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| | |
|---------------------|------|
| V_{DSS} | 500V |
| $R_{DS(on)}$ (Max.) | 1.5Ω |
| I_D | 5A |
| P_D | 40W |

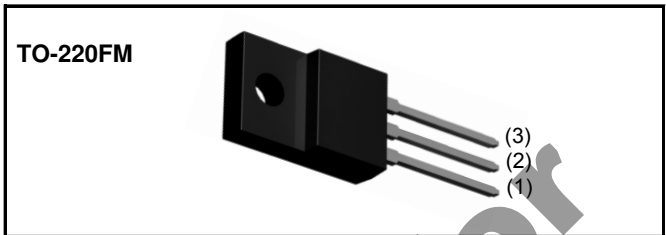
●Features

- 1) Low on-resistance.
- 2) Fast switching speed.
- 3) Gate-source voltage (V_{GSS}) guaranteed to be $\pm 30V$.
- 4) Drive circuits can be simple.
- 5) Parallel use is easy.
- 6) Pb-free lead plating ; RoHS compliant

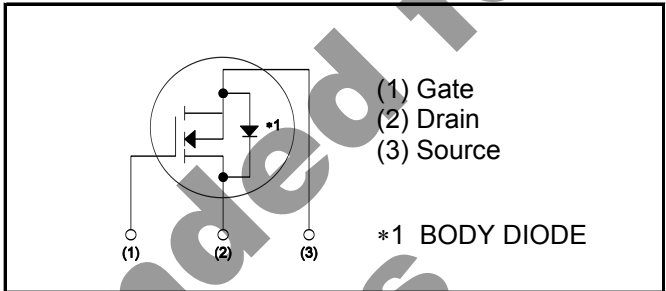
●Application

Switching Power Supply

●Outline



●Inner circuit



●Packaging specifications

| | | |
|------|---------------------------|-----------|
| Type | Packaging | Bulk |
| | Reel size (mm) | - |
| | Tape width (mm) | - |
| | Basic ordering unit (pcs) | 500 |
| | Taping code | - |
| | Marking | ZDX050N50 |

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

| Parameter | Symbol | Value | Unit |
|--|------------------|-------------|------------|
| Drain - Source voltage | V_{DSS} | 500 | V |
| Continuous drain current | I_D *1 | ± 5 | A |
| Pulsed drain current | $I_{D,pulse}$ *2 | ± 15 | A |
| Gate - Source voltage | V_{GSS} | ± 30 | V |
| Power dissipation ($T_c = 25^\circ C$) | P_D | 40 | W |
| Junction temperature | T_j | 150 | $^\circ C$ |
| Range of storage temperature | T_{stg} | -55 to +150 | $^\circ C$ |

●Thermal resistance

| Parameter | Symbol | Values | | | Unit |
|--|------------|--------|------|-------|------|
| | | Min. | Typ. | Max. | |
| Thermal resistance, junction - ambient | R_{thJA} | - | - | 3.125 | °C/W |

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|-------------------|---------------------------------|--------|------|-----------|---------------|
| | | | Min. | Typ. | Max. | |
| Drain - Source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = 1mA$ | 500 | - | - | V |
| Zero gate voltage drain current | I_{DSS} | $V_{DS} = 500V, V_{GS} = 0V$ | - | - | 100 | μA |
| Gate - Source leakage current | I_{GSS} | $V_{GS} = \pm 30V, V_{DS} = 0V$ | - | - | ± 100 | nA |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS} = 10V, I_D = 1mA$ | 2.5 | - | 4.4 | V |
| Static drain - source on - state resistance | $R_{DS(on)}^{*3}$ | $V_{GS} = 10V, I_D = 2.5A$ | - | 1.2 | 1.5 | Ω |

