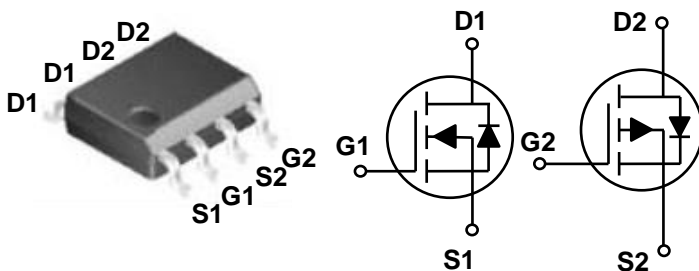


General Description

These N+P dual Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

| | | |
|-------|-------|-------|
| BVDSS | RDSON | ID |
| 60V | 54mΩ | 4.5A |
| -60V | 105mΩ | -3.5A |

SOP8 Pin Configuration



Features

- Fast switching
- Green Device Available
- Suit for 4.5V Gate Drive Applications

Applications

- DC Fan
- Motor Drive Applications
- Networking
- Half / Full Bridge Topology



Absolute Maximum Ratings Tc=25°C unless otherwise noted

| Symbol | Parameter | Rating | | Units |
|------------------|--|------------|-------|-------|
| V _{DS} | Drain-Source Voltage | 60 | -60 | V |
| V _{GS} | Gate-Source Voltage | ±20 | ±20 | V |
| I _D | Drain Current – Continuous (T _C =25°C) | 4.5 | -3.5 | A |
| | Drain Current – Continuous (T _C =100°C) | 2.85 | -2.21 | A |
| I _{DM} | Drain Current – Pulsed ¹ | 18 | -14 | A |
| P _D | Power Dissipation (T _C =25°C) | 3.57 | | W |
| | Power Dissipation – Derate above 25°C | 0.028 | | W/°C |
| T _{STG} | Storage Temperature Range | -55 to 150 | | °C |
| T _J | Operating Junction Temperature Range | -55 to 150 | | °C |

Thermal Characteristics

| Symbol | Parameter | Typ. | Max. | Unit |
|------------------|--|------|------|------|
| R _{θJA} | Thermal Resistance Junction to ambient | --- | 75 | °C/W |
| R _{θJC} | Thermal Resistance Junction to Case | --- | 35 | °C/W |

N-CH Electrical Characteristics (T_J=25 °C, unless otherwise)
Off Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------------|---|--|------|------|------|------|
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} =0V, I _D =250uA | 60 | --- | --- | V |
| ΔBV _{DSS} /ΔT _J | BV _{DSS} Temperature Coefficient | Reference to 25°C, I _D =1mA | --- | 0.05 | --- | V/°C |
| I _{DSS} | Drain-Source Leakage Current | V _{DS} =60V, V _{GS} =0V, T _J =25°C | --- | --- | 1 | uA |
| | | V _{DS} =48V, V _{GS} =0V, T _J =125°C | --- | --- | 10 | uA |
| I _{GSS} | Gate-Source Leakage Current | V _{GS} =±20V, V _{DS} =0V | --- | --- | ±100 | nA |

On Characteristics

| | | | | | | |
|----------------------|---|--|-----|------|-----|-------|
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} =10V, I _D =6A | --- | 45 | 54 | mΩ |
| | | V _{GS} =4.5V, I _D =3A | --- | 52 | 63 | mΩ |
| V _{GS(th)} | Gate Threshold Voltage | V _{GS} =V _{DS} , I _D =250uA | 1.2 | 1.8 | 2.5 | V |
| ΔV _{GS(th)} | V _{GS(th)} Temperature Coefficient | | --- | -4.2 | --- | mV/°C |
| gfs | Forward Transconductance | V _{DS} =10V, I _D =4A | --- | 4.2 | --- | S |

