# GE04N70B

**N-CHANNEL ENHANCEMENT MODE POWER MOSFET**

| | |
|---|---|
| $BV_{DSS}$ | 650/700V |
| $R_{DS(ON)}$ | 2.4Ω |
| $I_D$ | 4A |

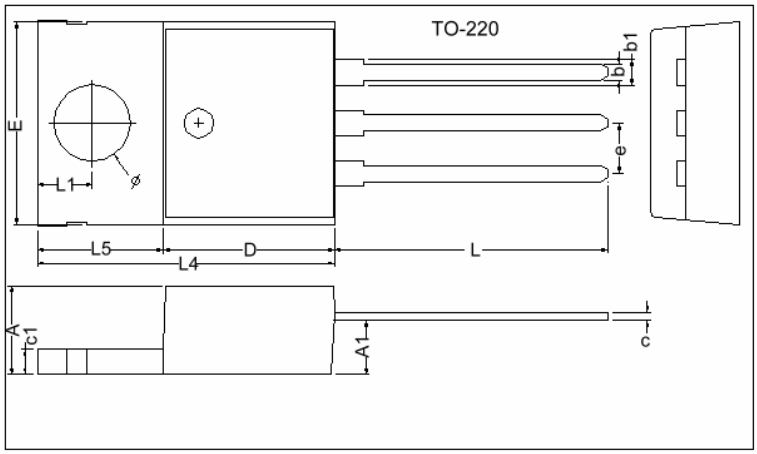
## Description

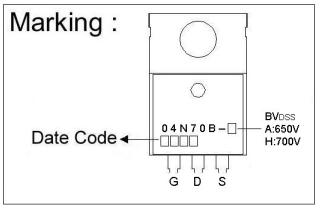
The GE04N70B series are specially designed as main switching devices for universal 90~265VAC off-line AC/DC converter applications. TO-220 type provide high blocking voltage to overcome voltage surge and sag in the toughest power system with the best combination of fast switching, ruggedized design and cost-effectiveness.
The TO-220 package is universally preferred for all commercial-industrial applications. The device is suited for switch mode power supplies, DC-AC converters and high current high speed switching circuits.

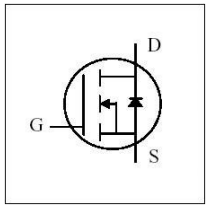
## Features

*Simple Drive Requirement
*Dynamic dv/dt Rating
*Repetitive Avalanche Rated
*Fast Switching

## Package Dimensions




| REF. | Millimeter | | REF. | Millimeter | |
|---|---|---|---|---|---|
| | Min. | Max. | | Min. | Max. |
| A | 4.40 | 4.80 | c1 | 1.25 | 1.45 |
| b | 0.76 | 1.00 | b1 | 1.17 | 1.47 |
| c | 0.36 | 0.50 | L | 13.25 | 14.25 |
| D | 8.60 | 9.00 | e | 2.54 REF. | |
| E | 9.80 | 10.4 | L1 | 2.60 | 2.89 |
| L4 | 14.7 | 15.3 | Ø | 3.71 | 3.96 |
| L5 | 6.20 | 6.60 | A1 | 2.60 | 2.80 |

## Absolute Maximum Ratings

| Parameter | Symbol | Ratings | Unit |
|---|---|---|---|
| Drain-Source Voltage A/H | $V_{DS}$ | 650/700 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Continuous Drain Current , $V_{GS}$@10V | $I_D$ @Tc=25℃ | 4 | A |
| Continuous Drain Current , $V_{GS}$@10V | $I_D$ @Tc=100℃ | 2.5 | A |
| Pulsed Drain Current[1,] | $I_{DM}$ | 15 | A |
| Total Power Dissipation | $P_D$ @Tc=25℃ | 62.5 | W |
| Linear Derating Factor | | 0.5 | W/℃ |
| Single Pulse Avalanche Energy[2] | $E_{AS}$ | 100 | mJ |
| Avalanche Current | $I_{AR}$ | 4 | A |
| Repetitive Avalanche Energy | $E_{AR}$ | 4 | mJ |
| Operating Junction and Storage Temperature Range | Tj, Tstg | -55 ~ +150 | ℃ |