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|------------------------------|-------------------|---|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Transconductance | g_{fs}^{*3} | $V_{DS} = 10\text{V}, I_D = 2.5\text{A}$ | 1 | 4 | - | S |
| Input capacitance | C_{iss} | $V_{GS} = 0\text{V}$ | - | 600 | - | pF |
| Output capacitance | C_{oss} | $V_{DS} = 25\text{V}$ | - | 62 | - | |
| Reverse transfer capacitance | C_{rss} | $f = 1\text{MHz}$ | - | 5 | - | |
| Turn - on delay time | $t_{d(on)}^{*3}$ | $V_{DD} \approx 250\text{V}, V_{GS} = 10\text{V}$ | - | 20 | - | ns |
| Rise time | t_r^{*3} | $I_D = 2.5\text{A}$ | - | 12 | - | |
| Turn - off delay time | $t_{d(off)}^{*3}$ | $R_L = 10\Omega$ | - | 38 | - | |
| Fall time | t_f^{*3} | $R_G = 10\Omega$ | - | 22 | - | |

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|----------------------|-----------------|---|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Total gate charge | Q_g^{*3} | $V_{DD} \approx 250\text{V}$ | - | 14 | - | nC |
| Gate - Source charge | Q_{gs}^{*3} | $I_D = 5\text{A}$ | - | 6 | - | |
| Gate - Drain charge | Q_{gd}^{*3} | $V_{GS} = 10\text{V}$ | - | 4 | - | |
| Gate plateau voltage | $V_{(plateau)}$ | $V_{DD} \approx 250\text{V}, I_D = 5\text{A}$ | - | 6 | - | V |

*1 Limited only by maximum temperature allowed.

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

*3 Pulsed

●Body diode electrical characteristics (Source-Drain)($T_a = 25^\circ\text{C}$)

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---------------|---------------------------------------|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Inverse diode continuous, forward current | I_S^{*1} | $T_c = 25^\circ\text{C}$ | - | - | 5 | A |
| Inverse diode direct current, pulsed | I_{SM}^{*2} | | - | - | 15 | A |
| Forward voltage | V_{SD}^{*3} | $V_{GS} = 0\text{V}, I_S = 5\text{A}$ | - | - | 1.5 | V |

