# CRMFGH0604A

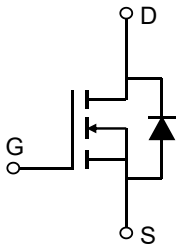
## N-Channel 60V, 4.3mΩ Typ. Power MOSFET

## Description

### Features

- 60V, 60A

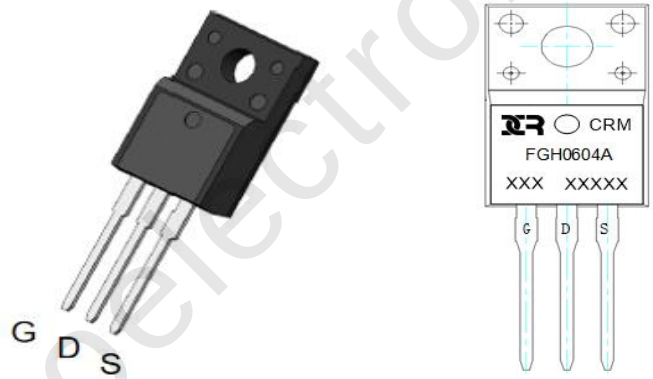
  $R_{DS(ON)}$ Typ = 4.3mΩ @ $V_{GS}$ = 10V
- Advanced Split Gate Trench Technology
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- 100% UIS TESTED!
- 100% ΔVds TESTED!




**Schematic Diagram**

### Application

- Load Switch
- PWM Application
- Power Management




**Marking and Pin Assignment**

### Package Marking and Ordering Information

| Device | Marking | Package | Outline | TUBE(pcs) | Inner Box (pcs) | Per Carton (pcs) |
|---|---|---|---|---|---|---|
| CRMFGH0604A | CRMFGH0604A | TO-220F-3L | TUBE | 50 | 1000 | 5000 |

### Absolute Maximum Ratings (@ $T_J$ = 25°C unless otherwise specified)

| Symbol | Parameter | | Value | Units |
|---|---|---|---|---|
| $V_{DS}$ | Drain-to-Source Voltage | | 60 | V |
| $V_{GS}$ | Gate-to-Source Voltage | | ±20 | V |
| $I_D$ | Continuous Drain Current | $T_C$ = 25°C | 60 | A |
| | | $T_C$ = 100°C | 36 | A |
| $I_{DM}$ | Pulsed Drain Current [1] | | 240 | A |
| $E_{AS}$ | Single Pulsed Avalanche Energy [2] | | 132 | mJ |
| $P_D$ | Power Dissipation | $T_C$= 25°C | 37 | W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient [3] | | 72 | °C/W |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | | 3.3 | °C/W |
| $T_J$, $T_{STG}$ | Junction & Storage Temperature Range | | -55 to 150 | °C |

## Electrical Characteristics ($T_J$ = 25°C unless otherwise specified)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $I_D$ = 250μA, $V_{GS}$ = 0V | 60 | - | - | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 60V, $V_{GS}$ = 0V | - | - | 1.0 | μA |
| $I_{GSS}$ | Gate-Body Leakage Current | $V_{DS}$ = 0V, $V_{GS}$ = ±20V | - | - | ±100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 2.4 | 2.8 | 3.6 | V |
| $R_{DS(ON)}$ | Static Drain-Source ON-Resistance(4) | $V_{GS}$ = 10V, $I_D$ = 20A | - | 4.3 | 5.6 | mΩ |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$ = 0V, $V_{DS}$ = 30V, f = 1MHz | - | 1563 | - | pF |
| $C_{oss}$ | Output Capacitance | | - | 580 | - | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 14 | - | pF |
| $Q_g$ | Total Gate Charge | $V_{GS}$ = 0 to 10V $V_{DS}$ = 30V, $I_D$ = 20A | - | 29 | - | nC |
| $Q_{gs}$ | Gate Source Charge | | - | 8.3 | - | nC |
| $Q_{gd}$ | Gate Drain("Miller") Charge | | - | 5.8 | - | nC |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On DelayTime | $V_{GS}$ = 10V, $V_{DD}$ = 30V $I_D$= 20A, $R_{GEN}$ = 4.5Ω | - | 10 | - | ns |
| $t_r$ | Turn-On Rise Time | | - | 28 | - | ns |
| $t_{d(off)}$ | Turn-Off DelayTime | | - | 20 | - | ns |
| $t_f$ | Turn-Off Fall Time | | - | 25 | - | ns |
| **Drain-Source Diode Characteristics and Max Ratings** | | | | | | |
| $I_S$ | Maximum Continuous Drain to Source Diode Forward Current | | - | - | 60 | A |
| $I_{SM}$ | Maximum Pulsed Drain to Source Diode Forward Current | | - | - | 240 | A |
| $V_{SD}$ | Drain to Source Diode Forward Voltage | $V_{GS}$ = 0V, $I_S$ =20A | - | - | 1.2 | V |
| trr | Body Diode Reverse Recovery Time | $I_F$ = 20A, di/dt = 100A/us | - | 31 | - | ns |
| Qrr | Body Diode Reverse Recovery Charge | | - | 19 | - | nC |

