

| | |
|---------------------|--------------|
| V_{DSS} | 1200V |
| $R_{DS(on)}$ (Typ.) | 40m Ω |
| I_D^{*1} | 56A |
| P_D | 267W |

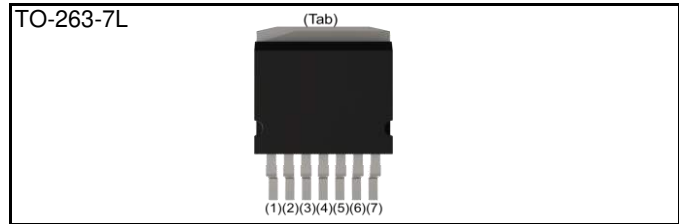
●Features

- 1) Low on-resistance
- 2) Fast switching speed
- 3) Fast reverse recovery
- 4) Easy to parallel
- 5) Simple to drive
- 6) Pb-free lead plating ; RoHS compliant

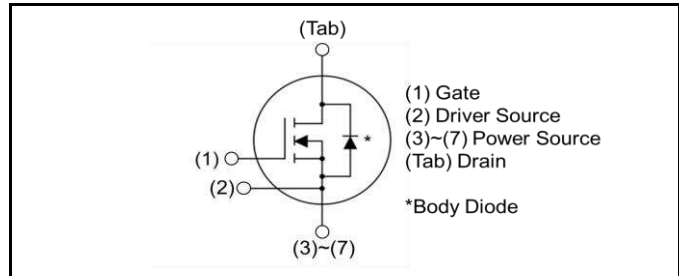
●Application

- Solar inverters
- DC/DC converters
- Switch mode power supplies
- Induction heating
- Motor drives

●Outline



●Inner circuit



Please note Driver Source and Power Source are not exchangeable. Their exchange might lead to malfunction.

●Packaging specifications

| Type | Packing | Embossed tape |
|------|---------------------------|---------------|
| | Reel size (mm) | 330 |
| | Tape width (mm) | 24 |
| | Basic ordering unit (pcs) | 1000 |
| | Taping code | TL |
| | Marking | SCT3040KW7 |

●Absolute maximum ratings ($T_{vj} = 25^{\circ}\text{C}$ unless otherwise specified)

| Parameter | Symbol | Value | Unit | |
|--|-----------------------------|-------------|--------------------|---|
| Drain - Source Voltage | V_{DSS} | 1200 | V | |
| Continuous Drain current | $T_c = 25^{\circ}\text{C}$ | I_D^{*1} | 56 | A |
| | $T_c = 100^{\circ}\text{C}$ | I_D^{*1} | 39 | A |
| Pulsed Drain current ($T_c = 25^{\circ}\text{C}$) | $I_{D,pulse}^{*2}$ | 140 | A | |
| Gate - Source voltage (DC) | V_{GSS} | -4 to +22 | V | |
| Gate - Source surge voltage ($t_{surge} < 300\text{ns}$) | $V_{GSS,surge}^{*3}$ | -4 to +26 | V | |
| Recommended drive voltage | $V_{GS,op}^{*4}$ | 0 / +18 | V | |
| Virtual Junction temperature | T_{vj} | 175 | $^{\circ}\text{C}$ | |
| Range of storage temperature | T_{stg} | -55 to +175 | $^{\circ}\text{C}$ | |

●Electrical characteristics (T_{vj} = 25°C unless otherwise specified)

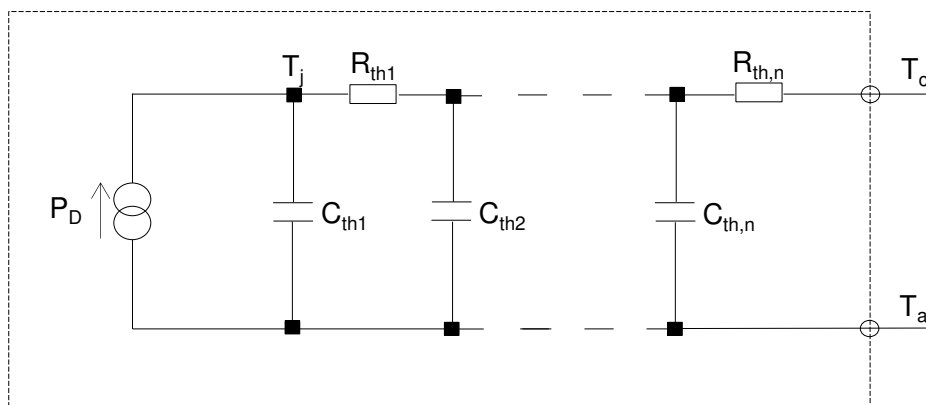
| Parameter | Symbol | Conditions | Values | | | Unit |
|---|-----------------------------------|--|--------------|----------|---------|------|
| | | | Min. | Typ. | Max. | |
| Drain - Source breakdown voltage | V _{(BR)DSS} | V _{GS} = 0V, I _D = 1mA T _{vj} = 25°C T _{vj} = -55°C | 1200 1200 | - - | - - | V |
| Zero Gate voltage Drain current | I _{DSS} | V _{GS} = 0V, V _{DS} = 1200V T _{vj} = 25°C T _{vj} = 150°C | - - | 1 2 | 10 - | μA |
| Gate - Source leakage current | I _{GSS+} | V _{GS} = +22V, V _{DS} = 0V | - | - | 100 | nA |
| Gate - Source leakage current | I _{GSS-} | V _{GS} = -4V, V _{DS} = 0V | - | - | -100 | nA |
| Gate threshold voltage | V _{GS(th)} | V _{DS} = 10V, I _D = 10mA | 2.7 | - | 5.6 | V |
| Static Drain - Source on - state resistance | R _{DS(on)} ^{*5} | V _{GS} = 18V, I _D = 20A T _{vj} = 25°C T _{vj} = 150°C | - - | 40 68 | 52 - | mΩ |
| Gate input resistance | R _G | f = 1MHz, open drain | - | 7 | - | Ω |

●Thermal resistance

| Parameter | Symbol | Values | | | Unit |
|-------------------------------------|-------------------|--------|------|------|------|
| | | Min. | Typ. | Max. | |
| Thermal resistance, junction - case | R _{thJC} | - | 0.44 | 0.56 | K/W |

●Typical Transient Thermal Characteristics

| Symbol | Value | Unit | Symbol | Value | Unit |
|------------------|-------------------------|------|------------------|-------------------------|------|
| R _{th1} | 4.06 × 10 ⁻² | K/W | C _{th1} | 7.06 × 10 ⁻³ | Ws/K |
| R _{th2} | 6.86 × 10 ⁻² | | C _{th2} | 2.59 × 10 ⁻² | |
| R _{th3} | 3.31 × 10 ⁻¹ | | C _{th3} | 2.77 × 10 ⁻² | |