## Thermal Data

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance Junction-case Max. | Rthj-c | 2.0 | ℃/W |
| Thermal Resistance Junction-ambient Max. | Rthj-a | 62 | ℃/W |

## Electrical Characteristics(Tj = 25℃ Unless otherwise specified)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | 650 | - | - | V | $V_{GS}$=0, $I_D$=250uA A |
| | | 700 | - | - | V | $V_{GS}$=0, $I_D$=250uA H |
| Breakdown Voltage Temperature Coefficient | $\triangle BV_{DSS}/\triangle Tj$ | - | 0.6 | - | V/℃ | Reference to 25℃, $I_D$=1mA |
| Gate Threshold Voltage | $V_{GS(th)}$ | 2.0 | - | 4.0 | V | $V_{DS}$=$V_{GS}$, $I_D$=250uA |
| Forward Transconductance | $g_{fs}$ | - | 2.5 | - | S | $V_{DS}$=50V, $I_D$=2A |
| Gate-Source Leakage Current | $I_{GSS}$ | - | - | ±100 | nA | $V_{GS}$= ±20V |
| Drain-Source Leakage Current(Tj=25℃) | $I_{DSS}$ | - | - | 100 | uA | $V_{DS}$=600V, $V_{GS}$=0 |
| Drain-Source Leakage Current(Tj=150℃) | | - | - | 500 | uA | $V_{DS}$=480V, $V_{GS}$=0 |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | - | - | 2.4 | Ω | $V_{GS}$=10V, $I_D$=2A |
| Total Gate Charge[3] | $Q_g$ | - | 16.7 | - | nC | $I_D$=4A<br>$V_{DS}$=480V<br>$V_{GS}$=10V |
| Gate-Source Charge | $Q_{gs}$ | - | 4.1 | - | | |
| Gate-Drain (“Miller”) Change | $Q_{gd}$ | - | 4.9 | - | | |
| Turn-on Delay Time[3] | $T_{d(on)}$ | - | 11 | - | ns | $V_{DD}$=300V<br>$I_D$=4A<br>$V_{GS}$=10V<br>$R_G$=10Ω<br>$R_D$=75Ω |
| Rise Time | $T_r$ | - | 8.3 | - | | |
| Turn-off Delay Time | $T_{d(off)}$ | - | 23.8 | - | | |
| Fall Time | $T_f$ | - | 8.2 | - | | |
| Input Capacitance | $C_{iss}$ | - | 950 | - | pF | $V_{GS}$=0V<br>$V_{DS}$=25V<br>f=1.0MHz |
| Output Capacitance | $C_{oss}$ | - | 65 | - | | |
| Reverse Transfer Capacitance | $C_{rss}$ | - | 6 | - | | |

## Source-Drain Diode

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| Forward On Voltage[3] | $V_{SD}$ | - | - | 1.5 | V | $I_S$=4A, $V_{GS}$=0V, Tj=25℃ |
| Continuous Source Current(Body Diode) | $I_S$ | - | - | 4 | A | $V_D$= $V_G$=0V, $V_S$=1.5V |
| Pulsed Source Current (Body Diode)[1] | $I_{SM}$ | - | - | 15 | A | |

Notes: 1. Pulse width limited by safe operating area.