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2. $E_{AS}$ condition: Starting $T_J$=25°C, $V_{DD}$=30V, $V_G$=10V, $R_G$=25ohm, L=0.5mH, $I_{AS}$=23A
3. $R_{\theta JA}$ is measured with the device mounted on a 1inch$^2$ pad of 2oz copper FR4 PCB
4. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%.

## Typical Performance Characteristics

Figure 1: Output Characteristics

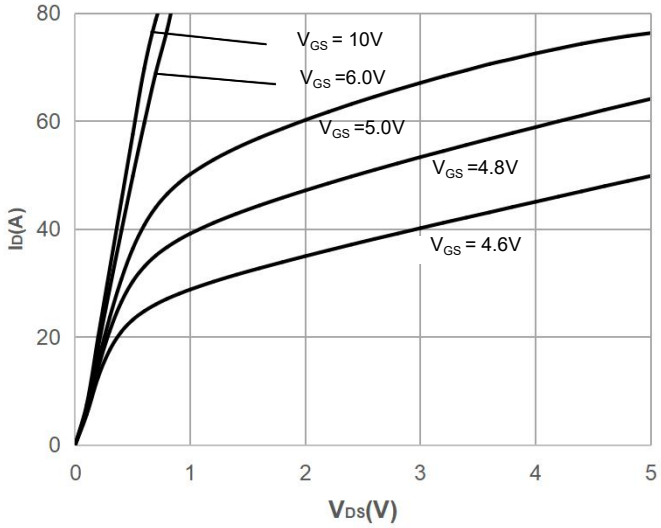



Figure 2: Typical Transfer Characteristics

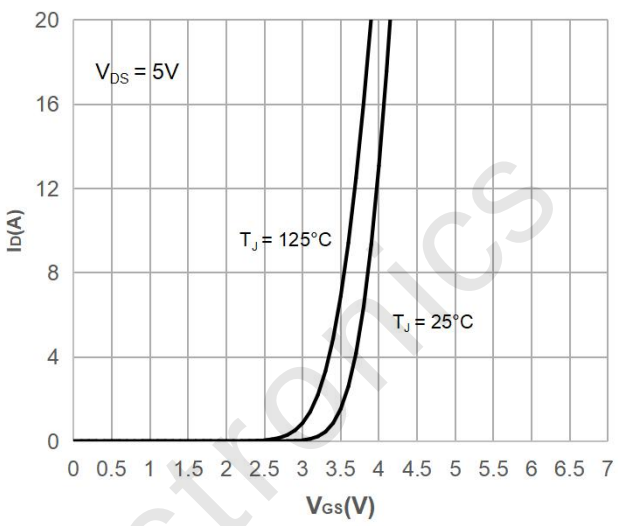



Figure 3: On-resistance vs. Drain Current

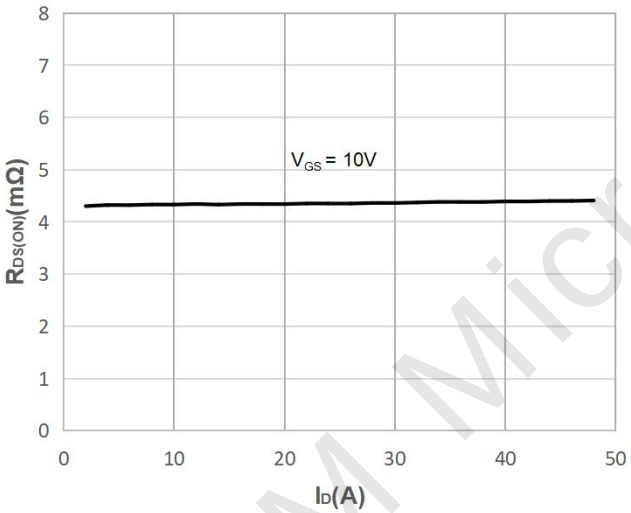



Figure 4: Body Diode Characteristics

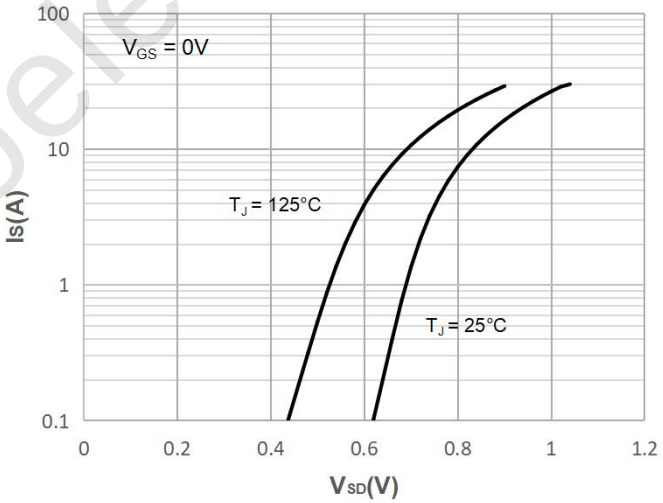



Figure 5: Gate Charge Characteristics

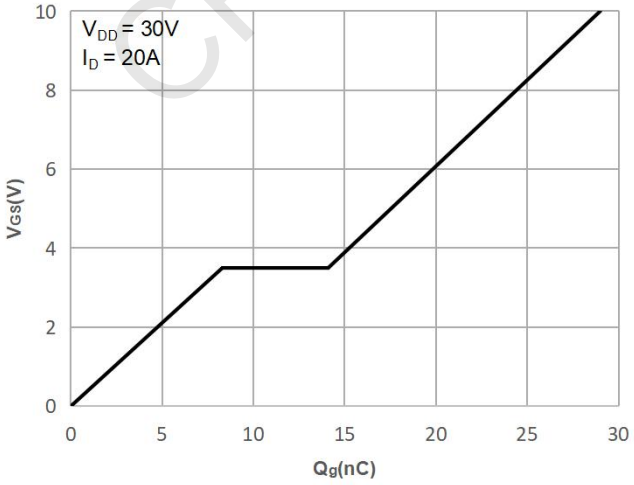
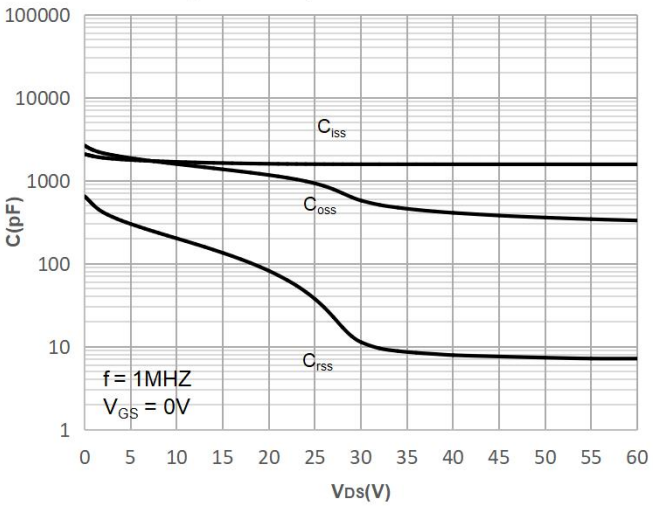



