

General Description

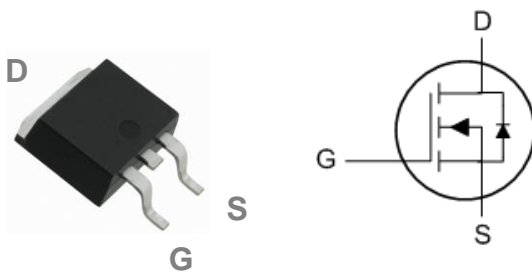
These N-Channel enhancement mode power field effect transistors are using advanced super junction technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation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

| | | |
|-------|-------|----|
| BVDSS | RDSON | ID |
| 500V | 1.5Ω | 5A |

Features

- Improved dv/dt capability
- Fast switching
- 100% EAS Guaranteed
- Green Device Available

TO252 Pin Configuration



Applications

- High efficient switched mode power supplies
- TV Power
- Adapter/charger
- Server Power
- PV Inverter / UPS

Absolute Maximum Ratings $T_c=25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | Rating | Units |
|-----------|--|------------|---------------------|
| V_{DS} | Drain-Source Voltage | 500 | V |
| V_{GS} | Gate-Source Voltage | ± 30 | V |
| I_D | Drain Current – Continuous ($T_c=25^\circ\text{C}$) | 5 | A |
| | Drain Current – Continuous ($T_c=100^\circ\text{C}$) | 3.1 | A |
| I_{DM} | Drain Current – Pulsed ¹ | 20 | A |
| EAS | Single Pulse Avalanche Energy ² | 280 | mJ |
| IAS | Single Pulse Avalanche Current ² | 7.5 | A |
| P_D | Power Dissipation ($T_c=25^\circ\text{C}$) | 52 | W |
| | Power Dissipation – Derate above 25°C | 0.42 | W/ $^\circ\text{C}$ |
| T_{STG} | Storage Temperature Range | -55 to 150 | $^\circ\text{C}$ |
| T_J | Operating Junction Temperature Range | -55 to 150 | $^\circ\text{C}$ |

Thermal Characteristics

| Symbol | Parameter | Typ. | Max. | Unit |
|-----------------|--|------|------|---------------------------|
| $R_{\theta JA}$ | Thermal Resistance Junction to ambient | --- | 62 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JC}$ | Thermal Resistance Junction to Case | --- | 2.4 | $^\circ\text{C}/\text{W}$ |

Electrical Characteristics (T_J=25 °C, unless otherwise noted)
Off Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-------------------|--------------------------------|---|------|------|------|------|
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} =0V, I _D =250uA | 500 | --- | --- | V |
| I _{DSS} | Drain-Source Leakage Current | V _{DS} =500V, V _{GS} =0V, T _J =25°C | --- | --- | 1 | uA |
| | | V _{DS} =400V, V _{GS} =0V, T _J =100°C | --- | --- | 10 | uA |
| I _{GSS} | Gate-Source Leakage Current | V _{GS} =±30V, V _{DS} =0V | --- | --- | ±100 | nA |

On Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---------------------|-----------------------------------|--|------|------|------|------|
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} =10V, I _D =2A | --- | 1.1 | 1.5 | Ω |
| V _{GS(th)} | Gate Threshold Voltage | V _{GS} =V _{DS} , I _D =250uA | 2 | 3 | 4 | V |
| g _{fs} | Forward Transconductance | V _{DS} =30V, I _D =2A | --- | 5 | --- | S |

