

## Description

The PSJMT065R400 is a high voltage MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

### MOSFET Product Summary

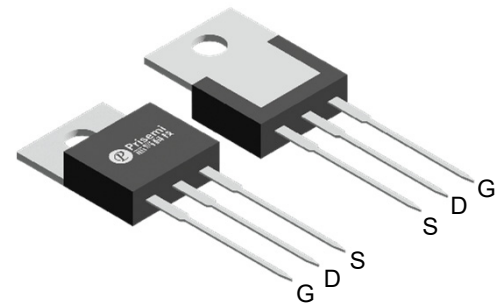
| $V_{DS}(V)$ | $R_{DS(on)}(m\Omega)$ | $I_D(A)$ |
|-------------|-----------------------|----------|
| 650         | 290@ $V_{GS} = 10V$   | 11.3     |

## Feature

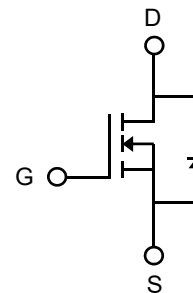
- Fast Switching Capability
- Lead free product is acquired.
- Avalanche Energy Tested

## Applications

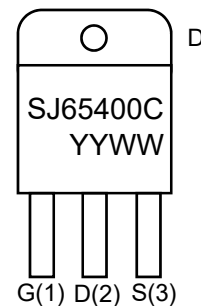
- PWM applications
- Load Switch
- Power Management
- DC-DC Converters



**TO-220  
Bottom View**



**Circuit Diagram**



**Marking (Top View)**

## Absolute maximum rating@25°C

| Rating                                                 |                   | Symbol          | Value    | Units |
|--------------------------------------------------------|-------------------|-----------------|----------|-------|
| Drain-Source Voltage                                   |                   | $V_{DS}$        | 650      | V     |
| Gate-Source Voltage                                    |                   | $V_{GS}$        | ±30      | V     |
| Drain Current-Continuous <sup>1)</sup>                 | $T_C=25^\circ C$  | $I_D$           | 11.3     | A     |
|                                                        | $T_C=100^\circ C$ |                 | 7.1      |       |
| Pulsed Drain Current <sup>2)</sup>                     |                   | $I_{DM}$        | 34       | A     |
| Total Power Dissipation <sup>3)</sup>                  |                   | $P_D$           | 129      | W     |
| Avalanche Current <sup>4)</sup>                        |                   | $I_{AS}$        | 3.4      | A     |
| Avalanche Energy <sup>4)</sup>                         |                   | $E_{AS}$        | 118      | mJ    |
| Thermal Resistance , Junction-to-Case <sup>6)</sup>    |                   | $R_{\theta JC}$ | 1.0      | °C/W  |
| Thermal Resistance , Junction-to-Ambient <sup>5)</sup> |                   | $R_{\theta JA}$ | 52.6     | °C/W  |
| Junction and Storage Temperature Range                 |                   | $T_J, T_{STG}$  | -55~+150 | °C    |