● **Electrical characteristics** ($T_{vj} = 25^{\circ}\text{C}$ unless otherwise specified)

| Parameter | Symbol | Conditions | Values | | | Unit |
|--|-------------------|---|--------|------|------|---------------|
| | | | Min. | Typ. | Max. | |
| Transconductance | g_{fs}^{*5} | $V_{DS} = 10\text{V}, I_D = 20\text{A}$ | - | 8.3 | - | S |
| Input capacitance | C_{iss} | $V_{GS} = 0\text{V}$ | - | 1337 | - | pF |
| Output capacitance | C_{oss} | $V_{DS} = 800\text{V}$ | - | 76 | - | |
| Reverse transfer capacitance | C_{rss} | $f = 1\text{MHz}$ | - | 27 | - | |
| Effective output capacitance, energy related | $C_{o(er)}$ | $V_{GS} = 0\text{V}$ $V_{DS} = 0\text{V to } 600\text{V}$ | - | 122 | - | pF |
| Total Gate charge | Q_g^{*5} | $V_{DS} = 600\text{V}$ $I_D = 20\text{A}$ | - | 107 | - | nC |
| Gate - Source charge | Q_{gs}^{*5} | $V_{GS} = 18\text{V}$ | - | 17 | - | |
| Gate - Drain charge | Q_{gd}^{*5} | See Fig. 1-1. | - | 56 | - | |
| Turn - on delay time | $t_{d(on)}^{*5}$ | $V_{DS} = 600\text{V}$ $I_D = 20\text{A}$ | - | 6 | - | ns |
| Rise time | t_r^{*5} | $V_{GS} = 0\text{V}/+18\text{V}$ | - | 19 | - | |
| Turn - off delay time | $t_{d(off)}^{*5}$ | $R_G = 0\Omega, L = 750\mu\text{H}$ $L_\sigma = 50\text{nH}, C_\sigma = 10\text{pF}$ | - | 29 | - | |
| Fall time | t_f^{*5} | See Fig. 2-1, 2-2, 2-3. | - | 19 | - | |
| Turn - on switching loss | E_{on}^{*5} | E_{on} includes diode reverse recovery. | - | 286 | - | μJ |
| Turn - off switching loss | E_{off}^{*5} | | - | 69 | - | |

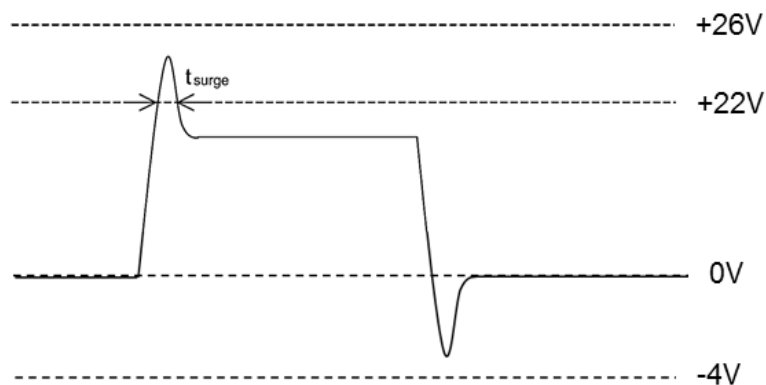
● **Body diode electrical characteristics** (Source-Drain) ($T_{vj} = 25^{\circ}\text{C}$ unless otherwise specified)

| Parameter | Symbol | Conditions | Values | | | Unit |
|--|----------------|---|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Body diode continuous, forward current | I_S^{*1} | $T_c = 25^{\circ}\text{C}$ | - | - | 56 | A |
| Body diode direct current, pulsed | I_{SM}^{*2} | | - | - | 140 | A |
| Forward voltage | V_{SD}^{*5} | $V_{GS} = 0\text{V}, I_S = 20\text{A}$ | - | 3.2 | - | V |
| Reverse recovery time | t_{rr}^{*5} | $I_F = 20\text{A}$ $V_R = 600\text{V}$ $di/dt = 2500\text{A}/\mu\text{s}$ $L_{\sigma} = 50\text{nH}, C_{\sigma} = 10\text{pF}$ See Fig. 3-1, 3-2. | - | 25 | - | ns |
| Reverse recovery charge | Q_{rr}^{*5} | | - | 535 | - | nC |
| Peak reverse recovery current | I_{rrm}^{*5} | | - | 35 | - | A |

*1 Limited by maximum T_{vj} and for Max. R_{thJC} .

*2 $PW \leq 10\mu\text{s}$, Duty cycle $\leq 1\%$

*3 Example of acceptable V_{GS} waveform



Please note especially when using driver source that V_{GSS_surge} must be in the range of absolute maximum rating.

*4 Please be advised not to use SiC-MOSFETs with V_{GS} below 13V as doing so may cause thermal runaway.

