## 650V Super-junction Power MOSFET

| | |
|---|---|
| $V_{DSS}$ | 650V |
| $I_D$ | 20A |
| $R_{DS(ON)_MAX}$ @$V_{GS}$=10V | 0.19Ω |

DESCRIPTION：

·Very low FOM $R_{DS(on)}$×Qg

·Ultra-fast body diode

·100% avalanche tested

·Easy to use/drive

·RoHS compliant



TO-263AC

TYPICAL APPLICATIONS：

·Switch Mode Power Supply (SMPS)

·Uninterruptible Power Supply (UPS)

·Power Factor Correction (PFC)

·LLC Half bridge

·Charger

MAXIMUM RATINGS (at $T_C$ = 25 °C, unless otherwise specified)

| Characteristic | Condition | Symbol | Value | Unit |
|---|---|---|---|---|
| Continuous Drain Current | Tc=25℃<br>Tc=100℃ | $I_D$ | 20<br>12 | A |
| Pulsed Drain Current (1) | | $I_{D\ pulse}$ | 60 | A |
| Gate-Source Voltage | | $V_{GS}$ | ±30 | V |
| Single Pulsed Avalanche Energy (2) | | $E_{AS}$ | 484 | mJ |
| Repetitive Avalanche Energy (2) | | $E_{AR}$ | 0.7 | mJ |
| Avalanche Current | | $I_{AR}$ | 3.5 | A |
| Power dissipation | | $P_D$ | 151 | W |
| Continuous Diode Forward Current | | $I_S$ | 20 | A |
| Diode Pulsed Current (1) | | $I_{S\ pulse}$ | 60 | A |
| Reverse Diode dv/dt | | dv/dt | 50 | V/ns |
| Junction & Storage temperature Range | | $T_J$, $T_{STG}$ | -55~+150 | ℃ |

Notes： 1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.

2. $I_{AS}$ = 3.5A, $V_{DD}$ = 50V, $R_G$ = 25Ω, Starting $T_J$ = 25°C

ELECTRICAL CHARATERISTICS (at $T_J$ = 25 °C, unless otherwise specified)

| Characteristic | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage<br>VGS = 0V, ID = 250uA | $V_{(BR)DSS}$ | 650 | | | V |
| Zero Gate Voltage Drain Current<br>VDS = 650 V, VGS = 0 V ,Tj=25℃<br>VDS = 650 V, VGS = 0 V ,Tj=150℃ | $I_{DSS}$ | | | 5<br>2500 | uA |
| Gate-Source Leakage Current<br>VGS = ±30V, VDS = 0V | $I_{GSS}$ | | | ±100 | nA |
| Gate-Source threshold voltage<br>VDS = VGS, ID = 250uA | $V_{GS(th)}$ | 3 | | 5 | V |
| Drain-Source On-State Resistance<br>VGS = 10V, ID = 10A | $R_{DS(on)}$ | | 0.17 | 0.19 | Ω |
| Gate Resistance<br>f=1MHz | Rg | | 12 | | Ω |
| Input capacitance<br>f=1MHz, VDS=100 V, VGS=0 V | $C_{iss}$ | | 1834 | | pF |
| Output capacitance<br>f=1MHz, VDS=100 V, VGS=0 V | $C_{oss}$ | | 57 | | pF |
| Reverse transfer capacitance<br>f=1MHz, VDS=100 V, VGS=0 V | $C_{rss}$ | | 1.7 | | pF |
| Total Gate Charge<br>VDS= 520V, ID= 20A,VGS= 10V | $Q_G$ | | 42 | | nC |
| Gate to Source Charge<br>VDS= 520V, ID= 20A,VGS= 10V | $Q_{GS}$ | | 10 | | nC |
| Gate to Drain Charge<br>VDS= 520V, ID= 20A,VGS= 10V | $Q_{GD}$ | | 17 | | nC |
| Turn-on delay time<br>VDD=400 V, ID=20A, $R_{GEN}$=25Ω | td (ON) | | 34 | | ns |
| Rise time<br>VDD=400 V, ID=20A, $R_{GEN}$=25Ω | tr | | 72 | | ns |
| Turn-off delay time<br>VDD=400 V, ID=20A, $R_{GEN}$=25Ω | td (OFF) | | 114 | | ns |
| Fall time<br>VDD=400 V, ID=20A, $R_{GEN}$=25Ω | tf | | 41 | | ns |
| Diode Forward Voltage<br>VGS = 0V, $I_{SD}$ =10A | $V_{SD}$ | | 1.0 | 1.5 | V |
| Revers Recovery Time<br>$V_R$=400V, $I_S$ = $I_F$, $di_F/dt$ = 100A/us | Trr | | 112 | | ns |
| Revers Recovery Charge<br>$V_R$=400V, $I_S$ = $I_F$, $di_F/dt$ = 100A/us | Qrr | | 0.54 | | uC |
| Peak Reverse Recovery Current<br>$V_R$=400V, $I_S$ = $I_F$, $di_F/dt$ = 100A/us | Irrm | | 9.6 | | A |

