

## Features

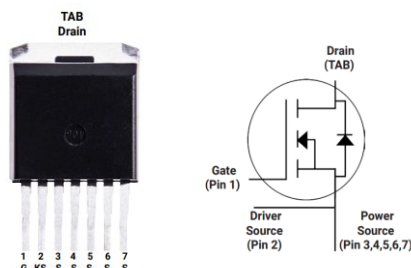
- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Avalanche Ruggednes

## Product Summary

|                    |       |
|--------------------|-------|
| $V_{DS}$           | 1200V |
| $R_{DS(on)_{typ}}$ | 320mΩ |
| $I_D$              | 7.6A  |

## Applications

- Solar Inverters
- Switch Mode Power Supplies
- High Voltage DC-DC Converter
- Battery Chargers



## Package Marking and Ordering Information

| Part #     | Marking   | Package  |
|------------|-----------|----------|
| T1M320120J | 1M320120J | TO-263-7 |

## Absolute Maximum Ratings

| Parameter                                                                                                                         | Symbol                | Value      | Unit             |
|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------|------------|------------------|
| Drain-source voltage                                                                                                              | $V_{DS}$              | 1200       | V                |
| Continuous drain current<br>$T_C = 25^\circ\text{C}$ , $V_{GS} = 18\text{V}$<br>$T_C = 100^\circ\text{C}$ , $V_{GS} = 18\text{V}$ | $I_D$                 | 7.6<br>5.5 | A                |
| Pulsed drain current ( $T_C = 25^\circ\text{C}$ , $t_p$ limited by $T_{jmax}$ )                                                   | $I_{D \text{ pulse}}$ | 20         | A                |
| Gate-Source voltage                                                                                                               | $V_{GS}$              | -4/+18     | V                |
| Gate-Source voltage (Absolute maximum values)                                                                                     | $V_{GSmax}$           | -8/+22     | V                |
| Power dissipation ( $T_C = 25^\circ\text{C}$ )                                                                                    | $P_{tot}$             | 60         | W                |
| Operating junction and storage temperature                                                                                        | $T_j$ , $T_{stg}$     | -55...+175 | $^\circ\text{C}$ |

- Example of acceptable  $V_{GS}$  waveform



**Thermal Resistance**

| Parameter                                   | Symbol     | Value | Unit |
|---------------------------------------------|------------|-------|------|
| Thermal resistance, junction – case. Max    | $R_{thJC}$ | 2.50  | °C/W |
| Thermal resistance, junction – ambient. Max | $R_{thJA}$ | 40    |      |

**Electrical Characteristic** (at  $T_j = 25\text{ °C}$ , unless otherwise specified)

| Parameter | Symbol | Value |      |      | Unit | Test Condition |
|-----------|--------|-------|------|------|------|----------------|
|           |        | min.  | typ. | max. |      |                |

**Static Characteristic**

|                                  |              |      |     |     |         |                                                 |
|----------------------------------|--------------|------|-----|-----|---------|-------------------------------------------------|
| Drain-source breakdown voltage   | $BV_{DSS}$   | 1200 | -   | -   | V       | $V_{GS}=0V, I_D=100\mu A$                       |
| Gate threshold voltage           | $V_{GS(th)}$ | 2    | 3.1 | 4   | V       | $V_{DS}=V_{GS}, I_D=1mA$                        |
| Zero gate voltage drain current  | $I_{DSS}$    | -    | 1   | 20  | $\mu A$ | $V_{DS}=1200V, V_{GS}=0V$<br>$T_C=25\text{ °C}$ |
|                                  |              | -    | 5   | -   |         | $T_C=175\text{ °C}$                             |
| Gate-source leakage current      | $I_{GSS}$    | -    |     | 100 | nA      | $V_{GS}=18V, V_{DS}=0V$                         |
| Drain-source on-state resistance | $R_{DS(on)}$ | -    | 320 | 450 | mΩ      | $V_{GS}=18V, I_D=3.6A,$<br>$T_j=25\text{ °C}$   |
|                                  |              | -    | 480 | -   |         | $T_J=175\text{ °C}$                             |
| Transconductance                 | $g_{fs}$     | -    | 3   | -   | S       | $V_{DS}=20V, I_D=3.6A$                          |

