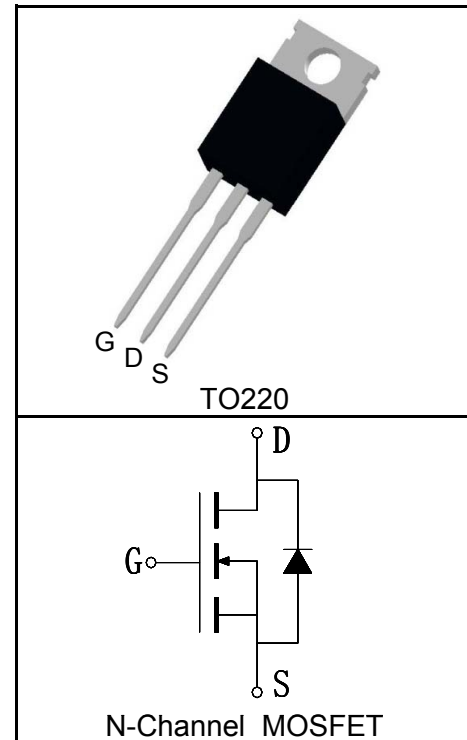


**Features**

- 150V/120A,  
 $R_{DS(ON)} = 11m\Omega(Typ.)@V_{GS}=10V$
- Reliable and Rugged
- 100% avalanche tested
- 175°C Operating Temperature
- Lead Free and Green Devices Available (RoHS Compliant)

**Applications**

- High Speed Power Switching
- High Efficiency Synchronous in SMPS
- Automotive applications and a wide variety of other applications

**Pin Description**

**Absolute Maximum Ratings**

| Symbol   | Parameter                                | Rating                   | Unit         |
|--|--|--------------------------|--------------|
| <b>Common Ratings</b> ( $T_C=25^\circ C$ Unless Otherwise Noted) |  |                          |              |
| $V_{DSS}$  | Drain-Source Voltage                     | 150                      | V            |
| $V_{GSS}$  | Gate-Source Voltage                      | $\pm 25$                 |              |
| $T_J$  | Maximum Junction Temperature             | 175                      | $^\circ C$   |
| $T_{STG}$  | Storage Temperature Range                | -55 to 175               | $^\circ C$   |
| $I_S$  | Diode Continuous Forward Current         | $T_C=25^\circ C$<br>120  | A            |
| <b>Mounted on Large Heat Sink</b>                                |  |                          |              |
| $I_{DP}^{①}$   | 300 $\mu s$ Pulse Drain Current Tested   | $T_C=25^\circ C$<br>480  | A            |
| $I_D^{②}$  | Continuous Drain Current( $V_{GS}=10V$ ) | $T_C=25^\circ C$<br>120  | A            |
|  |  | $T_C=100^\circ C$<br>85  |              |
| $P_D$  | Maximum Power Dissipation                | $T_C=25^\circ C$<br>375  | W            |
|  |  | $T_C=100^\circ C$<br>188 |              |
| $R_{\theta JC}$  | Thermal Resistance-Junction to Case      | 0.4                      | $^\circ C/W$ |
| $R_{\theta JA}$  | Thermal Resistance-Junction to Ambient   | 62.5                     | $^\circ C/W$ |
| <b>Drain-Source Avalanche Ratings</b>                            |  |                          |              |
| $E_{AS}^{③}$   | Avalanche Energy, Single Pulsed          | 552                      | mJ           |

