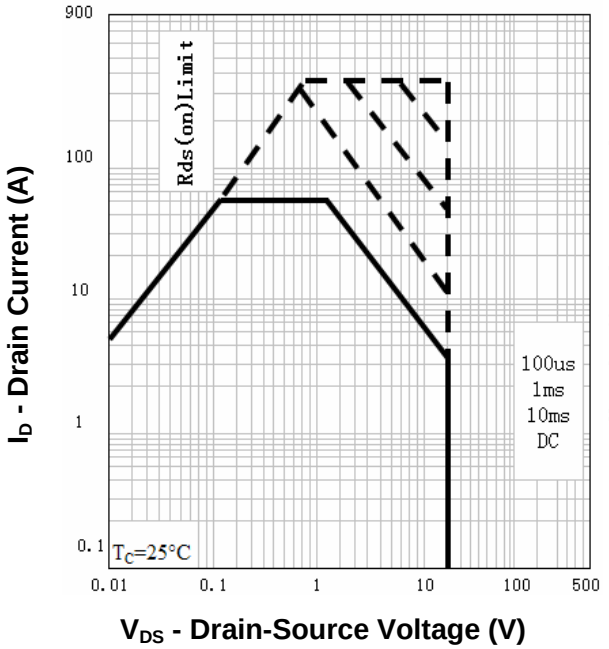
### Power Dissipation



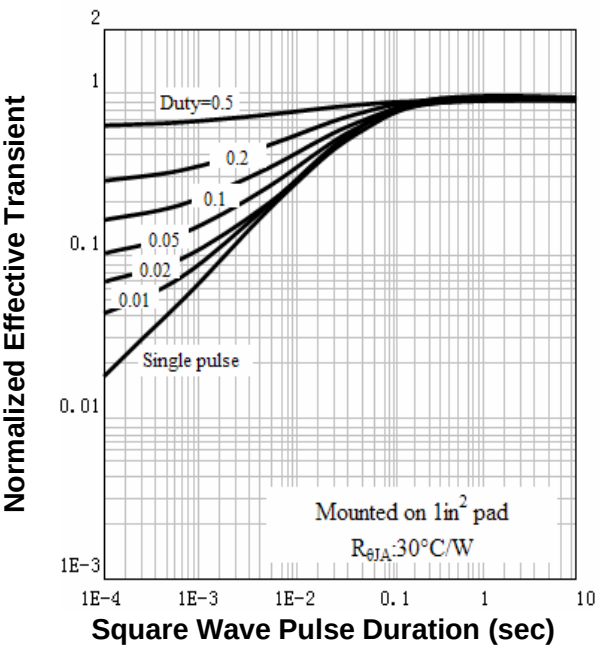

### Drain Current




### Safe Operation Area

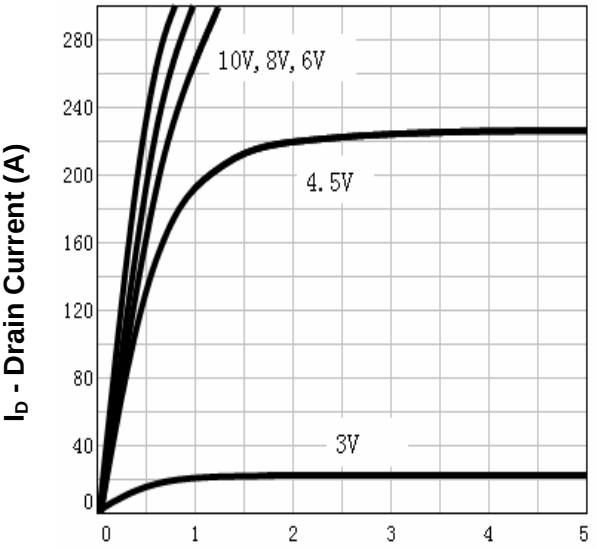



### Thermal Transient Impedance

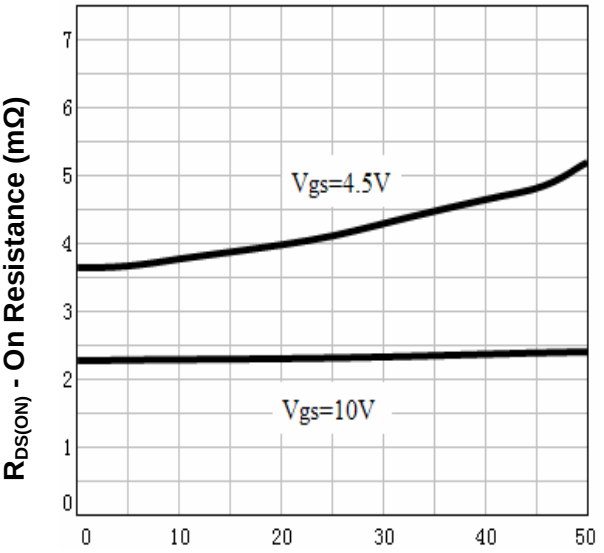


## Typical Characteristics

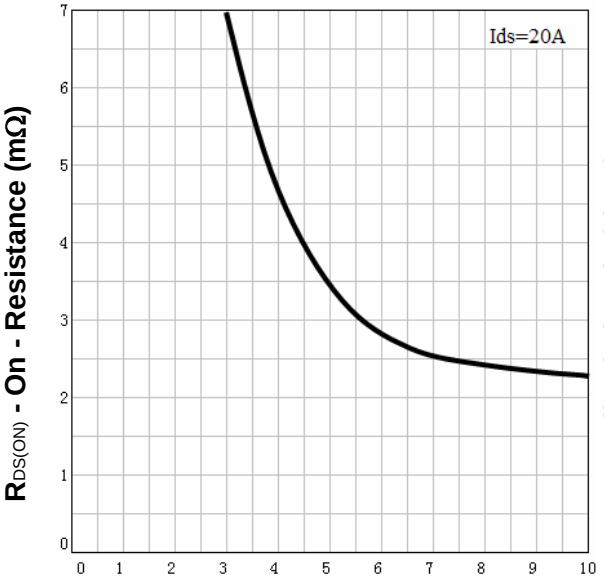
