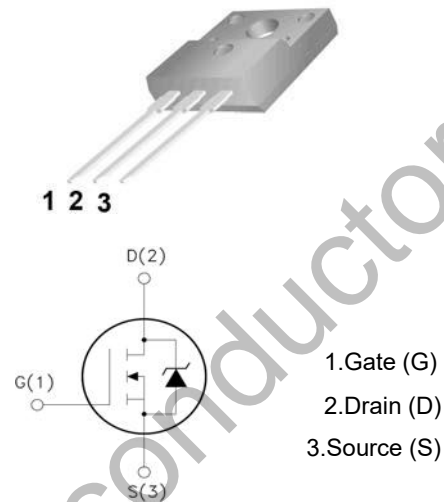![WG WildGoose logo]

TO-220F

RoHS COMPLIANT

### WGF30N50SE

500V N-Channel MOSFET

### Features:

- ☐ Low Intrinsic Capacitances.
- ☐ Excellent Switching Characteristics.
- ☐ Extended Safe Operating Area.
- ☐ Unrivalled Gate Charge :Qg=78nC (Typ.).
- ☐ VDSS=500V,$I_D$=30A
- ☐ $R_{DS}$(on) : 160mΩ (Tye ) @$V_G$=10V
- ☐ 100% Avalanche Tested

1.Gate (G)
2.Drain (D)
3.Source (S)

## Absolute Maximum Ratings (* **Drain current limited by junction temperature**)

| Symbol | Parameter | WGF30N50SE | Unit |
|---|---|---|---|
| $V_{DSS}$ | Drain-to-Source Voltage | 500 | V |
| $V_{GSS}$ | Gate-to-Source Voltage | ±30 | |
| $I_D$ | Continuous Drain Current | 30 | A |
| | Continuous Drain Current @ Tc=100℃ | 18 | |
| $I_{DM}$ | Pulsed Drain Current at $V_{GS}$=10V[2,4] | 112 | |
| $E_{AS}$ | Single Pulse Avalanche Energy | 3000 | mJ |
| dv/dt | Peak Diode Recovery dv/dt[3] | 5.0 | V/ns |
| $P_D$ | Power Dissipation | 300 | W |
| | Derating Factor above 25℃ | 2.38 | W/℃ |
| $T_L$ $T_{PAK}$ | Maximum Temperature for Soldering Leads at 0.063in (1.6mm) from Case for 10 seconds, Package Body for 10 seconds | 300 260 | ℃ |
| $T_J$& $T_{STG}$ | Operating and Storage Temperature Range | -55 to 150 | |

*Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.*

## Thermal Characteristics

| Symbol | Parameter | WGF30N50SE | Unit |
|---|---|---|---|
| $R_{θJC}$ | Thermal Resistance, Junction-to-Case | 0.42 | ℃/W |
| $R_{θJA}$ | Thermal Resistance, Junction-to-Ambient | 55 | |

## Electrical Characteristics  ( $T_C$ = 25 °C unless otherwise noted )

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$ = 0V, $I_D$ = 250uA | 500 | - | - | V |
| $\Delta BV_{DSS} / \Delta T_J$ | Breakdown Voltage Temperature coefficient | $I_D$ = 250uA, referenced to 25 °C | - | 0.3 | - | V/°C |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$ = 500V, $V_{GS}$ = 0V | - | - | 1 | uA |
| | | $V_{DS}$ = 400V, $T_C$ = 125 °C | - | - | 10 | uA |
| $I_{GSS}$ | Gate-Source Leakage, Forward | $V_{GS}$ = 30V,  $V_{DS}$ = 0V | - | - | 100 | nA |
| | Gate-source Leakage, Reverse | $V_{GS}$ = -30V,  $V_{DS}$ = 0V | - | - | -100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250uA | 2.0 | - | 4.0 | V |
| $R_{DS(ON)}$ | Static Drain-Source On-state Resistance | $V_{GS}$ =10 V, $I_D$ = 15 A | - | 160 | 200 | m$\Omega$ |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | | - | 4500 | - | |
| $C_{oss}$ | Output Capacitance | $V_{GS}$ =0 V, $V_{DS}$ =25V, f = 1MHz | - | 3150 | - | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 450 | - | |
| **Dynamic Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-on Delay Time | | - | 25 | - | |
| $t_r$ | Rise Time | $V_{DD}$ =250V, $I_D$ =15.0A, $R_G$ =25$\Omega$ | - | 39 | - | ns |
| $t_{d(off)}$ | Turn-off Delay Time | (Note 4, 5) | - | 100 | - | |
| $t_f$ | Fall Time | | - | 36 | - | |
| $Q_g$ | Total Gate Charge | | - | 78 | - | |
| $Q_{gs}$ | Gate-Source Charge | $V_{DS}$ =250V, $V_{GS}$ =10V, $I_D$ =30.0A | - | 21 | - | nC |
| $Q_{gd}$ | Gate-Drain Charge(Miller Charge) | (Note 4, 5) | - | 20 | - | |

## Source-Drain Diode Ratings and Characteristics

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit. |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current | Integral Reverse p-n Junction Diode in the MOSFET | - | - | 30 | A |
| $I_{SM}$ | Pulsed Source Current | | - | - | 110 | |
| $V_{SD}$ | Diode Forward Voltage | $I_S$ =30.0A, $V_{GS}$ =0V | - | - | 1.4 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_S$=30A, $V_{GS}$=0V, d$I_F$/dt=100A/us | - | 530 | - | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | - | 4.6 | - | uC |

※ NOTES

[1] $T_J$=+25℃ to +150℃ .
[2] Silicon limited current only.
[3] Package limited current.
[4] Repetitive rating; pulse width limited by maximum junction temperature.
[5] Pulse width≤380µs; duty cycle≤2%.