**Dynamic Characteristic**

|                              |                     |   |      |   |    |                                                                                                                                             |
|------------------------------|---------------------|---|------|---|----|---------------------------------------------------------------------------------------------------------------------------------------------|
| Input Capacitance            | C <sub>iss</sub>    | - | 324  | - | pF | V <sub>DS</sub> = 1000V<br>V <sub>GS</sub> = 0V<br>T <sub>J</sub> = 25°C<br>V <sub>AC</sub> = 25mV<br>f = 1MHz                              |
| Output Capacitance           | C <sub>oss</sub>    | - | 24   | - |    |                                                                                                                                             |
| Reverse Transfer Capacitance | C <sub>rss</sub>    | - | 4    | - |    |                                                                                                                                             |
| Gate Total Charge            | Q <sub>G</sub>      | - | 23.5 | - | nC | V <sub>DS</sub> = 800V<br>V <sub>GS</sub> = 0/18V<br>I <sub>D</sub> = 3.6A<br>I <sub>G</sub> = 10mA                                         |
| Gate-Source charge           | Q <sub>gs</sub>     | - | 3.2  | - |    |                                                                                                                                             |
| Gate-Drain charge            | Q <sub>gd</sub>     | - | 14   | - |    |                                                                                                                                             |
| Turn-On Switching Energy     | E <sub>ON</sub>     | - | 9    | - | μJ | V <sub>DD</sub> =800V,<br>V <sub>GS</sub> =-4/18V<br>R <sub>G</sub> =5Ω,<br>I <sub>D</sub> =3.6A<br>Inductive Load,<br>T <sub>J</sub> =25°C |
| Turn-Off Switching Energy    | E <sub>OFF</sub>    | - | 140  | - |    |                                                                                                                                             |
| Turn-on delay time           | t <sub>d(on)</sub>  | - | 10.9 | - | ns |                                                                                                                                             |
| Rise time                    | t <sub>r</sub>      | - | 16.2 | - |    |                                                                                                                                             |
| Turn-off delay time          | t <sub>d(off)</sub> | - | 11.2 | - |    |                                                                                                                                             |
| Fall time                    | t <sub>f</sub>      | - | 30.4 | - |    |                                                                                                                                             |
| Gate resistance              | R <sub>G</sub>      | - | 5.9  | - | Ω  | V <sub>AC</sub> = 25mV, f=1MHz                                                                                                              |

**Body Diode Characteristic**

| Parameter                          | Symbol   | Value |      |      | Unit | Test Condition                                                                          |
|------------------------------------|----------|-------|------|------|------|-----------------------------------------------------------------------------------------|
|                                    |          | min.  | typ. | max. |      |                                                                                         |
| Body Diode Forward Voltage         | $V_{SD}$ |       | 3.6  |      | V    | $V_{GS} = 0V, I_{SD}=4A,$<br>$T_J=25^\circ C$                                           |
|                                    |          |       | 3.2  |      |      | $V_{GS} = 0V, I_{SD}=4A,$<br>$T_J=175^\circ C$                                          |
| Body Diode Reverse Recovery Time   | $t_{rr}$ | -     | 12.3 | -    | ns   | $V_R = 800V, V_{GS} = 0V$<br>$I_D = 3.6A$<br>$di/dt = 800A/\mu S$<br>$T_J = 25^\circ C$ |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | -     | 23.5 | -    | nC   |                                                                                         |

Typical Performance Characteristics

Fig 1. Output Characteristic ( $T_J = -55^{\circ}\text{C}$ )

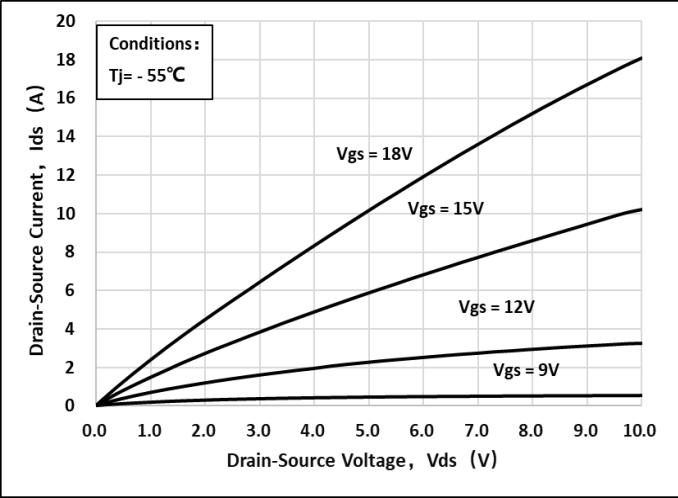


Fig 2. Output Characteristic ( $T_J = 25^{\circ}\text{C}$ )