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

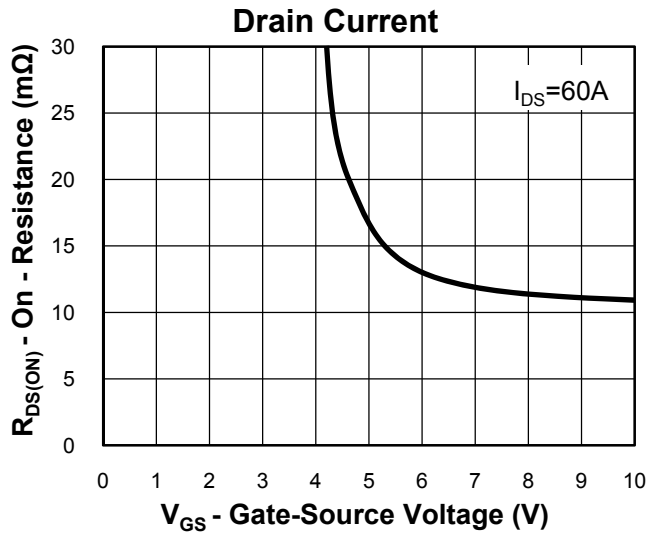
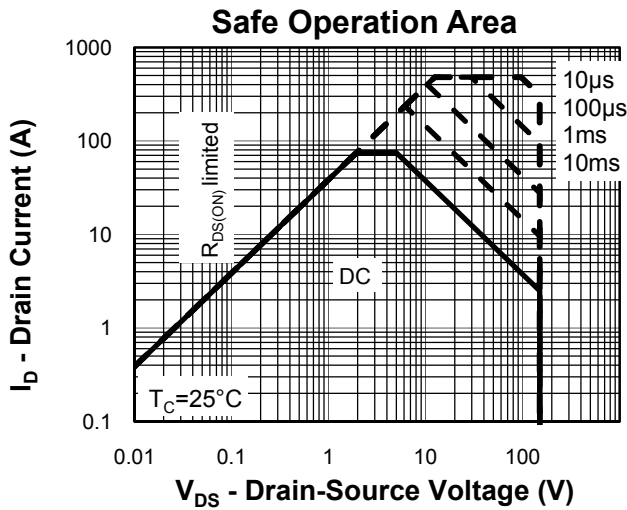
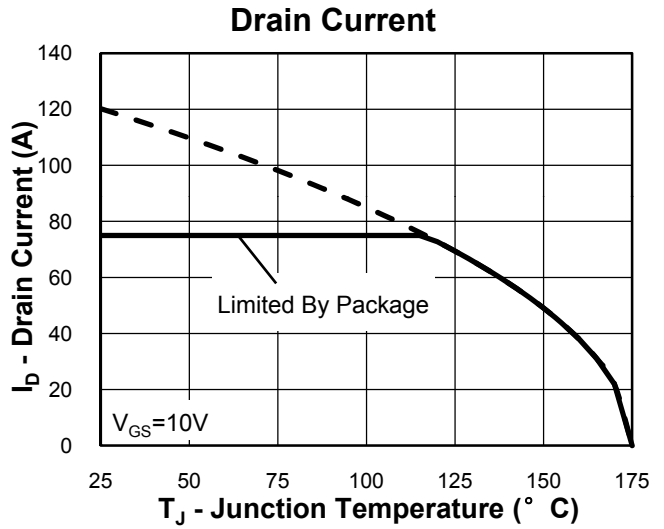
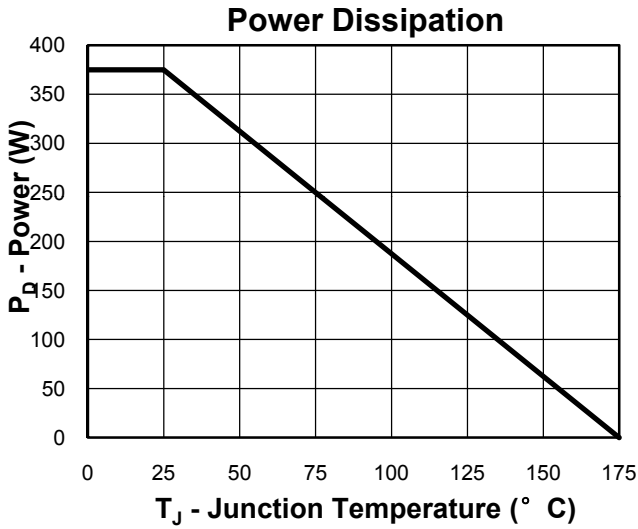
| Symbol  | Parameter                        | Test Condition  | RU1Z120R |      |           | Unit       |
|---|----------------------------------|---|----------|------|-----------|------------|
|   |                                  |   | Min.     | Typ. | Max.      |            |
| <b>Static Characteristics</b>                     |                                  |   |          |      |           |            |
| $BV_{DSS}$  | Drain-Source Breakdown Voltage   | $V_{GS}=0V, I_{DS}=250\mu A$                            | 150      |      |           | V          |
| $I_{DSS}$   | Zero Gate Voltage Drain Current  | $V_{DS}=150V, V_{GS}=0V$                                |          |      | 1         | $\mu A$    |
|   |                                  | $T_J=125^{\circ}\text{C}$                               |          |      | 30        |            |
| $V_{GS(th)}$                                      | Gate Threshold Voltage           | $V_{DS}=V_{GS}, I_{DS}=250\mu A$                        | 2.5      | 3.1  | 4.5       | V          |
| $I_{GSS}$   | Gate Leakage Current             | $V_{GS}=\pm 25V, V_{DS}=0V$                             |          |      | $\pm 100$ | nA         |
| $R_{DS(ON)}^{(4)}$                                | Drain-Source On-state Resistance | $V_{GS}=10V, I_{DS}=60A$                                |          | 11   | 15        | m $\Omega$ |
| <b>Diode Characteristics</b>                      |                                  |   |          |      |           |            |
| $V_{SD}^{(4)}$                                    | Diode Forward Voltage            | $I_{SD}=60A, V_{GS}=0V$                                 |          |      | 1.2       | V          |