Not Recommended for New Designs

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

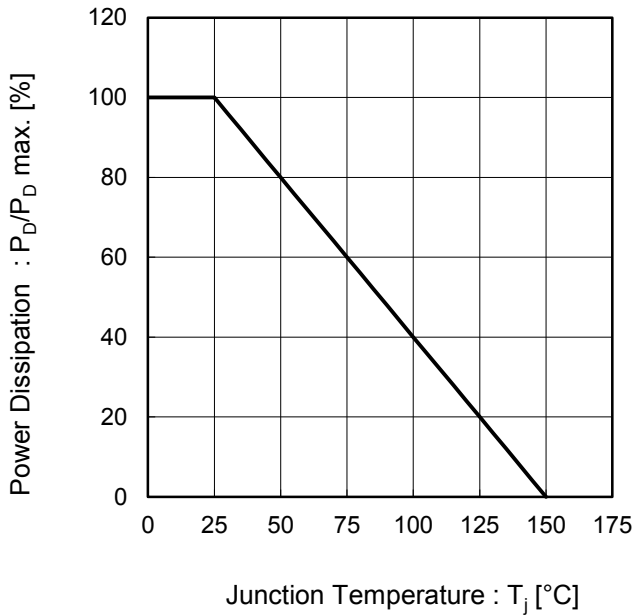


Fig.2 Maximum Safe Operating Area

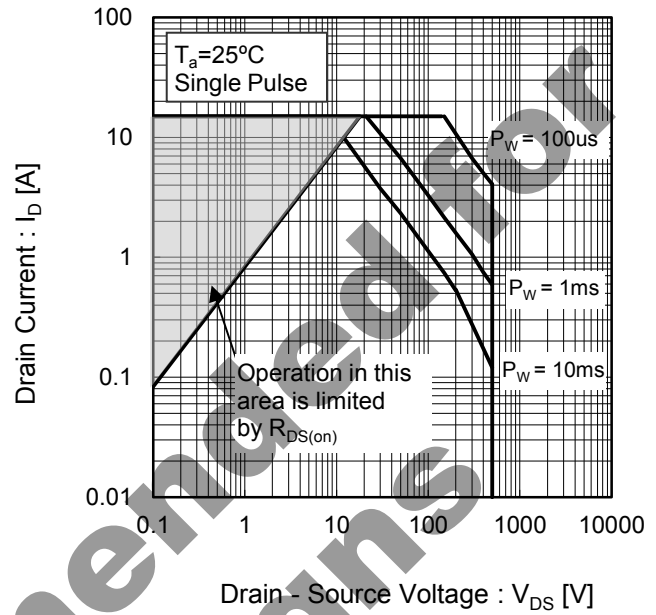
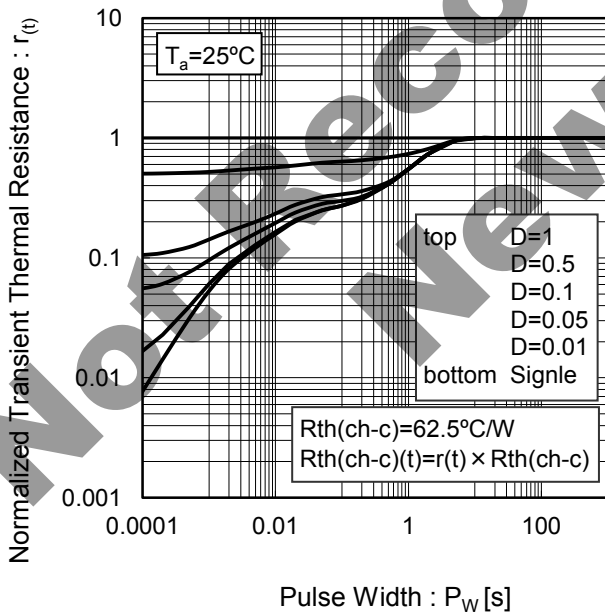


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

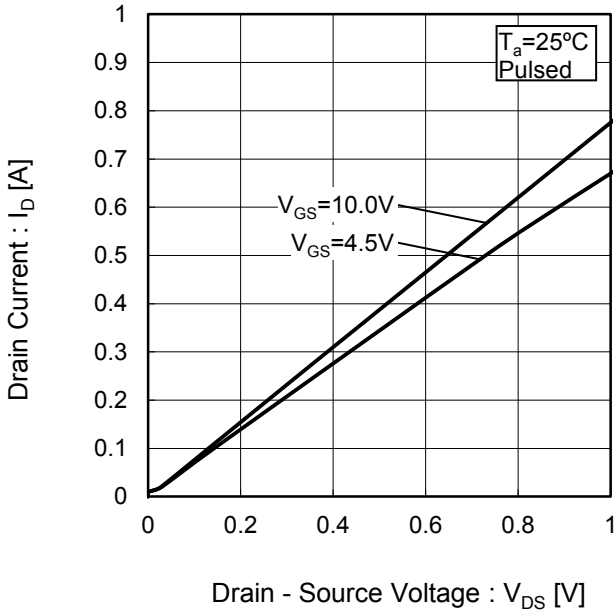


Fig.5 Typical Output Characteristics(II)