Figure 6: Capacitance Characteristics



## Typical Performance Characteristics

Figure 7: Normalized Breakdown voltage vs. Junction Temperature

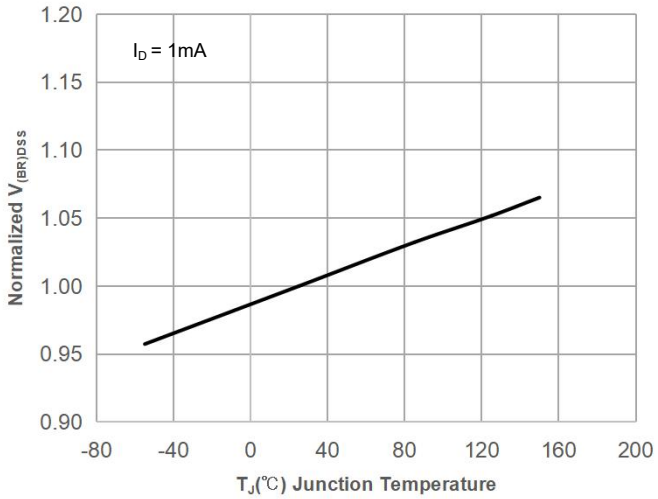



Figure 8: Normalized on Resistance vs. Junction Temperature

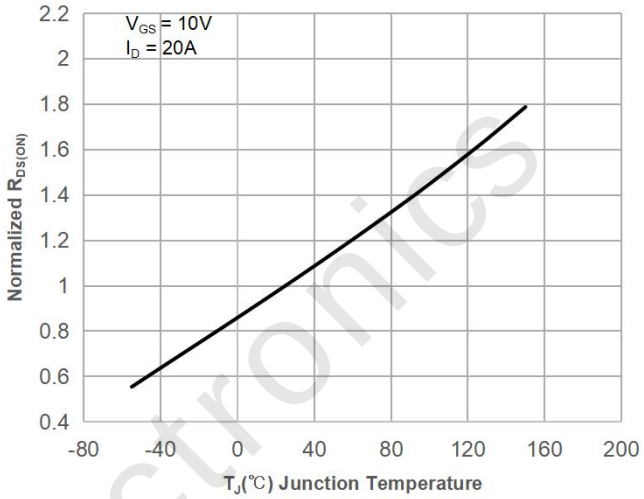



Figure 9: Maximum Safe Operating Area