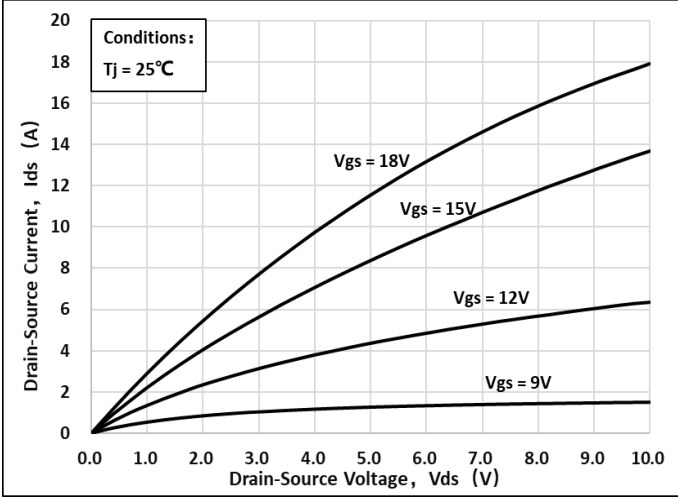


Fig 3. Output Characteristic ( $T_J = 175^{\circ}\text{C}$ )

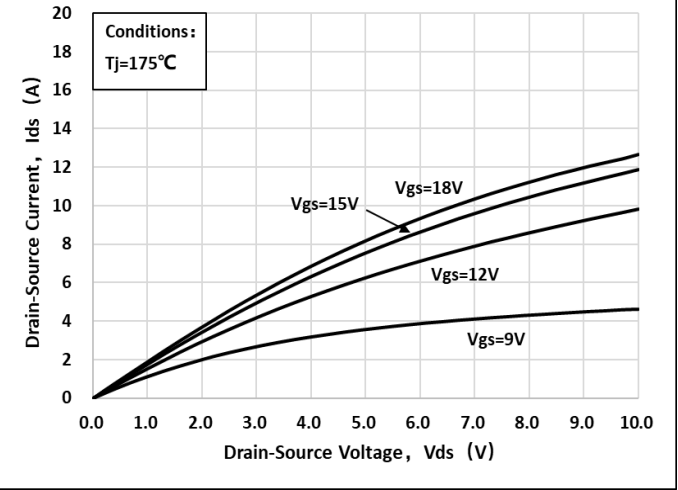


Fig 4:  $R_{ds(on)}$  Vs  $I_{ds}$  Characteristic

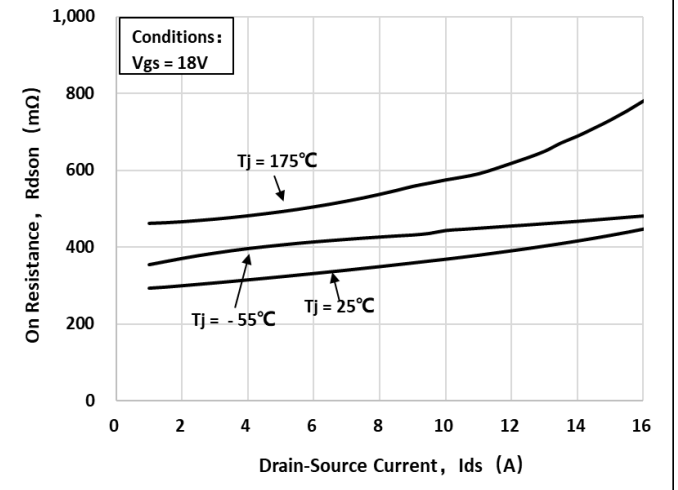


Fig 5:  $R_{ds(on)}$  vs. Temperature