Dynamic and switching Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---------------------|------------------------------------|--|------|------|------|------|
| Q _g | Total Gate Charge ^{3,4} | V _{DS} =400V, V _{GS} =10V, I _D =4A | --- | 17 | 34 | nC |
| Q _{gs} | Gate-Source Charge ^{3,4} | | --- | 3.6 | 7.2 | |
| Q _{gd} | Gate-Drain Charge ^{3,4} | | --- | 6.5 | 13 | |
| T _{d(on)} | Turn-On Delay Time ^{3,4} | V _{DD} =250V, V _{GS} =10V, R _G =25Ω I _D =2A | --- | 12 | 24 | ns |
| T _r | Rise Time ^{3,4} | | --- | 15 | 30 | |
| T _{d(off)} | Turn-Off Delay Time ^{3,4} | | --- | 30 | 60 | |
| T _f | Fall Time ^{3,4} | | --- | 11 | 22 | |
| C _{iss} | Input Capacitance | V _{DS} =25V, V _{GS} =0V, F=1MHz | --- | 570 | 1140 | pF |
| C _{oss} | Output Capacitance | | --- | 64 | 120 | |
| C _{rss} | Reverse Transfer Capacitance | | --- | 8 | 16 | |
| R _g | Gate resistance | V _{GS} =0V, V _{DS} =0V, F=1MHz | --- | 2.6 | 5.2 | Ω |

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 | --- | --- | 5 | A |
| I _{SM} | Pulsed Source Current | | --- | --- | 10 | A |
| V _{SD} | Diode Forward Voltage | V _{GS} =0V, I _S =1A, T _J =25°C | --- | --- | 1 | V |
| t _{rr} | Reverse Recovery Time | V _{GS} =0V, I _S =5A, di/dt=100A/μs | --- | 217 | --- | ns |
| Q _{rr} | Reverse Recovery Charge | T _J =25°C | --- | 1472 | --- | nC |

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V_{DD}=50V, V_{GS}=10V, L=10mH, I_{AS}=7.5A., R_G=25Ω, Starting T_J=25°C.
3. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.
4. Essentially independent of operating temperature.

