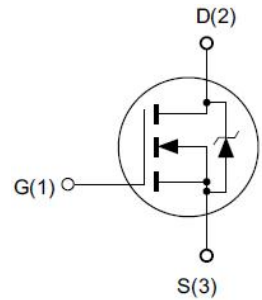
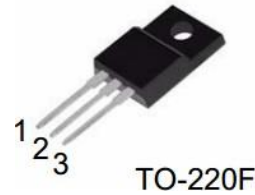


### Features

- ◆ 650V, 11A,  $R_{DS(ON)}(Typ.) = 0.32\Omega @ V_{GS} = 10V$ .
- ◆ Advanced Super junction Technology
- ◆ Low drain-source on-resistance
- ◆ Easy to control Gate switching

### Application

- ◆ PFC stages, hard switching PWM stages
- ◆ Resonant switching PWM
- ◆ PC, Silver box, Adaptor, LCD & PDP TV, Lighting
- ◆ Server power, Telecom power and UPS application.



### Absolute Maximum Ratings $T_c = 25^\circ C$ unless otherwise noted

| Symbol         | Parameter                                      | Rating          | Unit       |
|----------------|------------------------------------------------|-----------------|------------|
| $V_{DS}$       | Drain-Source Voltage <sup>a</sup>              | 650             | V          |
| $V_{GS}$       | Gate-Source Voltage                            | $\pm 30$        | V          |
| $I_D$          | Drain Current-Continuous, $T_c = 25^\circ C$   | 11              | A          |
| $I_{DM}$       | Drain Current-Pulsed <sup>b</sup>              | 33              | A          |
| $P_D$          | Maximum Power Dissipation @ $T_J = 25^\circ C$ | 31              | W          |
| $dv/dt$        | Peak Diode Recovery $dv/dt$ <sup>c</sup>       | 15              | V/ns       |
| $E_{AS}$       | Single Pulsed Avalanche Energy <sup>d</sup>    | 624             | mJ         |
| $T_J, T_{STG}$ | Operating and Store Temperature Range          | 150, -55 to 150 | $^\circ C$ |

### Thermal Characteristics

| Symbol          | Parameter                               | Value | Unit         |
|-----------------|-----------------------------------------|-------|--------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case    | 4.0   | $^\circ C/W$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 80    | $^\circ C/W$ |

### Electrical Characteristics $T_J = 25^\circ C$ unless otherwise noted

#### ■ Off Characteristics

| Symbol     | Parameter                         | Test Condition                  | Min. | Typ. | Max.      | Unit    |
|------------|-----------------------------------|---------------------------------|------|------|-----------|---------|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage    | $V_{GS} = 0V, I_D = 250\mu A$   | 650  | -    | -         | V       |
| $I_{DSS}$  | Zero Gate Voltage Drain Current   | $V_{DS} = 650V, V_{GS} = 0V$    | -    | -    | 1         | $\mu A$ |
| $I_{GSS}$  | Forward Gate Body Leakage Current | $V_{DS} = 0V, V_{GS} = \pm 30V$ | -    | -    | $\pm 100$ | nA      |

### ■ On Characteristics

| Symbol       | Parameter                                      | Test Condition                    | Min. | Typ. | Max. | Unit     |
|--------------|------------------------------------------------|-----------------------------------|------|------|------|----------|
| $V_{GS(th)}$ | Gate Threshold Voltage                         | $V_{DS} = V_{GS}, I_D = 250\mu A$ | 2.8  | -    | 4.2  | V        |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance <sup>c</sup> | $V_{GS} = 10V, I_D = 5.5A$        | -    | 0.32 | 0.35 | $\Omega$ |

### ■ Dynamic Characteristics

| Symbol    | Parameter                    | Test Condition                                   | Min. | Typ. | Max. | Unit     |
|-----------|------------------------------|--------------------------------------------------|------|------|------|----------|
| $R_g$     | Gate Resistance              | $f = 1.0MHz$                                     | -    | 11   | -    | $\Omega$ |
| $C_{iss}$ | Input Capacitance            | $V_{DS} = 50V,$<br>$V_{GS} = 0V,$<br>$f = 10KHz$ | -    | 901  | -    | pF       |
| $C_{oss}$ | Output Capacitance           |                                                  | -    | 59   | -    | pF       |
| $C_{rss}$ | Reverse Transfer Capacitance |                                                  | -    | 5.3  | -    | pF       |