## Typical Characteristics ( $T_C$ = 25 °C unless otherwise noted )

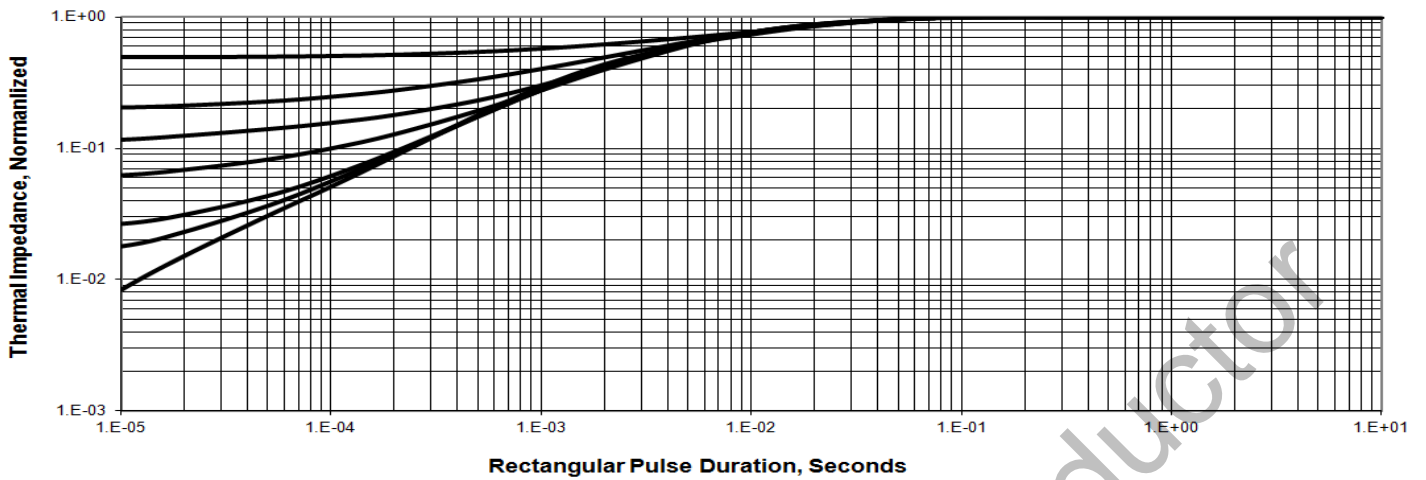### Figure 1. Maximum Transient Thermal Impedance



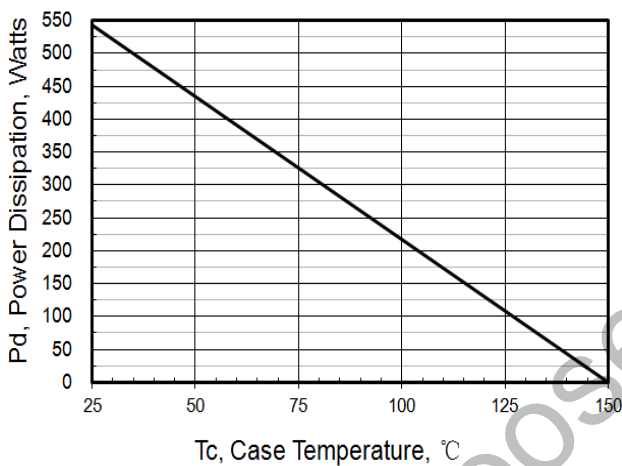### Figure 2 . Max. Power Dissipation vs Case Temperature