| $t_{rr}$  | Reverse Recovery Time            | $I_{SD}=60A, di_{SD}/dt=100A/\mu s$                     |          | 56   |           | ns         |
| $Q_{rr}$  | Reverse Recovery Charge          |   |          | 102  |           | nC         |
| <b>Dynamic Characteristics</b> <sup>(5)</sup>     |                                  |   |          |      |           |            |
| $R_G$   | Gate Resistance                  | $V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$                   |          | 1.5  |           | $\Omega$   |
| $C_{iss}$   | Input Capacitance                | $V_{GS}=0V,$<br>$V_{DS}=75V,$<br>Frequency=1.0MHz       |          | 4900 |           | pF         |
| $C_{oss}$   | Output Capacitance               |   |          | 1010 |           |            |
| $C_{riss}$  | Reverse Transfer Capacitance     |   |          | 220  |           |            |
| $t_{d(ON)}$                                       | Turn-on Delay Time               | $V_{DD}=75V, I_{DS}=60A,$<br>$V_{GEN}=10V, R_G=6\Omega$ |          | 20   |           | ns         |
| $t_r$   | Turn-on Rise Time                |   |          | 98   |           |            |
| $t_{d(OFF)}$                                      | Turn-off Delay Time              |   |          | 105  |           |            |
| $t_f$   | Turn-off Fall Time               |   |          | 52   |           |            |
| <b>Gate Charge Characteristics</b> <sup>(5)</sup> |                                  |   |          |      |           |            |
| $Q_g$   | Total Gate Charge                | $V_{DS}=120V, V_{GS}=10V,$<br>$I_{DS}=60A$              |          | 95   |           | nC         |
| $Q_{gs}$  | Gate-Source Charge               |   |          | 25   |           |            |
| $Q_{gd}$  | Gate-Drain Charge                |   |          | 30   |           |            |