## Electrical characteristics per line@25°C (unless otherwise specified)

| Parameter                                     | Symbol       | Conditions                                                   | Min. | Typ. | Max.      | Units      |
|-----------------------------------------------|--------------|--------------------------------------------------------------|------|------|-----------|------------|
| <b>Off Characteristics</b>                    |              |                                                              |      |      |           |            |
| Drain-Source Breakdown Voltage                | $BV_{DSS}$   | $V_{GS} = 0V, I_D = 250\mu A$                                | 650  | -    | -         | V          |
| Zero Gate Voltage Drain Current               | $I_{DSS}$    | $V_{DS} = 600V, V_{GS} = 0V$                                 | -    | -    | 1.0       | $\mu A$    |
| Gate-Body Leakage Current                     | $I_{GSS}$    | $V_{GS} = \pm 30V, V_{DS} = 0V$                              | -    | -    | $\pm 100$ | nA         |
| <b>On Characteristics</b>                     |              |                                                              |      |      |           |            |
| Gate Threshold Voltage                        | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\mu A$                            | 2.5  | 2.8  | 3.5       | V          |
| Drain-Source On-State Resistance              | $R_{DS(ON)}$ | $V_{GS} = 10V, I_D = 1A$                                     | -    | 290  | 400       | m $\Omega$ |
| <b>Dynamic Characteristics<sup>7)</sup></b>   |              |                                                              |      |      |           |            |
| Input Capacitance                             | $C_{iss}$    | $V_{DS} = 100V, V_{GS} = 0V,$<br>$f = 1.0MHz$                | -    | 633  | -         | pF         |
| Output Capacitance                            | $C_{oss}$    |                                                              | -    | 23   | -         |            |
| Reverse Transfer Capacitance                  | $C_{rss}$    |                                                              | -    | 1.1  | -         |            |
| <b>Switching Characteristics<sup>7)</sup></b> |              |                                                              |      |      |           |            |
| Turn-on Delay Time                            | $t_{d(on)}$  | $V_{DS} = 400V, V_{GS} = 10V,$<br>$I_D = 1A, R_G = 10\Omega$ | -    | 12.8 | -         | ns         |
| Turn-on Rise Time                             | $t_r$        |                                                              | -    | 9.5  | -         |            |
| Turn-Off Delay Time                           | $t_{d(off)}$ |                                                              | -    | 78.6 | -         |            |
| Turn-Off Fall Time                            | $t_f$        |                                                              | -    | 43.5 | -         |            |
| Total Gate Charge                             | $Q_g$        | $V_{DS} = 480V, V_{GS} = 10V,$<br>$I_D = 1A$                 | -    | 11.9 | -         | nC         |
| Gate-Source Charge                            | $Q_{gs}$     |                                                              | -    | 1.8  | -         |            |
| Gate-Drain Charge                             | $Q_{gd}$     |                                                              | -    | 2.7  | -         |            |
| Gate Resistance                               | $R_g$        | $f=1MHz$ , Open Drain                                        | -    | 4.0  | -         | $\Omega$   |
| <b>Drain-Source Diode Characteristics</b>     |              |                                                              |      |      |           |            |
| Diode Forward Voltage                         | $V_{SD}$     | $V_{GS} = 0V, I_S = 1A$                                      | -    | 0.8  | 1.2       | V          |
| Body Diode Reverse Recovery Time              | $t_{rr}$     | $I_F = 1A, V_R = 200V,$<br>$dI_F/dt = 100A/\mu s$            | -    | 109  | -         | ns         |
| Body Diode Reverse Recovery Charge            | $Q_{rr}$     |                                                              | -    | 0.6  | -         | $\mu C$    |
| Peak Reverse Recovery Current                 | $I_{rrm}$    |                                                              | -    | 9.8  | -         | A          |

## Notes:

1. Computed continuous current assumes the condition of  $T_{J\_Max}$  while the actual continuous current depends on the thermal & electro-mechanical application board design.
2. Repetitive Rating: Pulse width limited by maximum junction temperature( $T_{J\_Max}=150^\circ C$ ).
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. This single-pulse measurement was taken under the following condition [ $L=20mH, V_{GS}=10V, V_{DS}=150V$ ]while it's value is limited by  $T_{J\_Max}=150^\circ C$ .
5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
6. Device mounted on infinite heatsink.
7. Guaranteed by design, not subject to production.