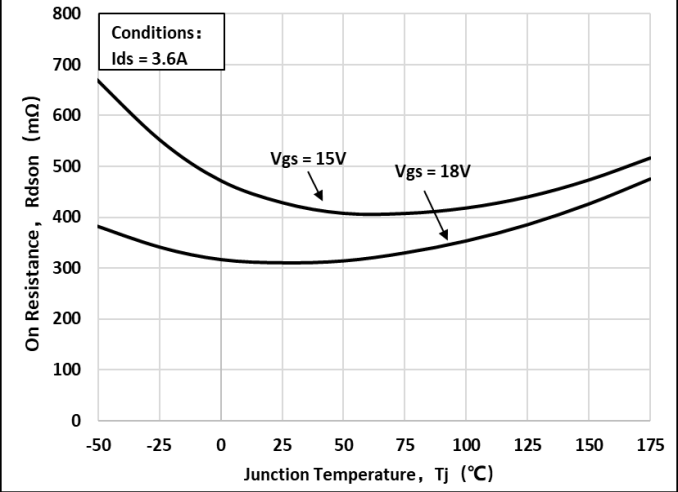


Fig 6: Transfer Characteristic

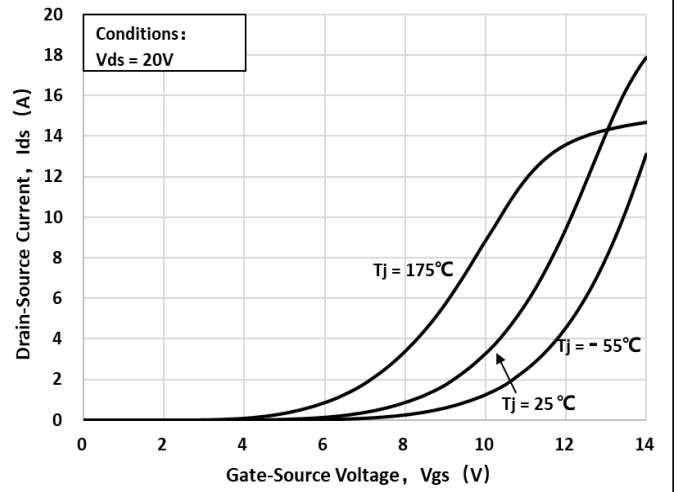


Fig 7: Body-diode Characteristic ( $T_J=-55^{\circ}\text{C}$ )

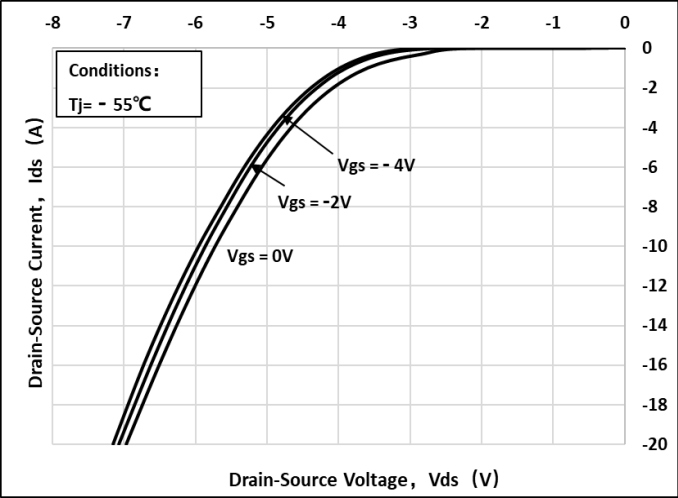


Fig 8: Body-diode Characteristic ( $T_J=25^{\circ}\text{C}$ )