- Notes:
- ① Pulse width limited by safe operating area.
  - ② Calculated continuous current based on maximum allowable junction temperature. The package limitation current is 75A.
  - ③ Limited by  $T_{Jmax}$ ,  $I_{AS}=47A$ ,  $V_{DD}=48V$ ,  $R_G=50\Omega$ , Starting  $T_J=25^{\circ}\text{C}$ .
  - ④ Pulse test; Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
  - ⑤ Guaranteed by design, not subject to production testing.

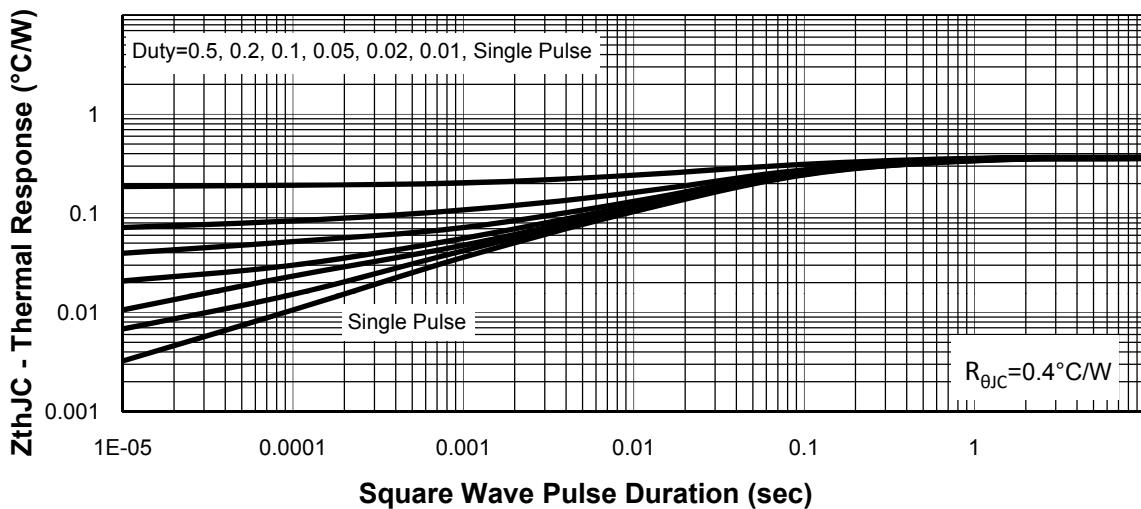
**Ordering and Marking Information**

| <b>Device</b> | <b>Marking</b> | <b>Package</b> | <b>Packaging</b> | <b>Quantity</b> | <b>Reel Size</b> | <b>Tape width</b> |
|---------------|----------------|----------------|------------------|-----------------|------------------|-------------------|
| RU1Z120R      | RU1Z120R       | TO220          | Tube             | 50              | -                | -                 |

