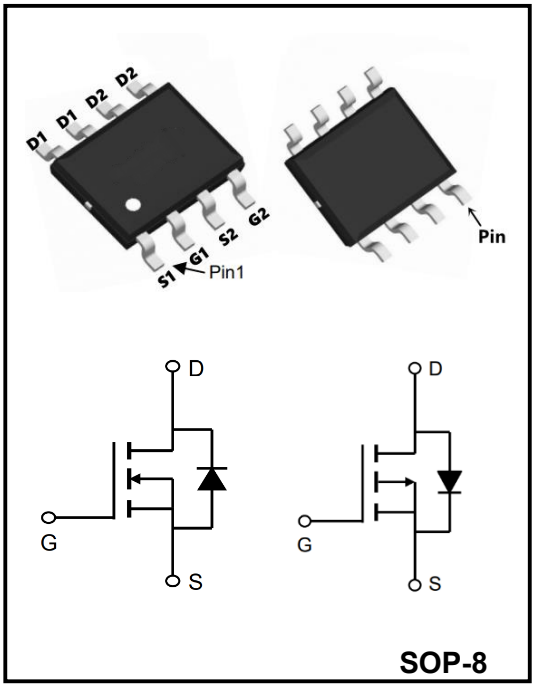
## 40V N+P-Channel Enhancement Mode MOSFET

### MAIN CHARACTERISTICS

| | |
|---|---|
| $I_D$ | 18A |
| $V_{DSS}$ | 40V |
| $R_{DSON}$-typ(@$V_{GS}$=10V) | ＜18mΩ(Type:12 mΩ) |
| $I_D$ | 16A |
| $V_{DSS}$ | -40V |
| $R_{DSON}$-typ(@$V_{GS}$=-10V) | ＜28mΩ(Type:20 mΩ) |




### Application

- BLDC
- Hight ESD

### Product Specification Classification

| Part Number | Package | Marking | Pack |
|---|---|---|---|
| YFW15G04S | SOP-8 | YFW 15G04S | 3000PCS/Tape |

### Absolute Maximum Ratings ($T_C$=25℃ unless otherwise noted)

| Parameter | Symbol | Rating | | Units |
|---|---|---|---|---|
| | | N-Ch | P-Ch | |
| Drain-Source Voltage | $V_{DS}$ | 40 | -40 | V |
| Gate-Source Voltage | $V_{GS}$ | ±25 | ±25 | V |
| Continuous Drain Current, $V_{GS}$ @ 10V[1] | $I_D$@$T_C$=25℃ | 18 | 16 | A |
| Continuous Drain Current, $V_{GS}$ @ 10V[1] | $I_D$@$T_C$=100℃ | 13 | -11 | A |
| Pulsed Drain Current[2] | $I_{DM}$ | 54 | -48 | A |
| Single Pulse Avalanche Energy[3] | EAS | 28 | 66 | mJ |
| Avalanche Current | $I_{AS}$ | 17.8 | -27.2 | A |
| Total Power Dissipation[4] | $P_D$@$T_C$=25℃ | 25 | 31.3 | W |
| Storage Temperature Range | $T_{STG}$ | -55 to 150 | -55 to 150 | ℃ |
| Operating Junction Temperature Range | $T_J$ | -55 to 150 | -55 to 150 | ℃ |
| Thermal Resistance Junction-Ambient [1] | $R_{\theta JA}$ | 62 | 62 | ℃/W |
| Thermal Resistance Junction-Case[1] | $R_{\theta JC}$ | 5 | 5 | ℃/W |