THERMAL CHARACTERISTICS

| Characteristic | Condition | Symbol | Value | Unit |
|---|---|---|---|---|
| Thermal resistance, | Junction to Ambient<br>Junction to Case | $R_{\theta JA}$<br>$R_{\theta JC}$ | 62<br>0.83 | ℃/W |

Typical Performance Characteristics

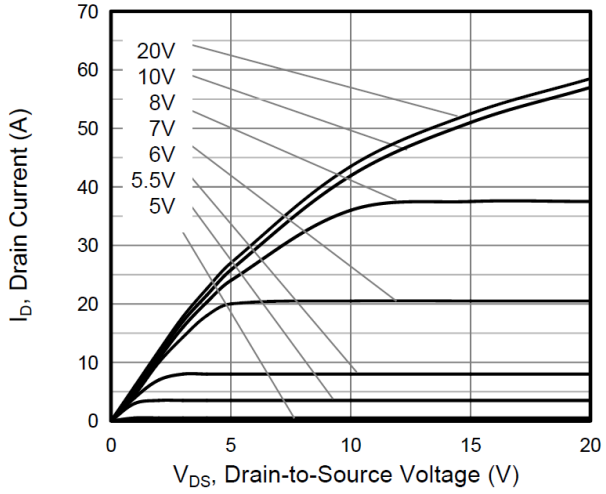



Figure 1. Output Characteristics