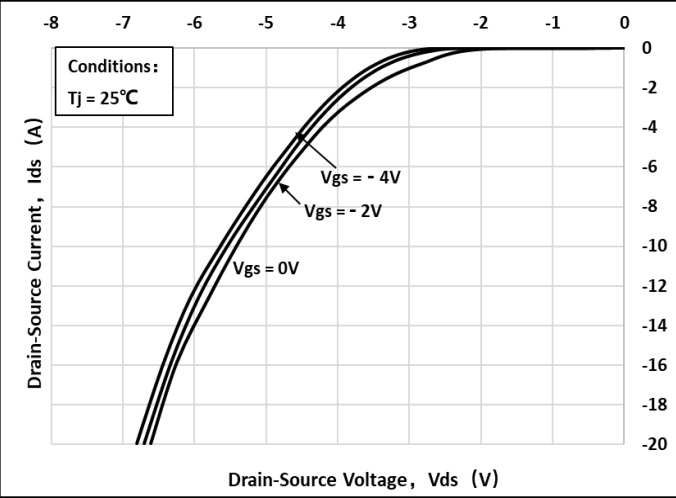


Fig 9: Body-diode Characteristic ( $T_J=175^{\circ}\text{C}$ )

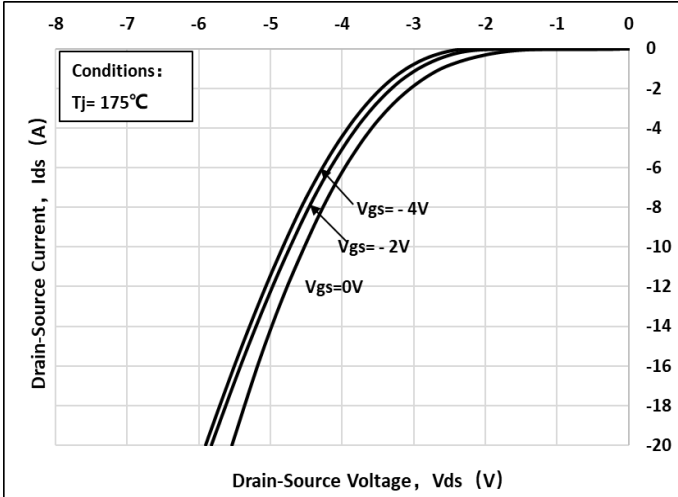


Fig 10:  $V_{TH}$  Vs  $T_J$  Temperature Characteristic

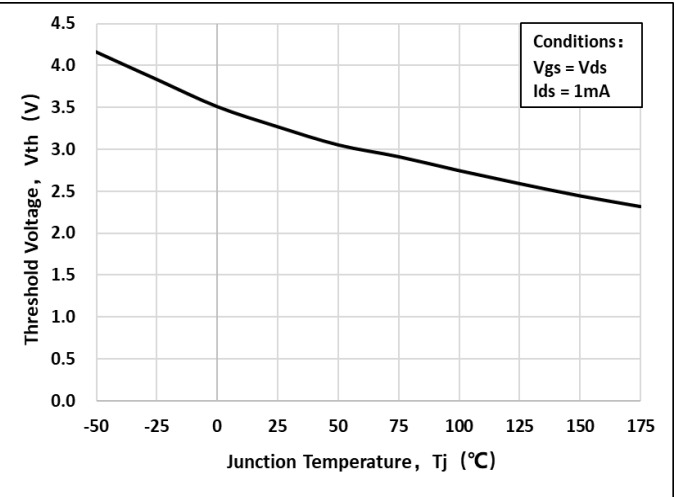


Fig 11: Gate Charge Characteristics

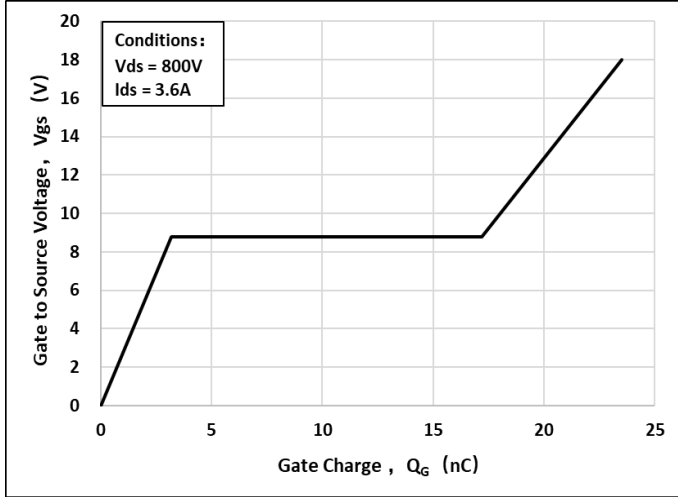


Fig 12: 3rd Quadrant Characteristic( $T_J=-55^{\circ}\text{C}$ )