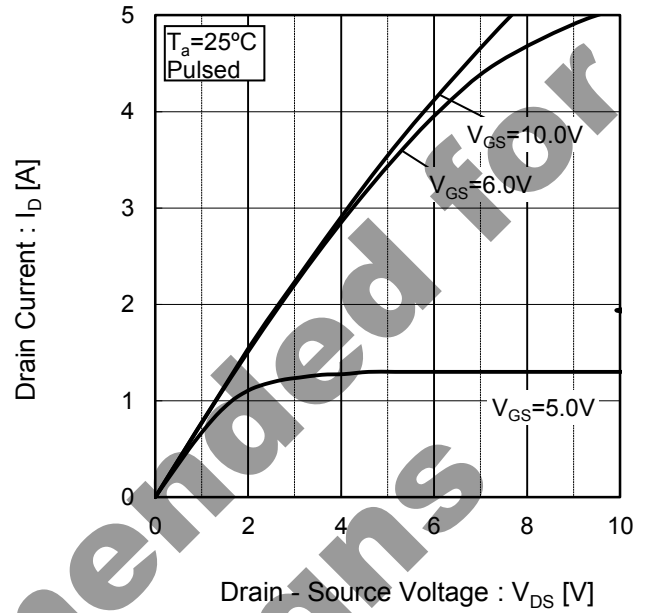


Fig.6 Breakdown Voltage vs. Channel Temperature

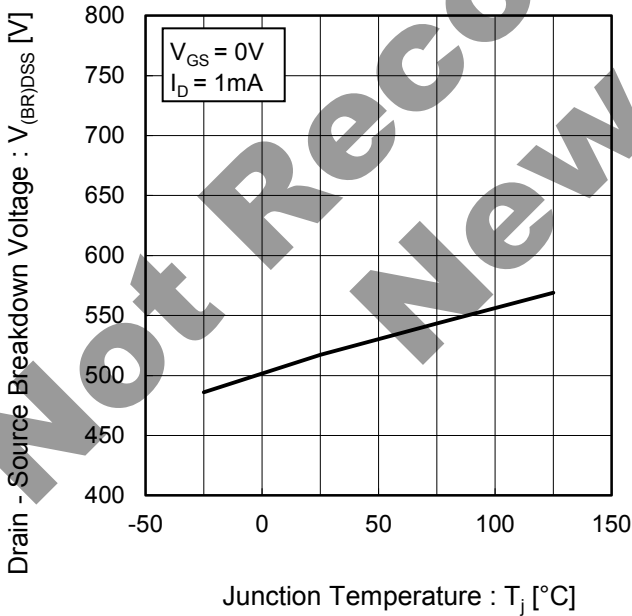
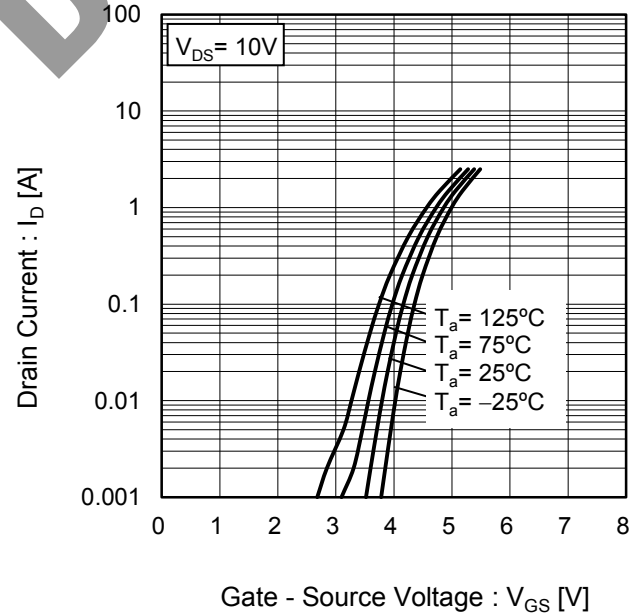