*5 Pulsed

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

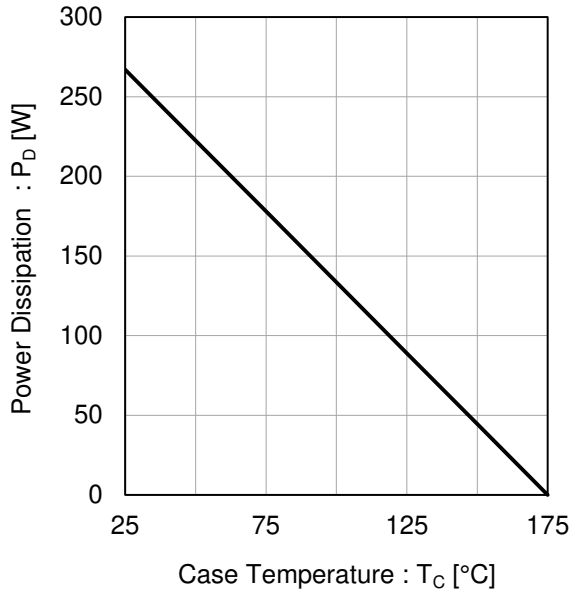


Fig.2 Maximum Safe Operating Area

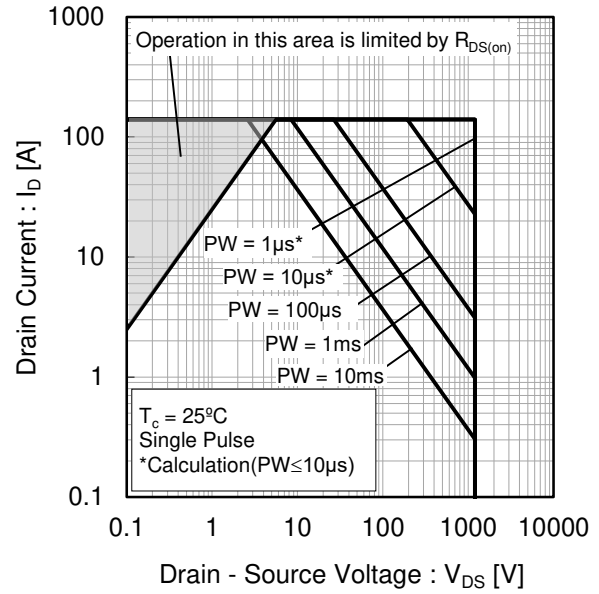
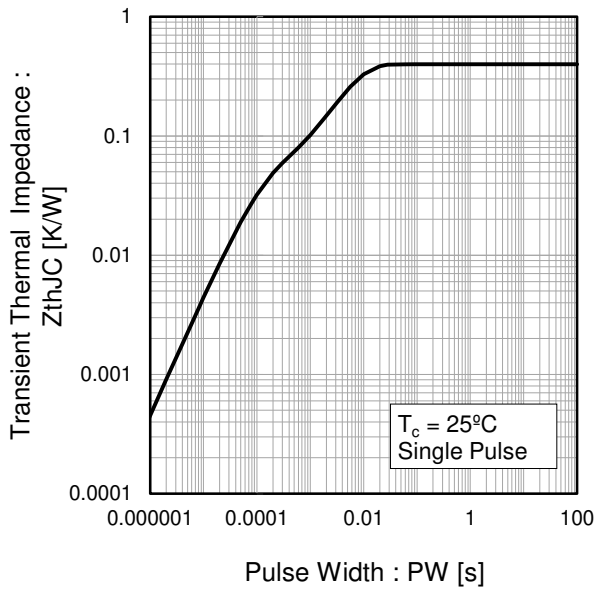


Fig.3 Typical Transient Thermal Impedance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

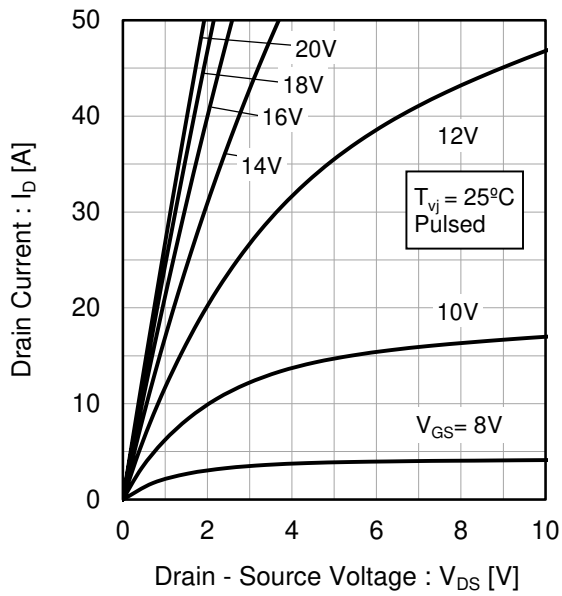


Fig.5 Typical Output Characteristics(II)

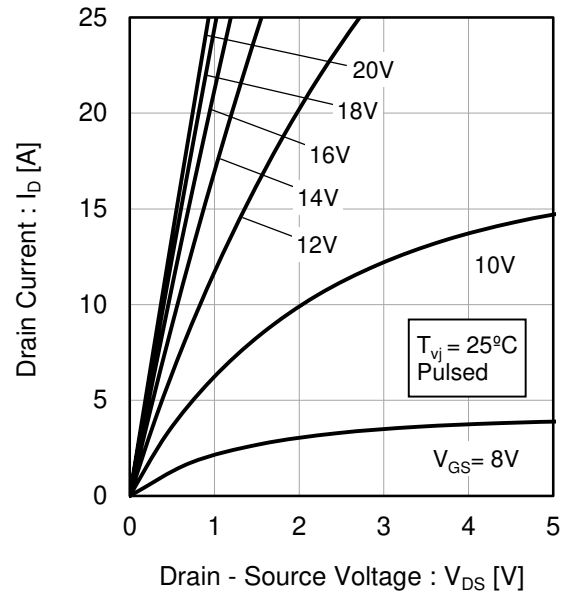
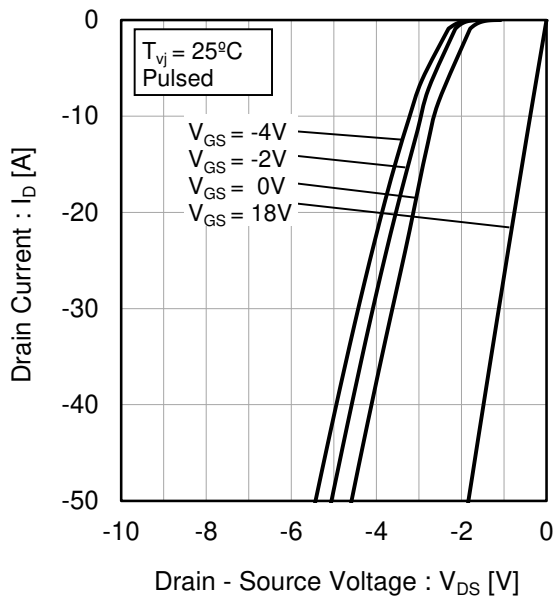


Fig.6 $T_{vj} = 25^\circ C$ 3rd Quadrant Characteristics



●Electrical characteristic curves

Fig.7 $T_{vj} = 150^{\circ}\text{C}$ Typical Output Characteristics(I)

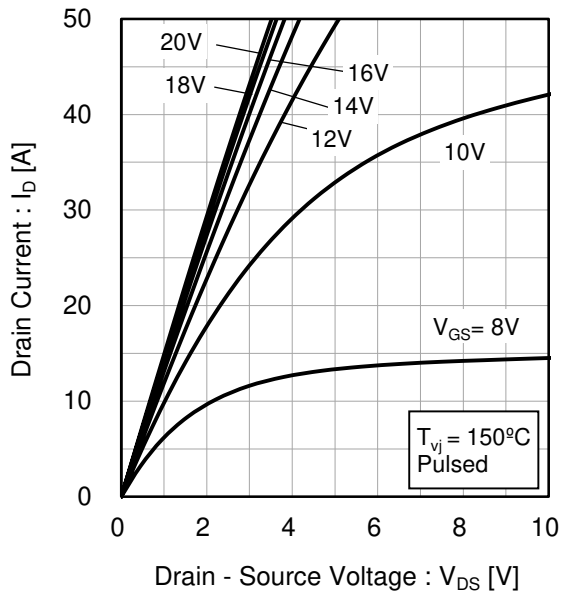


Fig.8 $T_{vj} = 150^{\circ}\text{C}$ Typical Output Characteristics(II)