## Typical Characteristics

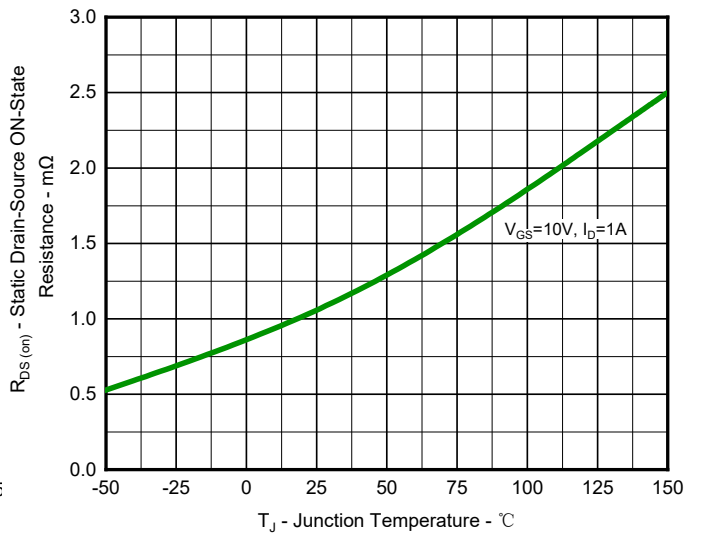
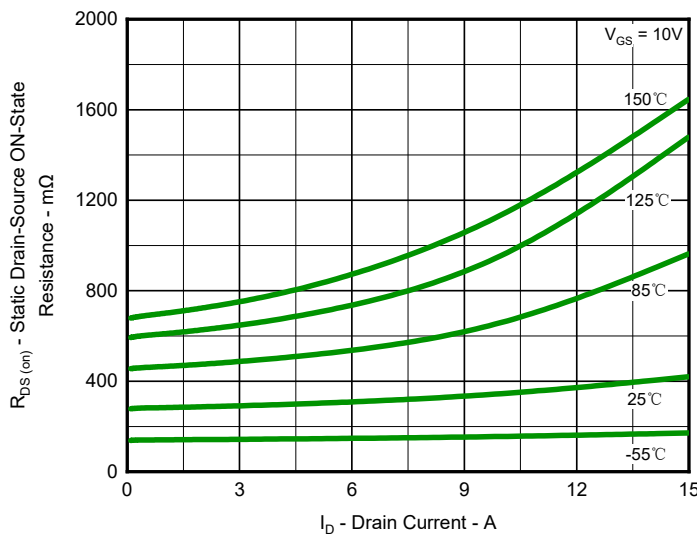
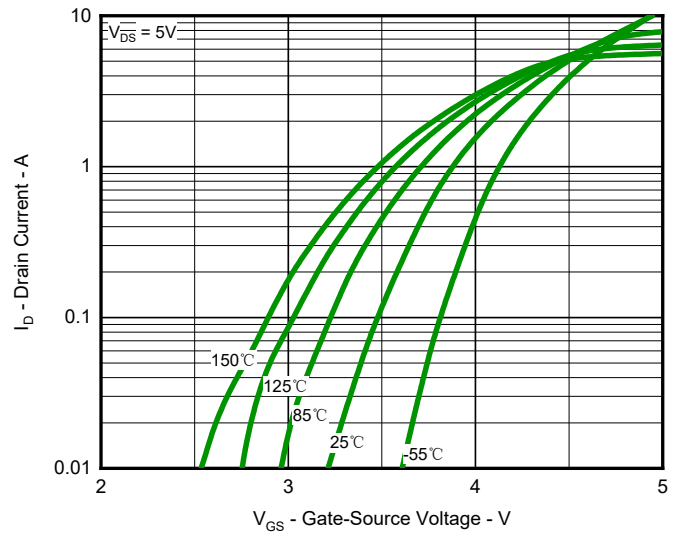
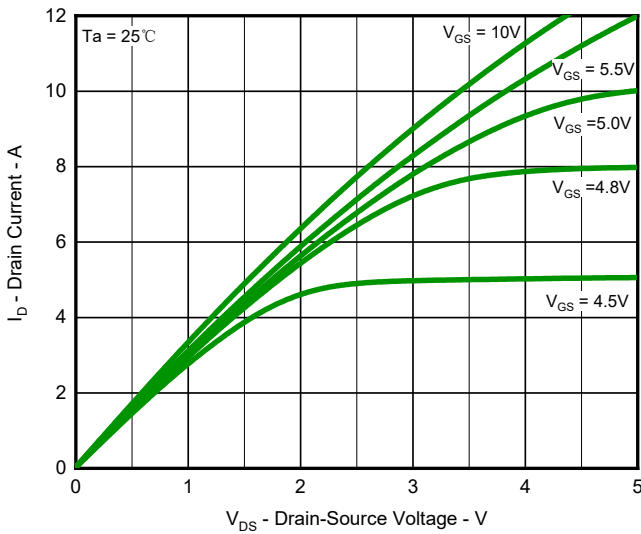