**Output Characteristics**



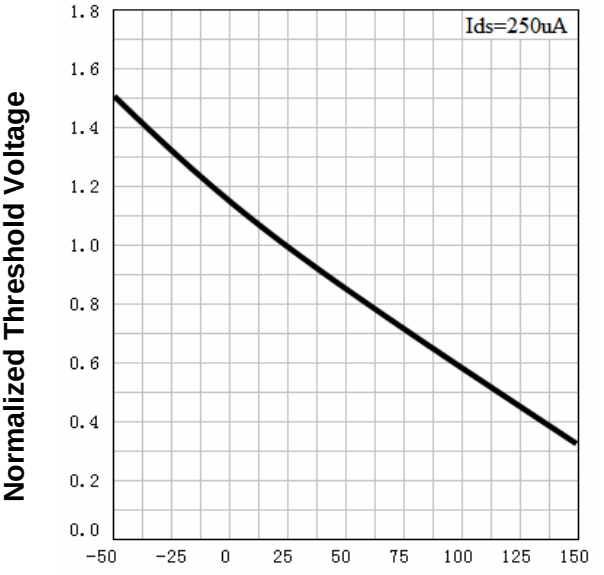

**Drain-Source On Resistance**




**Drain-Source On Resistance**

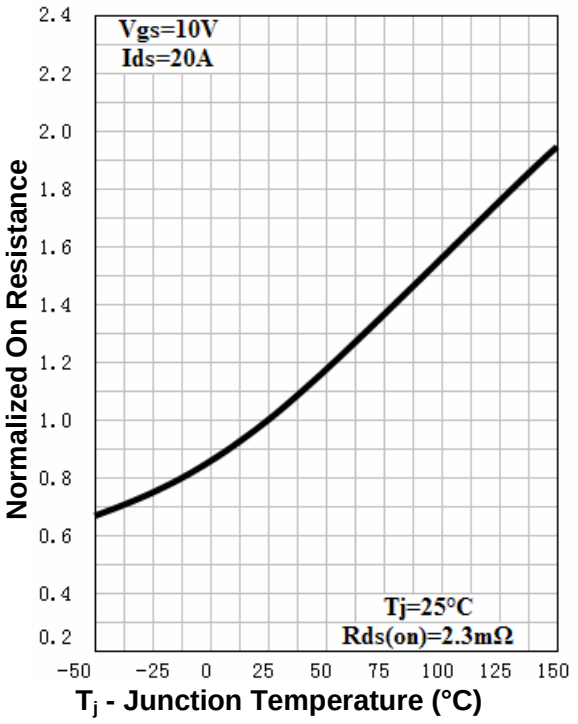



**Gate Threshold Voltage**

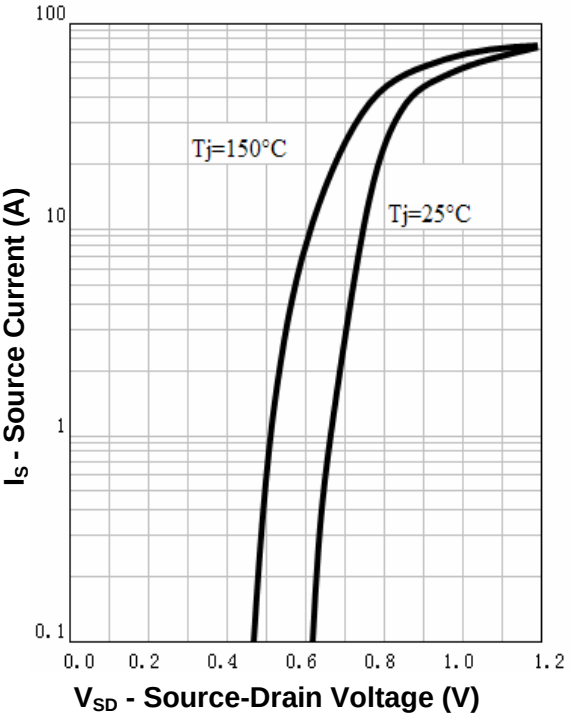


# Typical Characteristics

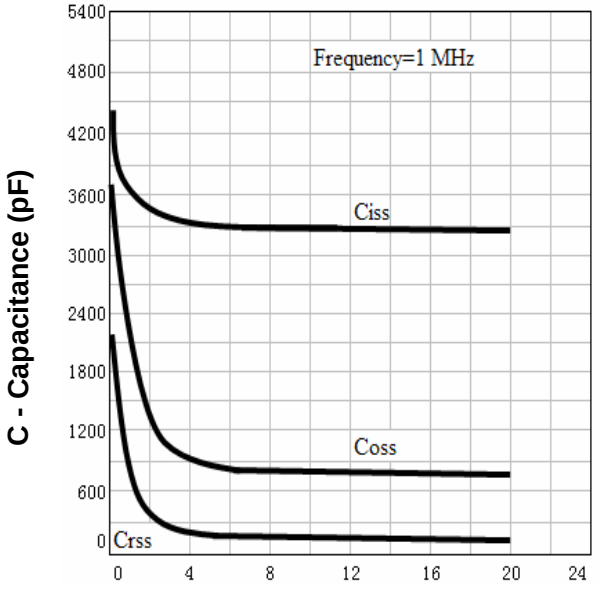
### Drain-Source On Resistance



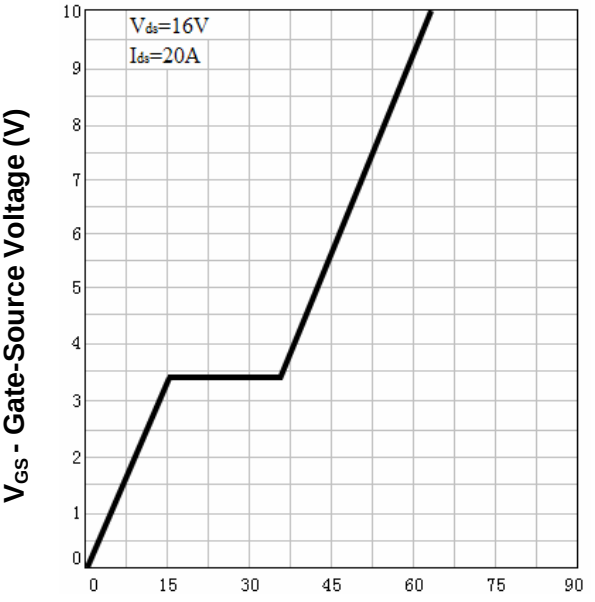