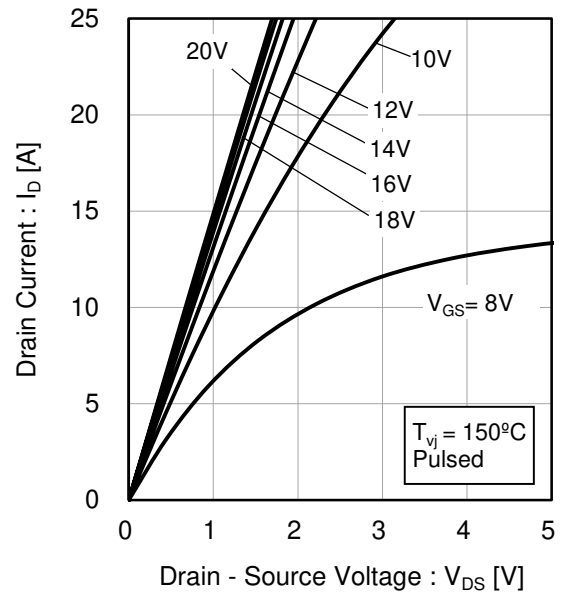


Fig.9 $T_{vj} = 150^{\circ}\text{C}$ 3rd Quadrant Characteristics

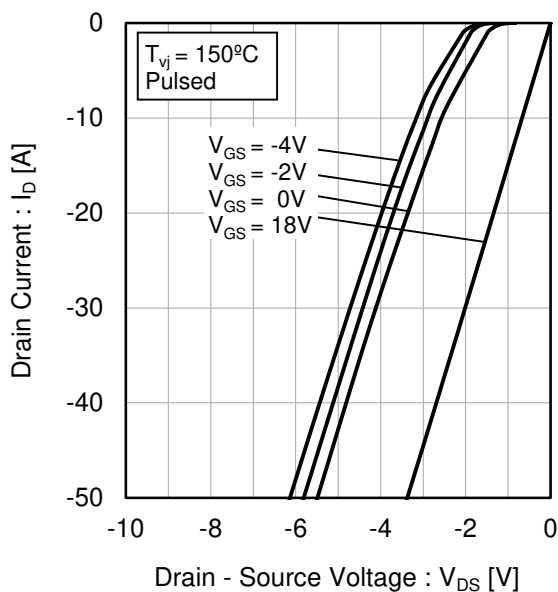
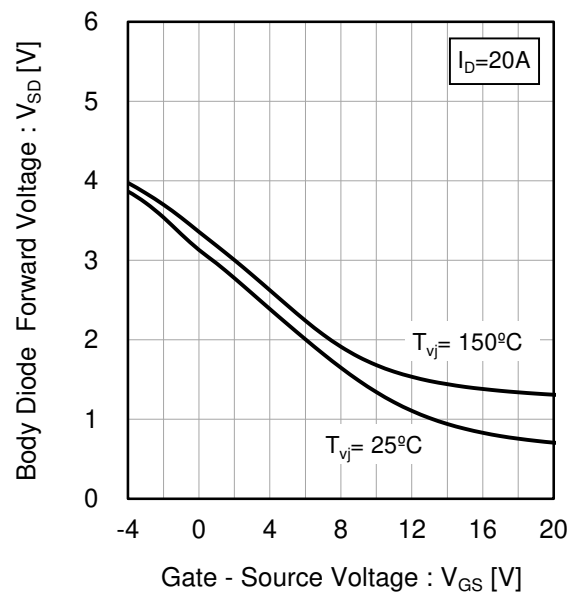


Fig.10 Body Diode Forward Voltage vs. Gate - Source Voltage



●Electrical characteristic curves

Fig.11 Typical Transfer Characteristics (I)

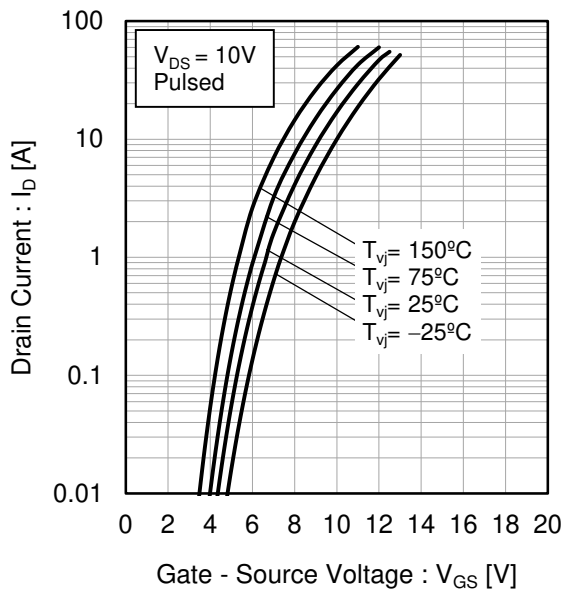


Fig.12 Typical Transfer Characteristics (II)