Fig.3 Typical On-Resistance vs Drain Current and Temperature

Fig.4 On-Resistance Variation with Temperature

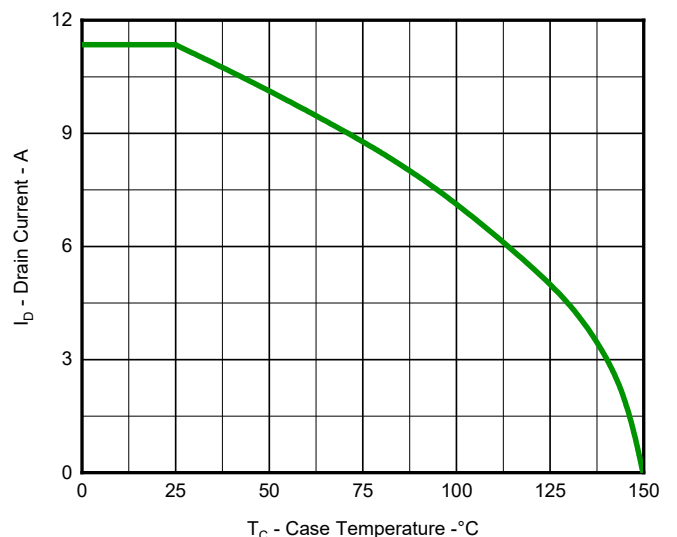
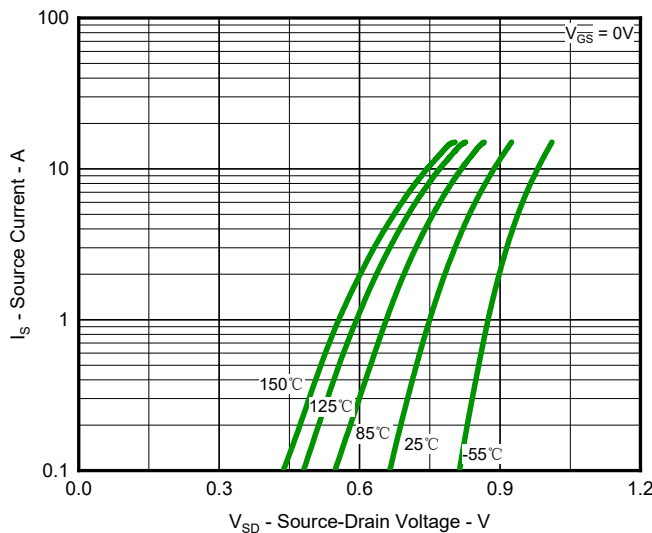