Dynamic and switching Characteristics

| | | | | | | |
|---------------------|------------------------------------|--|--|------|------|----|
| Q _g | Total Gate Charge ^{2,3} | V _{DS} =30V, V _{GS} =10V, I _D =4A | --- | 14 | 21 | nC |
| Q _{gs} | Gate-Source Charge ^{2,3} | | --- | 2.9 | 5 | |
| Q _{gd} | Gate-Drain Charge ^{2,3} | | --- | 2.3 | 4 | |
| T _{d(on)} | Turn-On Delay Time ^{2,3} | V _{DD} =30V, V _{GS} =10V, R _G =3.3Ω I _D =1A | --- | 3.9 | 7 | ns |
| T _r | Rise Time ^{2,3} | | --- | 12.6 | 24 | |
| T _{d(off)} | Turn-Off Delay Time ^{2,3} | | --- | 23.1 | 44 | |
| T _f | Fall Time ^{2,3} | | --- | 6.7 | 13 | |
| C _{iss} | Input Capacitance | V _{DS} =15V, V _{GS} =0V, F=1MHz | --- | 800 | 1160 | pF |
| C _{oss} | Output Capacitance | | --- | 380 | 550 | |
| C _{rss} | Reverse Transfer Capacitance | | --- | 115 | 170 | |
| R _g | Gate resistance | | V _{GS} =0V, V _{DS} =0V, F=1MHz | --- | 1.7 | |

Drain-Source Diode Characteristics and Maximum Ratings

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------------|---------------------------|---|------|------|------|------|
| I _S | Continuous Source Current | V _G =V _D =0V, Force Current | --- | --- | 4.5 | A |
| I _{SM} | Pulsed Source Current | | --- | --- | 9 | A |
| V _{SD} | Diode Forward Voltage | V _{GS} =0V, I _S =1A, T _J =25°C | --- | --- | 1 | V |

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.
3. Essentially independent of operating temperature.

