

| | |
|---------------------|-------|
| V_{DSS} | 200V |
| $R_{DS(on)}$ (Max.) | 325mΩ |
| I_D | 12A |
| P_D | 40W |

●Features

- 1) Low on-resistance.
- 2) Fast switching speed.
- 3) Drive circuits can be simple.
- 4) Parallel use is easy.
- 5) Pb-free lead plating ; RoHS compliant
- 6) 100% Avalanche tested

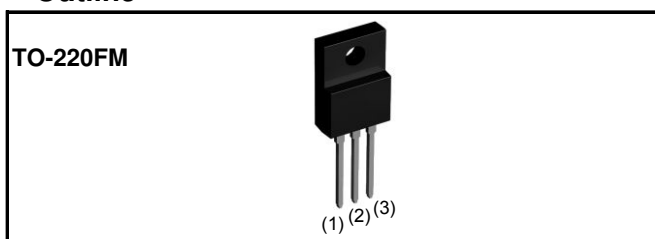
●Application

Switching Power Supply
 Automotive Motor Drive
 Automotive Solenoid Drive

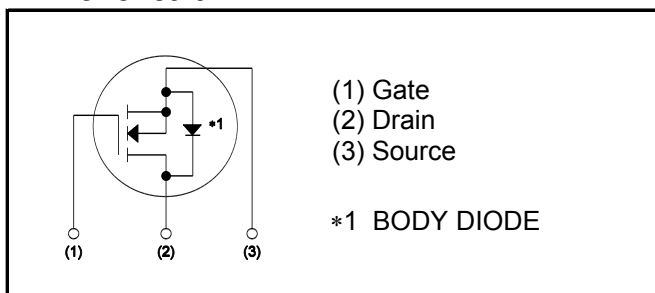
●Absolute maximum ratings ($T_a = 25^\circ\text{C}$)

| Parameter | Symbol | Value | Unit |
|--------------------------------|---------------------------|-------------|--------|
| Drain - Source voltage | V_{DSS} | 200 | V |
| Continuous drain current | $T_c = 25^\circ\text{C}$ | I_D^{*1} | ±12 A |
| | $T_c = 100^\circ\text{C}$ | I_D^{*1} | ±6.5 A |
| Pulsed drain current | $I_{D,pulse}^{*2}$ | ±48 | A |
| Gate - Source voltage | V_{GSS} | ±30 | V |
| Avalanche energy, single pulse | E_{AS}^{*3} | 11.6 | mJ |
| Avalanche current | I_{AR}^{*3} | 6.0 | A |
| Power dissipation | $T_c = 25^\circ\text{C}$ | P_D | 40 W |
| | $T_a = 25^\circ\text{C}$ | P_D | 2.23 W |
| Junction temperature | T_j | 150 | °C |
| Range of storage temperature | T_{stg} | -55 to +150 | °C |

●Outline



●Inner circuit



●Packaging specifications

| Type | Packaging | Bulk |
|------|---------------------------|-----------|
| | Reel size (mm) | - |
| | Tape width (mm) | - |
| | Basic ordering unit (pcs) | 500 |
| | Taping code | - |
| | Marking | RCX120N20 |

●Thermal resistance

| Parameter | Symbol | Values | | | Unit |
|--|------------|--------|------|-------|------|
| | | Min. | Typ. | Max. | |
| Thermal resistance, junction - case | R_{thJC} | - | - | 3.125 | °C/W |
| Thermal resistance, junction - ambient | R_{thJA} | - | - | 56 | °C/W |
| Soldering temperature, wavesoldering for 10s | T_{sold} | - | - | 265 | °C |

●Electrical characteristics ($T_a = 25^\circ\text{C}$)

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|-------------------|---|--------|------|-----------|---------------|
| | | | Min. | Typ. | Max. | |
| Drain - Source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = 1mA$ | 200 | - | - | V |
| Zero gate voltage drain current | I_{DSS} | $V_{DS} = 200V, V_{GS} = 0V$ $T_j = 25^\circ\text{C}$ | - | - | 10 | μA |
| | | $V_{DS} = 200V, V_{GS} = 0V$ $T_j = 125^\circ\text{C}$ | - | - | 100 | |
| Gate - Source leakage current | I_{GSS} | $V_{GS} = \pm 30V, V_{DS} = 0V$ | - | - | ± 100 | nA |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS} = 10V, I_D = 1mA$ | 3.25 | - | 5.25 | V |
| Static drain - source on - state resistance | $R_{DS(on)}^{*4}$ | $V_{GS} = 10V, I_D = 6.0A$ | - | 250 | 325 | $m\Omega$ |
| | | $V_{GS} = 10V, I_D = 6.0A$ $T_j = 125^\circ\text{C}$ | - | 565 | 790 | |
| Forward transfer admittance | g_{fs} | $V_{DS} = 10V, I_D = 6.0A$ | 2.75 | 5.50 | - | S |

●Electrical characteristics (T_a = 25°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|------------------------------|-----------------------------------|---|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Input capacitance | C _{iss} | V _{GS} = 0V | - | 740 | - | pF |
| Output capacitance | C _{oss} | V _{DS} = 25V | - | 57 | - | |
| Reverse transfer capacitance | C _{rss} | f = 1MHz | - | 26 | - | |
| Turn - on delay time | t _{d(on)} ^{*4} | V _{DD} ≈ 100V, V _{GS} = 10V | - | 20 | - | ns |
| Rise time | t _r ^{*4} | I _D = 6.0A | - | 33 | - | |
| Turn - off delay time | t _{d(off)} ^{*4} | R _L = 16.67Ω | - | 27 | - | |
| Fall time | t _f ^{*4} | R _G = 10Ω | - | 11 | - | |