Fig.7 Typical Transfer Characteristics



●Electrical characteristic curves

Fig.8 Gate Threshold Voltage vs. Channel Temperature

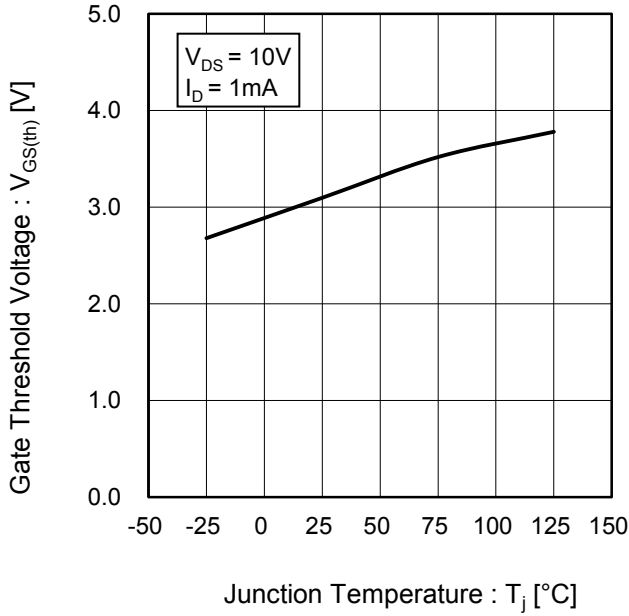


Fig.9 Transconductance vs. Drain Current

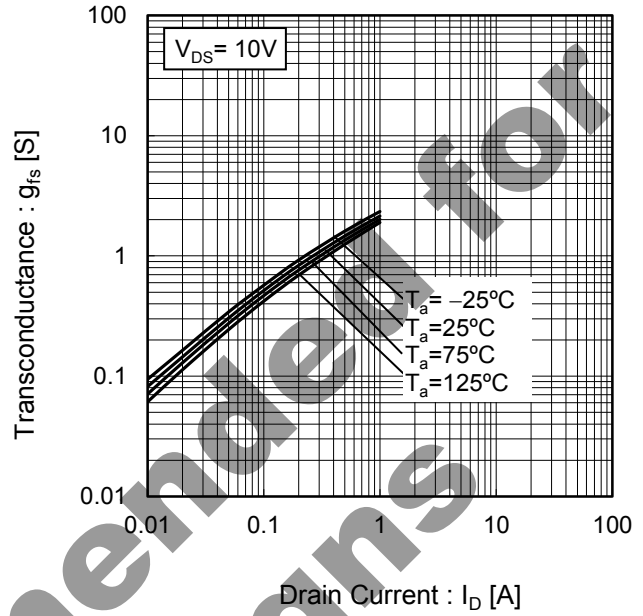
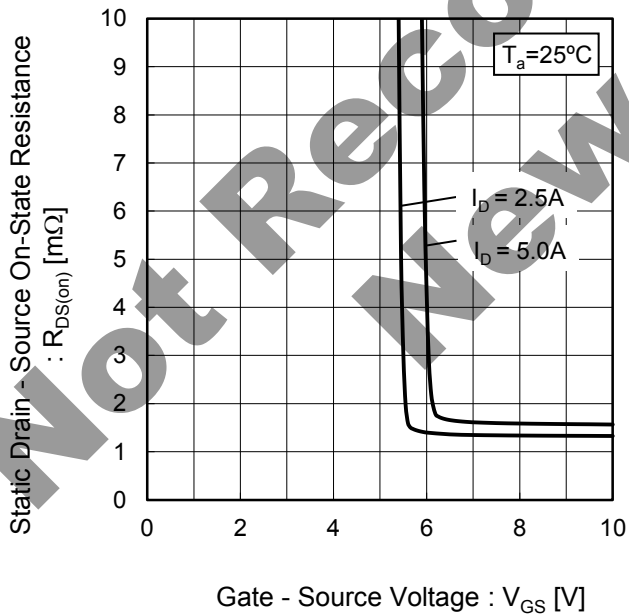