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

| Parameter | Conditions | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=250uA | BVDSS | 40 | 46 | --- | V |
| BVDSS Temperature Coefficient | Reference to 25℃ , $I_D$=1mA | △BVDSS/△TJ | --- | 0.032 | --- | V/℃ |
| Static Drain-Source On-Resistance[2] | $V_{GS}$=10V , $I_D$=15A | RDS(ON) | --- | 12 | 18 | mΩ |
| | $V_{GS}$=4.5V , $I_D$=10A | | --- | 18.4 | 24 | |
| Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =250uA | VGS(th) | 1.2 | 1.6 | 2.5 | V |
| $V_{GS(th)}$ Temperature Coefficient | | △$V_{GS(th)}$ | --- | -4.8 | --- | mV/℃ |
| Drain-Source Leakage Current | $V_{DS}$=32V , $V_{GS}$=0V , $T_J$=25℃ | IDSS | --- | --- | 1 | uA |
| | $V_{DS}$=32V , $V_{GS}$=0V , $T_J$=55℃ | | --- | --- | 5 | |
| Gate-Source Leakage Current | $V_{GS}$=±25V , $V_{DS}$=0V | IGSS | --- | --- | ±100 | nA |
| Forward Transconductance | $V_{DS}$=5V , $I_D$=15A | gfs | --- | 34 | --- | S |
| Gate Resistance | $V_{DS}$=0V , $V_{GS}$=0V , f=1MHz | $R_g$ | --- | 2.1 | --- | Ω |
| Total Gate Charge (4.5V) | $V_{DS}$=32V , $V_{GS}$=4.5V , $I_D$=15A | $Q_g$ | --- | 10 | --- | nC |
| Gate-Source Charge | | Qgs | --- | 2.55 | --- | |
| Gate-Drain Charge | | Qgd | --- | 4.8 | --- | |
| Turn-On Delay Time | $V_{DD}$=20V , $V_{GS}$=10V , $R_G$=3.3 $I_D$=15A | Td(on) | --- | 2.8 | --- | ns |
| Rise Time | | $T_r$ | --- | 12.8 | --- | |
| Turn-Off Delay Time | | Td(off) | --- | 21.2 | --- | |
| Fall Time | | $T_f$ | --- | 6.4 | --- | |
| Input Capacitance | $V_{DS}$=15V , $V_{GS}$=0V , f=1MHz | Ciss | --- | 1013 | --- | pF |
| Output Capacitance | | Coss | --- | 107 | --- | |
| Reverse Transfer Capacitance | | Crss | --- | 76 | --- | |
| Continuous Source Current[1,5] | $V_G$=$V_D$=0V , Force Current | IS | --- | --- | 40 | A |
| Pulsed Source Current[2,5] | | ISM | --- | --- | 85 | A |
| Diode Forward Voltage[2] | $V_{GS}$=0V , $I_S$=1A , $T_J$=25℃ | VSD | --- | --- | 1.2 | V |
| Reverse Recovery Time | IF=15A , dI/dt=100A/μs , $T_J$=25℃ | trr | --- | 10 | --- | nS |
| Reverse Recovery Charge | | $Q_{rr}$ | --- | 3.1 | --- | nC |

**Note :**

1、The data tested by surface mounted on a 1 inch$^2$ FR-4 board with 2OZ copper.

2、The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%

3、The power dissipation is limited by 150℃ junction temperature

4、The data is theoretically the same as $I_D$ and $I_{DM}$ , in real applications , should be limited by total power dissipation.

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

| Parameter | Conditions | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=-250uA | $BV_{DSS}$ | -40 | -45 | --- | V |
| $BV_{DSS}$ Temperature Coefficient | Reference to 25℃ , $I_D$=-1mA | $\triangle BV_{DSS}/\triangle T_J$ | --- | -0.012 | --- | V/℃ |
| Static Drain-Source On-Resistance[2] | $V_{GS}$=-10V , $I_D$=-8A | $R_{DS(ON)}$ | --- | 20 | 28 | mΩ |
| | $V_{GS}$=-4.5V , $I_D$=-4A | | --- | 32 | 42 | |
| Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =-250uA | $V_{GS(th)}$ | -1.0 | -1.6 | -2.5 | V |
| $V_{GS(th)}$ Temperature Coefficient | | $\triangle V_{GS(th)}$ | --- | 4.32 | --- | mV/℃ |
| Drain-Source Leakage Current | $V_{DS}$=-32V , $V_{GS}$=0V , $T_J$=25℃ | $I_{DSS}$ | --- | --- | 1 | uA |
| | $V_{DS}$=-32V , $V_{GS}$=0V , $T_J$=55℃ | | --- | --- | 5 | |
| Gate-Source Leakage Current | $V_{GS}$=±25V , $V_{DS}$=0V | $I_{GSS}$ | --- | --- | ±100 | nA |
| Forward Transconductance | $V_{DS}$=-5V , $I_D$=-8A | gfs | --- | 12.6 | --- | S |
| Gate Resistance | $V_{DS}$=0V , $V_{GS}$=0V , f=1MHz | $R_g$ | --- | 13 | 16 | |
| Total Gate Charge (-4.5V) | $V_{DS}$=-20V , $V_{GS}$=-4.5V , $I_D$=-12A | $Q_g$ | --- | 9 | --- | nC |
| Gate-Source Charge | | $Q_{gs}$ | --- | 2.54 | --- | |
| Gate-Drain Charge | | $Q_{gd}$ | --- | 3.1 | --- | |
| Turn-On Delay Time | $V_{DD}$=-15V , $V_{GS}$=-10V , $R_G$=3.3Ω, $I_D$=-1A | $T_{d(on)}$ | --- | 19.2 | --- | ns |
| Rise Time | | $T_r$ | --- | 12.8 | --- | |
| Turn-Off Delay Time | | $T_{d(off)}$ | --- | 48.6 | --- | |
| Fall Time | | $T_f$ | --- | 4.6 | --- | |
| Input Capacitance | $V_{DS}$=-15V , $V_{GS}$=0V , f=1MHz | $C_{iss}$ | --- | 1004 | --- | pF |
| Output Capacitance | | $C_{oss}$ | --- | 108 | --- | |
| Reverse Transfer Capacitance | | $C_{rss}$ | --- | 80 | --- | |
| Continuous Source Current[1,5] | $V_G$=$V_D$=0V , Force Current | $I_S$ | --- | --- | -20 | A |
| Pulsed Source Current[2,5] | | $I_{SM}$ | --- | --- | -40 | A |
| Diode Forward Voltage[2] | $V_{GS}$=0V , $I_S$=-1A , $T_J$=25℃ | $V_{SD}$ | --- | --- | -1 | V |