●Gate Charge characteristics (T_a = 25°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|----------------------|-------------------------------|--|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Total gate charge | Q _g ^{*4} | V _{DD} ≈ 100V | - | 15 | - | nC |
| Gate - Source charge | Q _{gs} ^{*4} | I _D = 12A | - | 6 | - | |
| Gate - Drain charge | Q _{gd} ^{*4} | V _{GS} = 10V | - | 6 | - | |
| Gate plateau voltage | V _(plateau) | V _{DD} ≈ 100V, I _D = 12A | - | 7.4 | - | V |

●Body diode electrical characteristics (Source-Drain)(T_a = 25°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|---------------------------|-------------------------------|--|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Continuous source current | I _S ^{*1} | T _c = 25°C | - | - | 12 | A |
| Pulsed source current | I _{SM} ^{*2} | | - | - | 48 | A |
| Forward voltage | V _{SD} ^{*4} | V _{GS} = 0V, I _S = 12A | - | - | 1.5 | V |
| Reverse recovery time | t _{rr} ^{*4} | I _S = 6.0A | - | 80 | - | ns |
| Reverse recovery charge | Q _{rr} ^{*4} | di/dt = 100A/μs | - | 290 | - | nC |

*1 Limited only by maximum temperature allowed.

*2 P_w ≤ 10μs, Duty cycle ≤ 1%

*3 L ≈ 500μH, V_{DD} = 50V, R_G = 25Ω, starting T_j = 25°C

*4 Pulsed

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

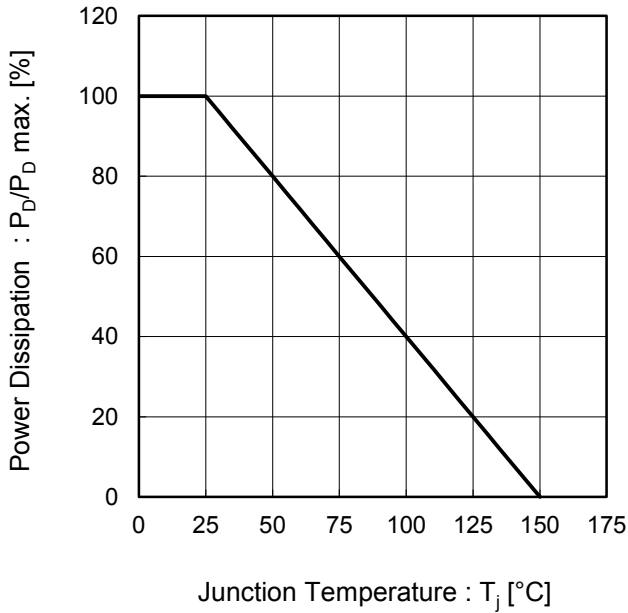


Fig.2 Maximum Safe Operating Area

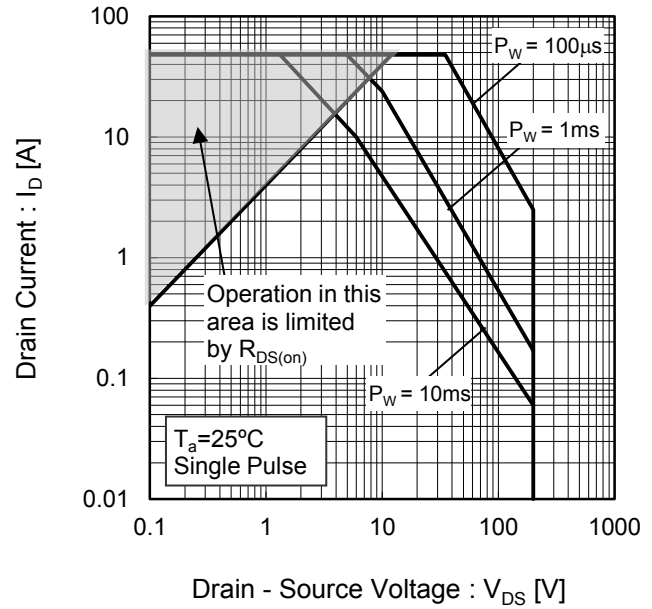
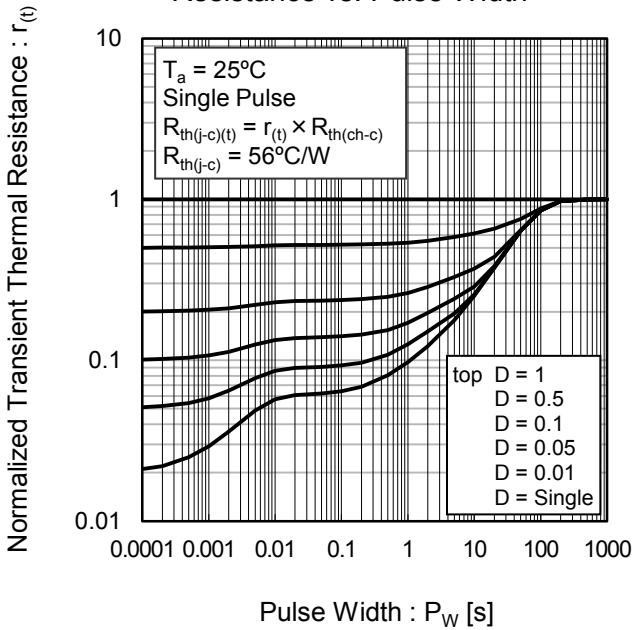