Fig.10 Static Drain - Source On - State Resistance vs. Gate Source Voltage



●Electrical characteristic curves

Fig.11 Static Drain - Source On - State Resistance vs. Drain Current(II)

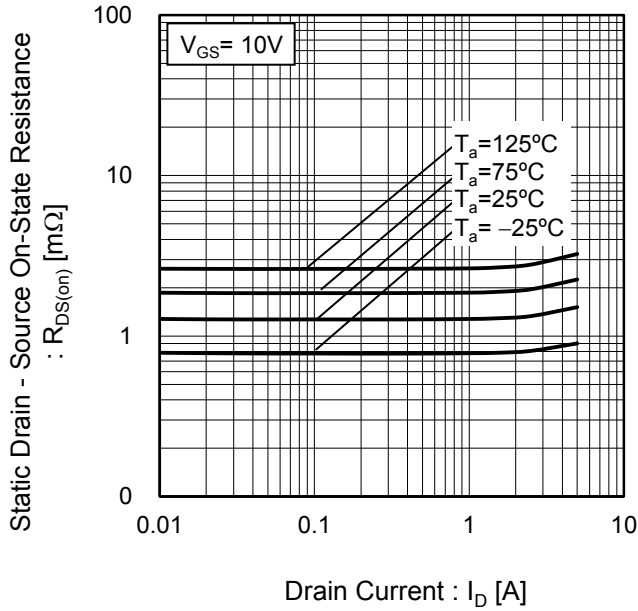
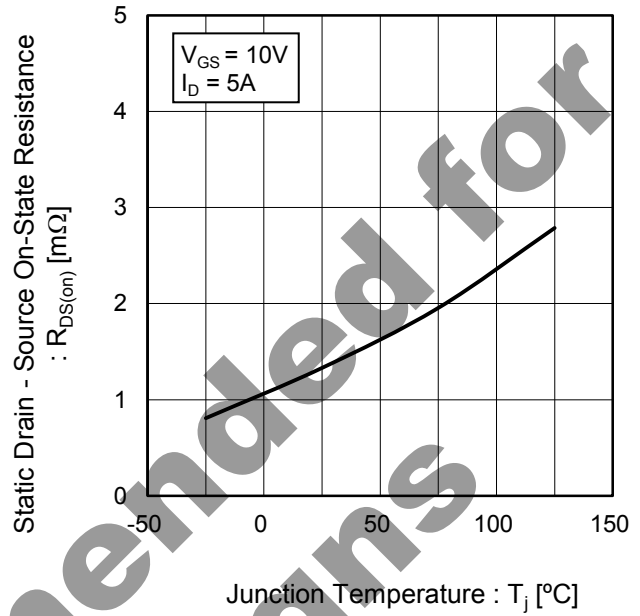