### ■ On Characteristics

| Symbol       | Parameter           | Test Condition                                                            | Min. | Typ. | Max. | Unit |
|--------------|---------------------|---------------------------------------------------------------------------|------|------|------|------|
| $t_{d(on)}$  | Turn-On Delay Time  | $V_{DD} = 400V,$<br>$I_D = 4.8A,$<br>$V_{GS} = 13V,$<br>$R_G = 3.4\Omega$ | -    | 7.2  | -    | ns   |
| $t_r$        | Turn-On Rise Time   |                                                                           | -    | 20.8 | -    | ns   |
| $t_{d(off)}$ | Turn-Off Delay Time |                                                                           | -    | 29.2 | -    | ns   |
| $t_f$        | Turn-Off Fall Time  |                                                                           | -    | 19.2 | -    | ns   |
| $Q_g$        | Total Gate Charge   | $V_{DS} = 400V,$<br>$I_D = 4.8A,$<br>$V_{GS} = 0 \text{ to } 10V$         | -    | 22   | -    | nC   |
| $Q_{gs}$     | Gate-Source Charge  |                                                                           | -    | 5.8  | -    | nC   |
| $Q_{gd}$     | Gate-Drain Charge   |                                                                           | -    | 17   | -    | nC   |

### ■ Drain-Source Diode Characteristics

| Symbol    | Parameter                          | Test Condition                                     | Min. | Typ. | Max. | Unit    |
|-----------|------------------------------------|----------------------------------------------------|------|------|------|---------|
| $V_{SD}$  | Drain-Source Diode Forward Voltage | $V_{GS} = 0V, I_F = 1A$                            | -    | 0.74 | -    | V       |
| $T_{rr}$  | Body Diode Reverse Recovery Time   | $I_F = 4.8A, V_R = 400V$<br>$di_F/dt = 100A/\mu s$ | -    | 250  | -    | ns      |
| $Q_{rr}$  | Body Diode Reverse Recovery Charge | $I_F = 4.8A, V_R = 400V$<br>$di_F/dt = 100A/\mu s$ | -    | 2.57 | -    | $\mu C$ |
| $I_{rrm}$ | Peak reverse recovery current      | $I_F = 4.8A, V_R = 400V$<br>$di_F/dt = 100A/\mu s$ | -    | 19.6 | -    | A       |

Notes:

- $T_J = +25^\circ C$  to  $+150^\circ C$
- Repetitive rating; pulse width limited by maximum junction temperature.
- Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$
- $L = 49.9mH, V_{DD} = 50V, I_{AS} = 5A, R_G = 25\Omega$  Starting  $T_J = 25^\circ C$