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Avalanche Current vs Inductive Load

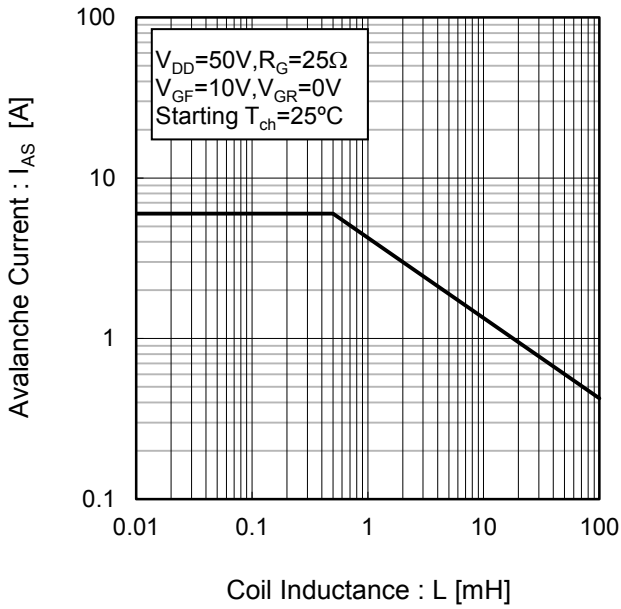


Fig.5 Avalanche Energy Derating Curve vs Junction Temperature

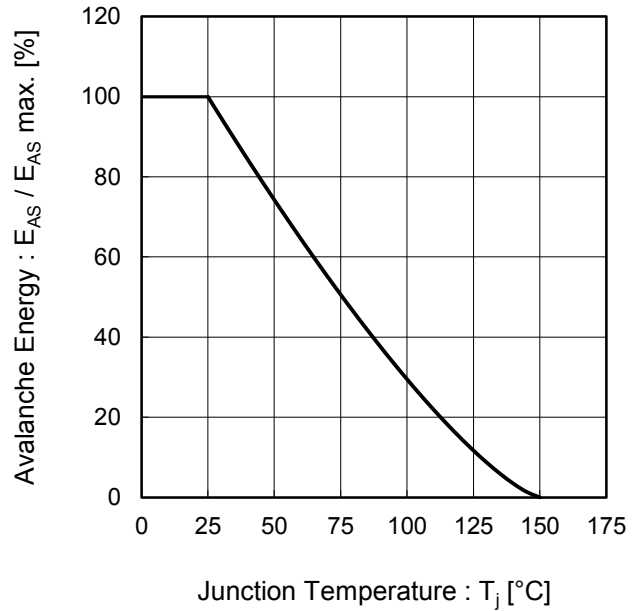


Fig.6 Typical Output Characteristics(I)

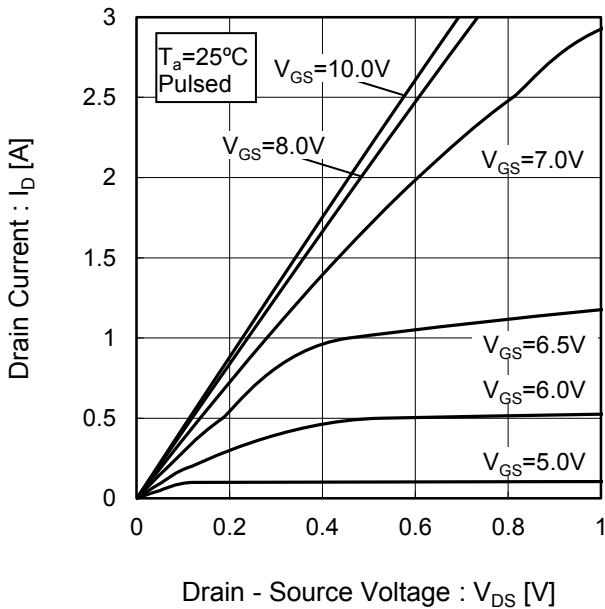
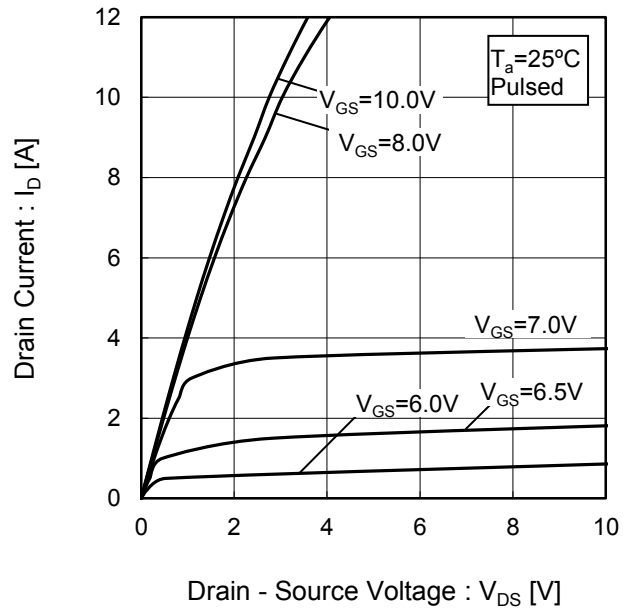


Fig.7 Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.8 Breakdown Voltage vs. Junction Temperature