**Note :**

1、The data tested by surface mounted on a 1 inch$^2$ FR-4 board with 2OZ copper.

2、The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%

3、The power dissipation is limited by 150℃ junction temperature

4、The data is theoretically the same as $I_D$ and $I_{DM}$ , in real applications , should be limited by total power dissipation.

## N-Channel Typical Characteristics

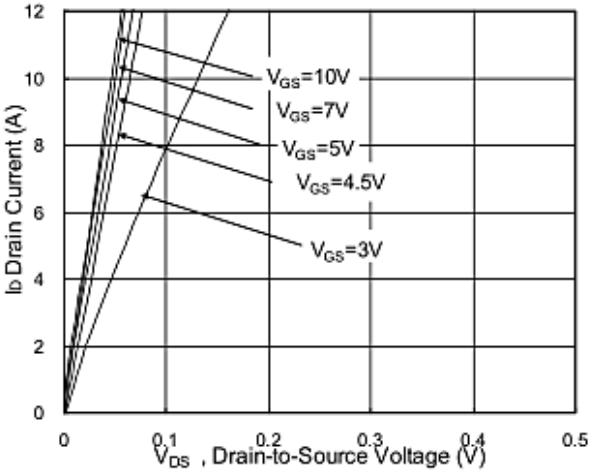



Fig.1 Typical Output Characteristics