Fig.12 Static Drain - Source On - State Resistance vs. Junction Temperature



Not Recommended for New Designs

●Electrical characteristic curves

Fig.13 Typical Capacitance vs. Drain - Source Voltage

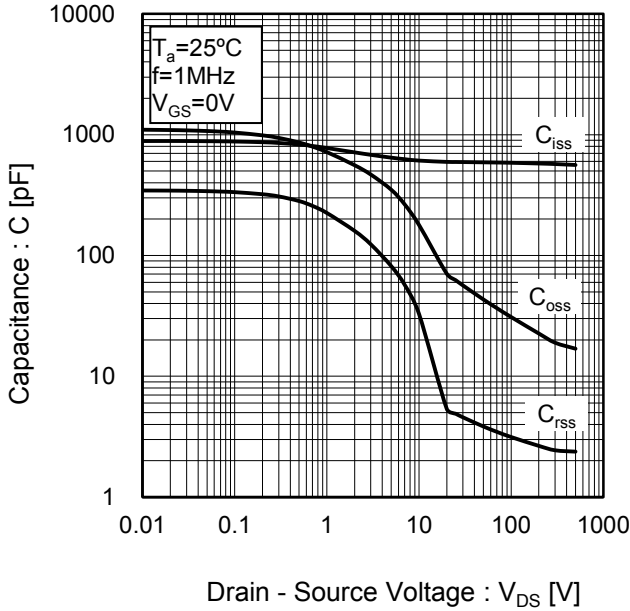


Fig.14 Switching Characteristics

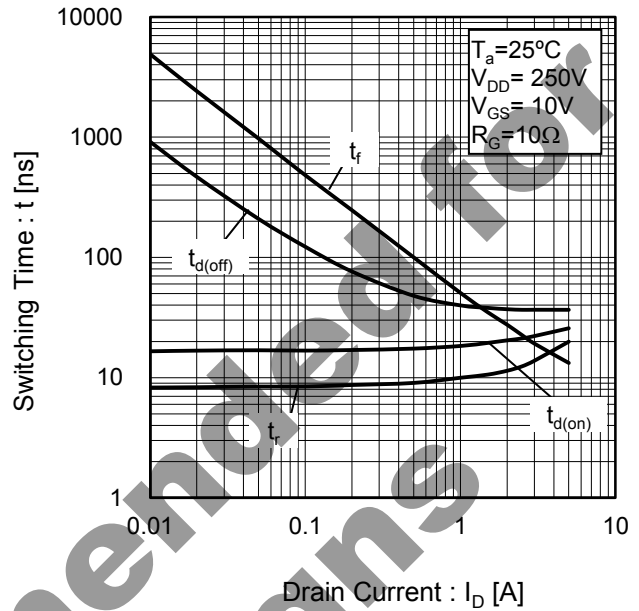


Fig.15 Dynamic Input Characteristics

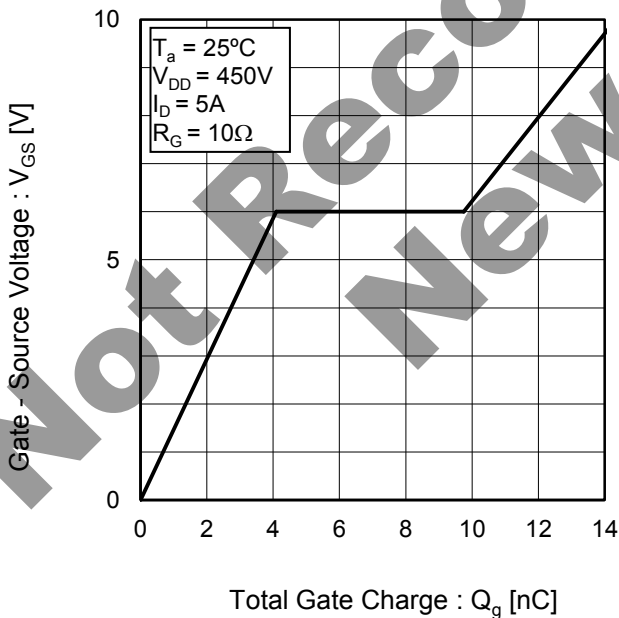
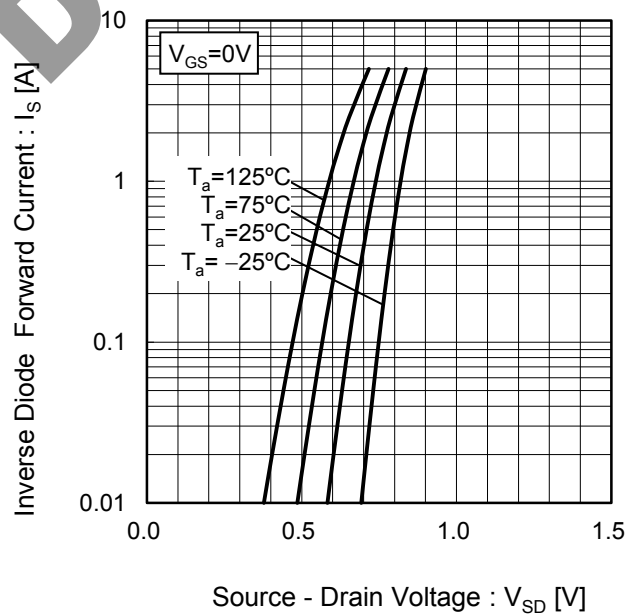