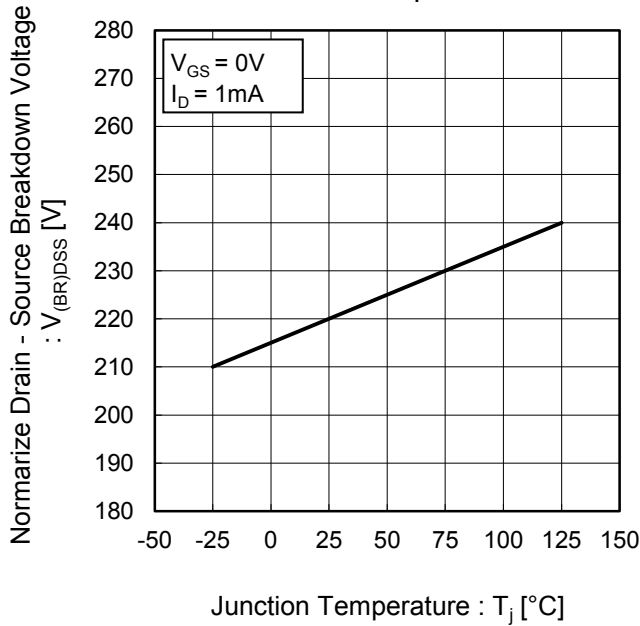


Fig.9 Typical Transfer Characteristics

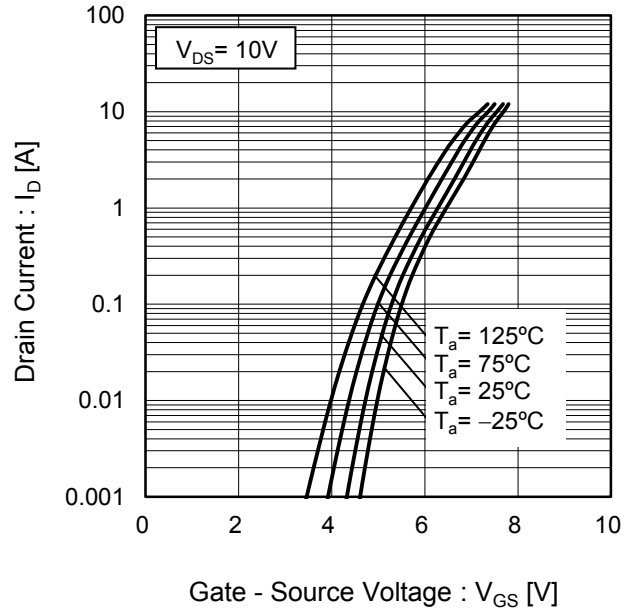


Fig.10 Gate Threshold Voltage vs. Junction Temperature

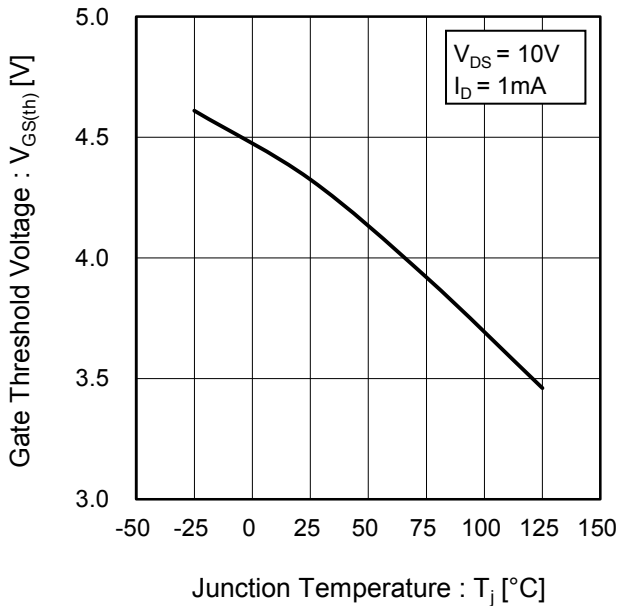
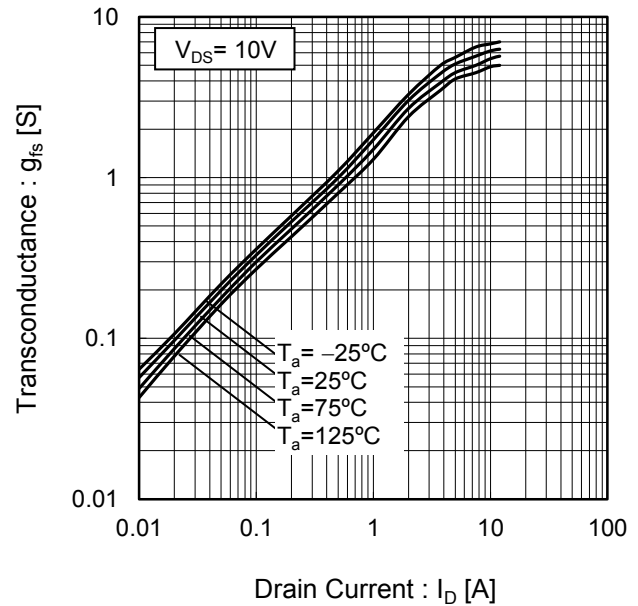