2. Staring Tj=25℃, $V_{DD}$=50V, L=25mH, $R_G$=25Ω, $I_{AS}$=4A.

3. Pulse width≦300us, duty cycle≦2%.

## Characteristics Curve

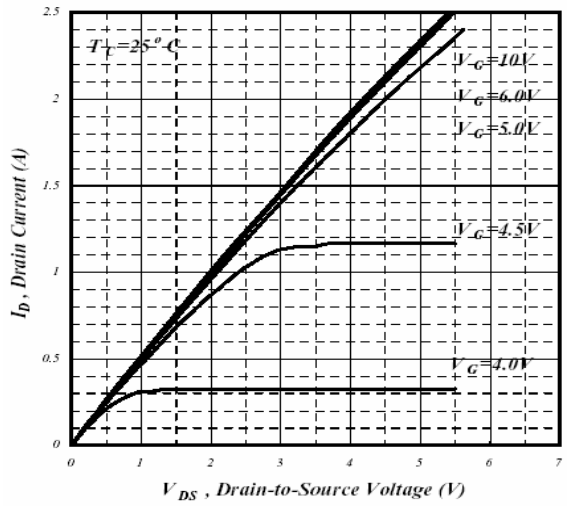



**Fig 1. Typical Output Characteristics**

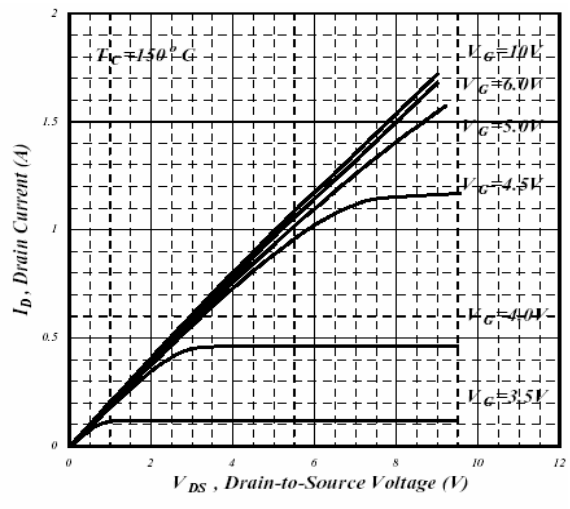



**Fig 2. Typical Output Characteristics**

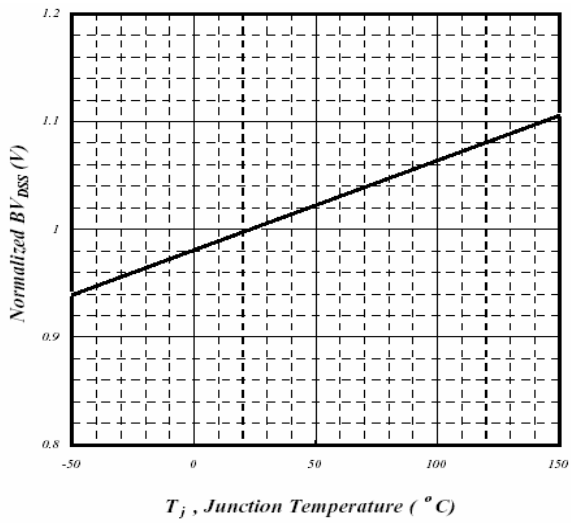



**Fig 3. Normalized BVDSS v.s. Junction Temperature**

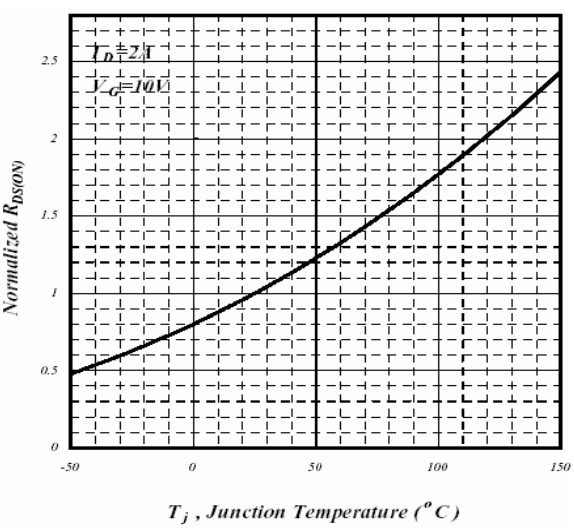