Fig.16 Inverse Diode Forward Current vs. Source - Drain Voltage



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

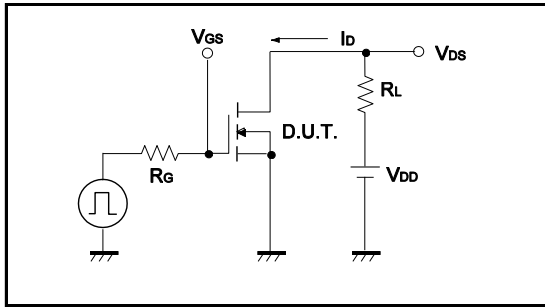


Fig.1-2 Switching Waveforms

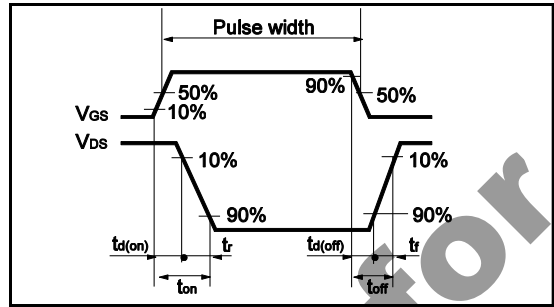


Fig.2-1 Gate Charge Measurement Circuit

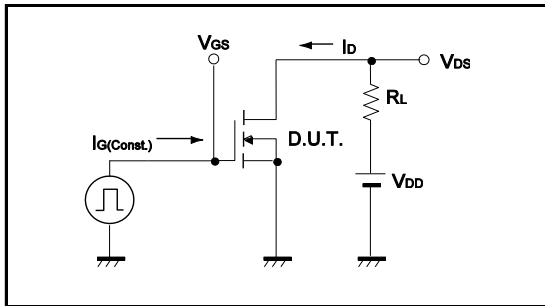
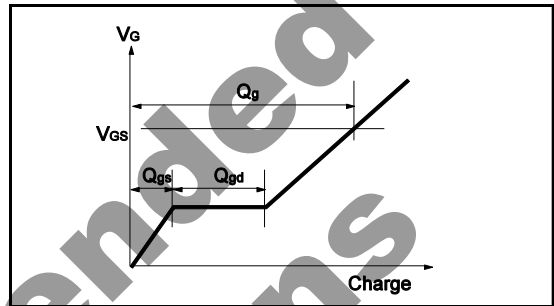
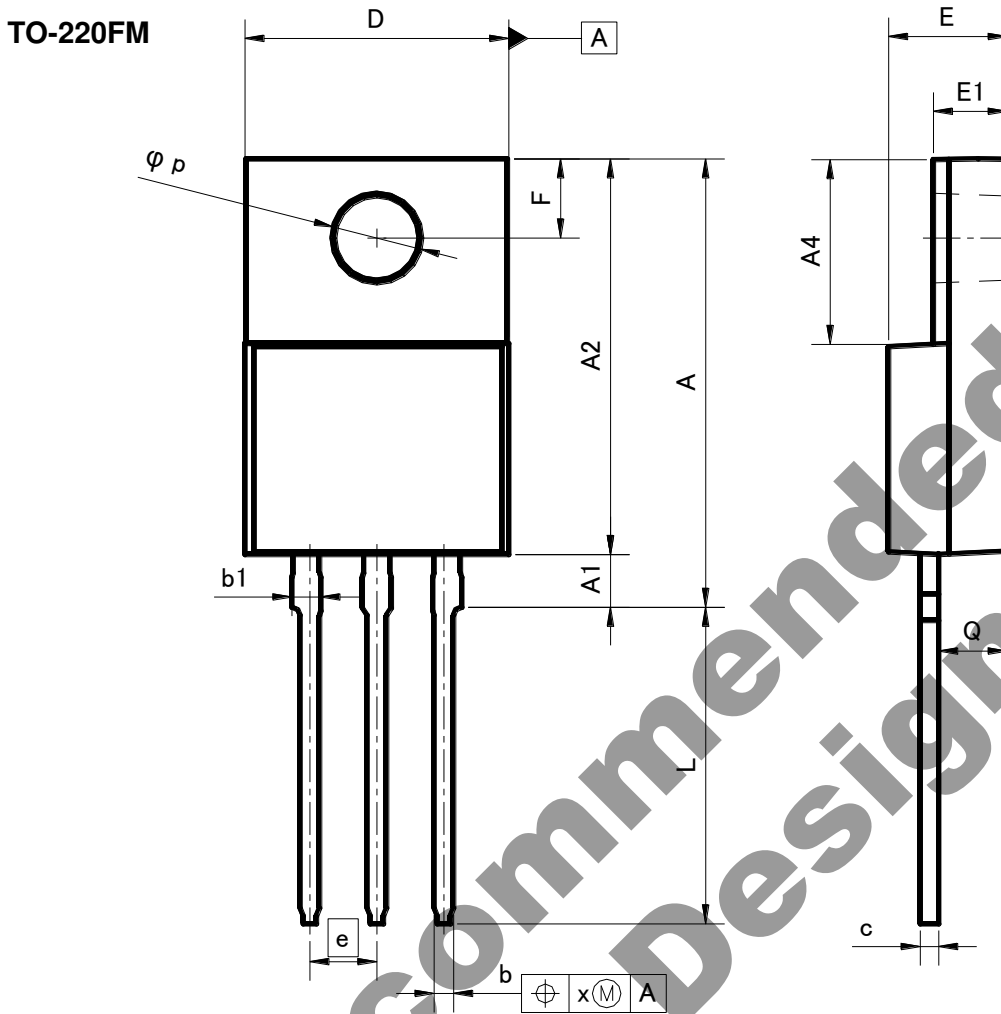


Fig.2-2 Gate Charge Waveform



Not Recommended for New Designs

●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

Notes

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