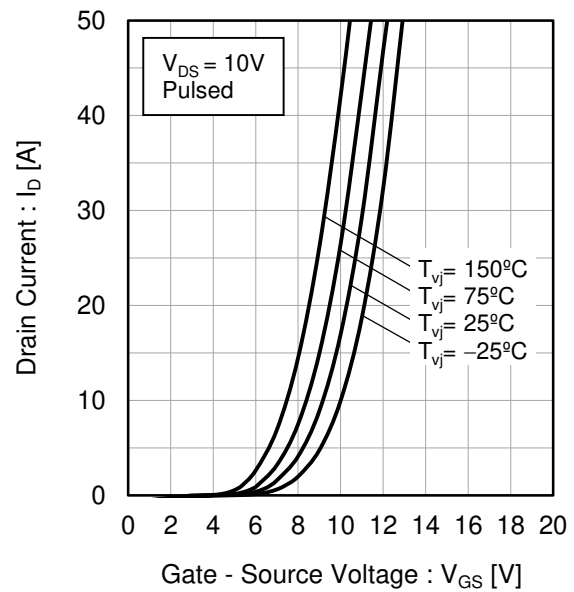


Fig.13 Gate Threshold Voltage vs. Virtual Junction Temperature

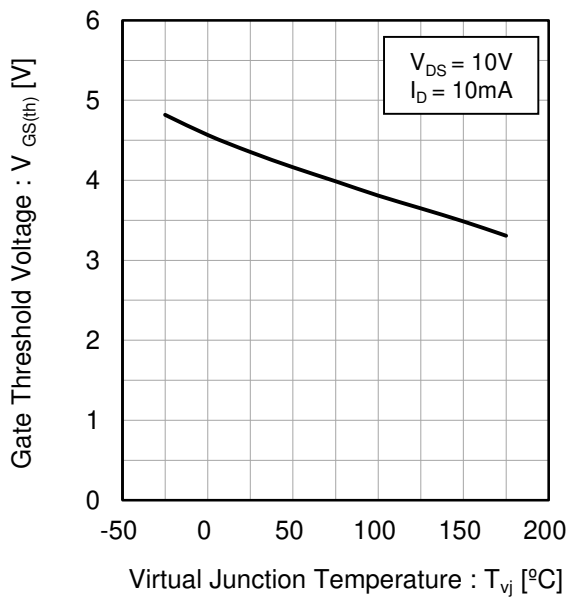
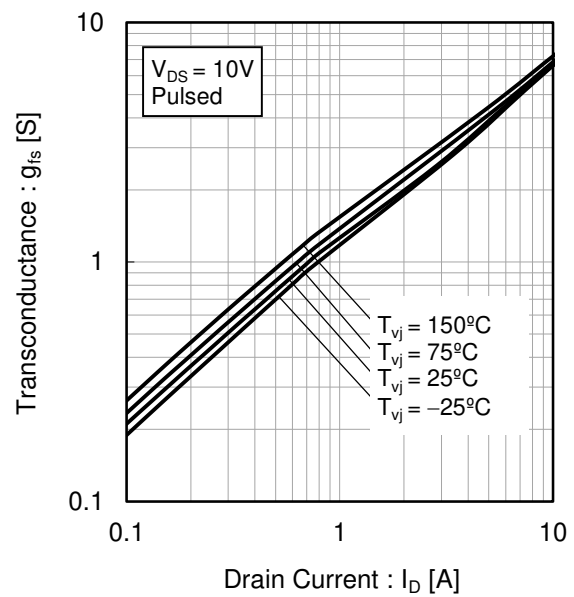


Fig.14 Transconductance vs. Drain Current



● Electrical characteristic curves

Fig.15 Static Drain - Source On - State Resistance vs. Gate - Source Voltage

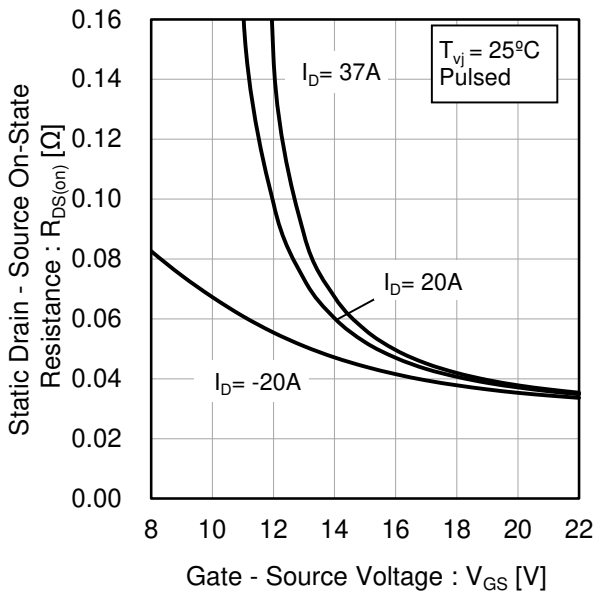


Fig.16 Static Drain - Source On - State Resistance vs. Virtual Junction Temperature

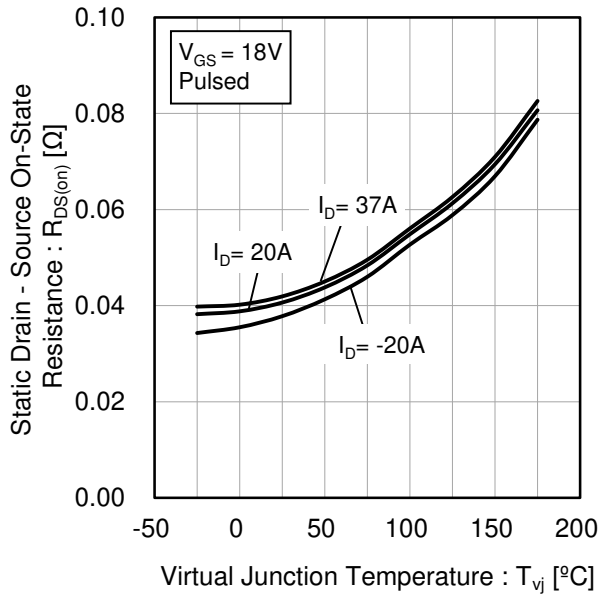


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current

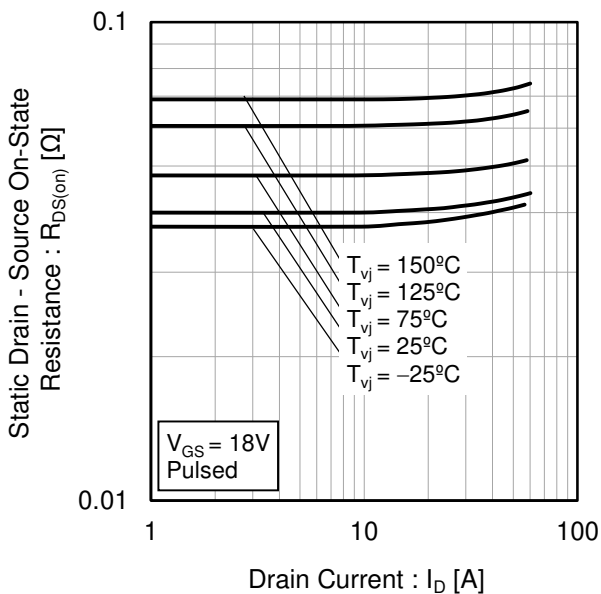
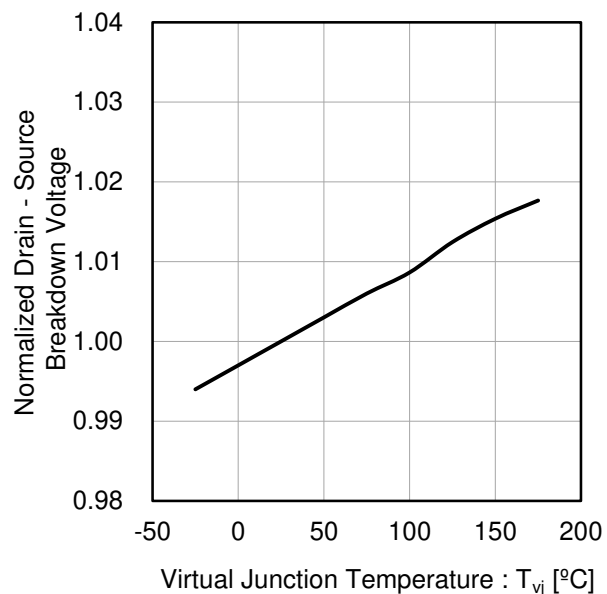