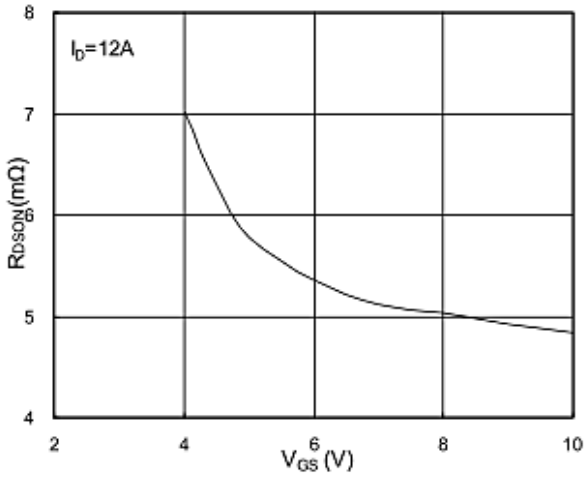



Fig.2 On-Resistance vs. G-S Voltage

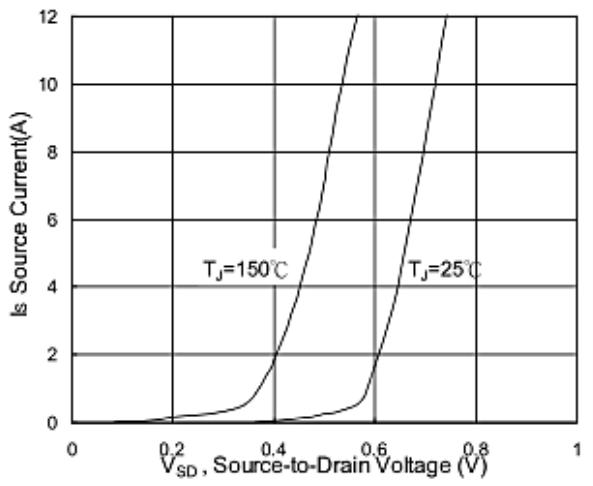



Fig.3 Forward Characteristics Of Reverse

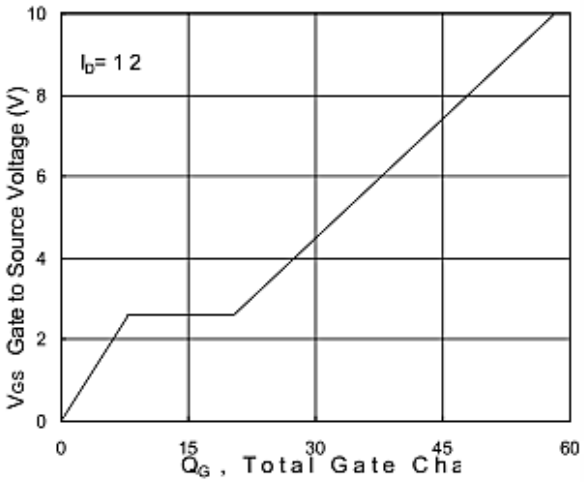



Fig.4 Gate-Charge Characteristics

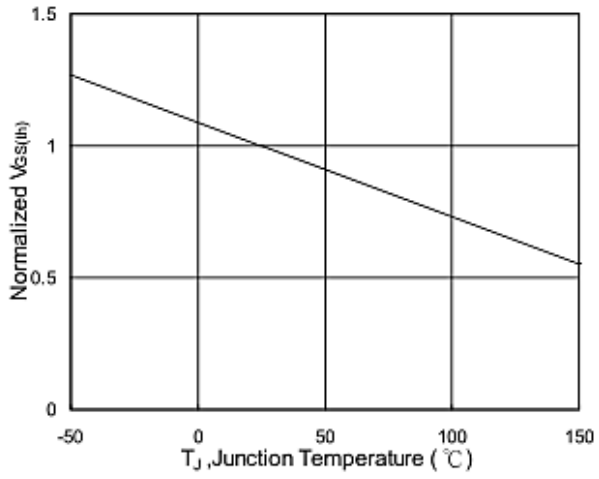



Fig.5 Normalized $V_{GS(th)}$ vs. $T_J$

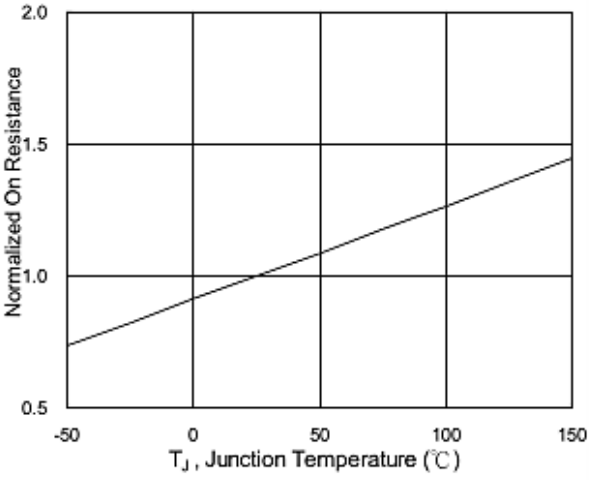



Fig.6 Normalized $R_{DSON}$ vs. $T_J$