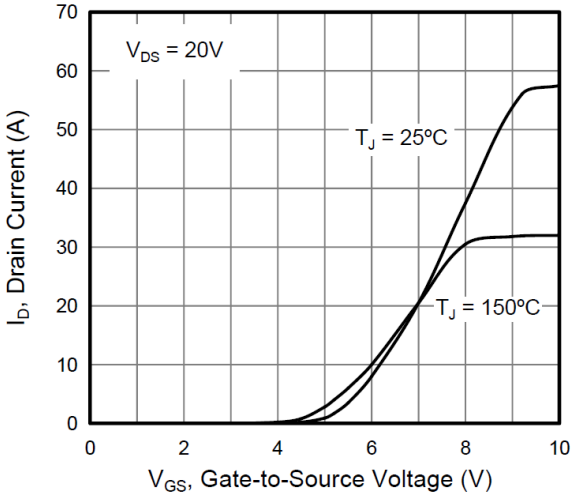



Figure 2. Transfer Characteristics

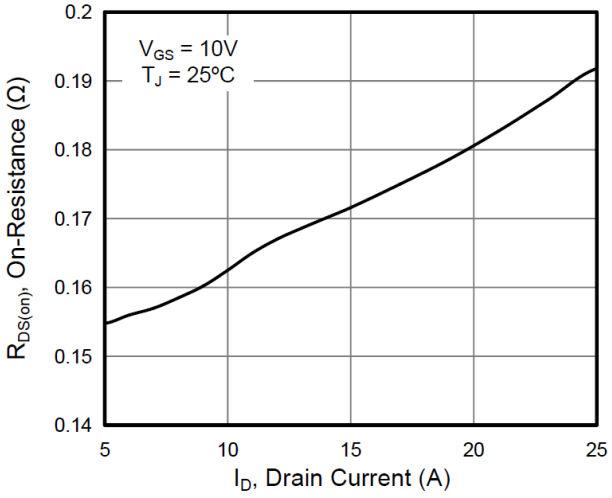



Figure 3. On-Resistance vs. Drain Current

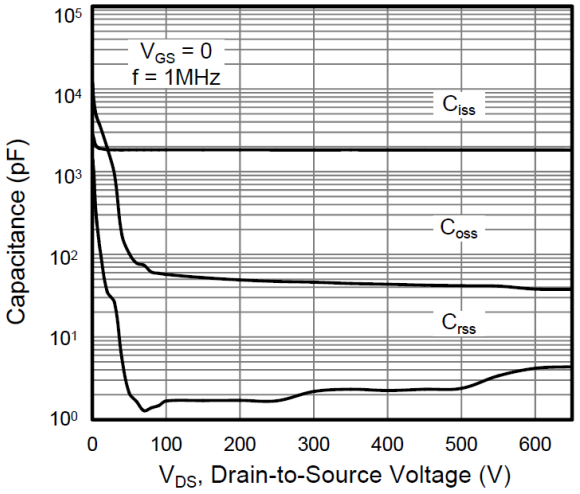



Figure 4. Capacitance

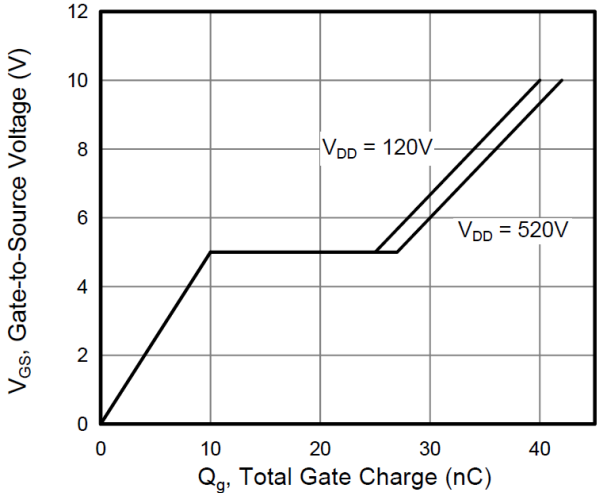



Figure 5. Gate Charge

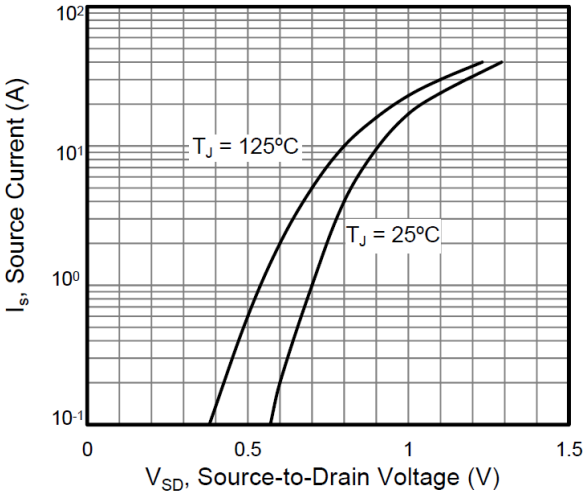