Fig.18 Normalized Drain - Source Breakdown Voltage vs. Virtual Junction Temperature



●Electrical characteristic curves

Fig.19 Typical Capacitance vs. Drain - Source Voltage

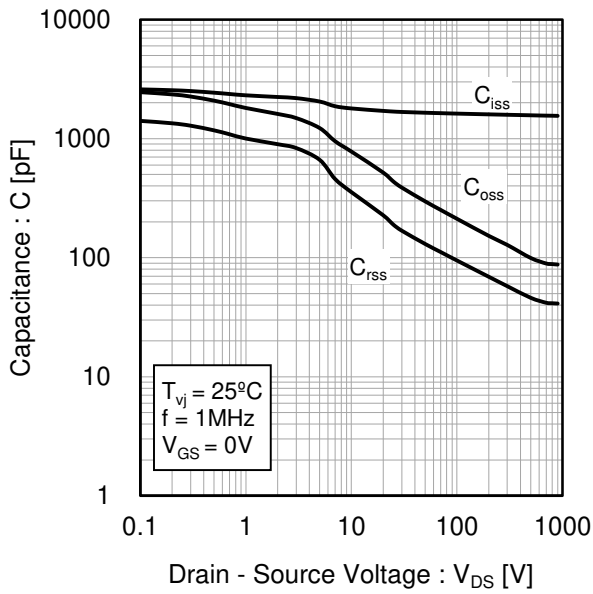


Fig.20 C_{oss} Stored Energy

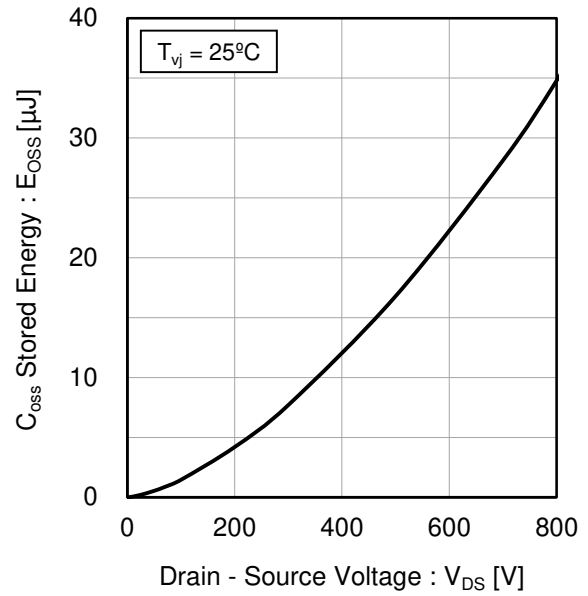
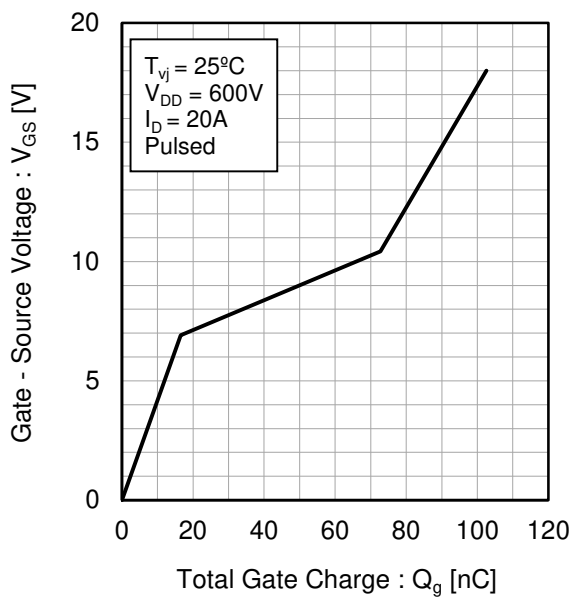
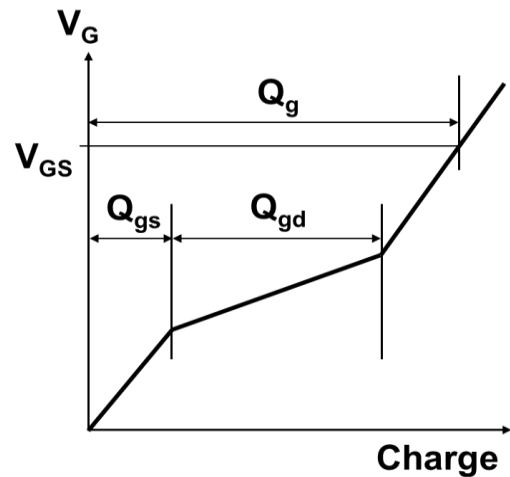