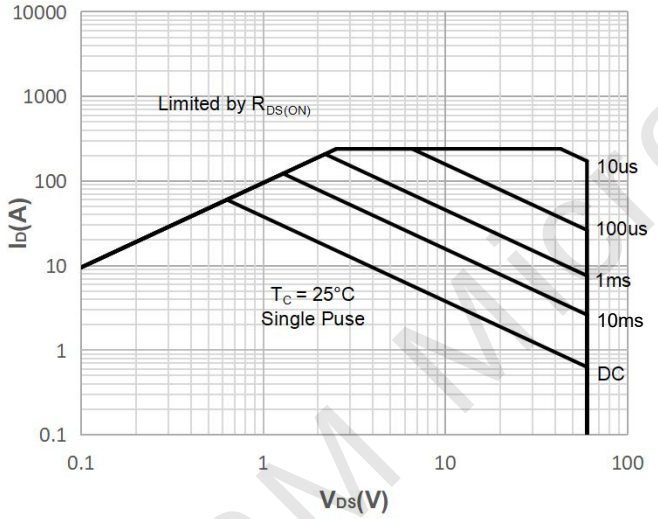



Figure 10: Maximum Continuous Drian Current vs. Case Temperature

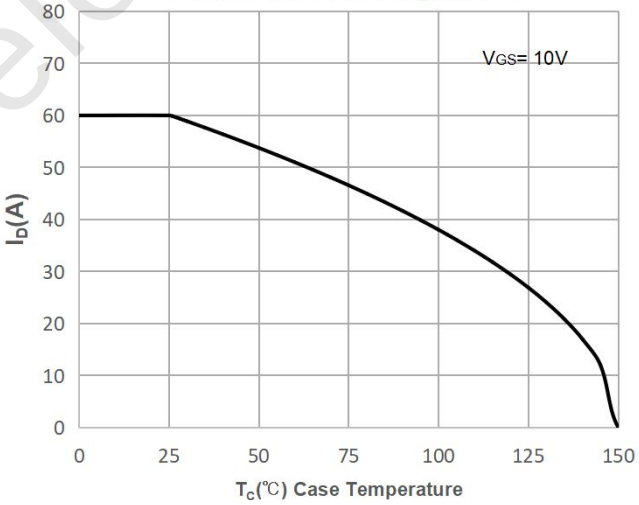



Figure 11: Normalized Maximum Transient Thermal Impedance

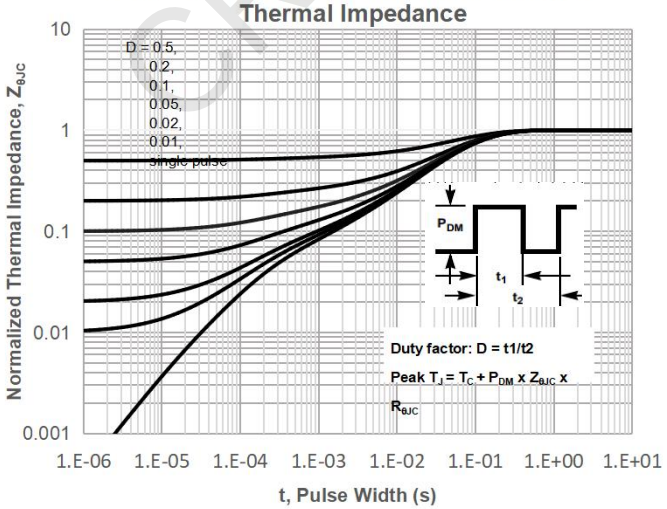
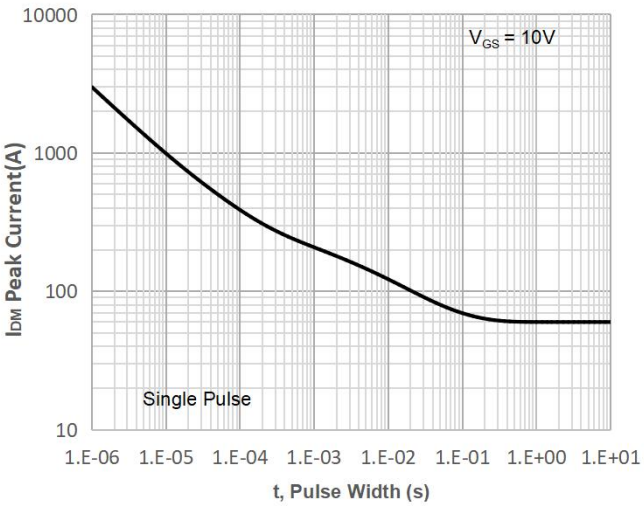



