

## Excellent Integrated System Limited

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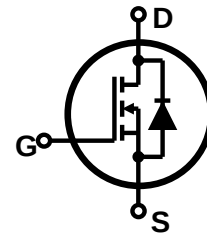
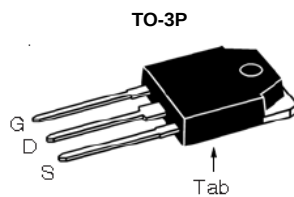
## Features

- Low gate charge
- 100% avalanche tested
- Improved dv/dt capability
- RoHS compliant
- JEDEC Qualification

$$V_{DSS} = 660 \text{ V @ } T_{jmax}$$

$$I_D = 20 \text{ A}$$

$$R_{DS(on)} = 0.33 \Omega(\text{max}) @ V_{GS} = 10 \text{ V}$$



| Device       | Package | Marking      | Remark |
|--------------|---------|--------------|--------|
| GP1M020A060M | TO-3P   | GP1M020A060M | RoHS   |

## Absolute Maximum Ratings

| Parameter                                                                     | Symbol                           | Value    | Unit                 |
|-------------------------------------------------------------------------------|----------------------------------|----------|----------------------|
| Drain-Source Voltage                                                          | $V_{DS}$                         | 600      | V                    |
| Gate-Source Voltage                                                           | $V_{GS}$                         | $\pm 30$ | V                    |
| Continuous Drain Current                                                      | $T_C = 25^\circ \text{C}$        | 20       | A                    |
|                                                                               | $T_C = 100^\circ \text{C}$       | 12.4     | A                    |
| Pulsed Drain Current (Note 1)                                                 | $I_{DM}$                         | 80       | A                    |
| Single Pulse Avalanche Energy (Note 2)                                        | $E_{AS}$                         | 1330     | mJ                   |
| Repetitive Avalanche Current (Note 1)                                         | $I_{AR}$                         | 20       | A                    |
| Repetitive Avalanche Energy (Note 1)                                          | $E_{AR}$                         | 34.7     | mJ                   |
| Power Dissipation                                                             | $T_C = 25^\circ \text{C}$        | 347      | W                    |
|                                                                               | Derate above $25^\circ \text{C}$ | 2.77     | W/ $^\circ \text{C}$ |
| Peak Diode Recovery dv/dt (Note 3)                                            | dv/dt                            | 4.5      | V/ns                 |
| Operating Junction and Storage Temperature Range                              | $T_J, T_{STG}$                   | -55~150  | $^\circ \text{C}$    |
| Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds | $T_L$                            | 300      | $^\circ \text{C}$    |