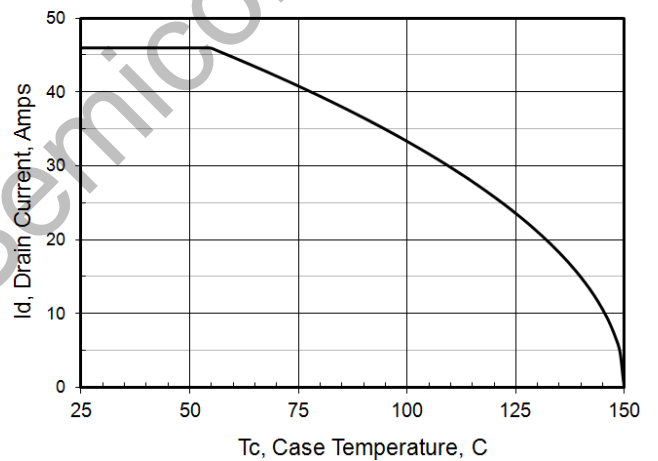### Figure 3 .Maximum Continuous Drain Current vs Tc
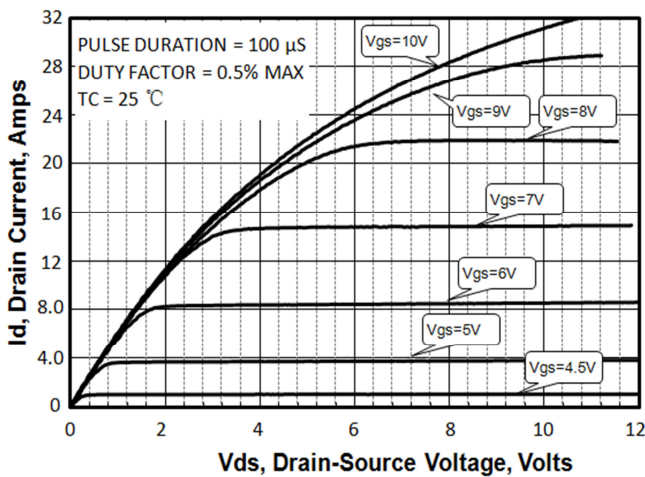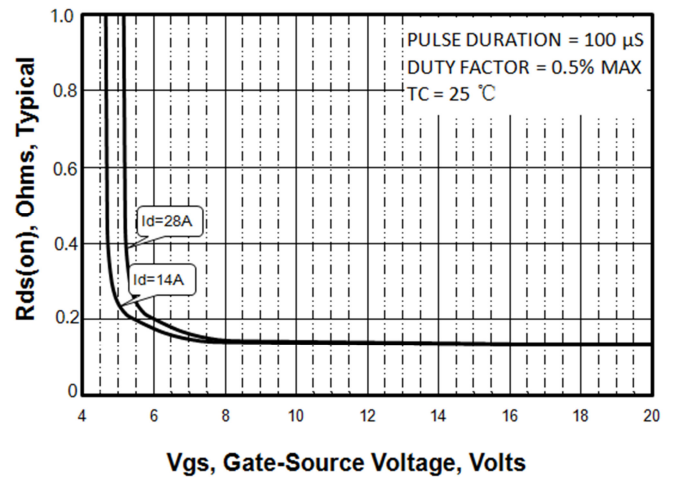


### Figure 4. Output Characteristics



### Figure 5. Rdson vs Gate Voltage

## Typical Characteristics ( $T_C$ = 25 °C unless otherwise noted )
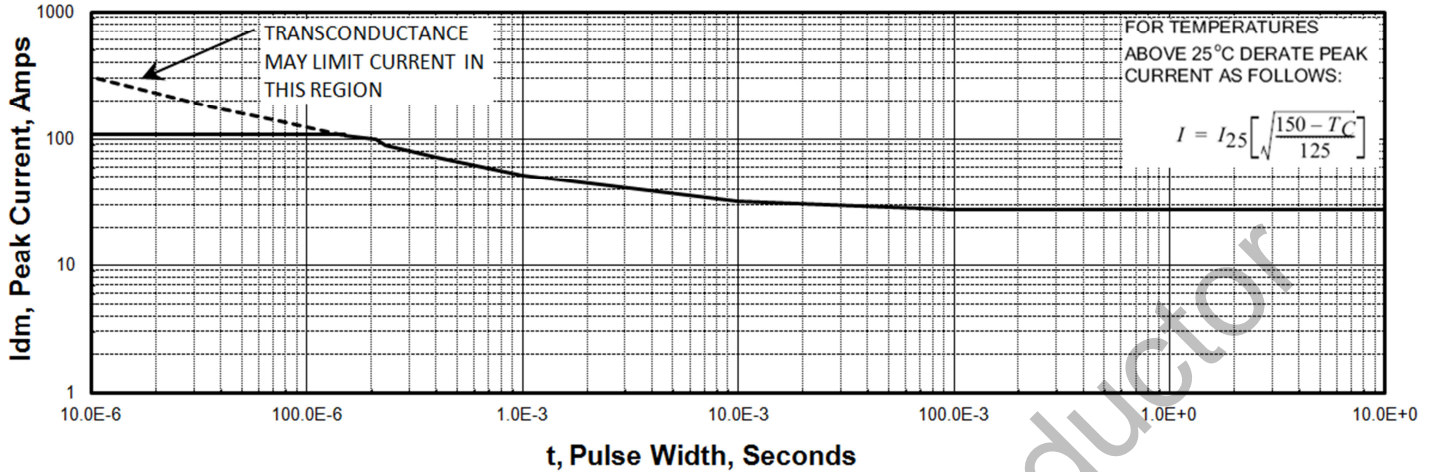
### Figure 6. Peak Current Capability