Figure 12: Peak Current Capacity



## Test Circuit

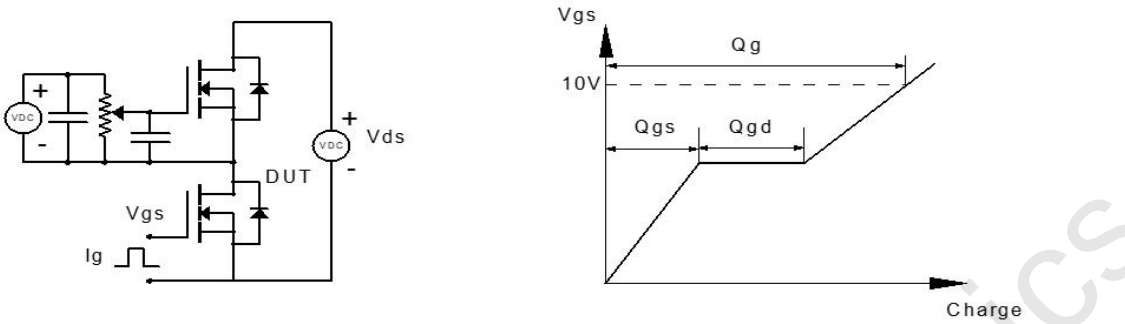



**Figure 1: Gate Charge Test Circuit & Waveform**

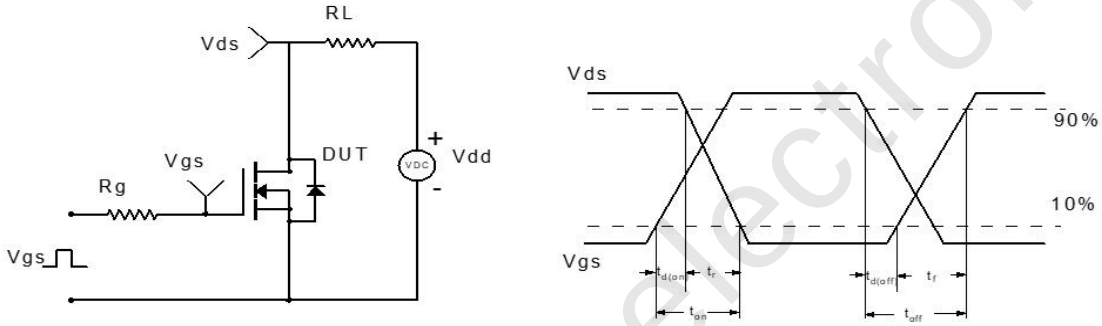



**Figure 2: Resistive Switching Test Circuit & Waveform**

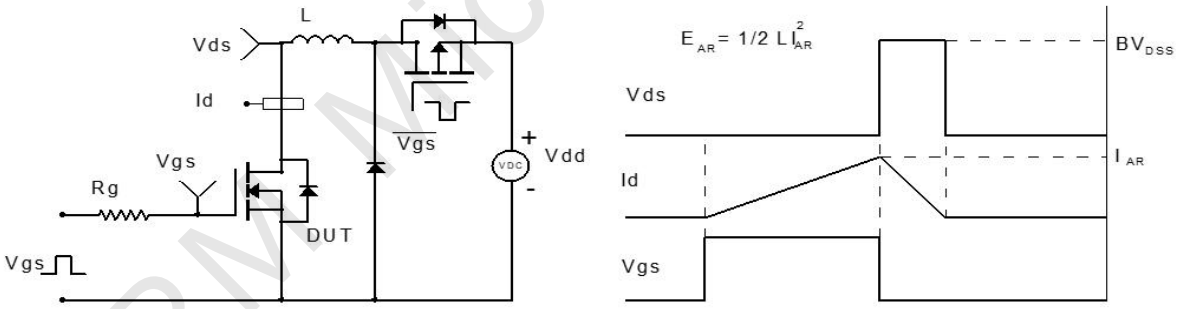



**Figure 3: Unclamped Inductive Switching Test Circuit& Waveform**

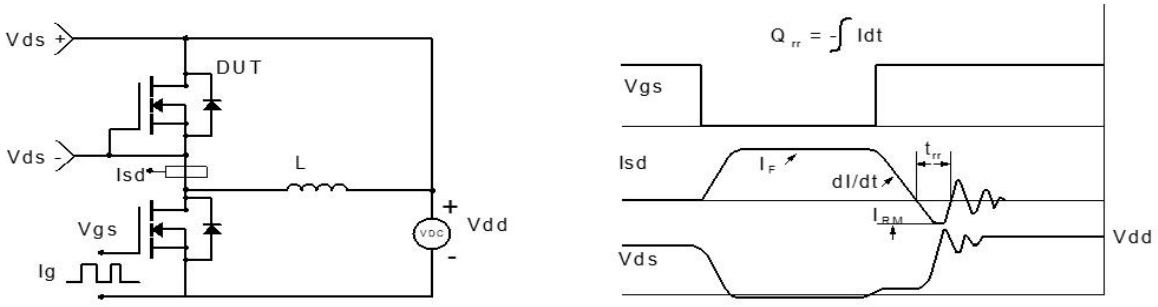
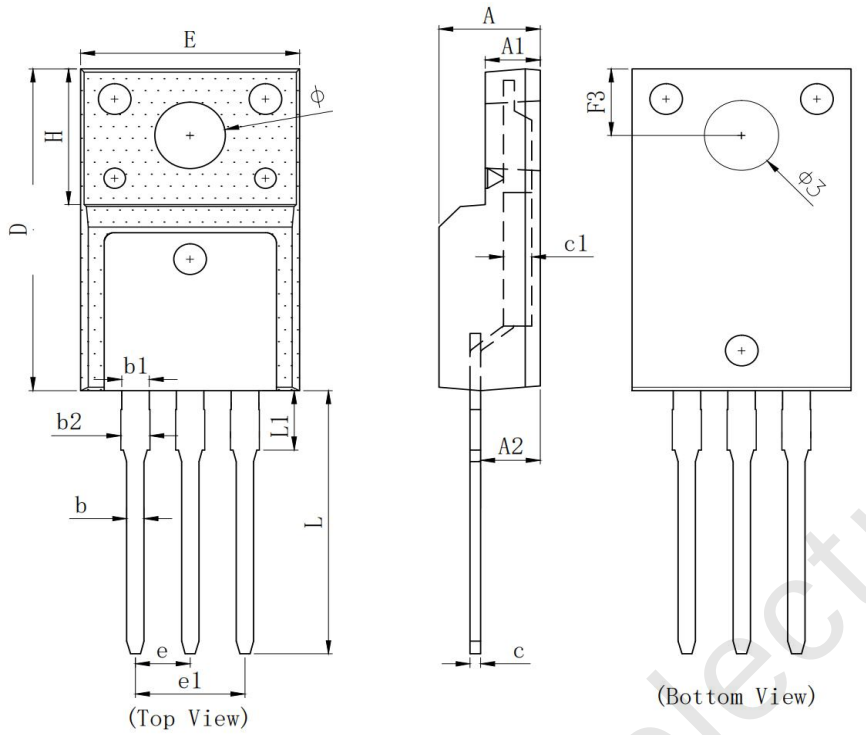



**Figure 4: Diode Recovery Test Circuit & Waveform**

## Package Mechanical Data(TO-220F-3L)




| SYMBOL | MILLIMETER | | |
|---|---|---|---|
| | MIN | Typ. | MAX |
| A | 4.500 | 4.700 | 4.900 |
| A1 | 2.340 | 2.540 | 2.740 |
| A2 | 2.560 | 2.760 | 2.960 |
| b | 0.700 | 0.800 | 0.950 |
| b1 | 1.180 | 1.280 | 1.430 |
| b2 | 1.250 | 1.350 | 1.550 |
| c | 0.400 | 0.500 | 0.650 |
| c1 | 1.200 | 1.300 | 1.350 |
| D | 15.570 | 15.870 | 16.170 |
| H | 6.700 REF | | |
| E | 9.960 | 10.160 | 10.360 |
| e | 2.540 BSC | | |
| e1 | 5.080 BSC | | |
| L | 12.680 | 12.980 | 13.280 |
| L1 | 2.780 | 2.930 | 3.080 |
| F3 | 3.150 | 3.300 | 3.450 |
| Φ | 3.030 | 3.180 | 3.450 |
| Φ3 | 3.150 | 3.450 | 3.650 |

(注：全尺寸测量时c1不测)

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