\* Limited only by maximum junction temperature

## Thermal Characteristics

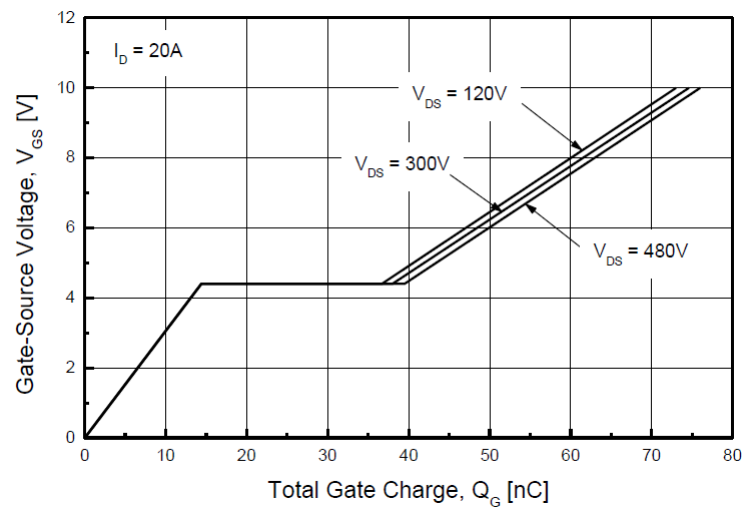
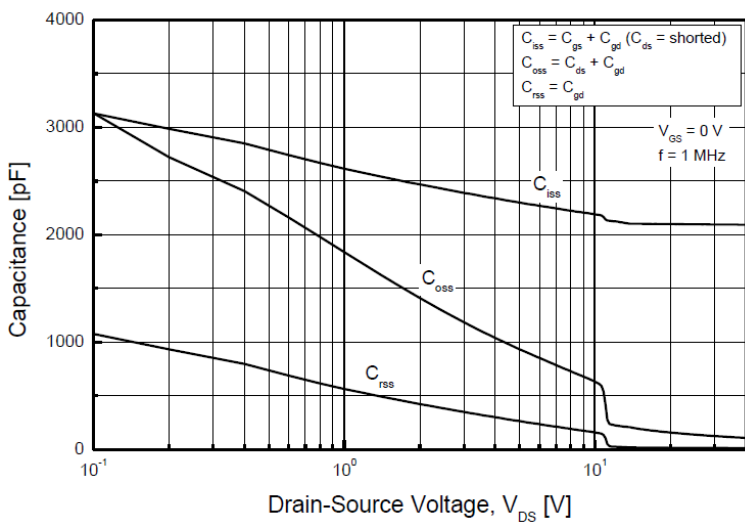
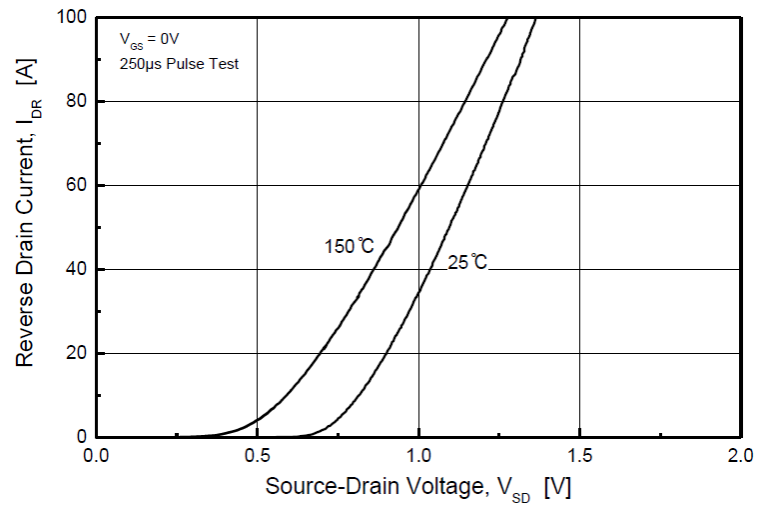
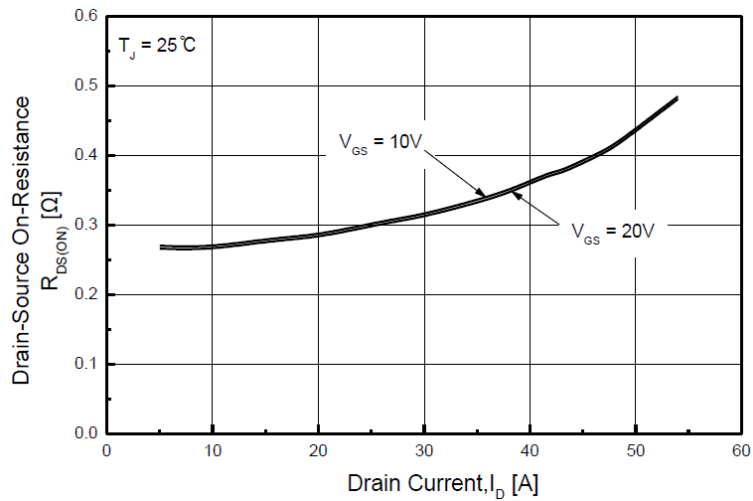
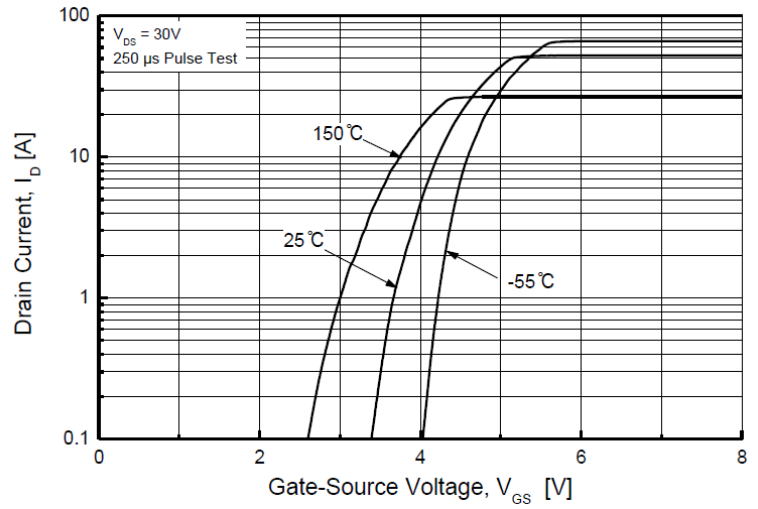
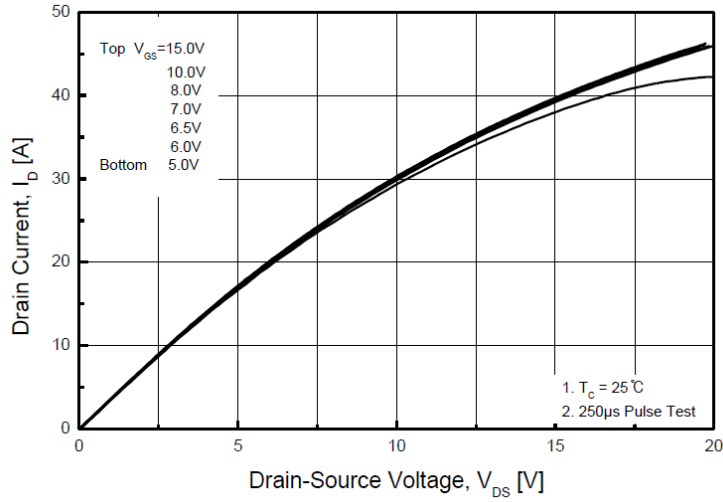
| Parameter                                       | Symbol          | Value | Unit                |
|-------------------------------------------------|-----------------|-------|---------------------|
| Maximum Thermal resistance, Junction-to-Case    | $R_{\theta JC}$ | 0.36  | $^\circ \text{C/W}$ |
| Maximum Thermal resistance, Junction-to-Ambient | $R_{\theta JA}$ | 62.5  | $^\circ \text{C/W}$ |