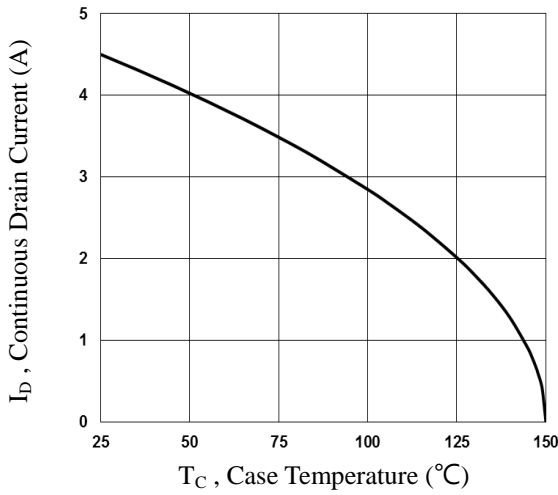


Fig.1 Continuous Drain Current vs. T_c

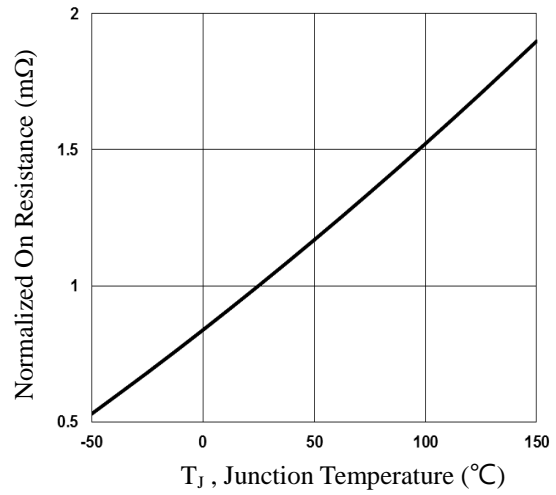


Fig.2 Normalized $R_{DS(on)}$ vs. T_j

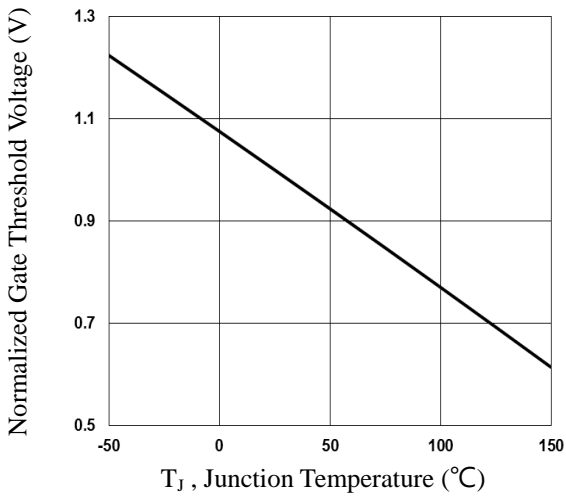


Fig.3 Normalized V_{th} vs. T_j

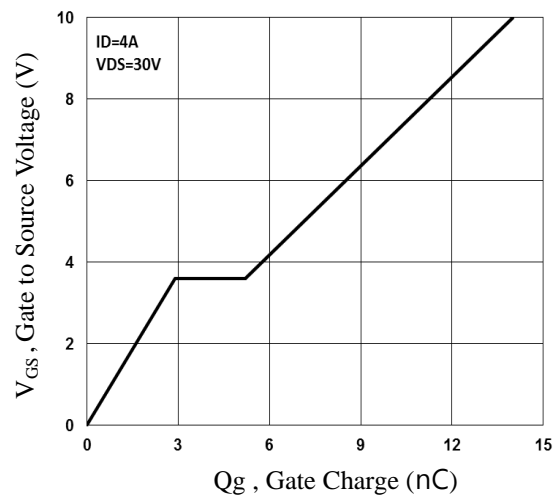


Fig.4 Gate Charge Waveform

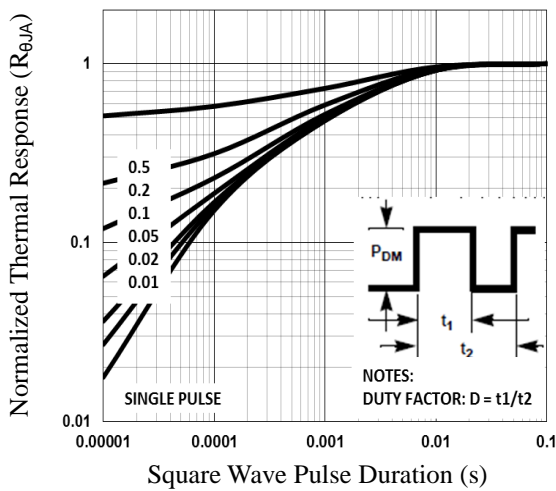


Fig.5 Normalized Transient Impedance

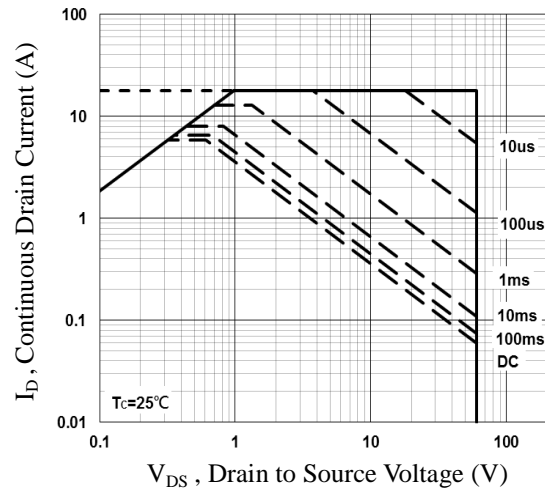


Fig.6 Maximum Safe Operation Area

P-CH Electrical Characteristics (T_J=25 °C, unless otherwise
Off Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------------|---|---|------|-------|------|------|
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} =0V, I _D =-250uA | -60 | --- | --- | V |
| ΔBV _{DSS} /ΔT _J | BV _{DSS} Temperature Coefficient | Reference to 25°C, I _D =-1mA | --- | -0.05 | --- | V/°C |
| I _{DSS} | Drain-Source Leakage Current | V _{DS} =-60V, V _{GS} =0V, T _J =25°C | --- | --- | -1 | uA |
| | | V _{DS} =-48V, V _{GS} =0V, T _J =125°C | --- | --- | -10 | uA |
| I _{GSS} | Gate-Source Leakage Current | V _{GS} =±20V, V _{DS} =0V | --- | --- | ±100 | nA |