## N-Channel Typical Characteristics

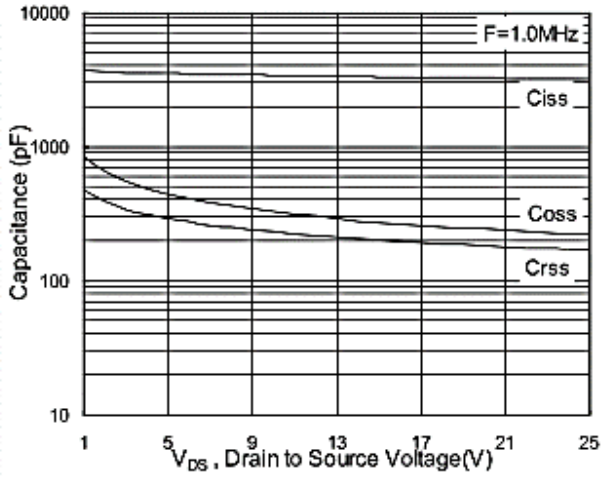



Fig.7 Capacitance

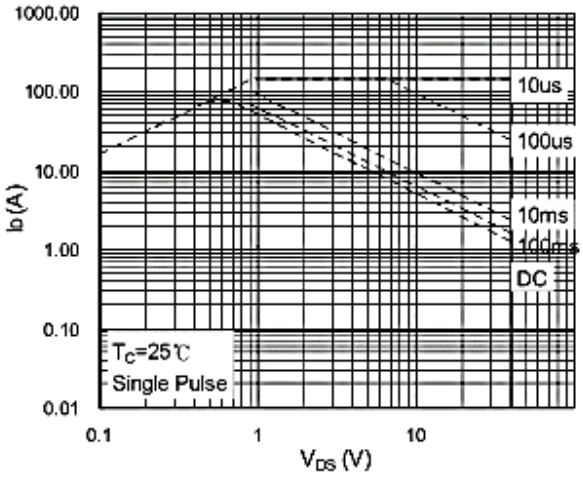



Fig.8 Safe Operating Area

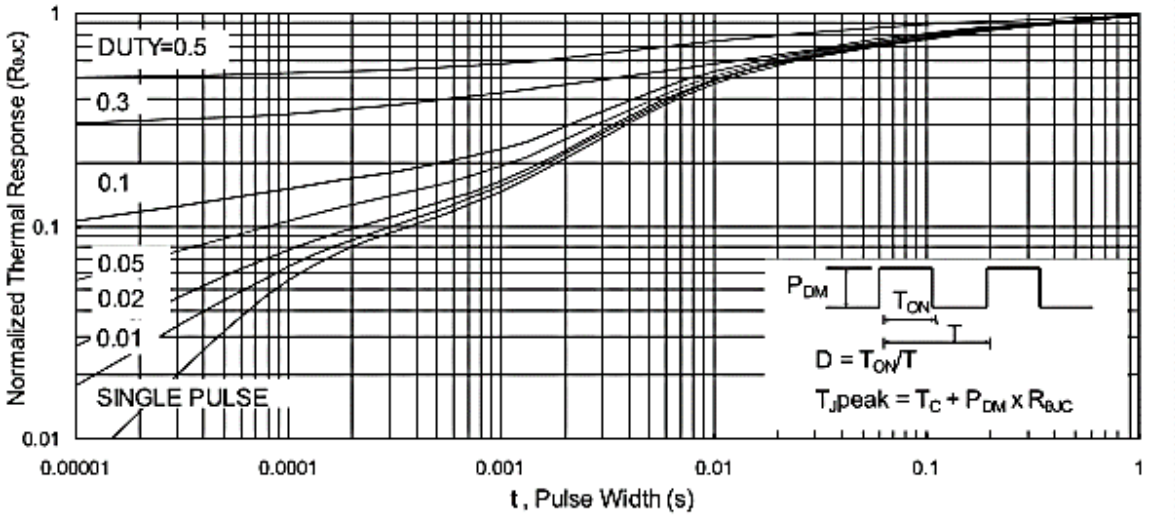



Fig.9 Normalized Maximum Transient Thermal Impedance

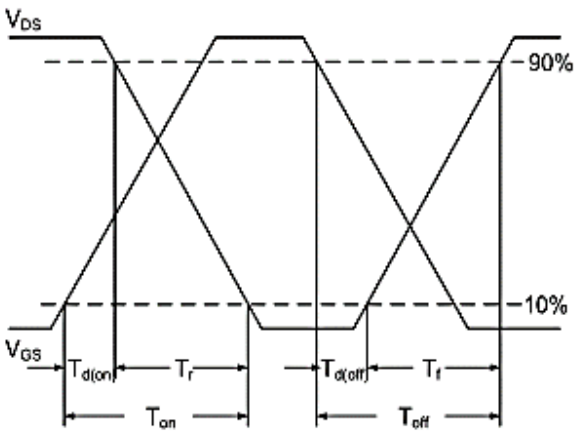



Fig.10 Switching Time Waveform

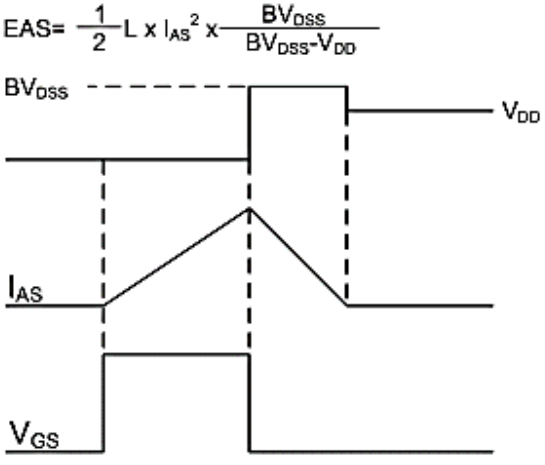



Fig.11 Unclamped Inductive Switching Wave

## P-Channel Typical Characteristics

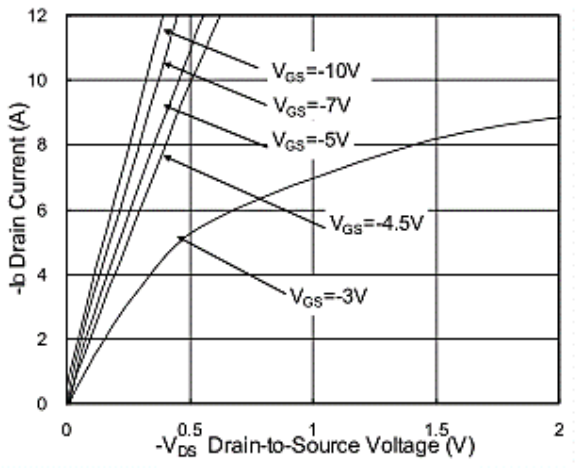