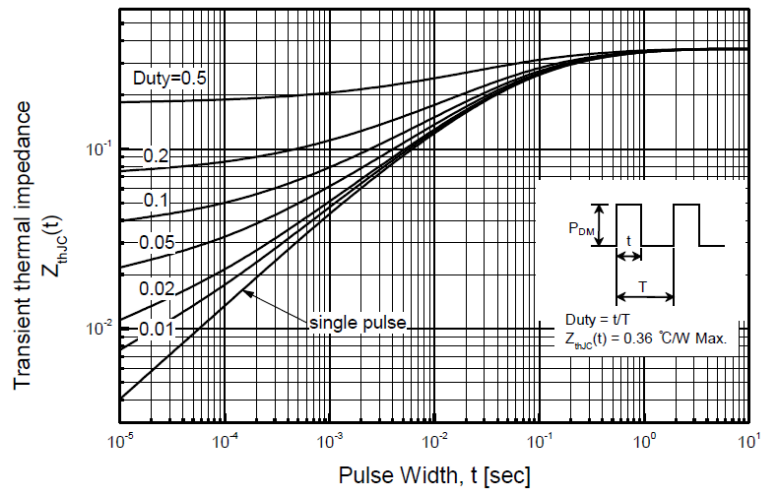
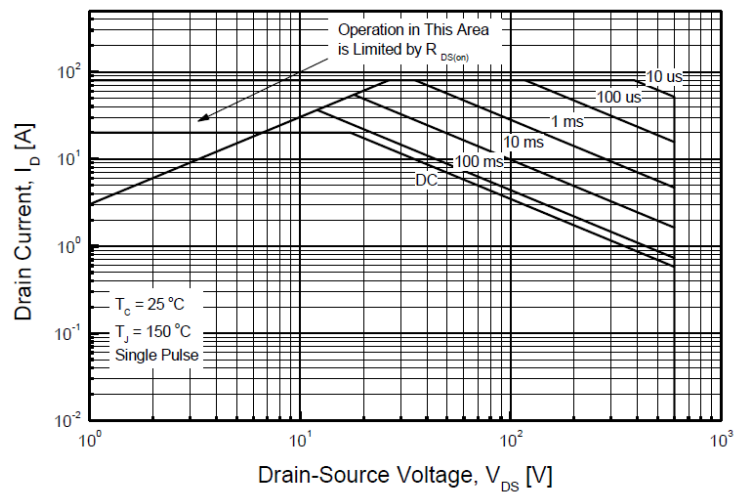
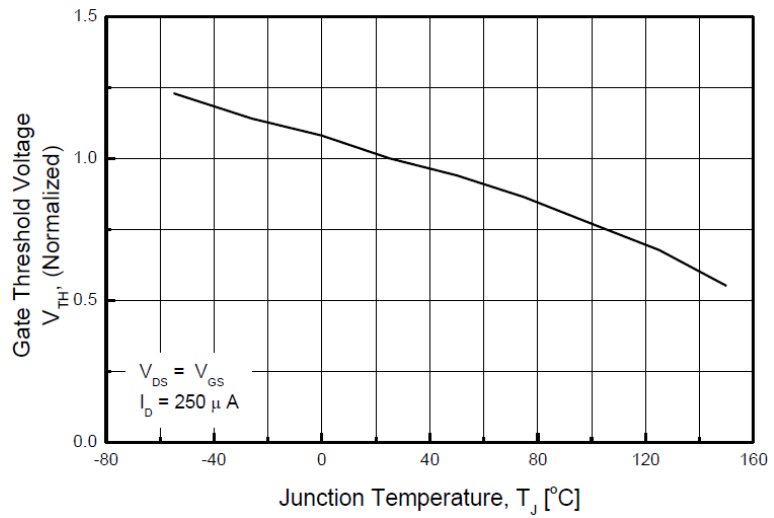
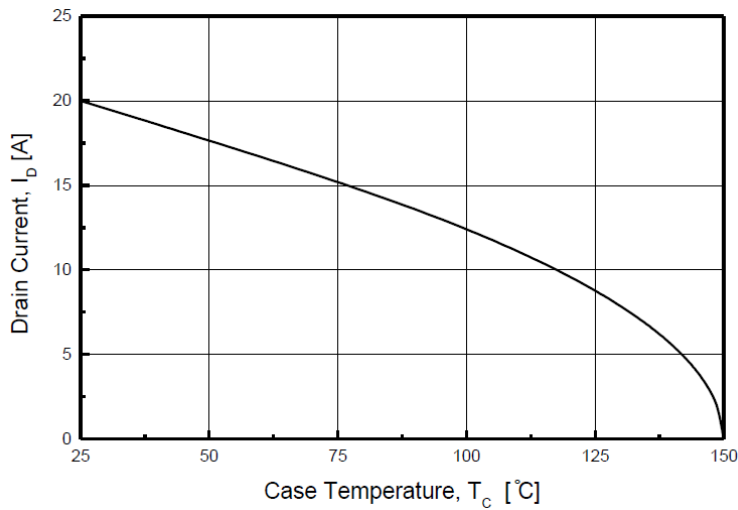
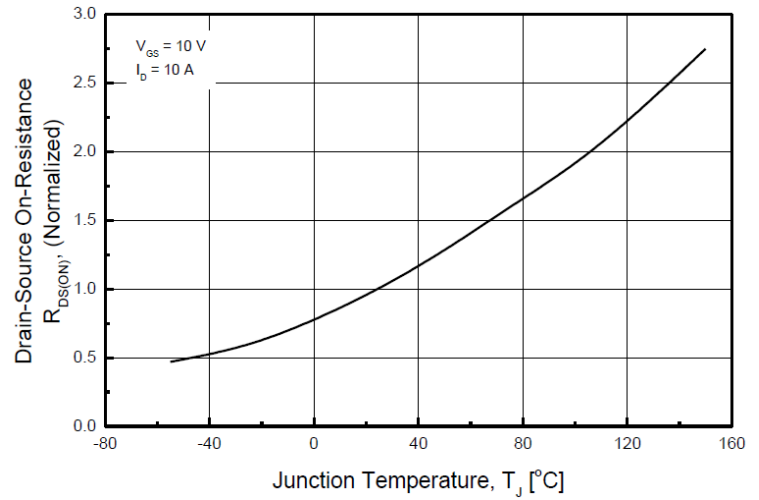
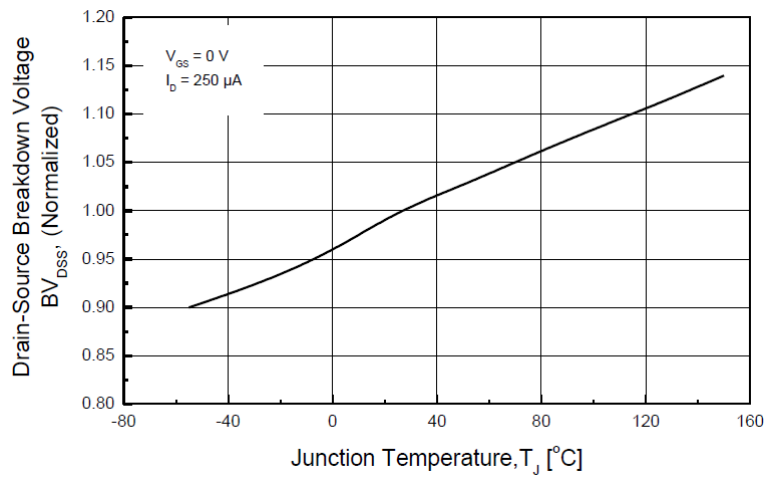
**Electrical Characteristics :  $T_C=25^{\circ}\text{C}$ , unless otherwise noted**