On Characteristics

| | | | | | | |
|----------------------|---|---|------|------|------|-------|
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} =-10V, I _D =-6A | --- | 87 | 105 | mΩ |
| | | V _{GS} =-4.5V, I _D =-3A | --- | 120 | 145 | mΩ |
| V _{GS(th)} | Gate Threshold Voltage | V _{GS} =V _{DS} , I _D =-250uA | -1.0 | -1.6 | -2.5 | V |
| ΔV _{GS(th)} | V _{GS(th)} Temperature Coefficient | | --- | 3 | --- | mV/°C |
| gfs | Forward Transconductance | V _{DS} =-10V, I _D =-6A | --- | 5.5 | --- | S |

Dynamic and switching Characteristics

| | | | | | | |
|---------------------|------------------------------------|---|-----|------|------|----|
| Q _g | Total Gate Charge ^{2,3} | V _{DS} =-30V, V _{GS} =-10V, I _D =-4A | --- | 10 | 15 | nC |
| Q _{gs} | Gate-Source Charge ^{2,3} | | --- | 1.6 | 3.2 | |
| Q _{gd} | Gate-Drain Charge ^{2,3} | | --- | 3 | 6 | |
| T _{d(on)} | Turn-On Delay Time ^{2,3} | V _{DD} =-30V, V _{GS} =-10V, R _G =6Ω I _D =-1A | --- | 8 | 16 | ns |
| T _r | Rise Time ^{2,3} | | --- | 15.4 | 30 | |
| T _{d(off)} | Turn-Off Delay Time ^{2,3} | | --- | 42.8 | 80 | |
| T _f | Fall Time ^{2,3} | | --- | 8.4 | 16 | |
| C _{iss} | Input Capacitance | V _{DS} =-30V, V _{GS} =0V, F=1MHz | --- | 785 | 1300 | pF |
| C _{oss} | Output Capacitance | | --- | 175 | 300 | |
| C _{rss} | Reverse Transfer Capacitance | | --- | 112 | 220 | |

Drain-Source Diode Characteristics and Maximum Ratings

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------------|---------------------------|--|------|------|------|------|
| I _S | Continuous Source Current | V _G =V _D =0V, Force Current | --- | --- | -3.5 | A |
| I _{SM} | Pulsed Source Current | | --- | --- | -7 | A |
| V _{SD} | Diode Forward Voltage | V _{GS} =0V, I _S =-1A, T _J =25°C | --- | --- | -1 | V |

Note :

4. Repetitive Rating : Pulsed width limited by maximum junction temperature.
5. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
6. Essentially independent of operating temperature.