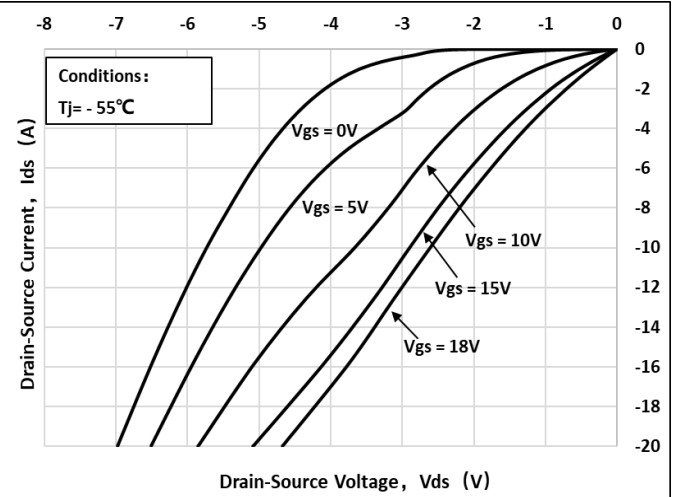


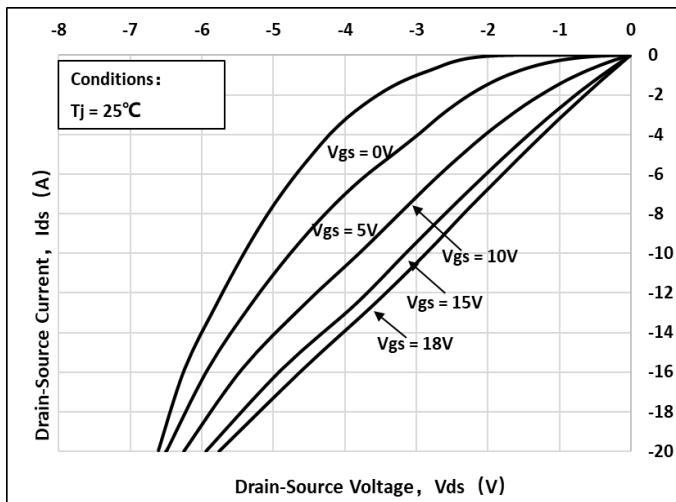
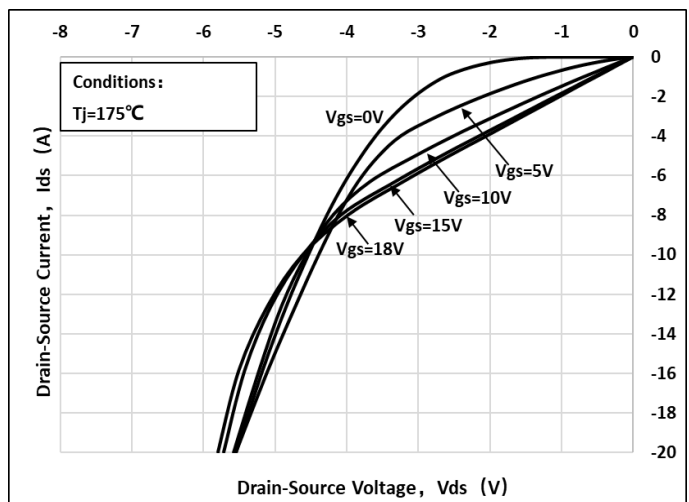
Fig 13: 3rd Quadrant Characteristic( $T_J=25^\circ\text{C}$ )Fig 14: 3rd Quadrant Characteristic( $T_J=175^\circ\text{C}$ )