Fig.5 Diode Forward Voltage vs. Current

Fig.6 Maximum Drain Current vs. Case Temperature

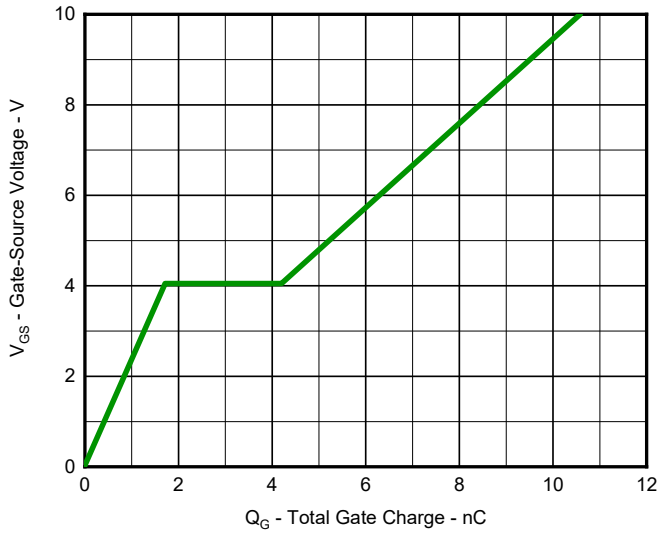


Fig.7 Gate Charge Characteristics

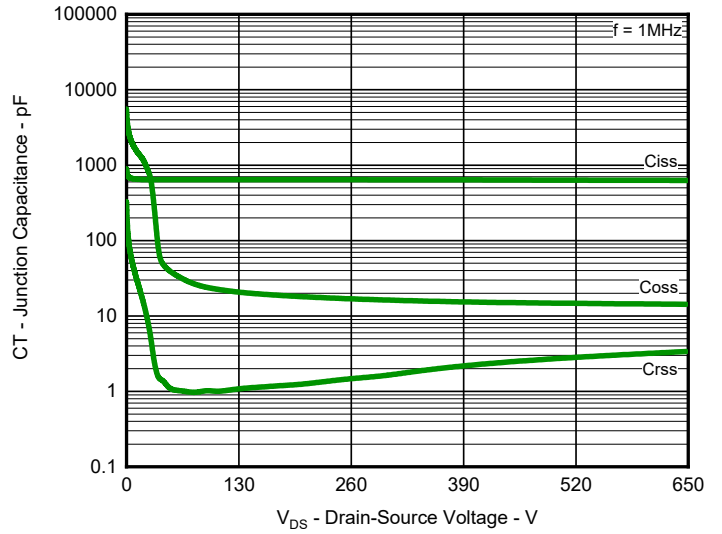