| Parameter                                             | Symbol              | Test condition                                                           | Min | Typ  | Max  | Units |
|-------------------------------------------------------|---------------------|--------------------------------------------------------------------------|-----|------|------|-------|
| OFF                                                   |                     |                                                                          |     |      |      |       |
| Drain-Source Breakdown Voltage                        | BV <sub>DSS</sub>   | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA                           | 600 | --   | --   | V     |
| Zero Gate Voltage Drain Current                       | I <sub>DSS</sub>    | V <sub>DS</sub> = 600 V, V <sub>GS</sub> = 0 V                           | --  | --   | 1    | μA    |
|                                                       |                     | V <sub>DS</sub> = 480 V, T <sub>C</sub> = 125°C                          | --  | --   | 10   | μA    |
| Forward Gate-Source Leakage Current                   | I <sub>GSSF</sub>   | V <sub>GS</sub> = 30 V, V <sub>DS</sub> = 0 V                            | --  | --   | 100  | nA    |
| Reverse Gate-Source Leakage Current                   | I <sub>GSSR</sub>   | V <sub>GS</sub> = -30 V, V <sub>DS</sub> = 0 V                           | --  | --   | -100 | nA    |
| ON                                                    |                     |                                                                          |     |      |      |       |
| Gate Threshold Voltage                                | V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA              | 2   | --   | 4    | V     |
| Drain-Source On-Resistance                            | R <sub>DS(on)</sub> | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10 A                            | --  | 0.27 | 0.33 | Ω     |
| Forward Transconductance <sup>(Note 4)</sup>          | g <sub>FS</sub>     | V <sub>DS</sub> = 30 V, I <sub>D</sub> = 10 A                            | --  | 30   | --   | S     |
| DYNAMIC                                               |                     |                                                                          |     |      |      |       |
| Input Capacitance                                     | C <sub>iss</sub>    | V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V,<br>f = 1.0 MHz            | --  | 2097 | --   | pF    |
| Output Capacitance                                    | C <sub>oss</sub>    |                                                                          | --  | 146  | --   | pF    |
| Reverse Transfer Capacitance                          | C <sub>rss</sub>    |                                                                          | --  | 14   | --   | pF    |
| SWITCHING                                             |                     |                                                                          |     |      |      |       |
| Turn-On Delay Time <sup>(Note 4,5)</sup>              | t <sub>d(on)</sub>  | V <sub>DD</sub> = 300 V, I <sub>D</sub> = 20 A,<br>R <sub>G</sub> = 25 Ω | --  | 73   | --   | ns    |
| Turn-On Rise Time <sup>(Note 4,5)</sup>               | t <sub>r</sub>      |                                                                          | --  | 63   | --   | ns    |
| Turn-Off Delay Time <sup>(Note 4,5)</sup>             | t <sub>d(off)</sub> |                                                                          | --  | 384  | --   | ns    |
| Turn-Off Fall Time <sup>(Note 4,5)</sup>              | t <sub>f</sub>      |                                                                          | --  | 72   | --   | ns    |
| Total Gate Charge <sup>(Note 4,5)</sup>               | Q <sub>g</sub>      | V <sub>DS</sub> = 480V, I <sub>D</sub> = 20 A,<br>V <sub>GS</sub> = 10 V | --  | 76   | --   | nC    |
| Gate-Source Charge <sup>(Note 4,5)</sup>              | Q <sub>gs</sub>     |                                                                          | --  | 14.4 | --   | nC    |
| Gate-Drain Charge <sup>(Note 4,5)</sup>               | Q <sub>gd</sub>     |                                                                          | --  | 25   | --   | nC    |
| SOURCE DRAIN DIODE                                    |                     |                                                                          |     |      |      |       |
| Maximum Continuous Drain-Source Diode Forward Current | I <sub>S</sub>      | ---                                                                      | --  | --   | 20   | A     |
| Maximum Pulsed Drain-Source Diode Forward Current     | I <sub>SM</sub>     | ---                                                                      | --  | --   | 80   | A     |
| Drain-Source Diode Forward Voltage                    | V <sub>SD</sub>     | V <sub>GS</sub> = 0 V, I <sub>S</sub> = 20 A                             | --  | --   | 1.5  | V     |
| Reverse Recovery Time <sup>(Note 4)</sup>             | t <sub>rr</sub>     | V <sub>GS</sub> = 0 V, I <sub>S</sub> = 20 A                             | --  | 452  | --   | ns    |
| Reverse Recovery Charge <sup>(Note 4)</sup>           | Q <sub>rr</sub>     | dl <sub>F</sub> / dt = 100 A/μs                                          | --  | 5.9  | --   | μC    |