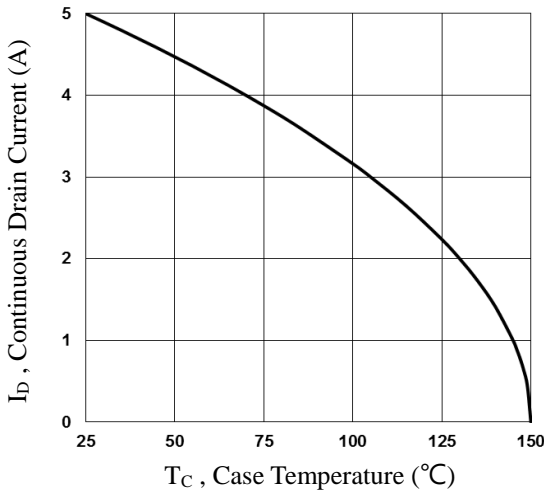


Fig.1 Continuous Drain Current vs. T_c

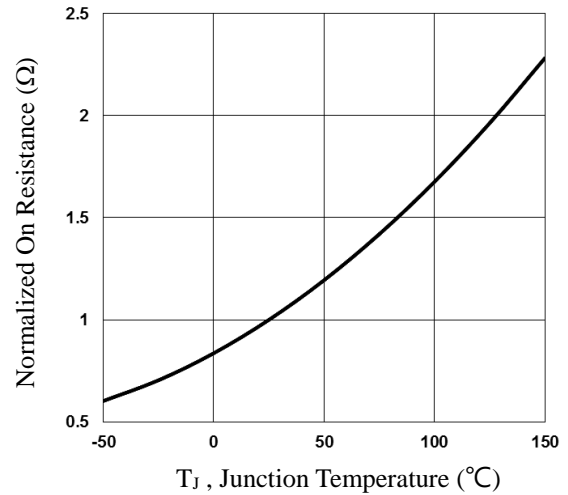


Fig.2 Normalized $R_{DS(on)}$ vs. T_j

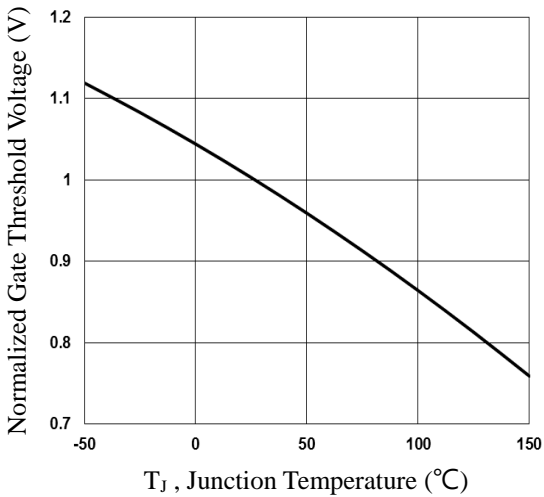


Fig.3 Normalized V_{th} vs. T_j

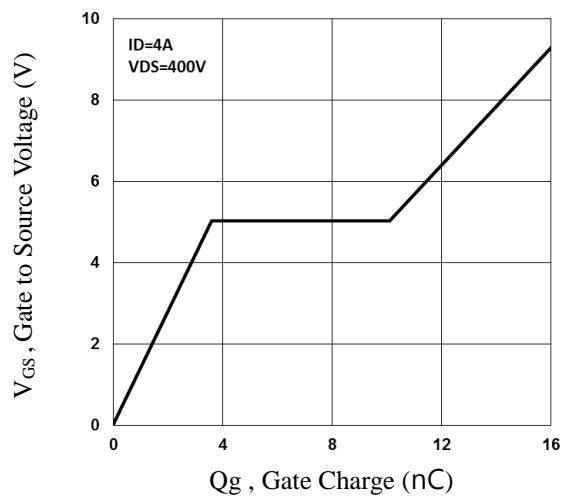


Fig.4 Gate Charge Waveform

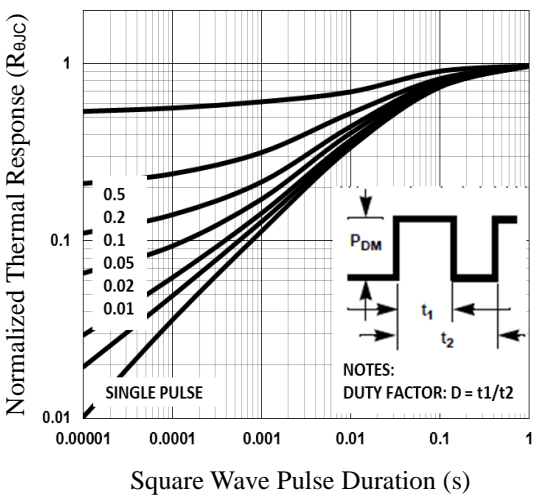


Fig.5 Normalized Transient Impedance

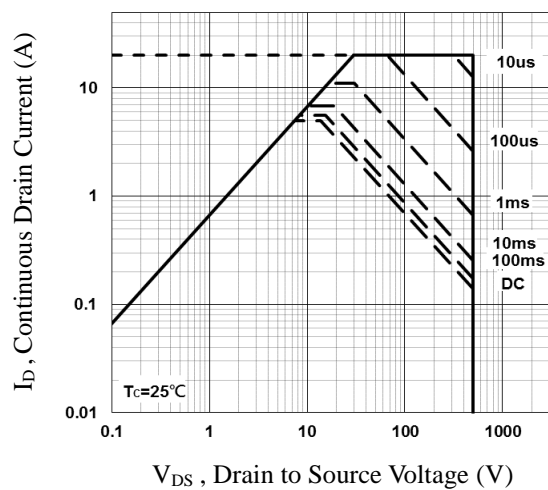


Fig.6 Maximum Safe Operation Area



Fig.7 Switching Time Waveform

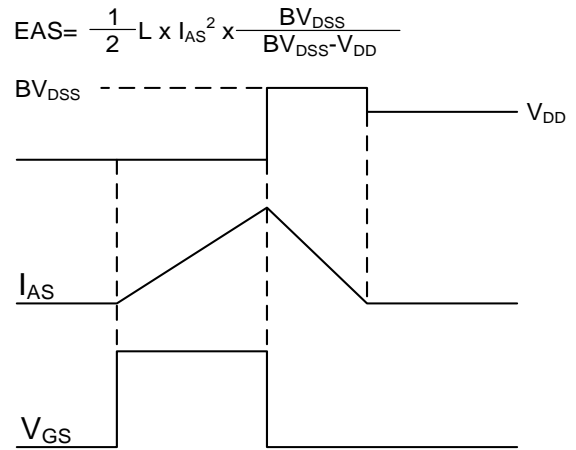
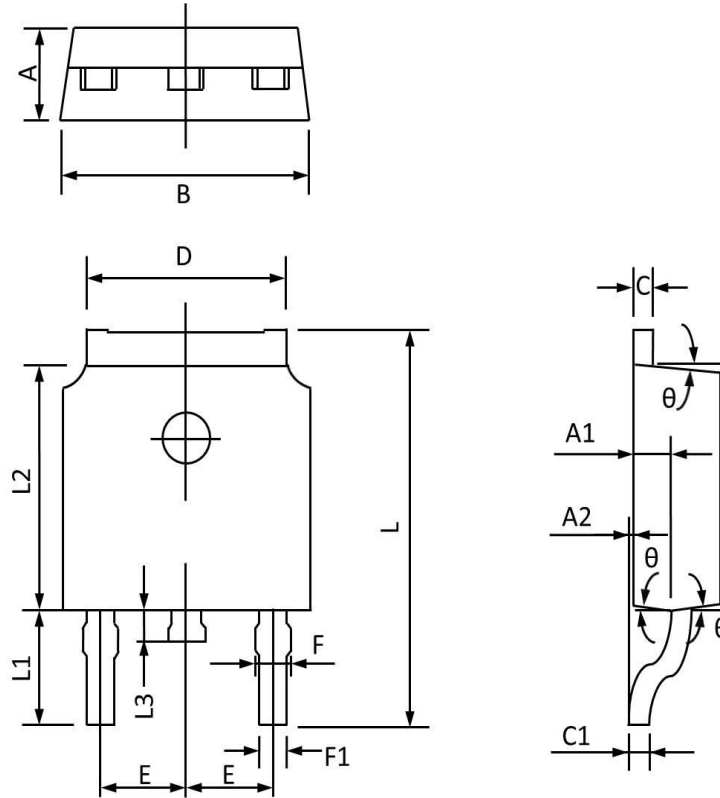


Fig.8 EAS Waveform

TO252 PACKAGE INFORMATION



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | MAX | MIN | MAX | MIN |
| A | 2.400 | 2.200 | 0.094 | 0.087 |
| A1 | 1.110 | 0.910 | 0.044 | 0.036 |
| A2 | 0.150 | 0.000 | 0.006 | 0.000 |
| B | 6.800 | 6.400 | 0.268 | 0.252 |
| C | 0.580 | 0.450 | 0.023 | 0.018 |
| C1 | 0.580 | 0.460 | 0.023 | 0.018 |
| D | 5.500 | 5.100 | 0.217 | 0.201 |
| E | 2.386 | 2.186 | 0.094 | 0.086 |
| F | 0.940 | 0.600 | 0.037 | 0.024 |
| F1 | 0.860 | 0.500 | 0.034 | 0.020 |
| L | 10.400 | 9.400 | 0.409 | 0.370 |
| L1 | 3.000 | 2.400 | 0.118 | 0.094 |
| L2 | 6.200 | 5.400 | 0.244 | 0.213 |
| L3 | 1.200 | 0.600 | 0.047 | 0.024 |
| θ | 9° | 3° | 9° | 3° |