### Source-Drain Diode Forward



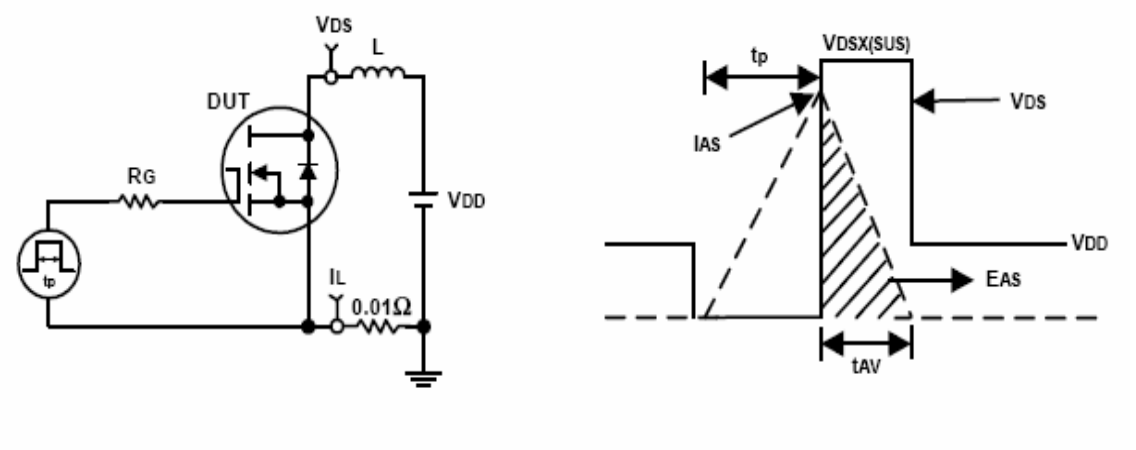

### Capacitance



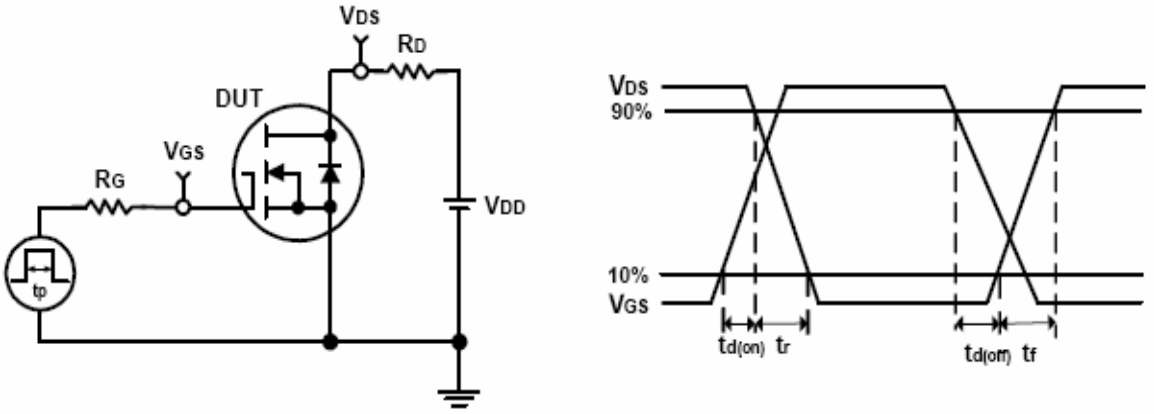

### Gate Charge



## Avalanche Test Circuit and Waveforms

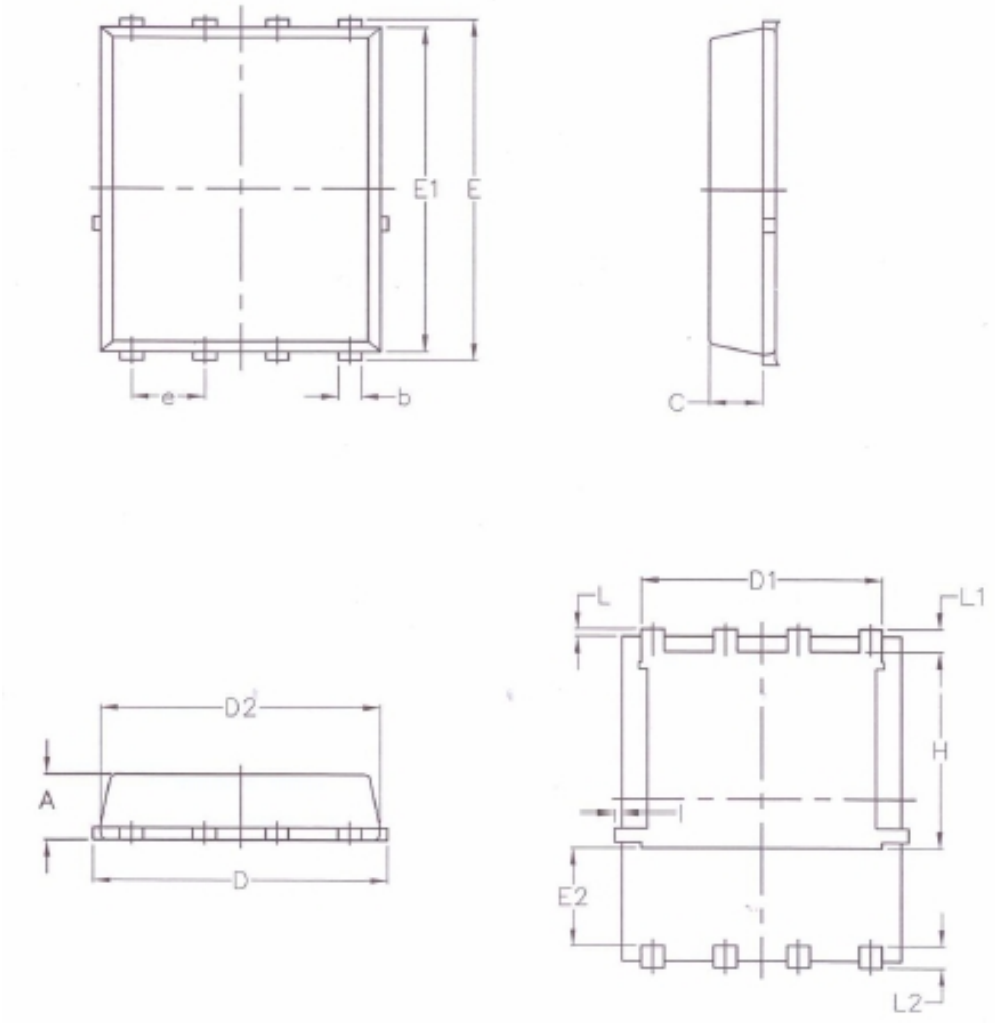



## Switching Time Test Circuit and Waveforms



## Package Information

PDFN 5X6




| SYMBOL | MM | | INCH | | SYMBOL | MM | | INCH | |
|---|---|---|---|---|---|---|---|---|---|
| | MIN | MAX | MIN | MAX | | MIN | MAX | MIN | MAX |
| A | 1.030 | 1.170 | 0.040 | 0.046 | E2 | 1.600 | - | 0.063 | - |
| b | 0.340 | 0.480 | 0.013 | 0.019 | e | 1.270 BSC | | 0.050 BSC | |
| C | 0.824 | 0.970 | 0.032 | 0.038 | L | 0.050 | 0.250 | 0.002 | 0.010 |
| D | 4.800 | 5.400 | 0.189 | 0.213 | L1 | 0.380 | 0.500 | 0.015 | 0.020 |
| D1 | 4.110 | 4.310 | 0.162 | 0.170 | L2 | 0.380 | 0.500 | 0.015 | 0.020 |
| D2 | 4.800 | 5.000 | 0.189 | 0.197 | H | 3.500 | 3.700 | 0.138 | 0.146 |
| E | 5.950 | 6.150 | 0.234 | 0.242 | I | - | 0.180 | - | 0.007 |
| E1 | 5.650 | 5.850 | 0.222 | 0.230 | | | | | |

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