Fig.11 Transconductance vs. Drain Current



●Electrical characteristic curves

Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage

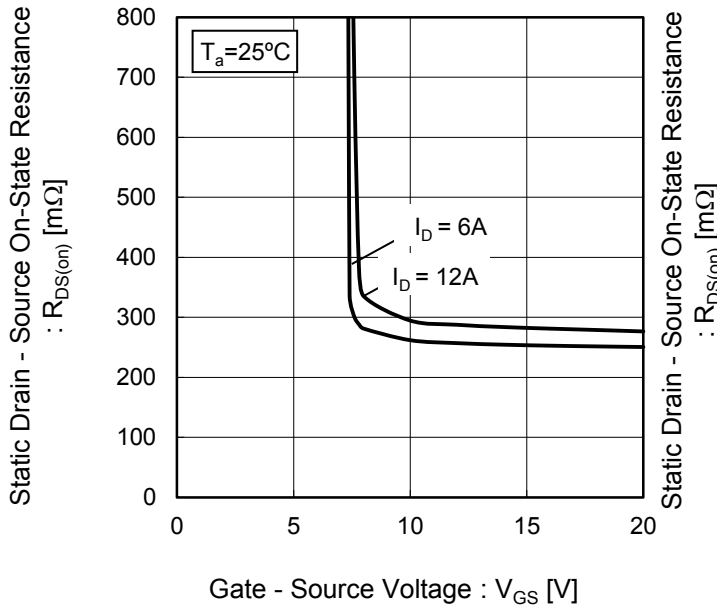


Fig.13 Static Drain - Source On - State Resistance vs. Drain Current(I)

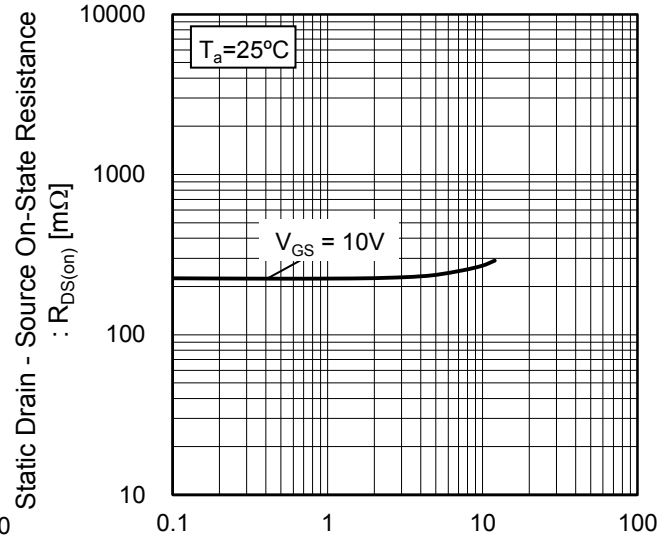
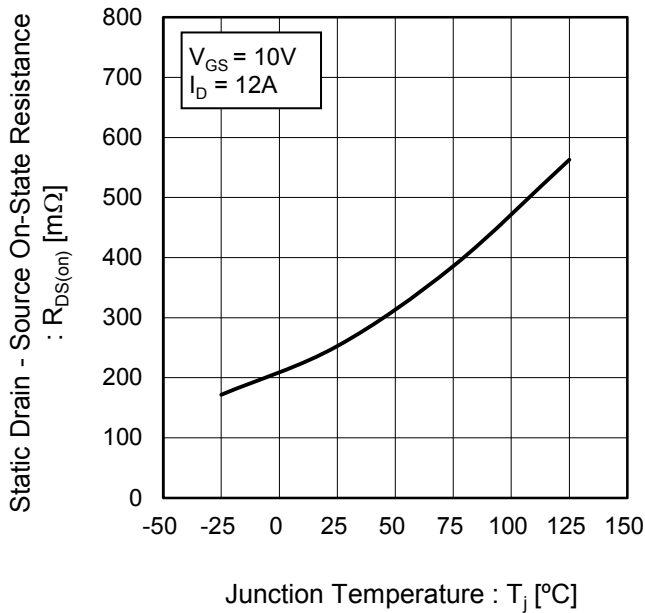


Fig.14 Static Drain - Source On - State Resistance vs. Junction Temperature



●Electrical characteristic curves

Fig.15 Static Drain - Source On - State Resistance vs. Drain Current(I)

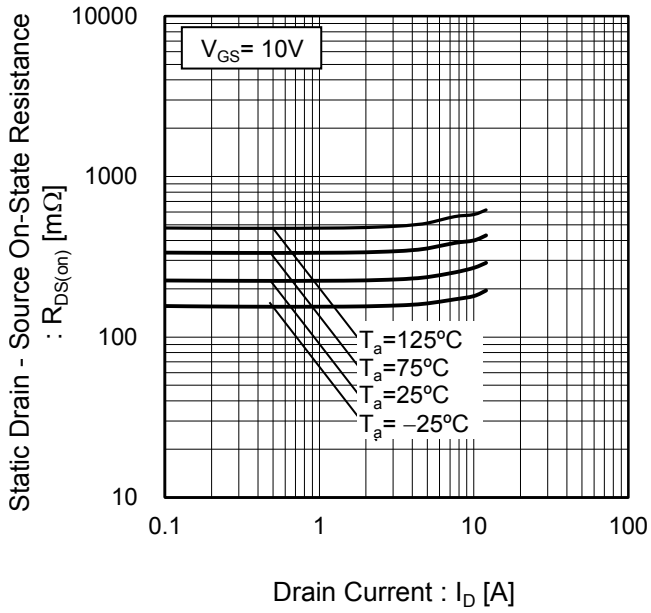
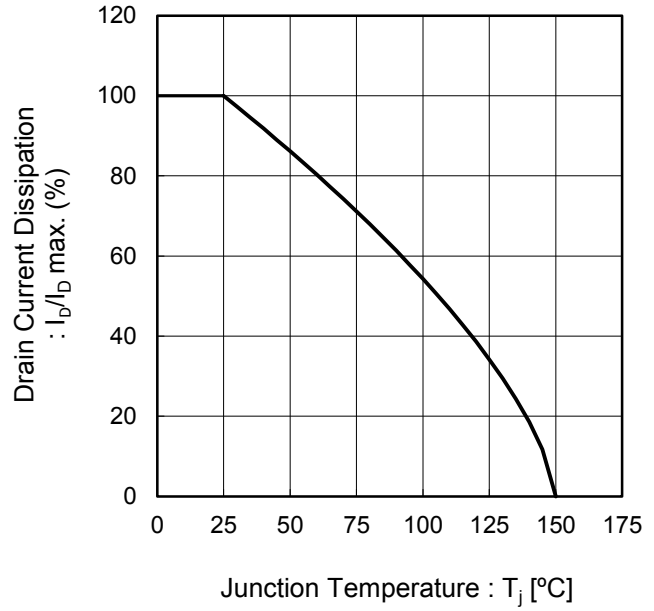