TRANSCONDUCTANCE MAY LIMIT CURRENT IN THIS REGION

FOR TEMPERATURES ABOVE 25 °C DERATE PEAK CURRENT AS FOLLOWS:

$$I = I_{25}\left[\sqrt{\frac{150 - T_C}{125}}\right]$$

### Figure 7. Transfer Characteristics



PULSE DURATION = 10 µS
DUTY FACTOR = 0.5% MAX
$V_{DS}$=30V

-55°C
+25°C
+150°C
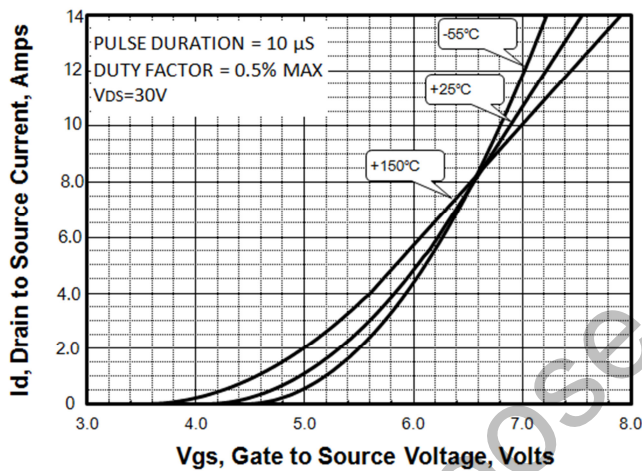
### Figure 8. Unclamped Inductive Switching Capability



STARTING $T_J$ = 25 ℃
STARTING $T_J$ = 150 ℃

If R= 0: tAV= (L×IAS)/(1.3BVDSS-VDD)
If R 0: tAV= (L/R) ln[IAS×R)/(1.3BVDSS-VDD)+1]
R equals total Series resistance of Drain circuit
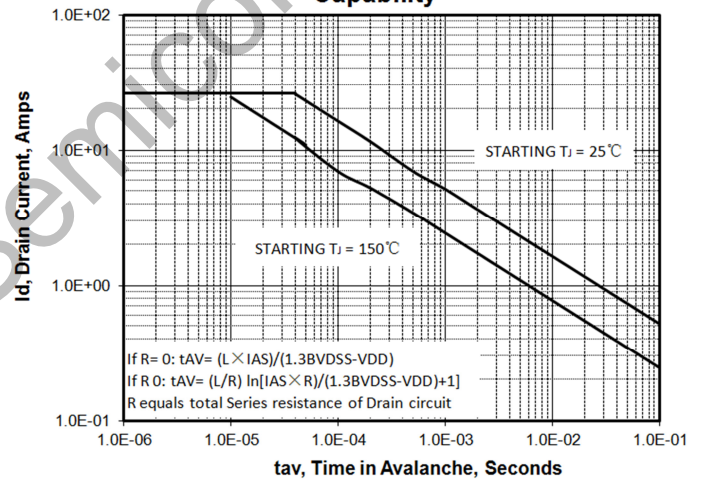
### Figure 9. Drain to Source ON Resistance vs Drain Current



PULSE DURATION = 10 µS
DUTY FACTOR = 0.5% MAX
TC = 25 ℃

$V_{GS}$ = 10V
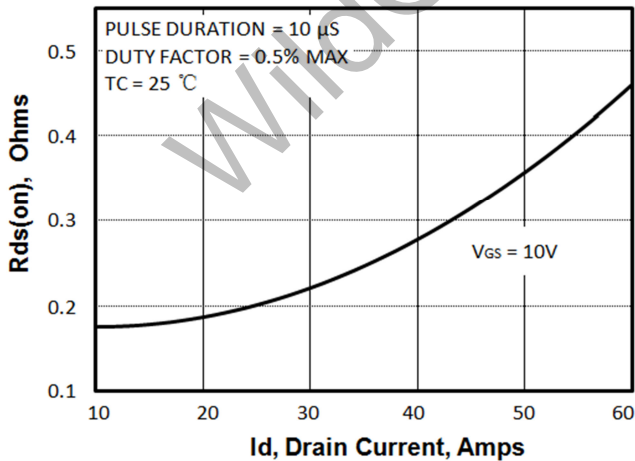
### Figure 10. Rdson vs Junction Temperature



PULSE DURATION = 10 µS
DUTY FACTOR = 0.5% MAX
$V_{GS}$ = 10V, $I_D$ = 14A
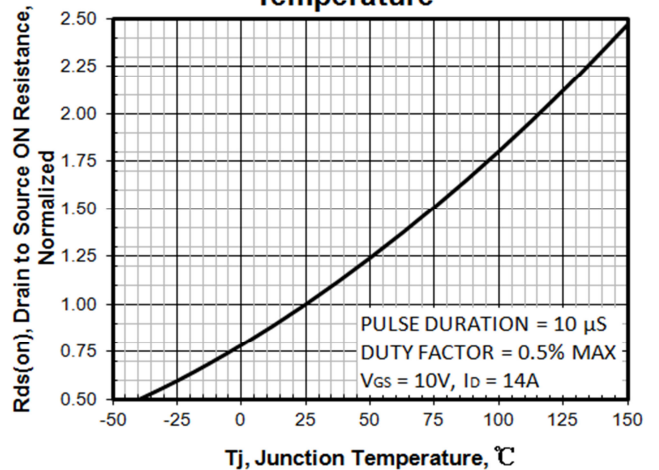
## Typical Characteristics ( T_C = 25 °C unless otherwise noted )