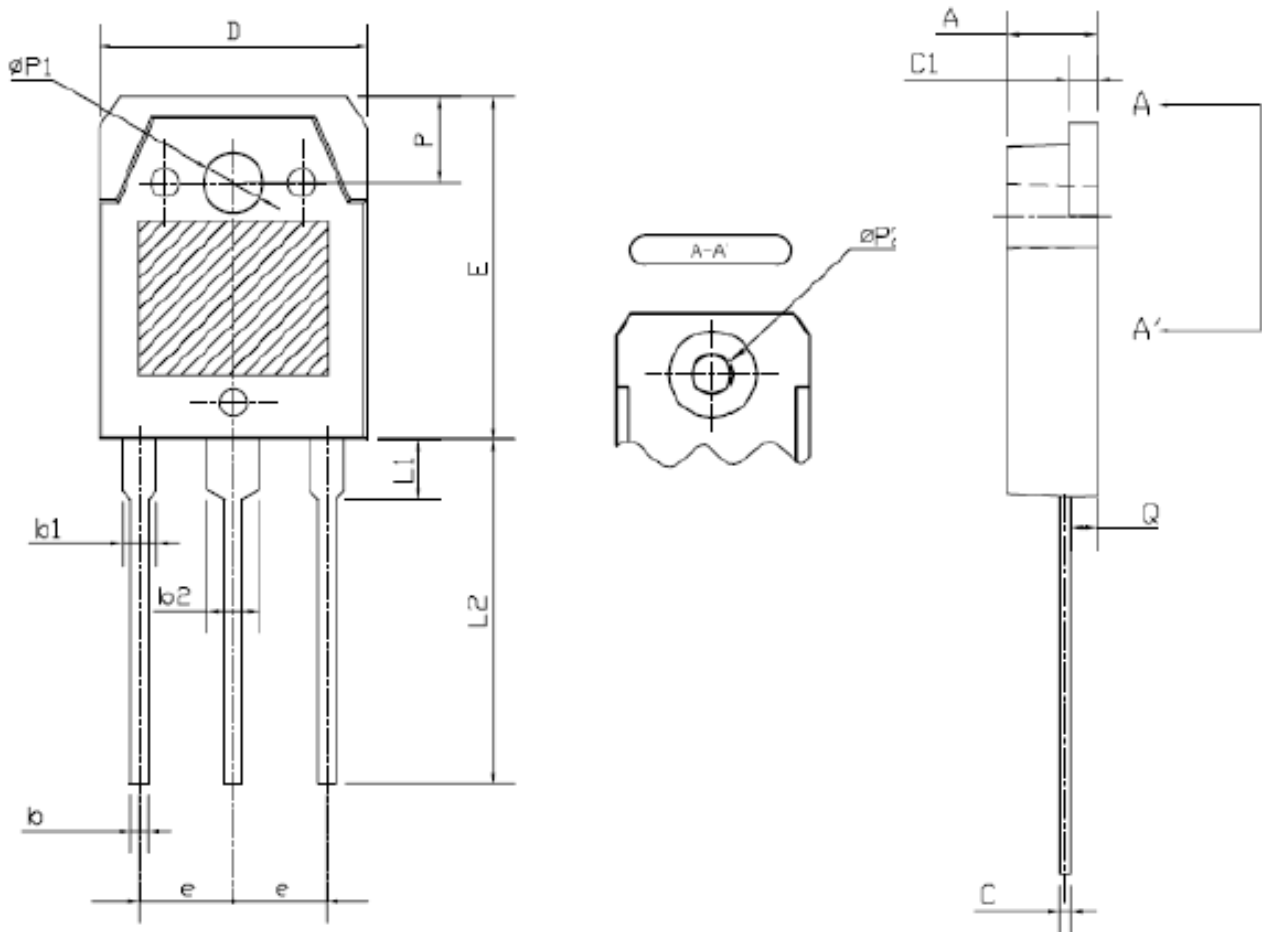
Note :