**Typical Characteristics**

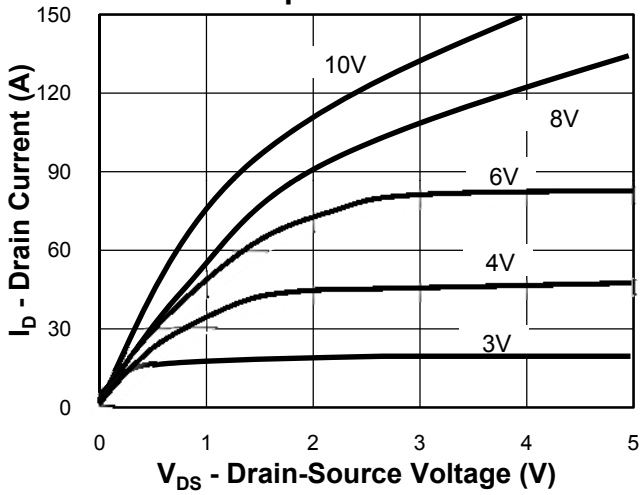


**Thermal Transient Impedance**

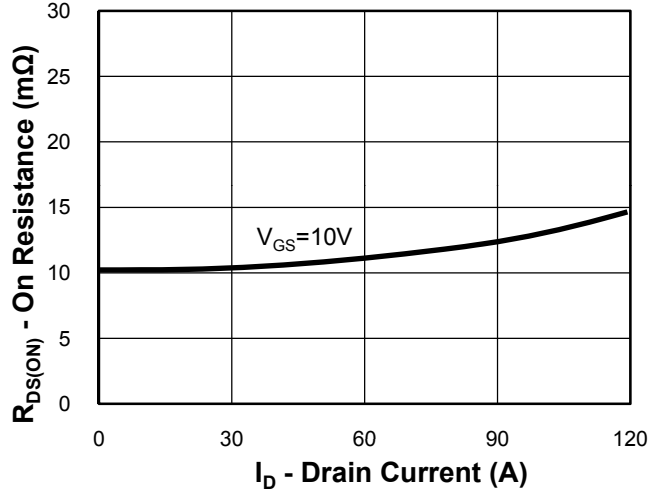


**Typical Characteristics**

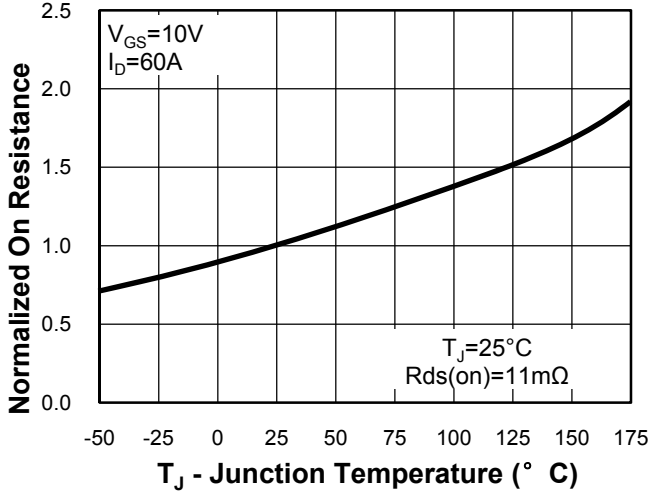
**Output Characteristics**



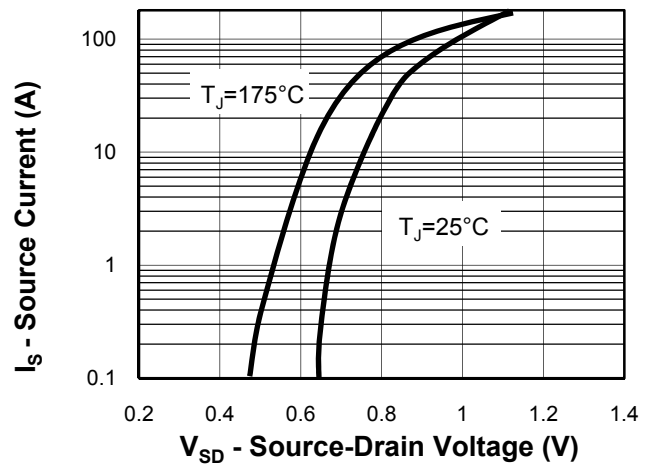
**Drain-Source On Resistance**



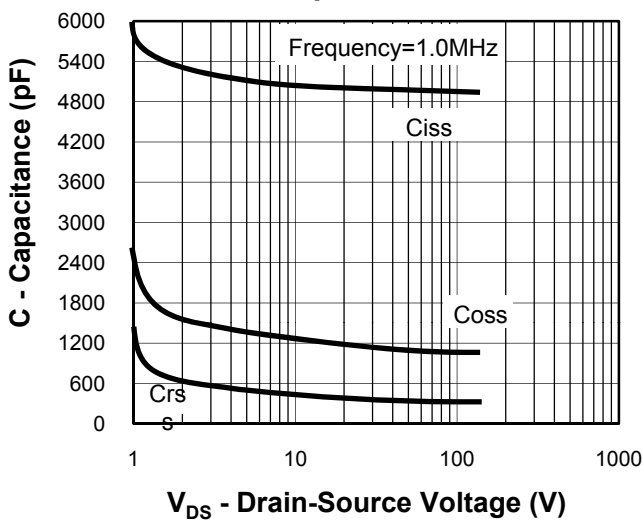
**Drain-Source On Resistance**



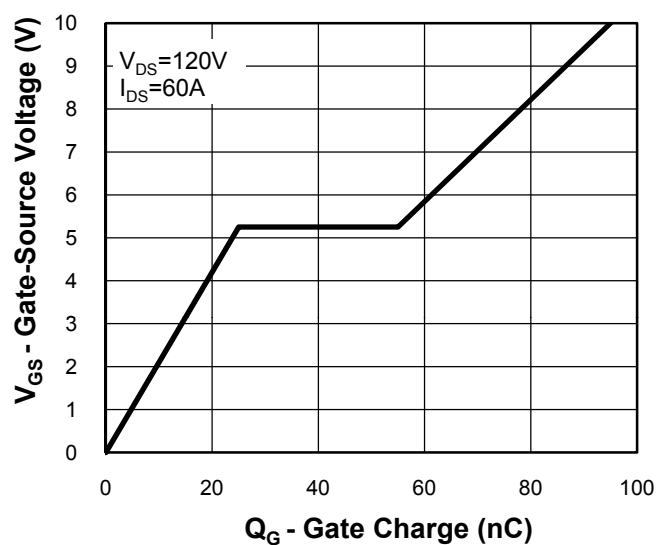
**Source-Drain Diode Forward**



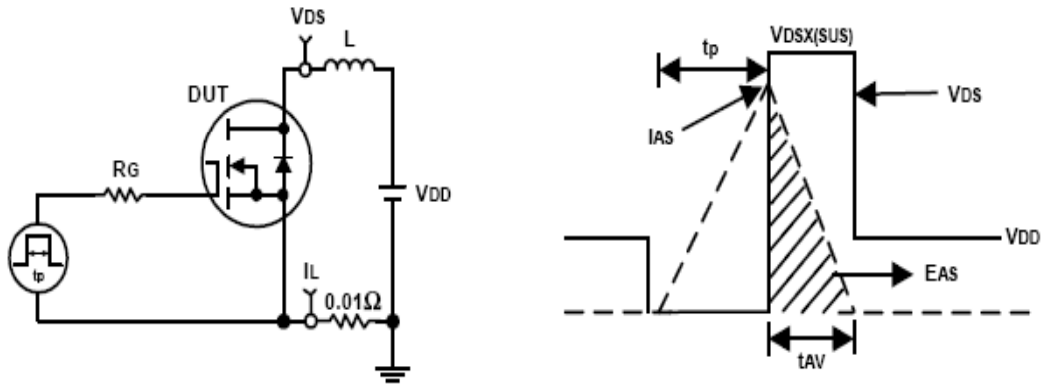
**Capacitance**



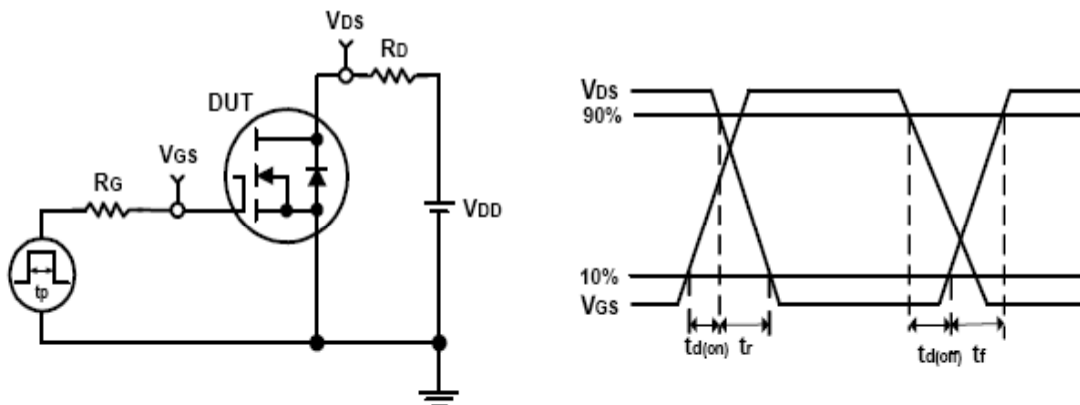
**Gate Charge**



**Avalanche Test Circuit and Waveforms**

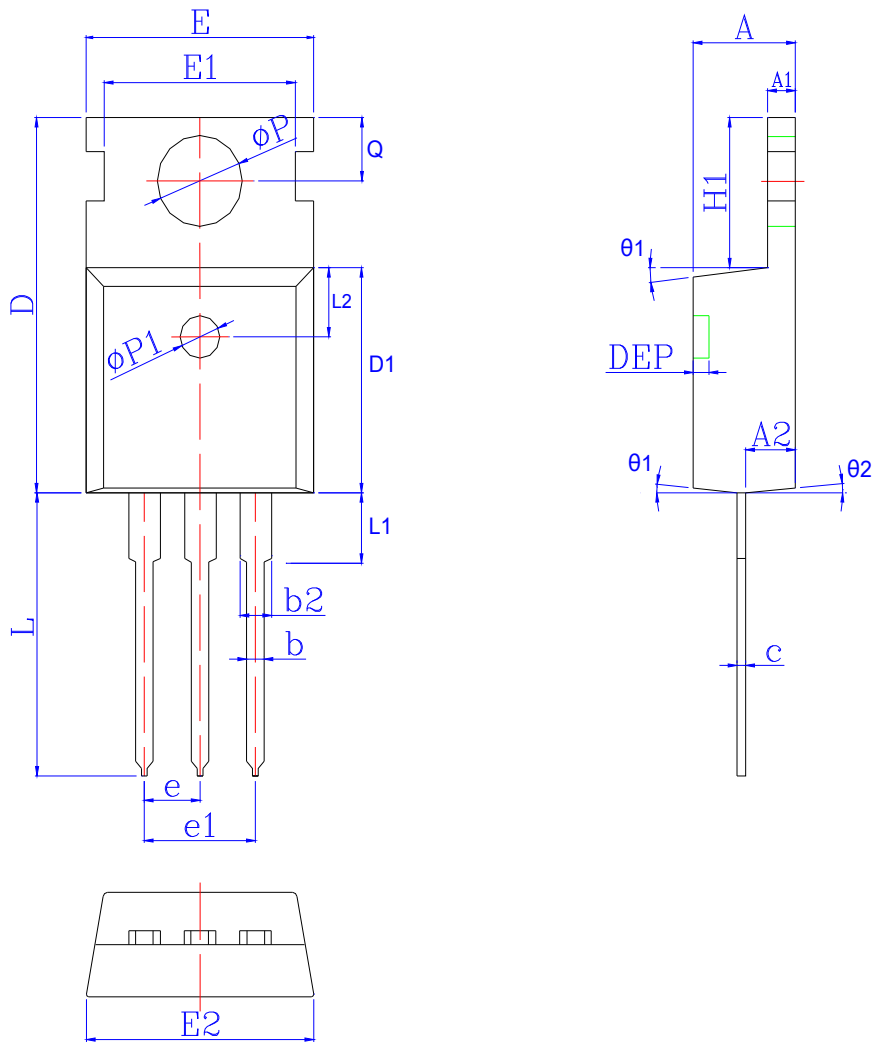


**Switching Time Test Circuit and Waveforms**



**Package Information**

**TO220**



| SYMBOL | MM    |       |       | INCH  |       |       | SYMBOL     | MM       |       |       | INCH      |       |       |