### Figure 11. Breakdown Voltage vs Temperature
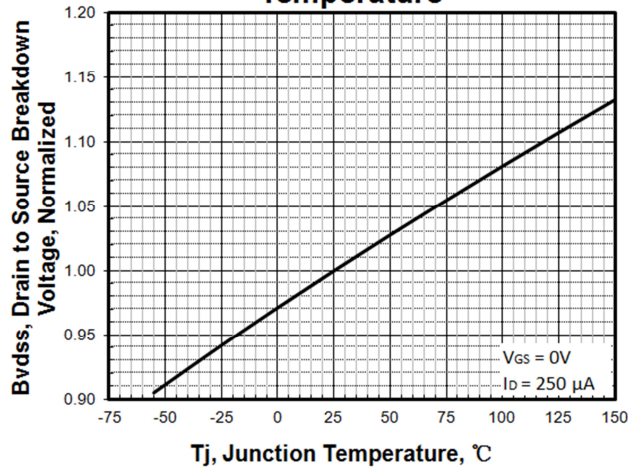


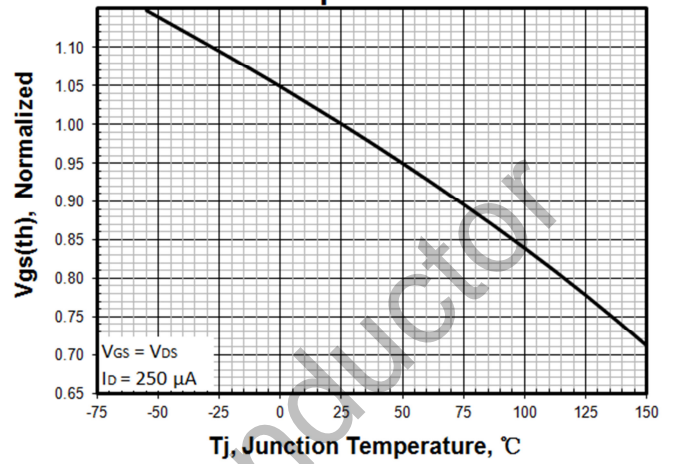### Figure 12. Threshold Voltage vs Temperature



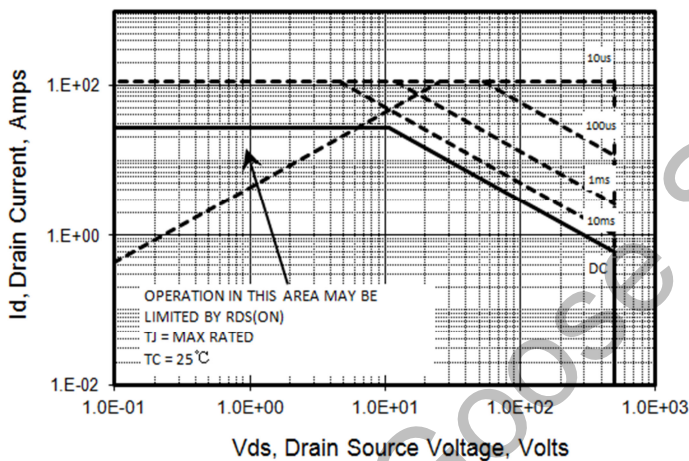### Figure 13 . Maximum Safe Operating Area
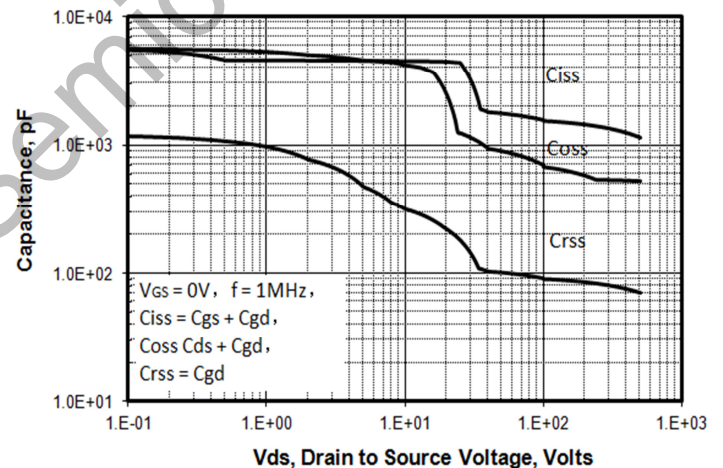