Fig.8 Typical Junction Capacitance

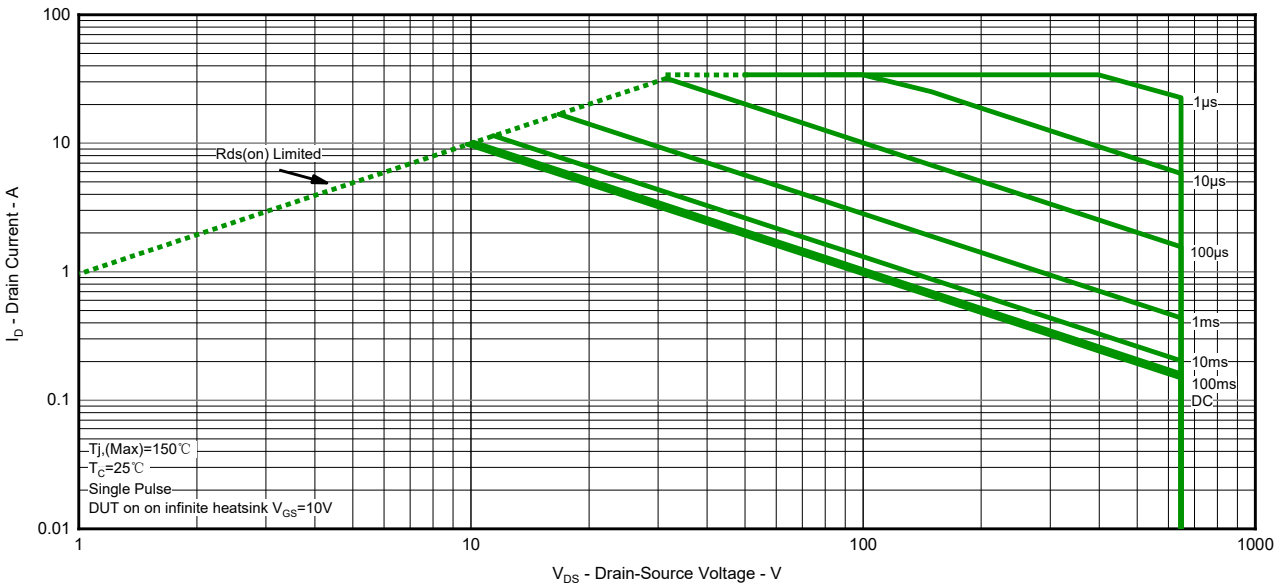


Fig.9 Safe Operation Area

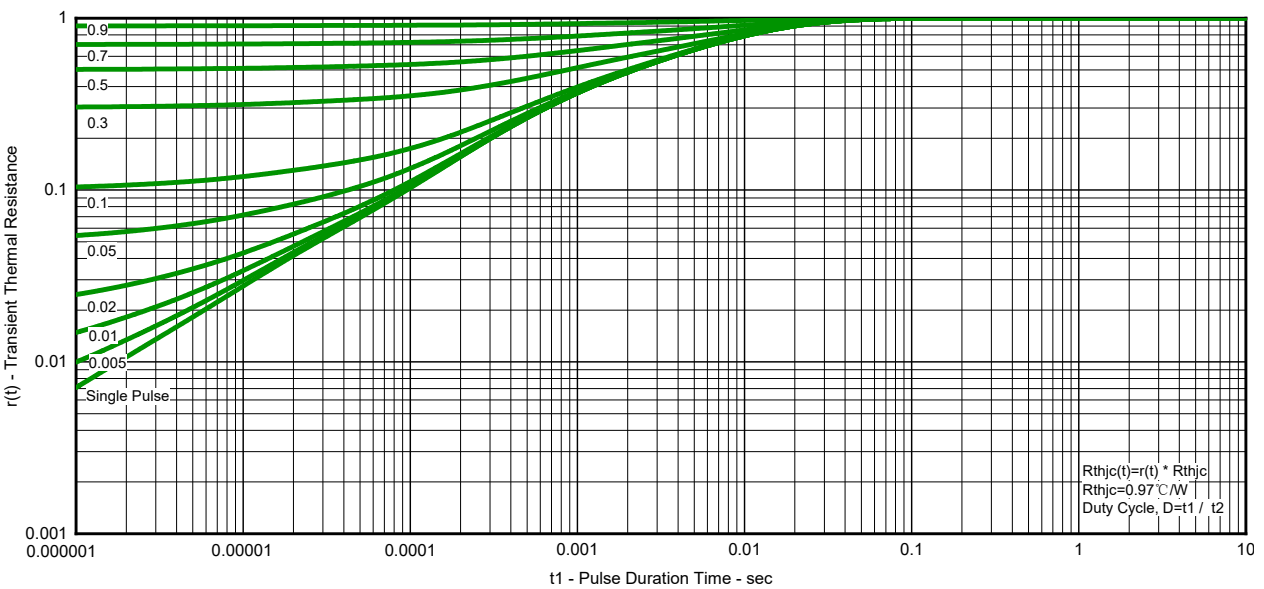
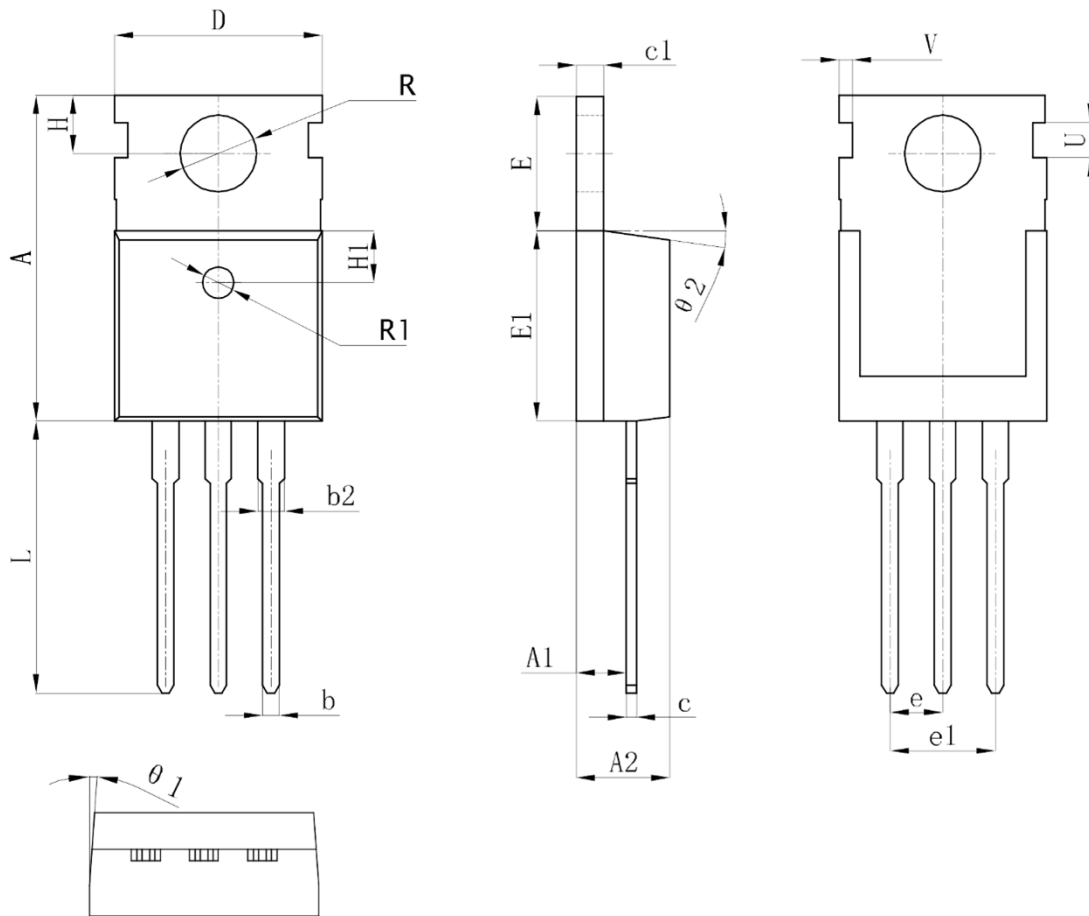