Fig 15: Capacitance Characteristic

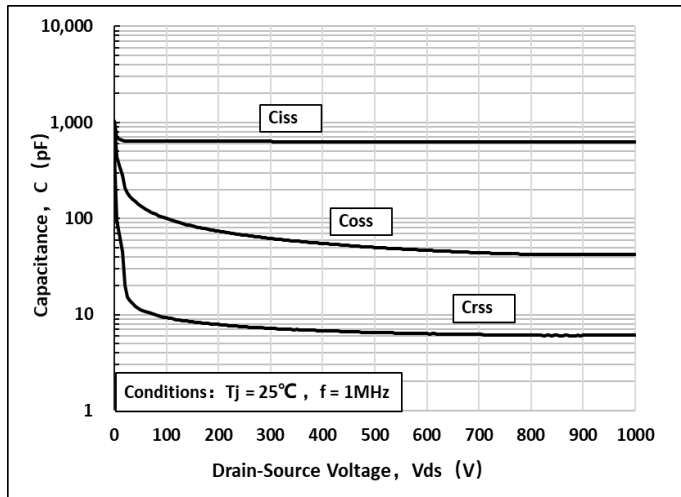


Fig 16: Safe Operating Area

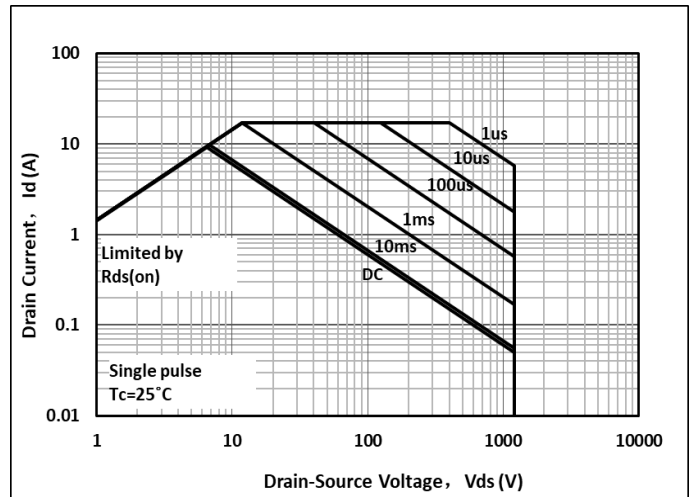
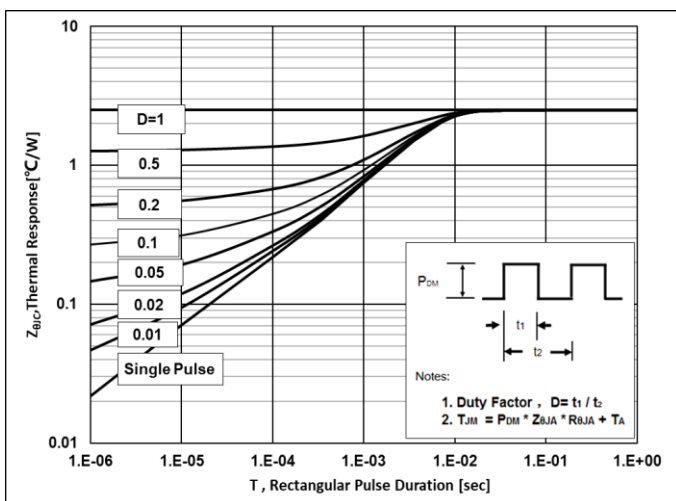