### Figure 14. Capacitance vs Vds



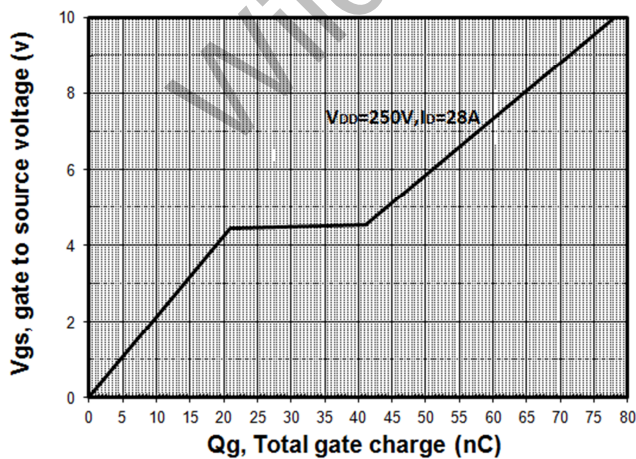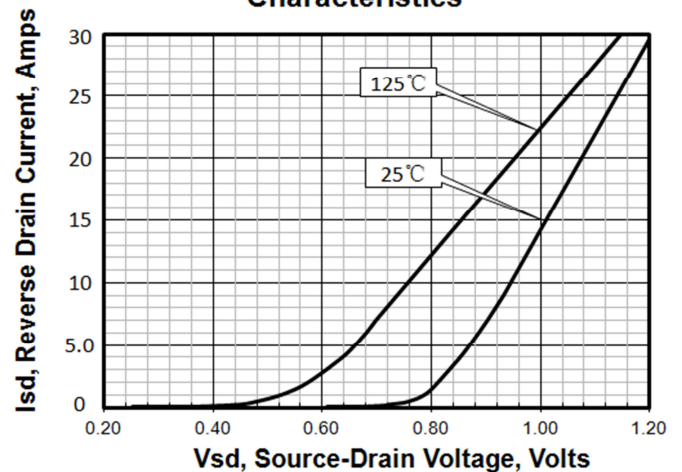### Figure 15 . Typical Gate Charge
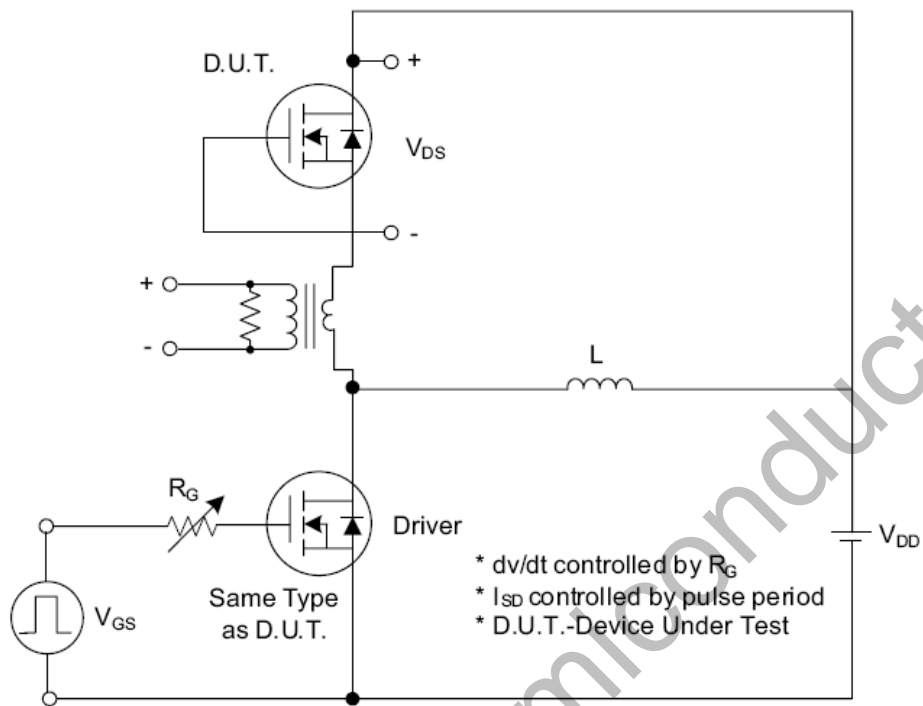


### Figure 16. Body Diode Transfer Characteristics

## Test circuit



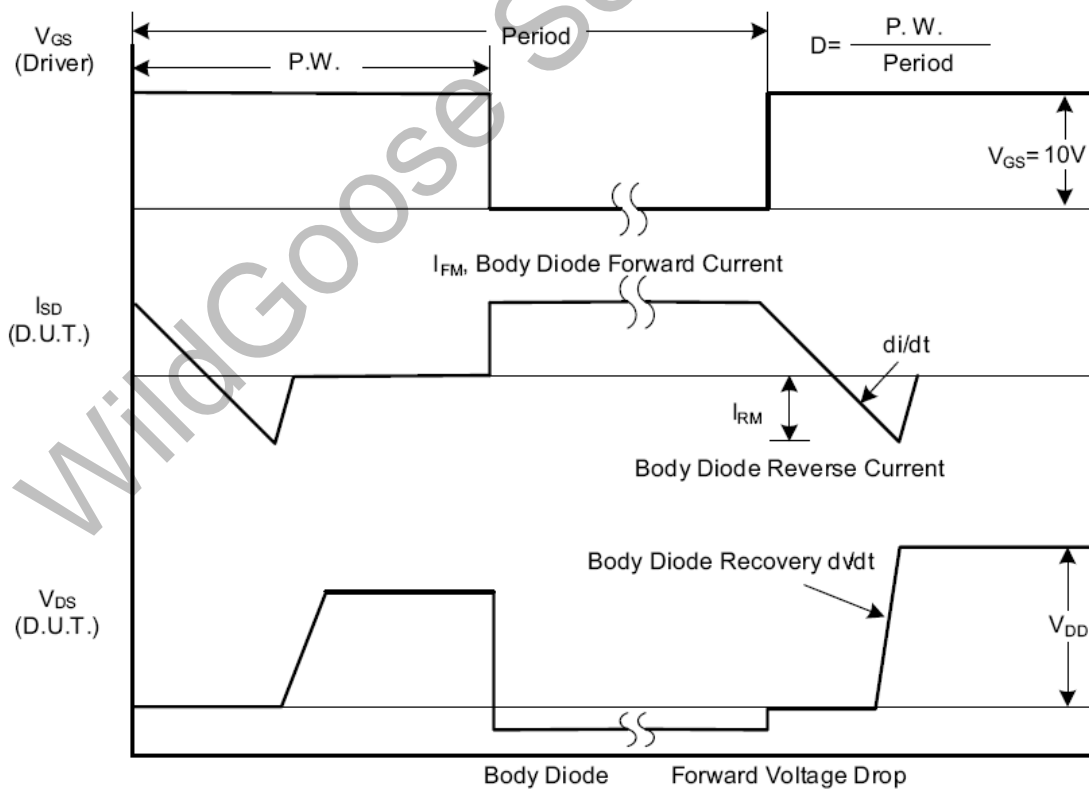Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit



Fig. 1.2 Peak Diode Recovery dv/dt Waveforms
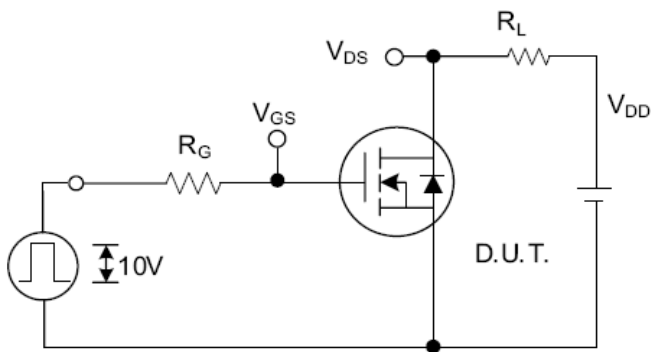
**Test circuit**
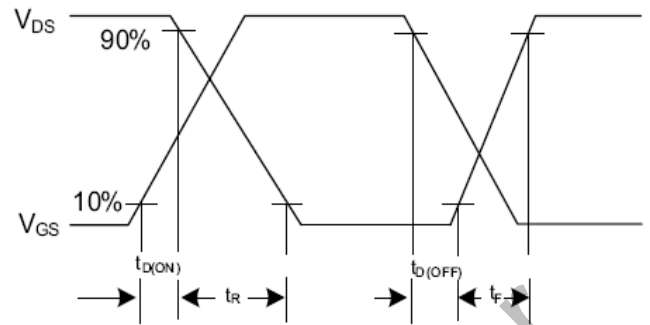