Figure 6. Body Diode Forward Voltage

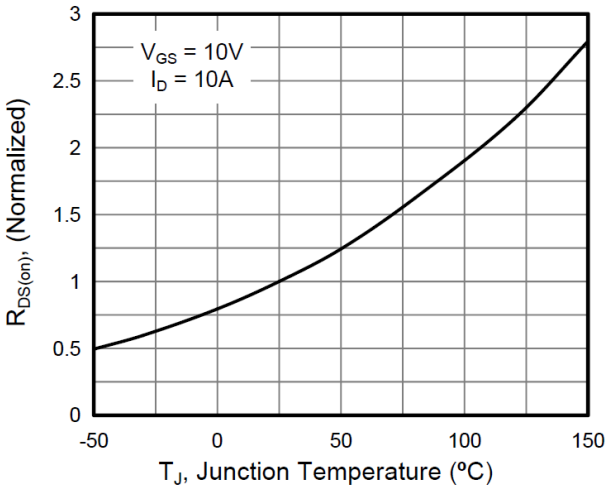



Figure 7. On-Resistance vs.Temperature

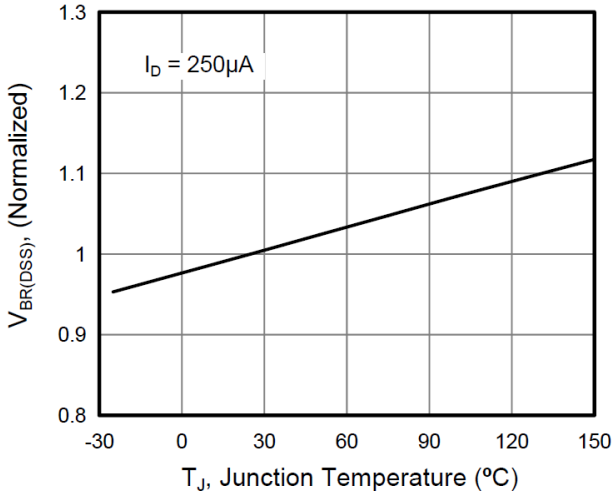



Figure8. Breakdown voltage vs. Junction Temperature

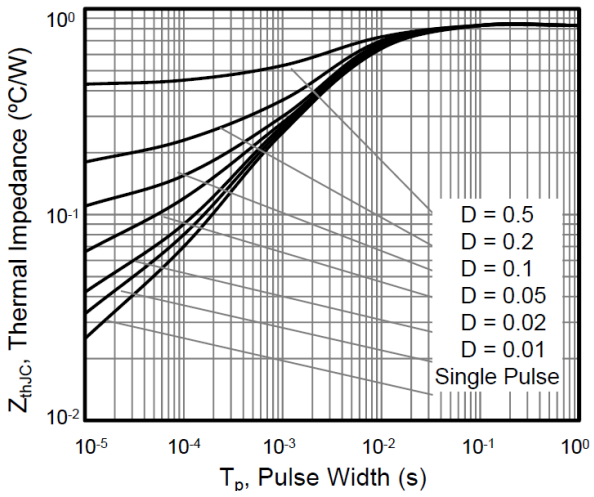



Figure 9. Transient Thermal Impedance