Fig.16 Drain Current Derating Curve



●Electrical characteristic curves

Fig.17 Typical Capacitance vs. Drain - Source Voltage

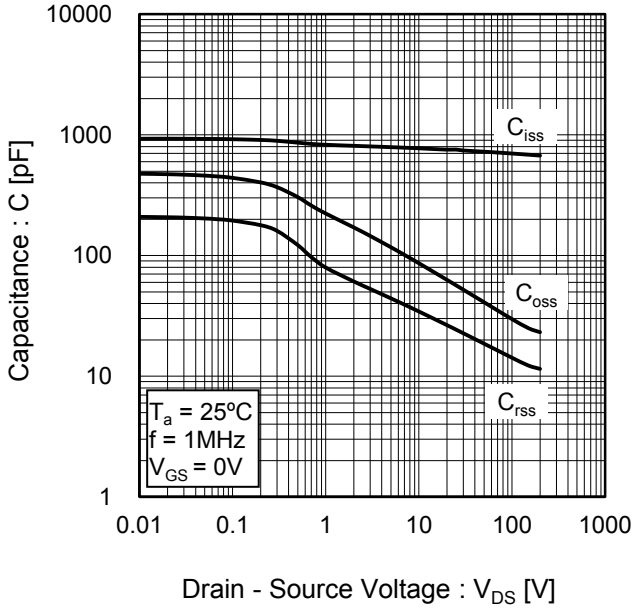


Fig.18 Switching Characteristics

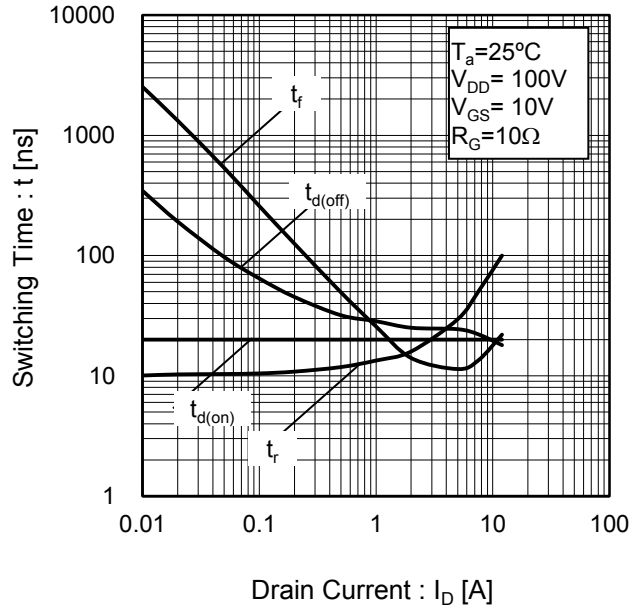
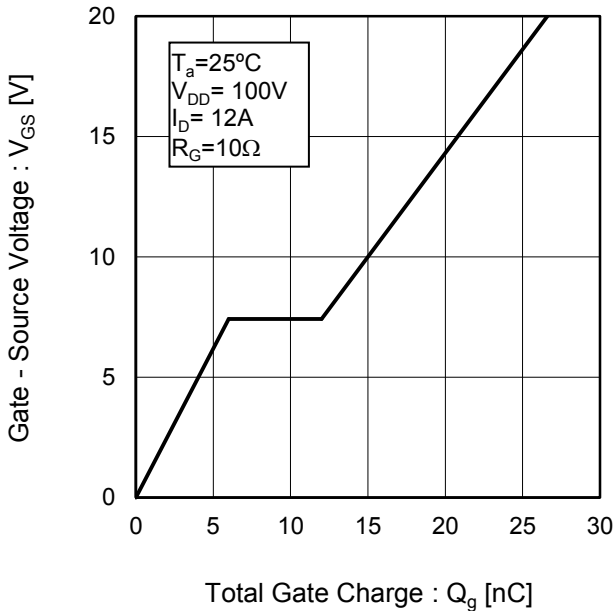