Fig.21 Dynamic Input Characteristics



*Gate Charge Waveform



●Electrical characteristic curves

Fig.22 Typical Switching Time vs. External Gate Resistance

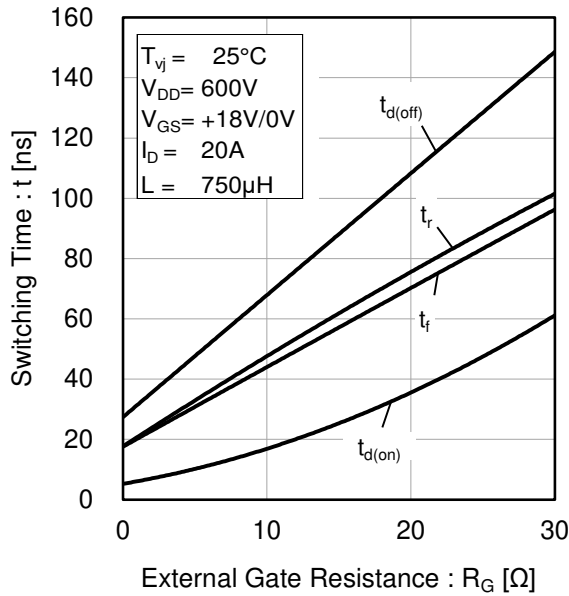


Fig.23 Typical Switching Loss vs. Drain - Source Voltage

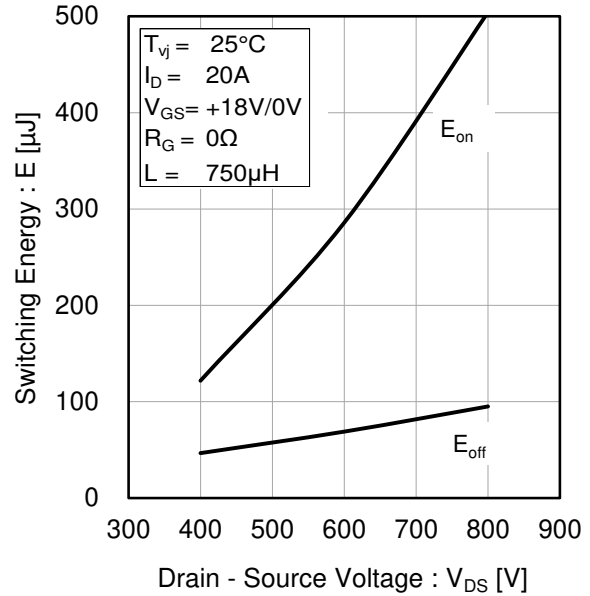


Fig.24 Typical Switching Loss vs. Drain Current

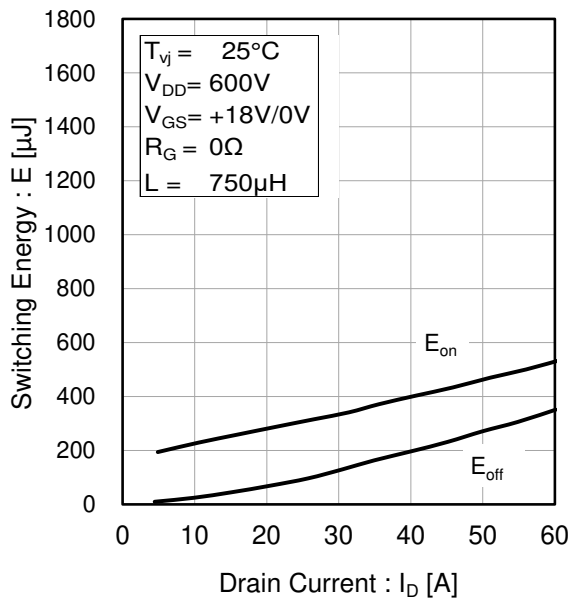
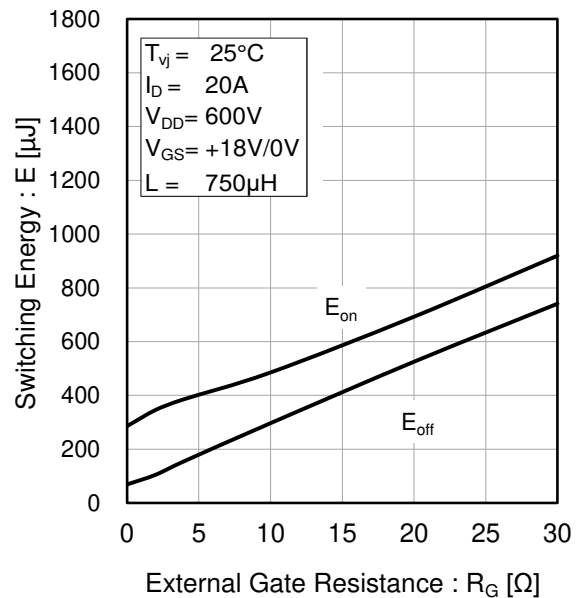