Fig 17: Transient Thermal Impedance



Test Circuit & Waveform

Figure A. Definition of switching times

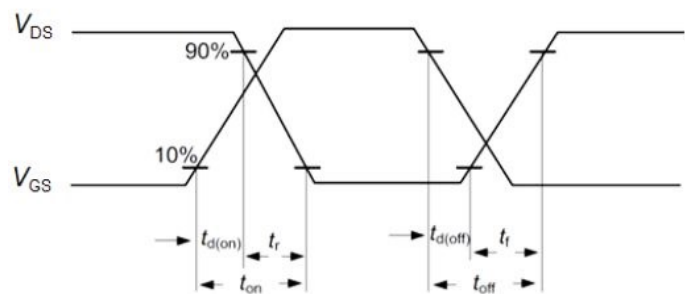


Figure B. Dynamic test circuit

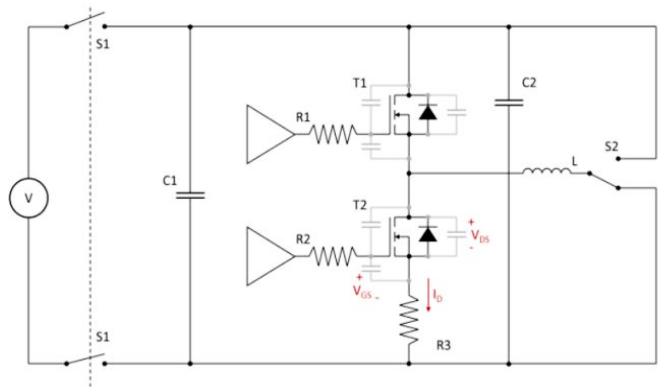


Figure C. Definition of body diodeswitching characteristics

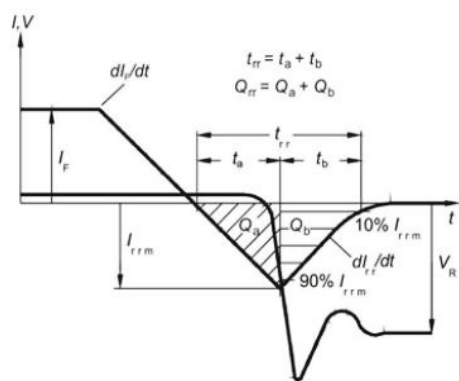
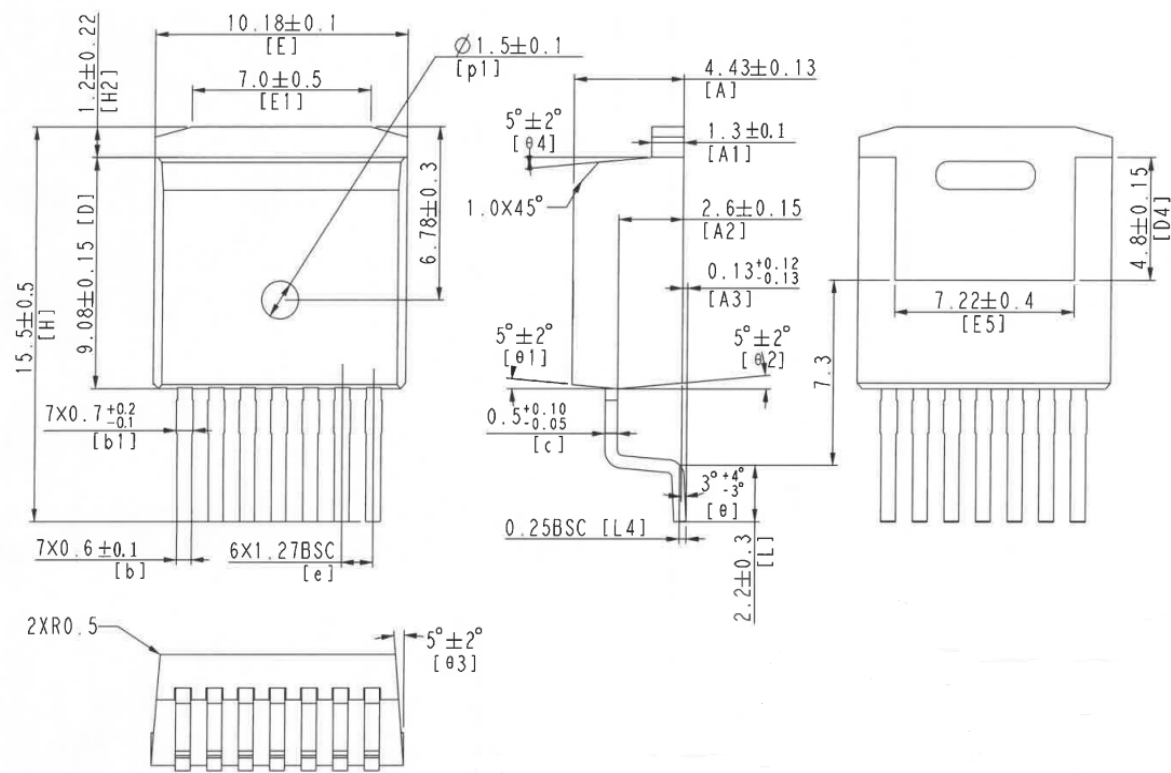


Figure C. Definition of diode switching characteristics

Package Outline:

UNIT:mm



## Contact Information

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For additional information, please contact your local Sales Representative.



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