**Fig 4. Normalized On-Resistance v.s. Junction Temperature**

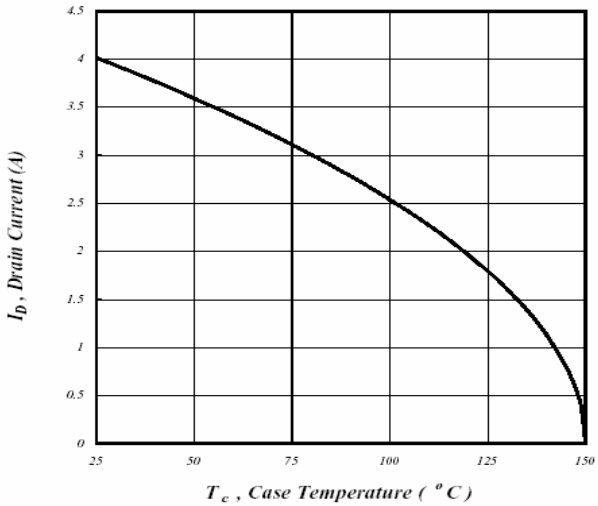



**Fig 5. Maximum Drain Current v.s. Case Temperature**

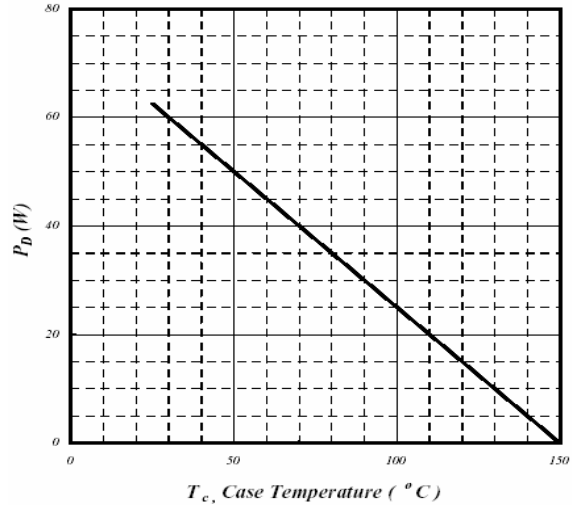



**Fig 6. Typical Power Dissipation**

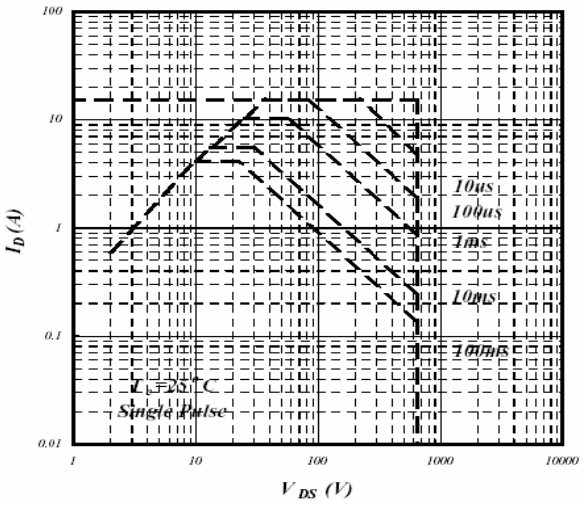



**Fig 7. Maximum Safe Operating Area**

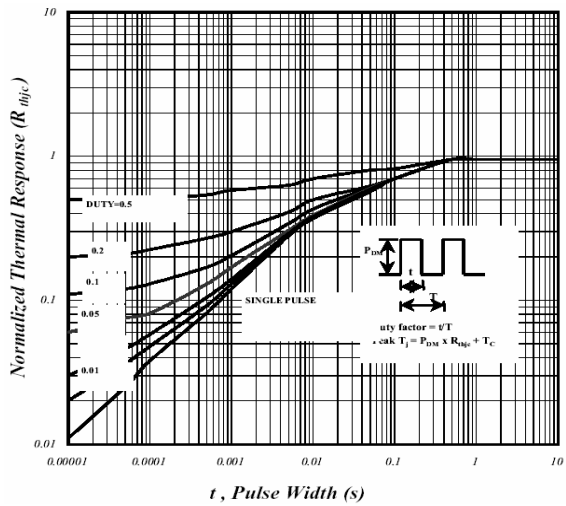