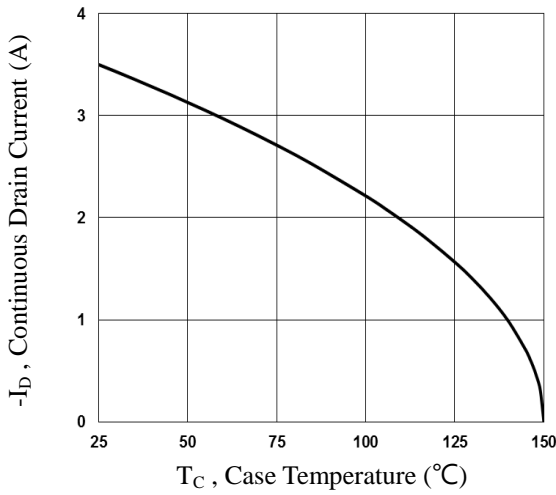


Fig.7 Continuous Drain Current vs. T_c

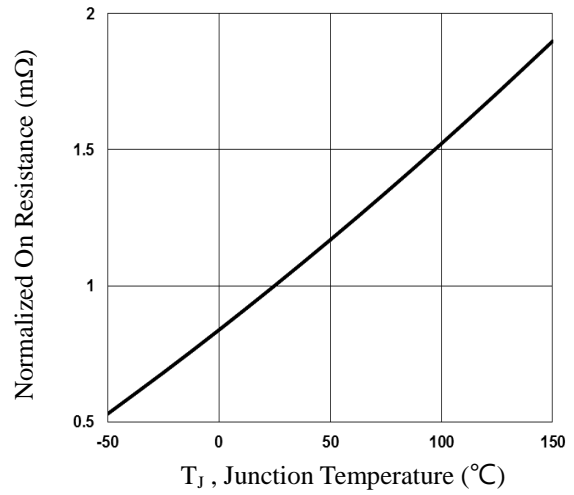


Fig.8 Normalized $R_{DS(on)}$ vs. T_j

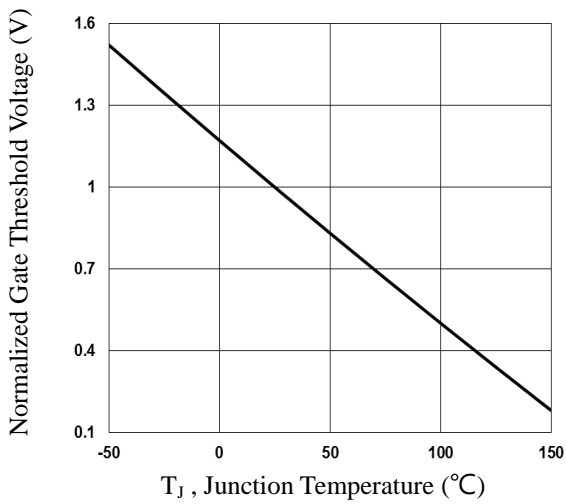


Fig.9 Normalized V_{th} vs. T_j

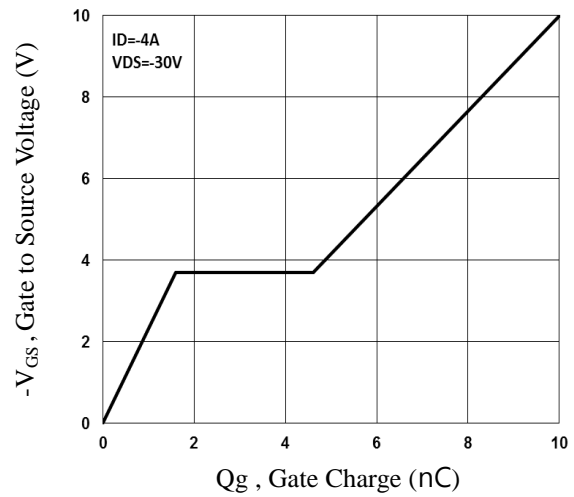


Fig.10 Gate Charge Waveform

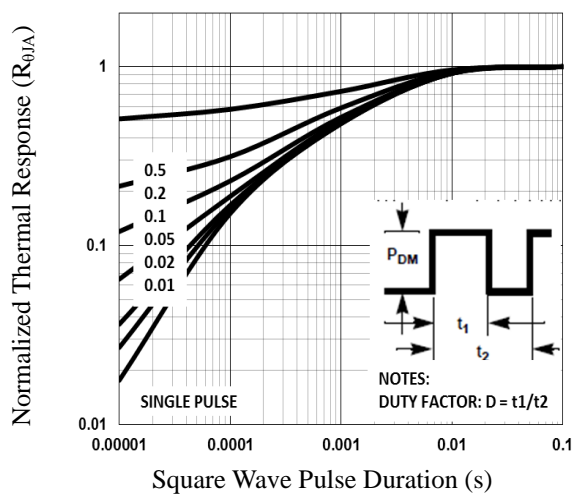


Fig.11 Normalized Transient Impedance

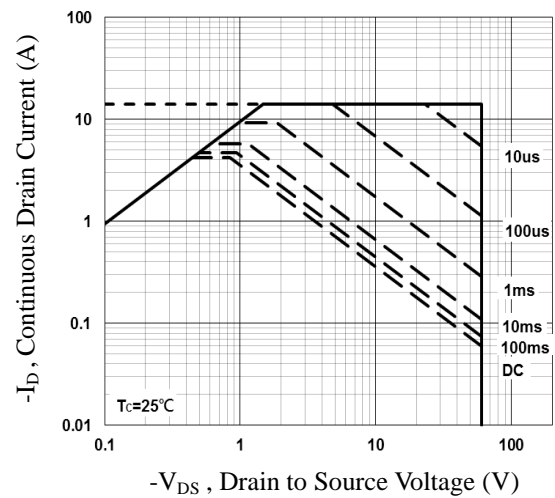
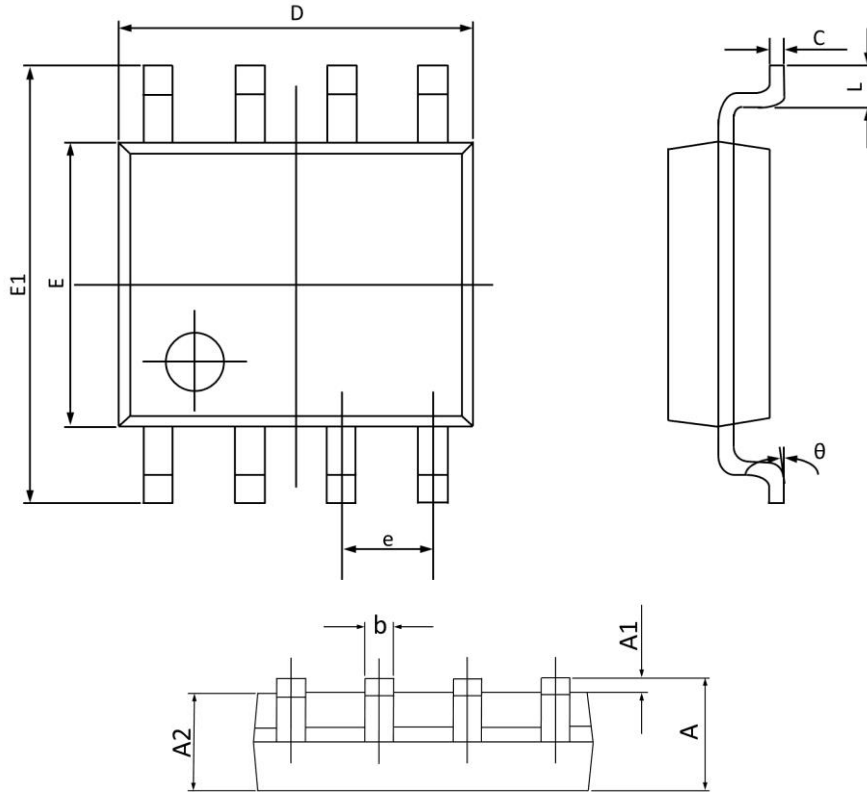


Fig.12 Maximum Safe Operation Area



SOP8 PACKAGE INFORMATION



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|----------|---------------------------|-------|----------------------|-------|
| | MAX | MIN | MAX | MIN |
| A | 1.750 | 1.350 | 0.069 | 0.053 |
| A1 | 0.250 | 0.100 | 0.010 | 0.004 |
| A2 | 1.500 | 1.300 | 0.059 | 0.051 |
| b | 0.490 | 0.350 | 0.019 | 0.014 |
| C | 0.260 | 0.190 | 0.010 | 0.007 |
| D | 5.100 | 4.700 | 0.201 | 0.185 |
| E | 4.100 | 3.700 | 0.161 | 0.146 |
| E1 | 6.200 | 5.800 | 0.244 | 0.228 |
| e | 1.27BSC | | 0.05BSC | |
| L | 0.900 | 0.400 | 0.035 | 0.016 |
| θ | 8° | 0° | 8° | 0° |