Fig. 2.1 Switching Test Circuit
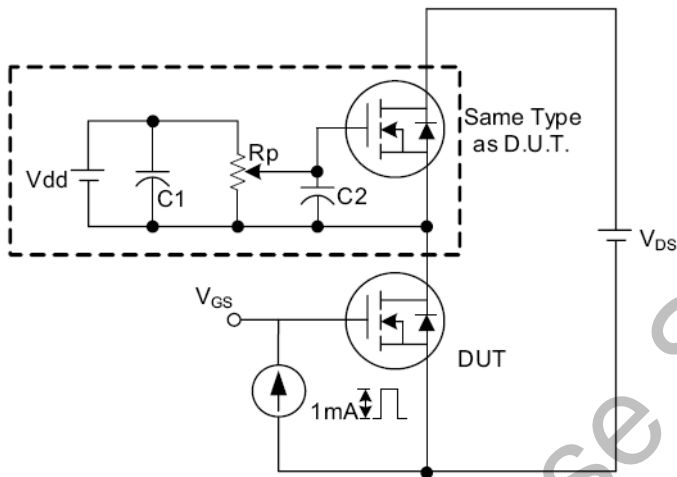


Fig. 2.2 Switching Waveforms
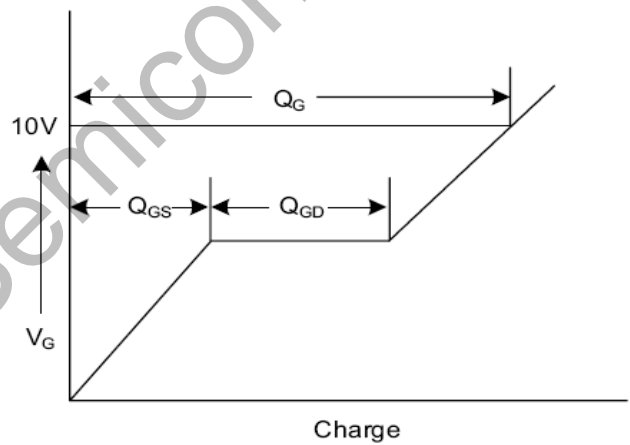


Fig. 3 . 1 Gate Charge Test Circuit



Fig. 3 . 2 Gate Charge Waveform
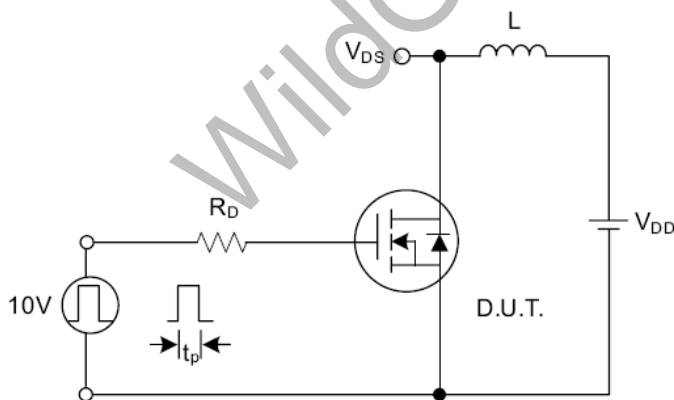


Fig. 4.1 Unclamped Inductive Switching Test Circuit



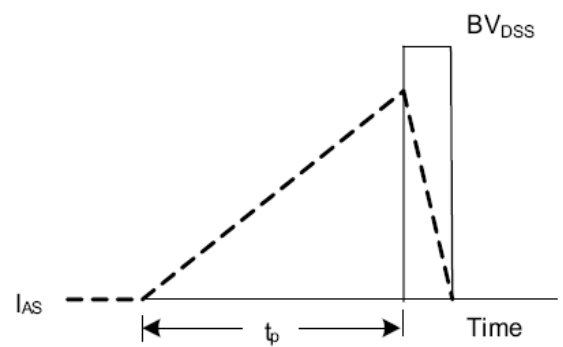Fig. 4.2 Unclamped Inductive Switching Waveforms

## Package Dimension

TO-220F

Unit: mm
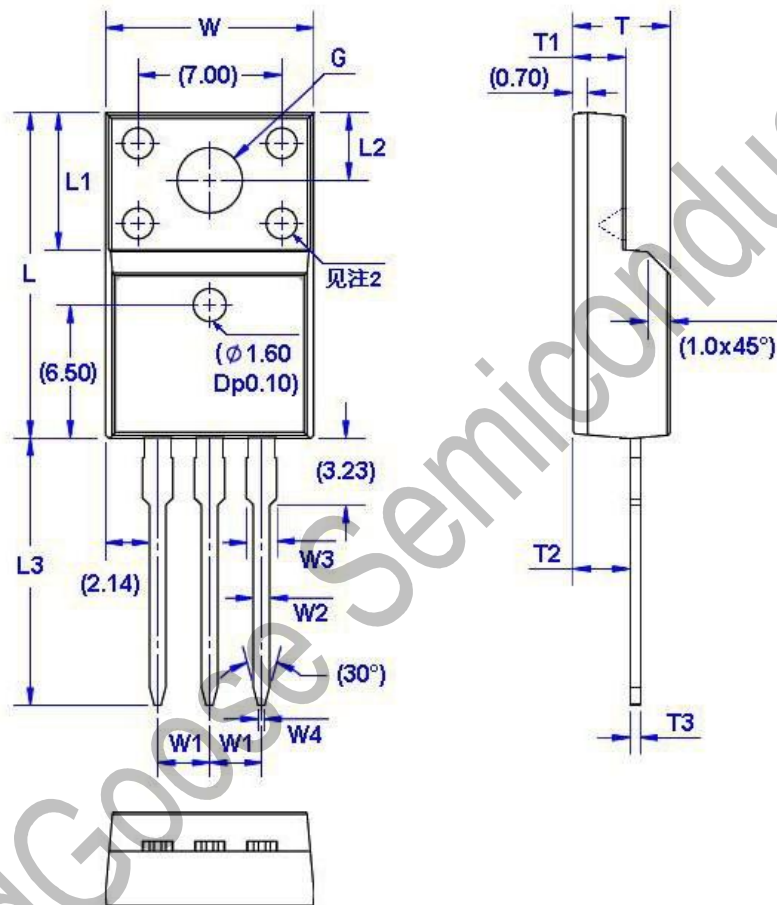


| Symbol | Size | | Symbol | Size | | Symbol | Size | | Symbol | Size | |
|--------|------|------|--------|------|------|--------|------|------|--------|------|------|
| | Min | Max | | Min | Max | | Min | Max | | Min | Max |
| W | 9.96 | 10.36 | W4 | 0.25 | 0.45 | L3 | 12.78 | 13.18 | T3 | 0.45 | 0.60 |
| W1 | 2.54 (TYP) | | L | 15.67 | 16.07 | T | 4.50 | 4.90 | G(Φ) | 3.08 | 3.28 |
| W2 | 0.70 | 0.90 | L1 | 6.48 | 6.88 | T1 | 2.34 | 2.74 | | | |
| W3 | 1.24 | 1.47 | L2 | 3.20 | 3.40 | T2 | 2.56 | 2.96 | | | |

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