Fig.19 Dynamic Input Characteristics



●Electrical characteristic curves

Fig.20 Source Current vs. Source - Drain Voltage

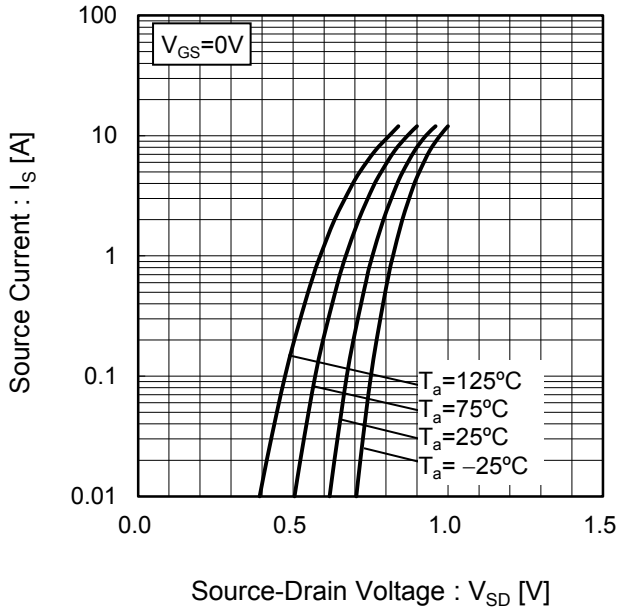
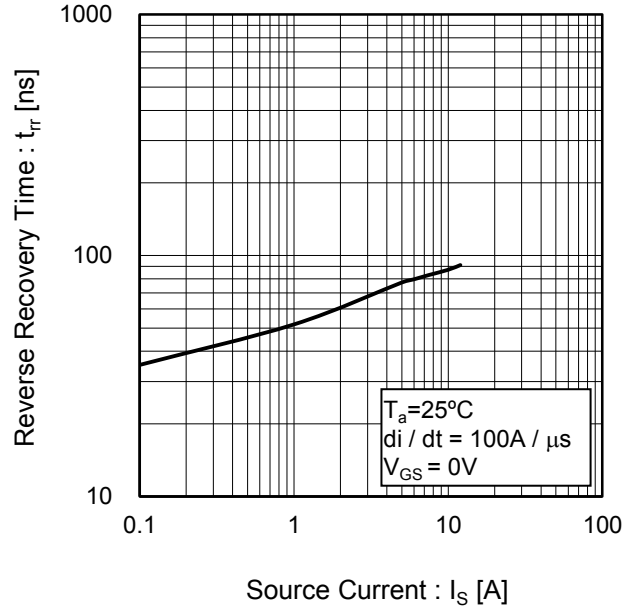