|--------|-------|-------|-------|-------|-------|-------|------------|----------|-------|-------|-----------|-------|-------|
|        | MIN   | NOM   | MAX   | MIN   | NOM   | MAX   |            | MIN      | NOM   | MAX   | MIN       | NOM   | MAX   |
| A      | 4.30  | 4.50  | 4.70  | 0.169 | 0.177 | 0.185 | $\Phi p1$  | 1.40     | 1.50  | 1.60  | 0.055     | 0.059 | 0.063 |
| A1     | 1.15  | 1.30  | 1.40  | 0.045 | 0.051 | 0.055 | e          | 2.54 BSC |       |       | 0.10 BSC  |       |       |
| A2     | 1.90  | 2.25  | 2.60  | 0.075 | 0.089 | 0.102 | e1         | 5.08 BSC |       |       | 0.20 BSC  |       |       |
| b      | 0.60  | 0.80  | 1.00  | 0.024 | 0.031 | 0.039 | H1         | 6.35     | 6.50  | 6.80  | 0.250     | 0.256 | 0.268 |
| b2     | 1.17  | 1.28  | 1.72  | 0.046 | 0.050 | 0.068 | L          | 12.70    | 13.18 | 13.65 | 0.500     | 0.519 | 0.537 |
| c      | 0.40  | 0.50  | 0.60  | 0.016 | 0.020 | 0.024 | L1         | *        | *     | 3.95  | *         | *     | 0.156 |
| D      | 15.40 | 15.70 | 16.00 | 0.606 | 0.618 | 0.630 | L2         | 2.50 REF |       |       | 0.098 REF |       |       |
| D1     | 8.96  | 9.21  | 9.46  | 0.353 | 0.363 | 0.372 | $\Phi p$   | 3.50     | 3.60  | 3.75  | 0.138     | 0.142 | 0.148 |
| DEP    | *     | *     | 0.30  | *     | *     | 0.012 | Q          | 2.70     | 2.80  | 3.20  | 0.106     | 0.110 | 0.126 |
| E      | 9.66  | 9.97  | 10.28 | 0.380 | 0.393 | 0.405 | $\theta 1$ | 5°       | 7°    | 9°    | 5°        | 7°    | 9°    |
| E1     | *     | 8.70  | *     | *     | 0.343 | *     | $\theta 2$ | 1°       | 3°    | 5°    | 1°        | 3°    | 5°    |
| E2     | 9.80  | 10.00 | 10.20 | 0.386 | 0.394 | 0.402 |            |          |       |       |           |       |       |

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