Fig.1 Typical Output Characteristics

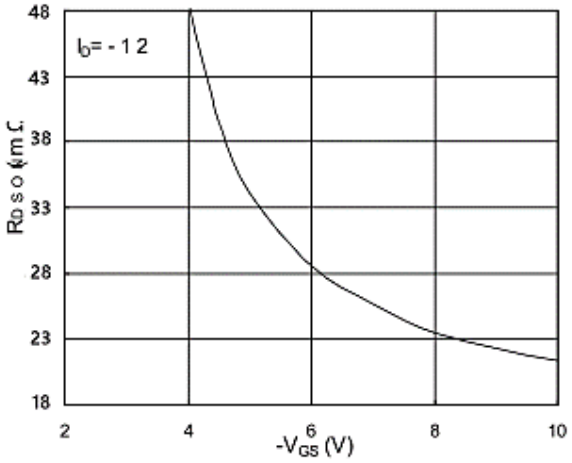



Fig.2 On-Resistance v.s Gate-Source

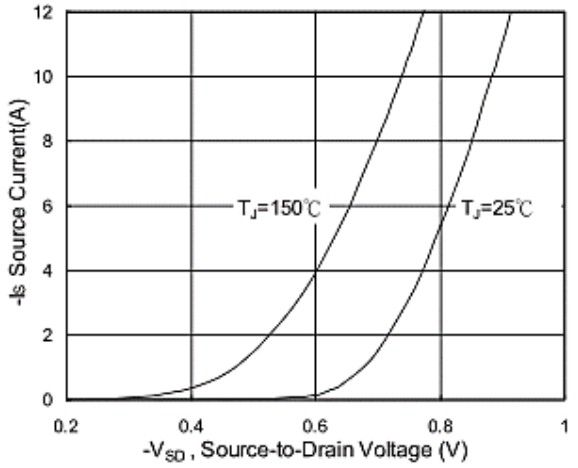



Fig.3 Forward Characteristics of Reverse

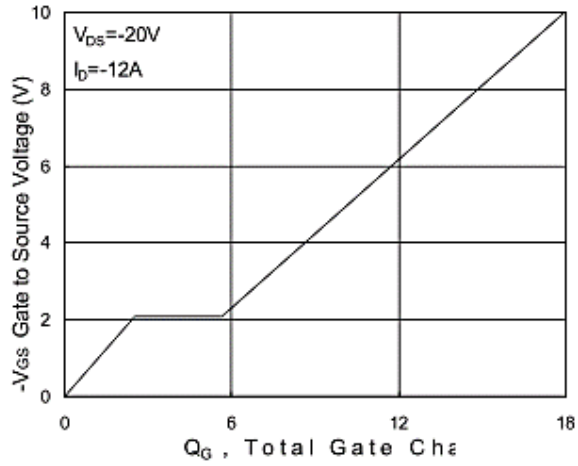



Fig.4 Gate-Charge Characteristics

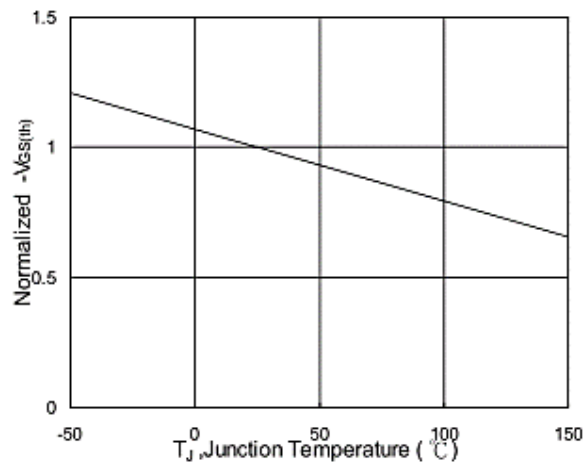



Fig.5 Normalized $V_{GS(th)}$ v.s $T_J$

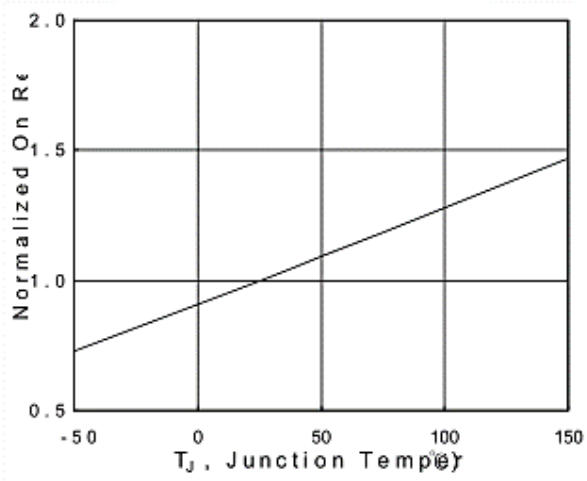



Fig.6 Normalized $R_{DSON}$ v.s $T_J$