### Characteristic Curve

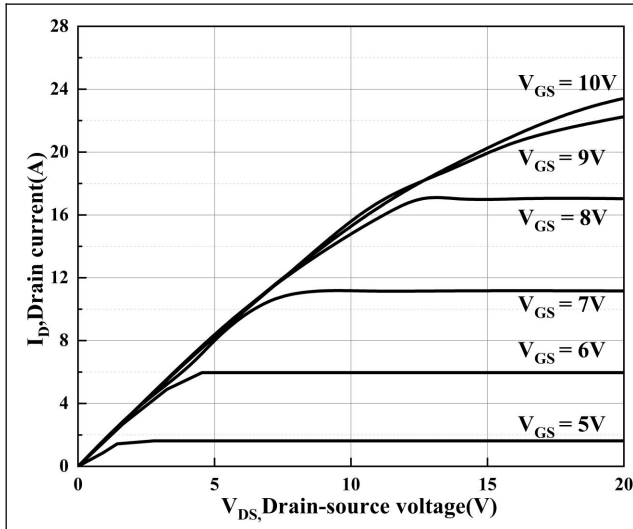


Figure 1. Typical Output Characteristics

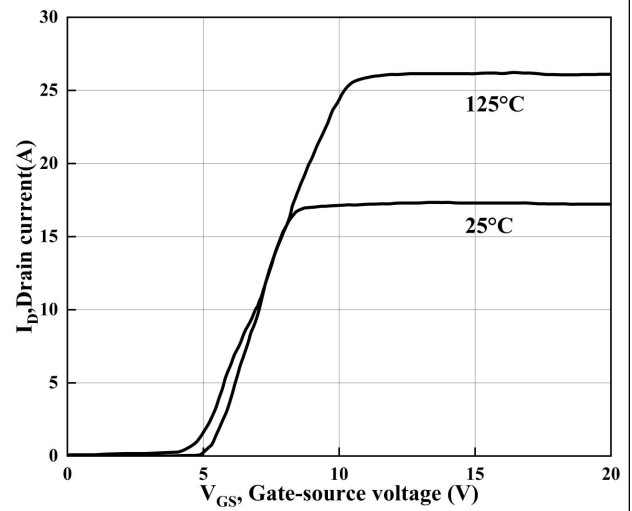


Figure 2. Typical Transfer Characteristics

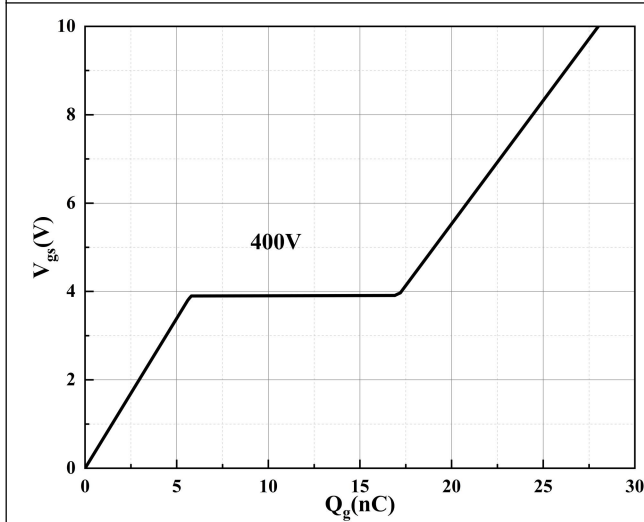


Figure 3. Gate-Charge Characteristics

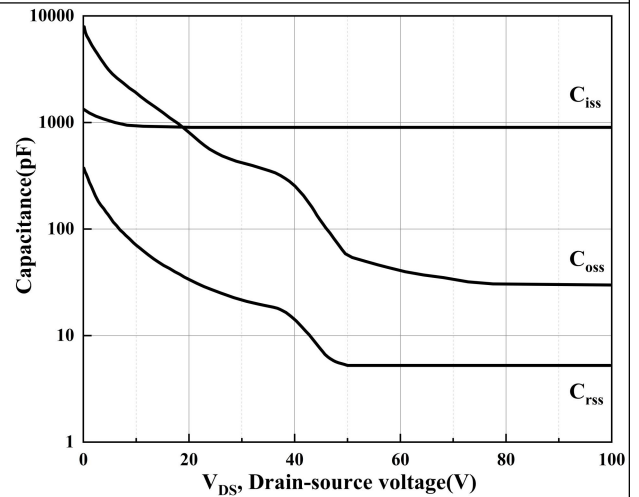


Figure 4. Capacitance Characteristics

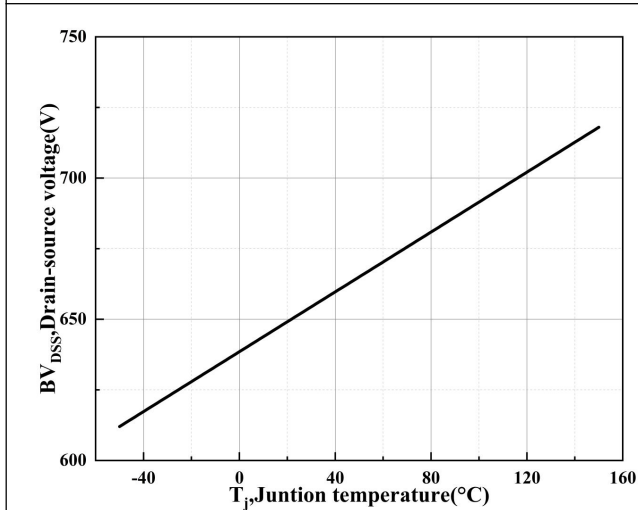


Figure 5. Drain-source Breakdown Voltage

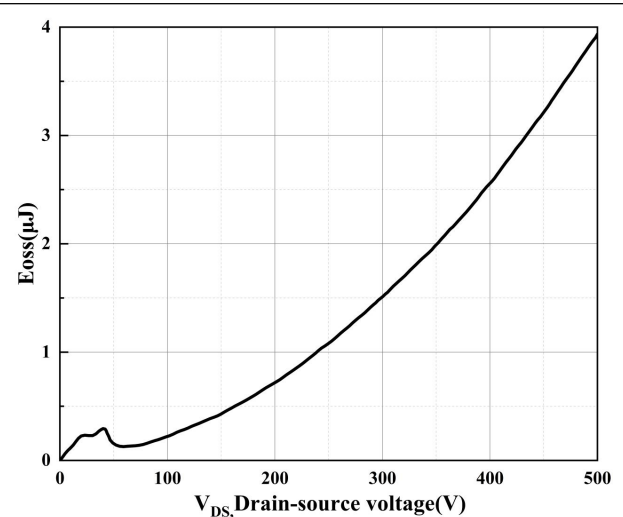


Figure 6. Typical  $C_{oss}$  Stored Energy

### ■ Package Information