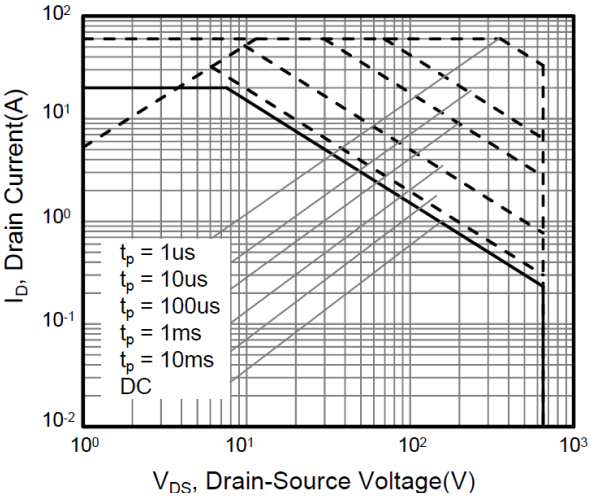



Figure 10. Safe Operation Area

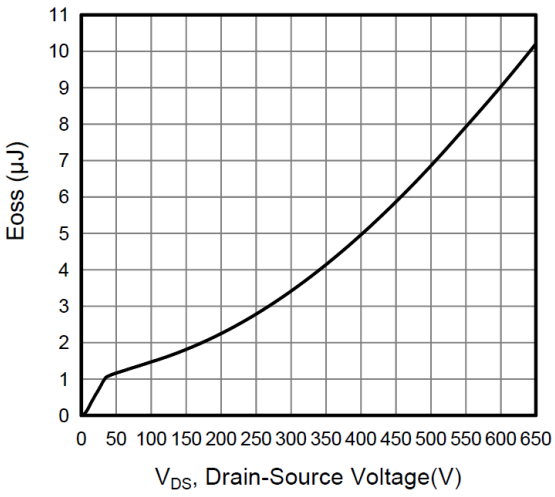
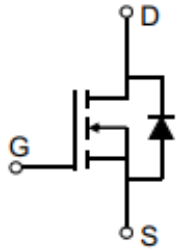
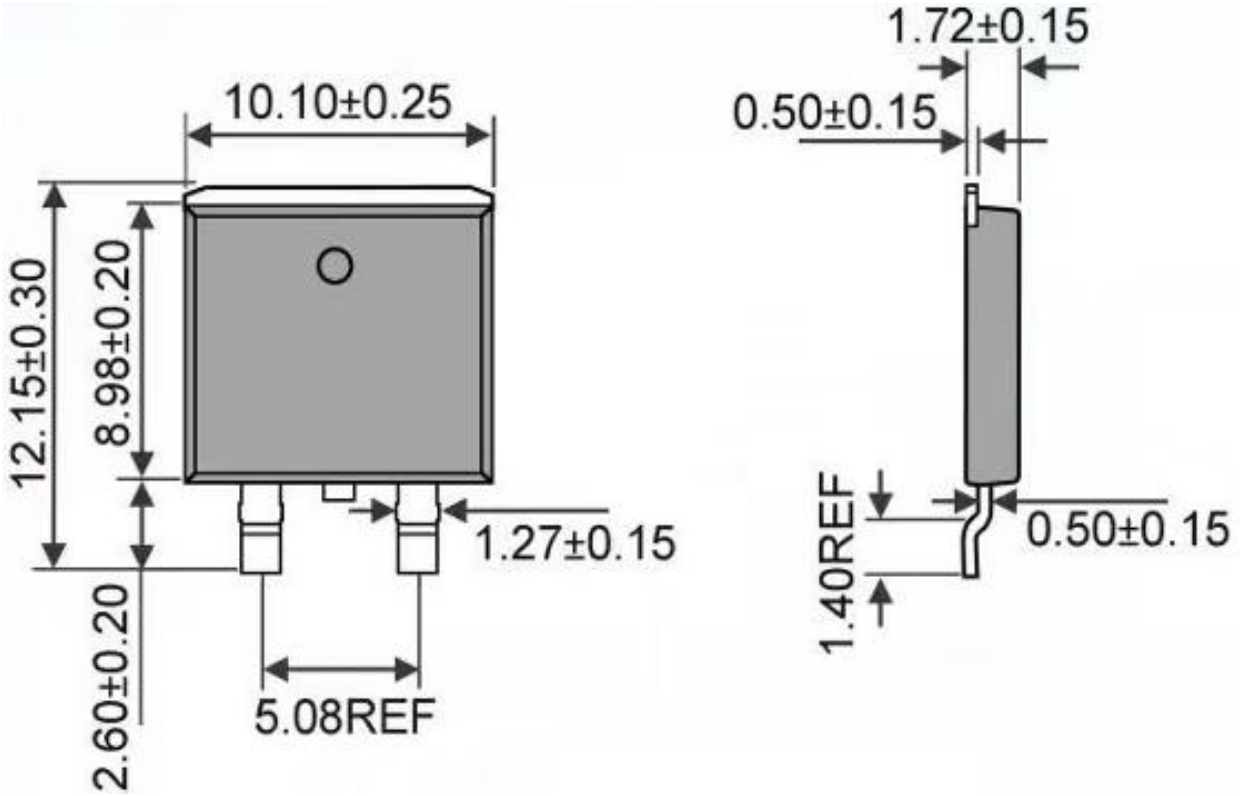



Figure 11. Typ. Coss Stored Energy

·Circuit diagram




·Package outlines : Dimensions in (mm)



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