**Fig 8. Effective Transient Thermal Impedance**

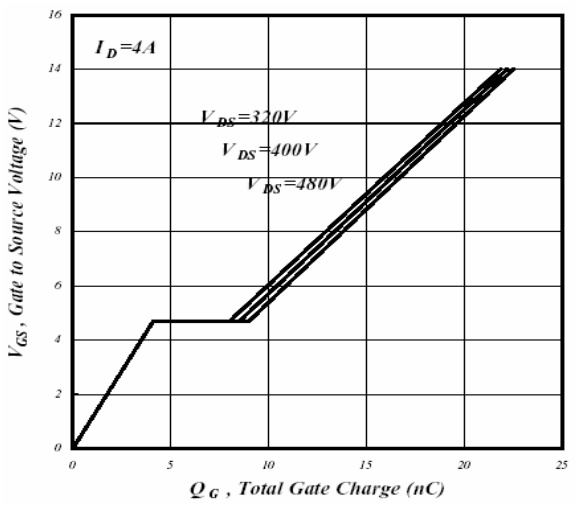



**Fig 9. Gate Charge Characteristics**

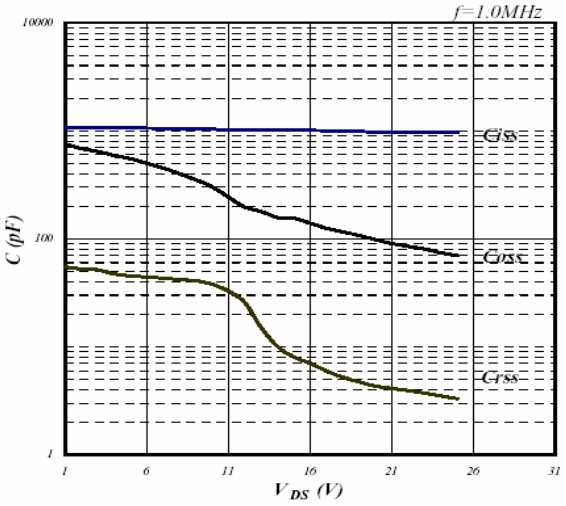



**Fig 10. Typical Capacitance Characteristics**

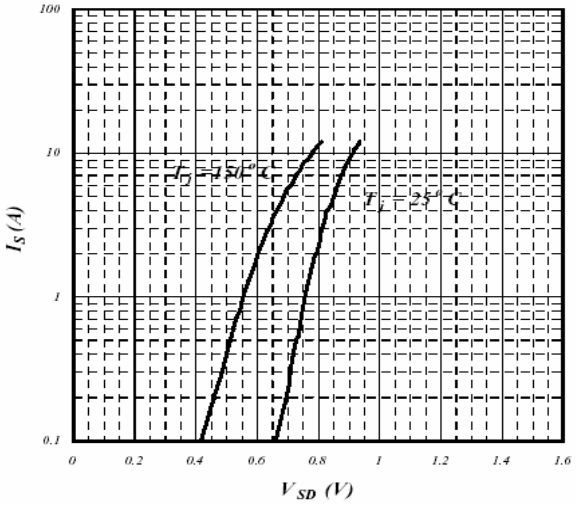



**Fig 11. Forward Characteristics of Reverse Diode**

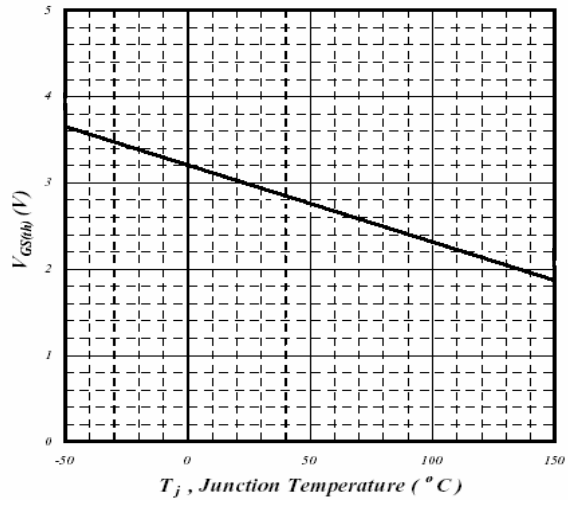