Fig.25 Typical Switching Loss vs. External Gate Resistance



● Measurement circuits and waveforms

Fig.1-1 Gate Charge Measurement Circuit

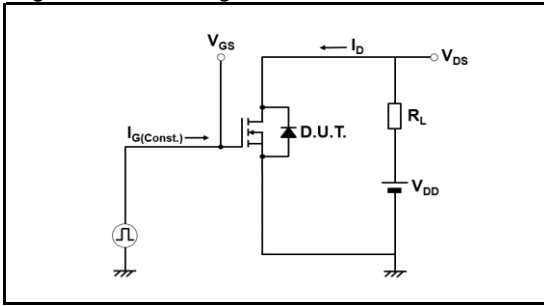


Fig.2-1 Switching Characteristics Measurement Circuit

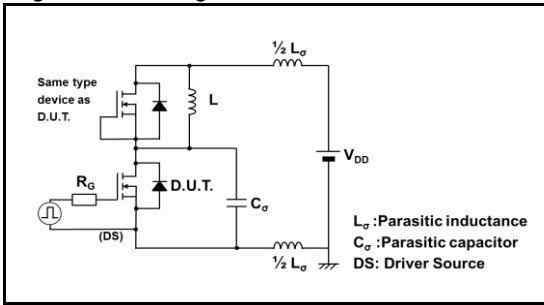


Fig.2-2 Waveforms for Switching Time

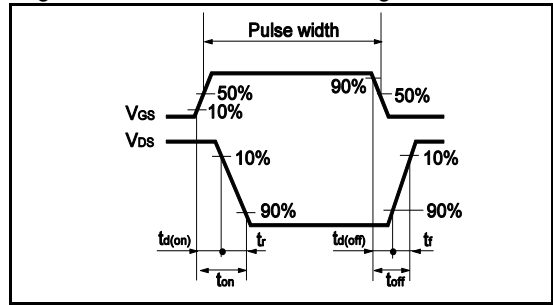


Fig.2-3 Waveforms for Switching Energy Loss

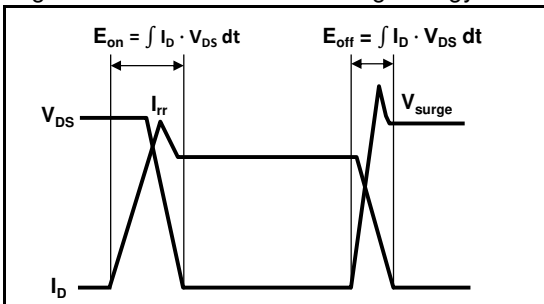


Fig.3-1 Reverse Recovery Time Measurement Circuit

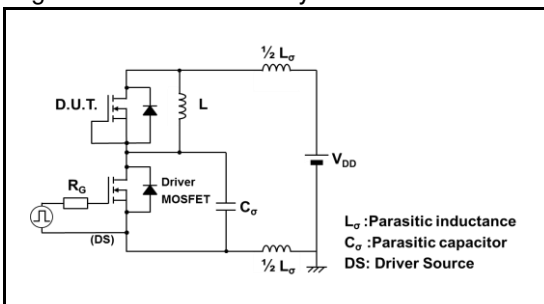
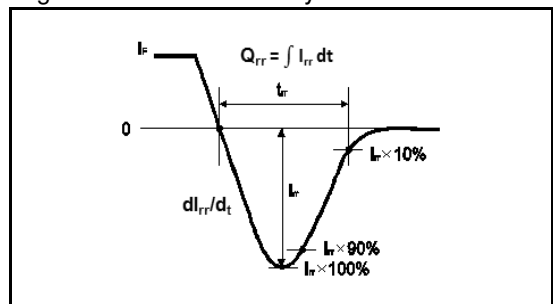
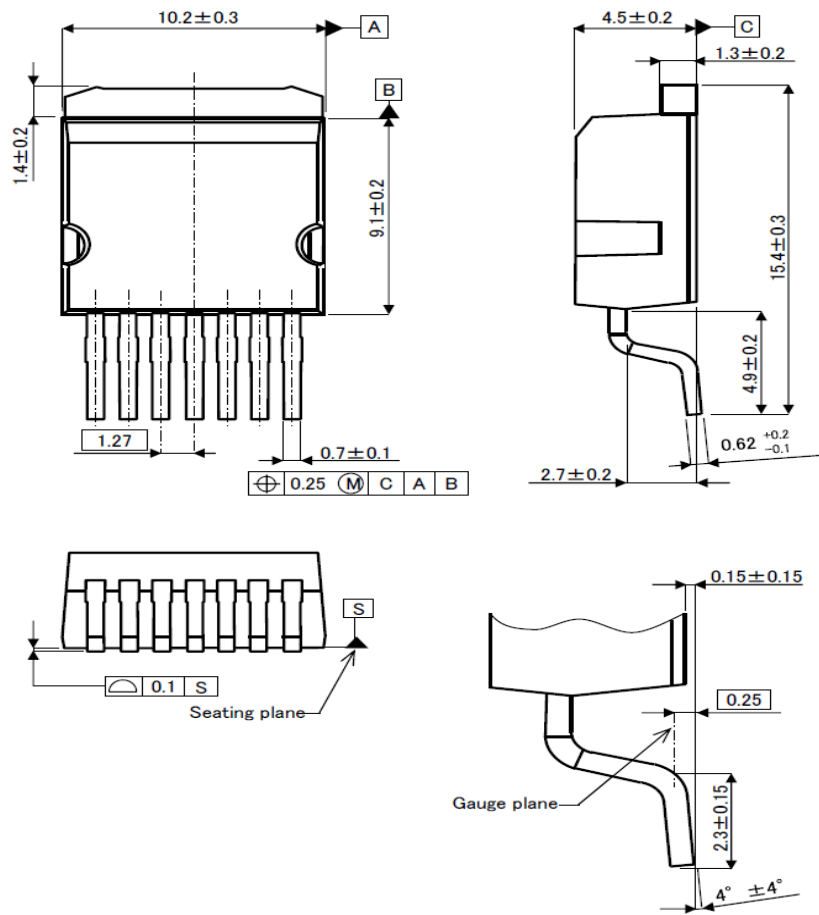


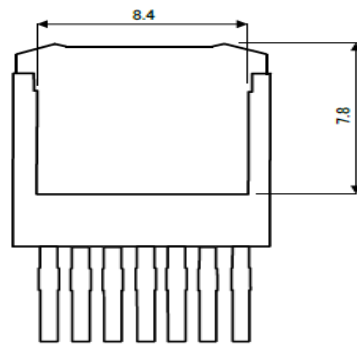
Fig.3-2 Reverse Recovery Waveform



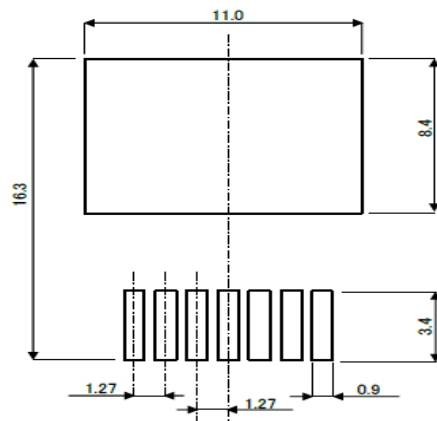
●Package Dimensions



Unit: mm

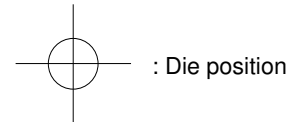
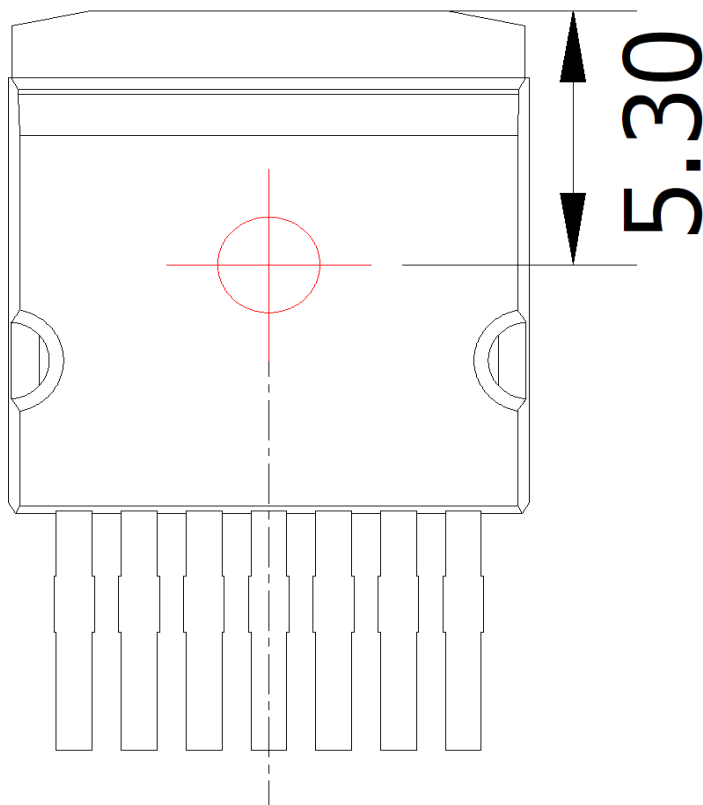


RECOMMENDED FOOTPRINT DIMENSIONS



Unit: mm

●Die Bonding Layout



- Front view of the packaging.
- Dimensions are design values.
- If the heat sink is to be installed, it should be in contact with the die bonding point.

Unit: mm

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