Fig.21 Reverse Recovery Time vs. Source Current



● Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

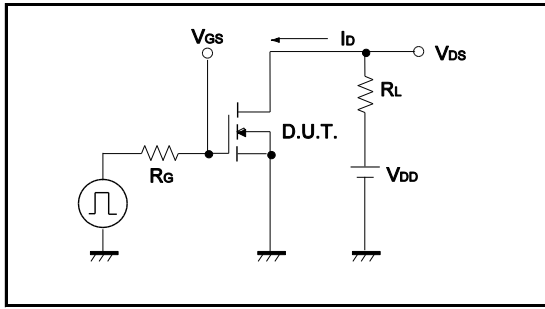


Fig.1-2 Switching Waveforms

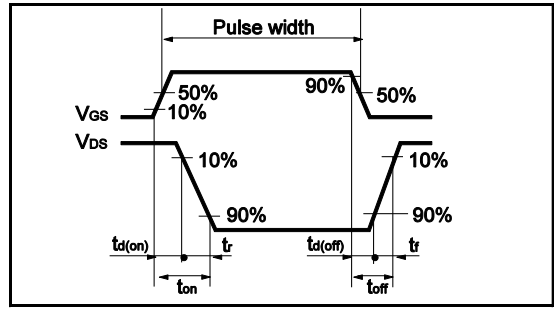


Fig.2-1 Gate Charge Measurement Circuit

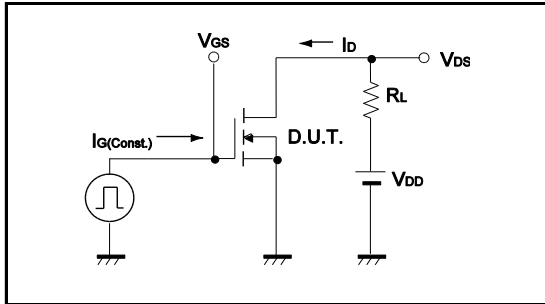


Fig.2-2 Gate Charge Waveform

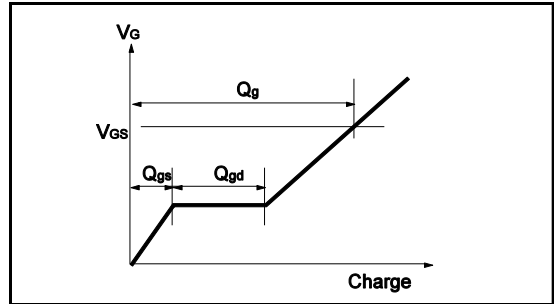


Fig.3-1 Avalanche Measurement Circuit

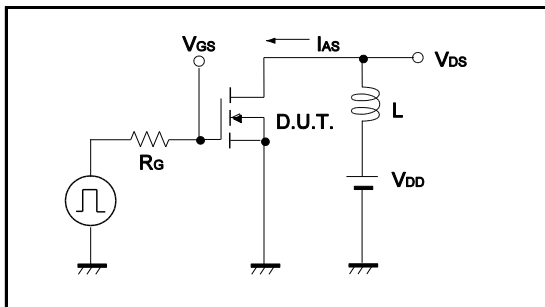
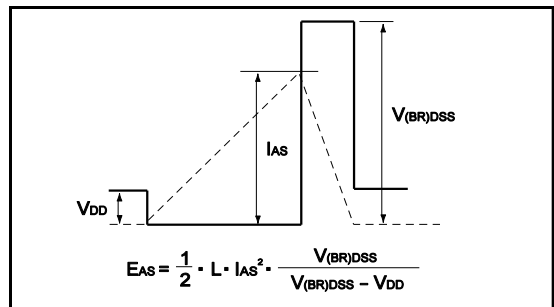
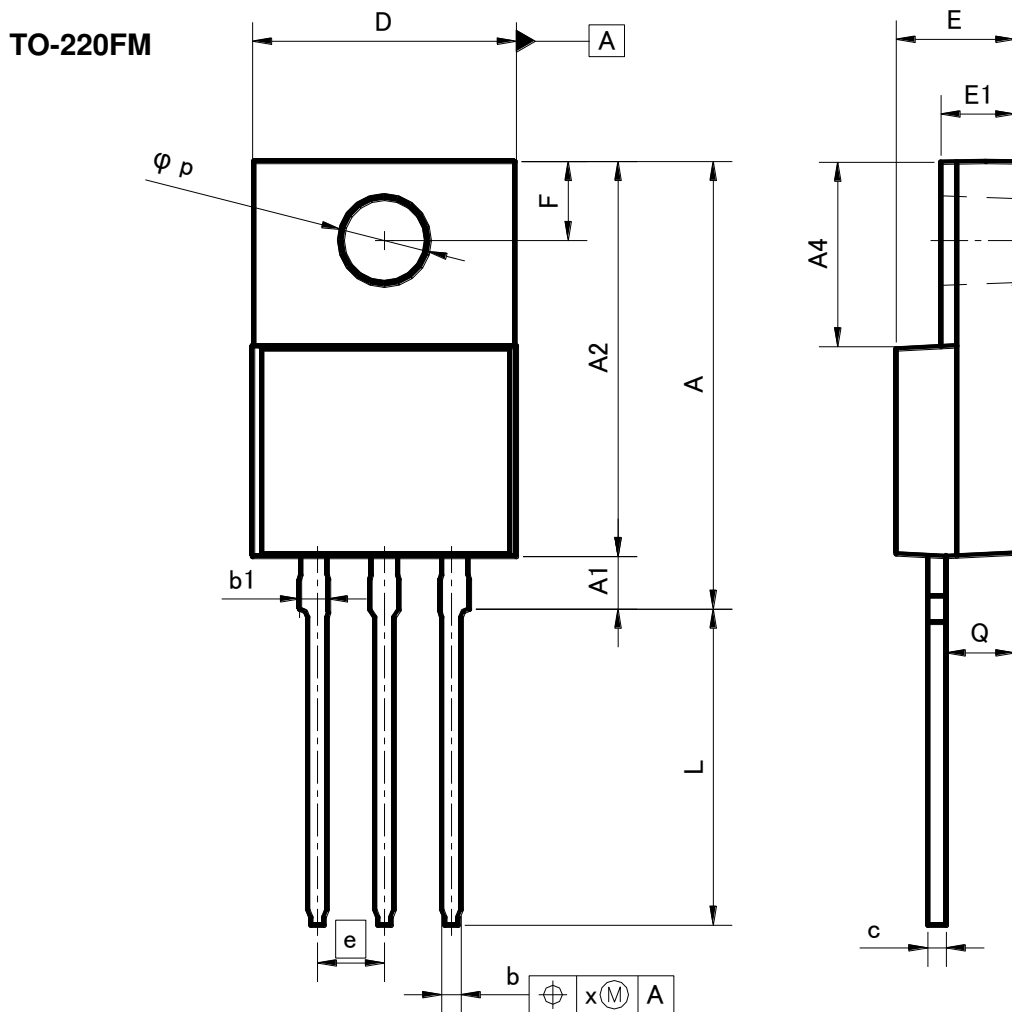


Fig.3-2 Avalanche Waveform



●Dimensions (Unit : mm)



| DIM | MILIMETERS | | INCHES | |
|-----|------------|-------|--------|-------|
| | MIN | MAX | MIN | MAX |
| A | 16.60 | 17.60 | 0.654 | 0.693 |
| A1 | 1.80 | 2.20 | 0.071 | 0.087 |
| A2 | 14.80 | 15.40 | 0.583 | 0.606 |
| A4 | 6.80 | 7.20 | 0.268 | 0.283 |
| b | 0.70 | 0.85 | 0.028 | 0.033 |
| b1 | 1.10 | 1.50 | 0.043 | 0.059 |
| c | 0.70 | 0.85 | 0.028 | 0.033 |
| D | 9.90 | 10.30 | 0.39 | 0.406 |
| E | 4.40 | 4.80 | 0.173 | 0.189 |
| e | 2.54 | | 0.10 | |
| E1 | 2.70 | 3.00 | 0.106 | 0.118 |
| F | 2.80 | 3.20 | 0.11 | 0.126 |
| L | 11.50 | 12.50 | 0.453 | 0.492 |
| p | 3.00 | 3.40 | 0.118 | 0.134 |
| Q | 2.10 | 3.10 | 0.083 | 0.122 |
| x | - | 0.381 | - | 0.015 |

Dimension in mm/inches

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