Fig.10 Transient Thermal Resistance

## Product dimension (TO-220)



| Dim | Millimeters |       | Inches |       | Dim        | Millimeters |       | Inches |       |
|-----|-------------|-------|--------|-------|------------|-------------|-------|--------|-------|
|     | Min         | Max   | Min    | Max   |            | Min         | Max   | Min    | Max   |
| A   | 15.40       | 15.80 | 0.606  | 0.622 | e1         | 4.84        | 5.32  | 0.191  | 0.209 |
| A1  | 2.35        | 2.50  | 0.093  | 0.098 | H          | 2.73        | 2.87  | 0.107  | 0.113 |
| A2  | 4.40        | 4.70  | 0.173  | 0.185 | H1         | 2.40        | 2.60  | 0.094  | 0.102 |
| b   | 0.70        | 0.90  | 0.028  | 0.035 | L          | 13.02       | 13.72 | 0.513  | 0.540 |
| b2  | 1.18        | 1.44  | 0.046  | 0.057 | R          | 3.50        | 3.63  | 0.138  | 0.143 |
| c   | 0.48        | 0.56  | 0.019  | 0.022 | R1         | 1.40        | 1.60  | 0.055  | 0.063 |
| c1  | 1.29        | 1.32  | 0.051  | 0.052 | U          | 1.65        | 1.85  | 0.065  | 0.073 |
| D   | 9.80        | 10.20 | 0.386  | 0.402 | V          | 0.58        | 0.78  | 0.023  | 0.031 |
| E   | 6.40        | 6.60  | 0.252  | 0.260 | $\theta_1$ | 2°          | 3°    | 2°     | 3°    |
| E1  | 9.00        | 9.20  | 0.354  | 0.362 | $\theta_2$ | 6.5°        | 7.5°  | 6.5°   | 7.5°  |
| e   | 2.42        | 2.66  | 0.095  | 0.105 |            |             |       |        |       |


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