1. Repeated rating : Pulse width limited by safe operating area
2.  $L=6.1\text{mH}, I_{AS} = 20\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\text{ }\Omega$ , Starting  $T_J = 25^{\circ}\text{C}$
3.  $I_{SD} \leq 20\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DS}$ , Starting  $T_J = 25^{\circ}\text{C}$
4. Pulse Test : Pulse width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2\%$
5. Essentially Independent of Operating Temperature Typical Characteristics





## TO-3P MECHANICAL DATA



| SYMBOL | MIN    | NOM   | MAX   |
|--------|--------|-------|-------|
| A      | 4.60   | 4.80  | 5.00  |
| b      | 0.80   | 1.00  | 1.20  |
| b1     | 1.80   | 2.00  | 2.20  |
| b2     | 2.80   | 3.00  | 3.20  |
| C      | 0.55   | 0.60  | 0.75  |
| C1     | 1.45   | 1.50  | 1.65  |
| D      | 15.40  | 15.60 | 15.80 |
| E      | 19.70  | 19.90 | 20.10 |
| e      | 5.15   | 5.45  | 5.75  |
| L1     | 3.30   | 3.50  | 3.70  |
| L2     | 19.80  | 20.00 | 20.20 |
| P      | 4.80   | 5.00  | 5.20  |
| øP1    | 3.30   | 3.40  | 3.50  |
| øP2    | (3.20) |       |       |
| Q      | 1.20   | 1.40  | 1.60  |

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