## P-Channel Typical Characteristics

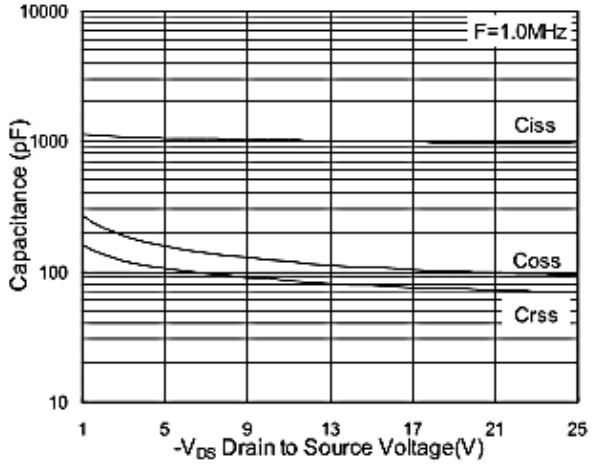



Fig.7 Capacitance

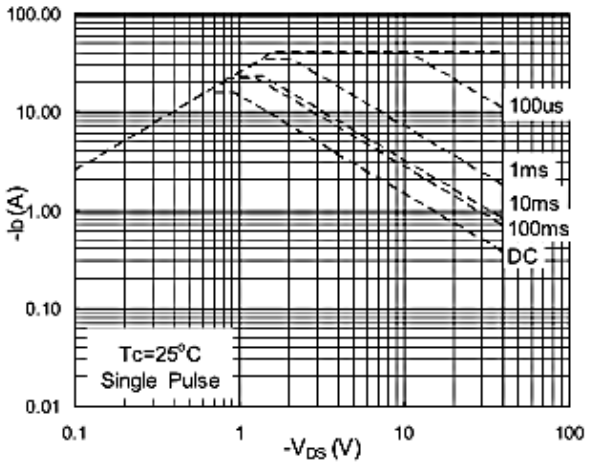



Fig.8 Safe Operating Area

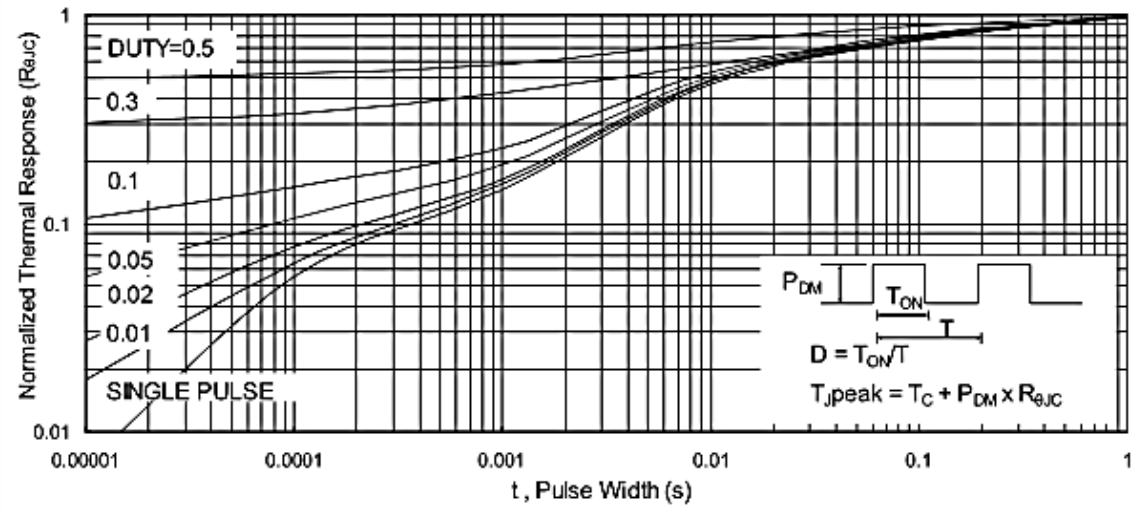



Fig.9 Normalized Maximum Transient Thermal Impedance

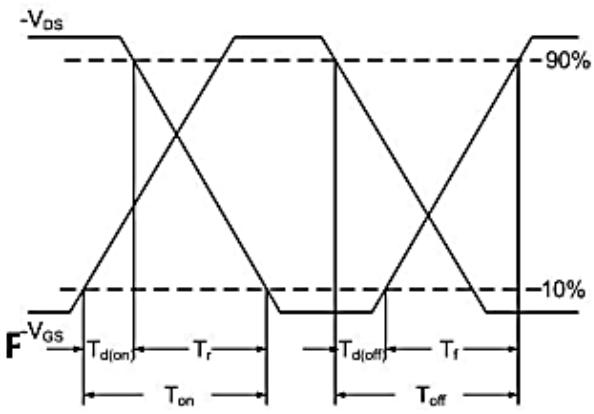



Fig.10 Switching Time Waveform

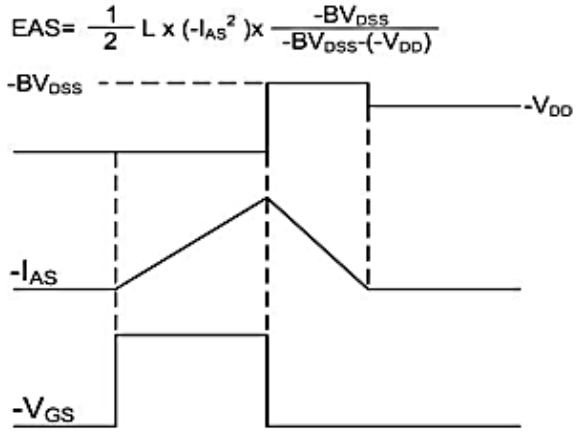
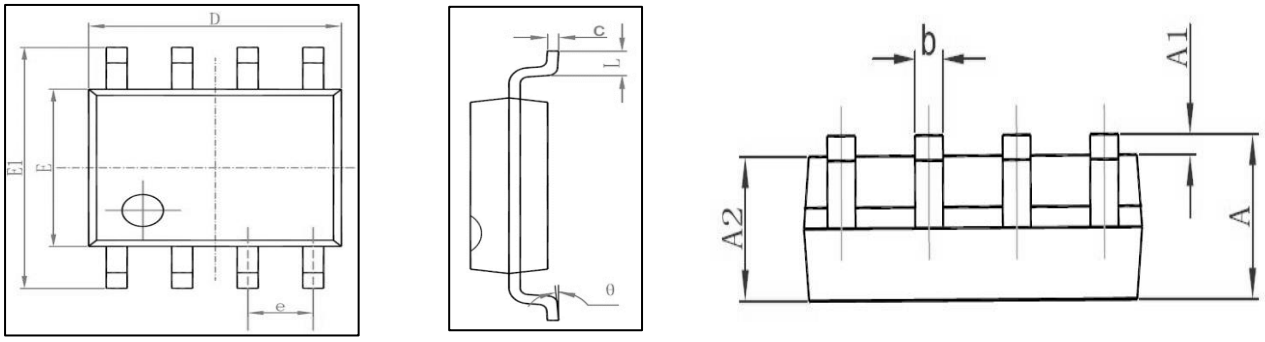


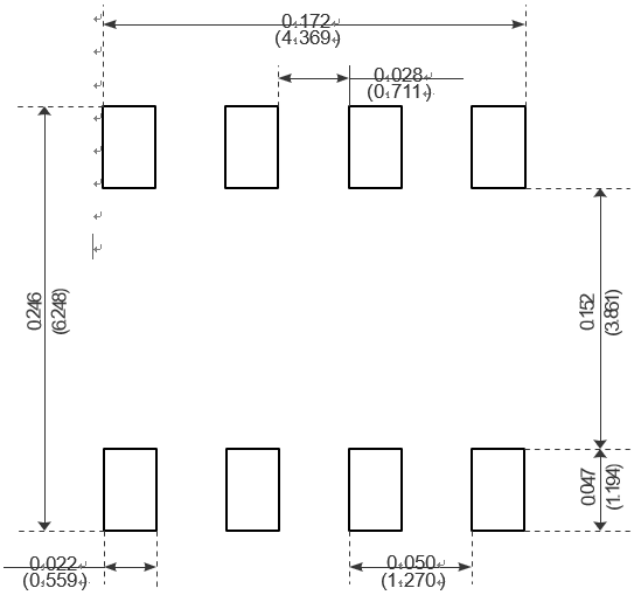

Fig.11 Unclamped Inductive Waveform

Package Outline Dimensions Millimeters

## SOP-8




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| b | 0.330 | 0.510 | 0.013 | 0.020 |
| c | 0.170 | 0.250 | 0.006 | 0.010 |
| D | 4.700 | 5.100 | 0.185 | 0.200 |
| E | 3.800 | 4.000 | 0.150 | 0.157 |
| E1 | 5.800 | 6.200 | 0.228 | 0.244 |
| e | 1.270 (BSC) | | 0.050 (BSC) | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |




Recommended Minimum Pads