**Fig 12. Gate Threshold Voltage v.s. Junction Temperature**

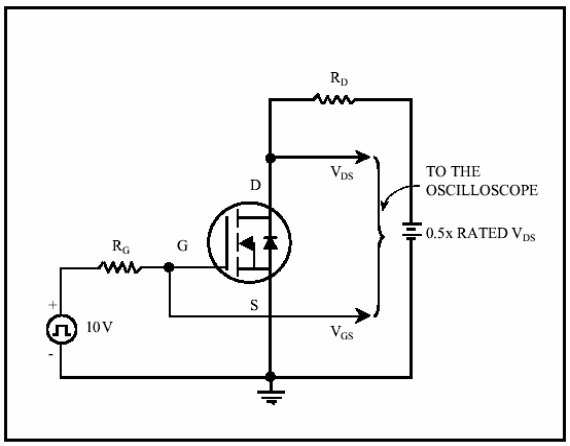



**Fig 13. Switching Time Circuit**

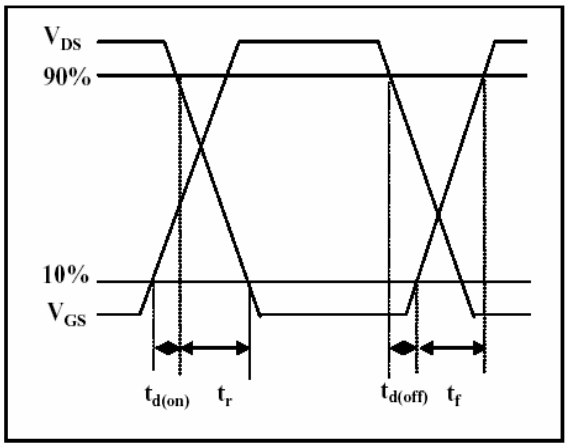



**Fig 14. Switching Time Waveform**

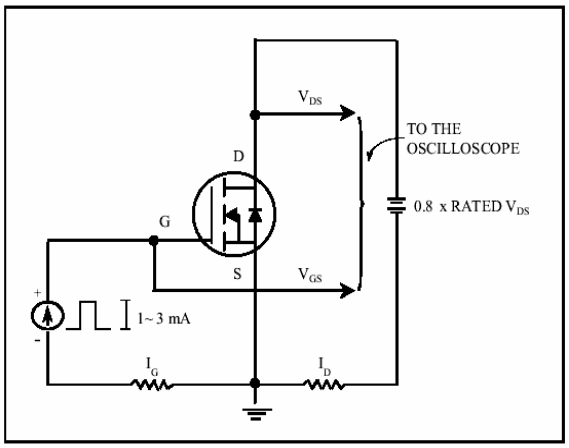



**Fig 15. Gate Charge Circuit**

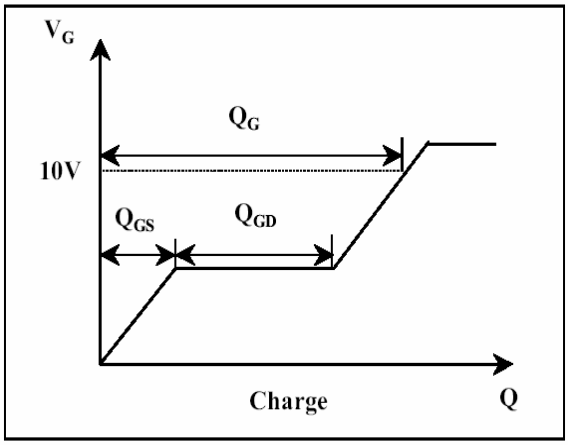



**Fig 16. Gate Charge Waveform**

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