

### Features

- Low drain-source on-resistance:  $R_{DS(ON)}=0.139\Omega(\text{typ})$
- Easy to control gate switching
- Enhancement mode:  $V_{th} = 2.8$  to  $4.2\text{V}$
- 100% avalanche tested
- RoHS compliant

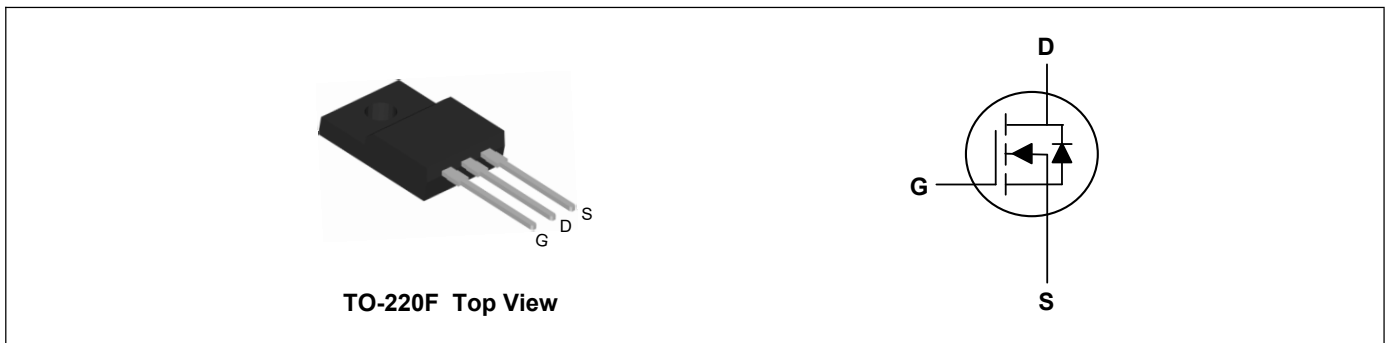
### Key Performance Parameters



| Parameter            | Value | Unit       |
|----------------------|-------|------------|
| $V_{DS} @ T_{j,max}$ | 650   | V          |
| $R_{DS(ON),max}$     | 170   | m $\Omega$ |
| $I_D$                | 25    | A          |
| $Q_{g,typ}$          | 37.8  | nC         |
| $I_{DM}$             | 75    | A          |

### Applications

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)
- Charger, Lighting.



### Absolute Maximum Ratings ( $T_C=25^\circ\text{C}$ , unless otherwise noted)

| Parameter   | Symbol                       | Value      | Unit             |
|---|------------------------------|------------|------------------|
| Drain-Source Voltage  | $V_{DS}$                     | 600        | V                |
| Gate-Source Voltage   | $V_{GS}$                     | $\pm 30$   | V                |
| Continuous Drain Current <sup>1</sup>   | $I_D @ T_C=25^\circ\text{C}$ | 25         | A                |
| Pulsed Drain Current <sup>2</sup>   | $I_{DM}$                     | 75         | A                |
| Single Pulse Avalanche Energy   | EAS                          | 845        | mJ               |
| MOSFET dv/dt ruggedness, $V_{DS} = 0 \dots 400\text{V}$   | dv/dt                        | 135        | V/ns             |
| Reverse diode dv/dt <sup>3</sup> $V_{DS}=0 \dots 400\text{V}$ , $I_{SD} \leq 48\text{A}$ , $T_J=25^\circ\text{C}$ |                              | 15         |                  |
| Total Power Dissipation ( $T_C=25^\circ\text{C}$ )  | $P_D$                        | 34         | W                |
| Storage Temperature Range   | $T_{STG}$                    | -55 to 150 | $^\circ\text{C}$ |
| Operating Junction Temperature Range  | $T_J$                        | -55 to 150 | $^\circ\text{C}$ |

### Thermal Characteristics

| Parameter                                 | Symbol          | Value | Unit               |
|---|-----------------|-------|--------------------|
| Thermal Resistance Junction-Ambient (Max) | $R_{\theta JA}$ | 80    | $^\circ\text{C/W}$ |
| Thermal Resistance Junction-Case (Max)    | $R_{\theta JC}$ | 3.67  | $^\circ\text{C/W}$ |

**Electrical Characteristics ( $T_J=25^{\circ}\text{C}$ , unless otherwise noted)**

| Parameter                         | Symbol        | Conditions  | Min | Typ  | Max       | Unit       |
|-----------------------------------|---------------|---|-----|------|-----------|------------|
| Drain-Source Breakdown Voltage    | $BV_{DSS}$    | $V_{GS}=0V, I_D=10mA$                               | 605 | ---  | ---       | V          |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$  | $V_{GS}=10V, I_D=12.5A$                             | --- | 139  | 170       | m $\Omega$ |
| Gate Threshold Voltage            | $V_{GS(th)}$  | $V_{GS}=V_{DS}, I_D=250\mu A$                       | 2.8 | ---  | 4.2       | V          |
| Drain-Source Leakage Current      | $I_{DSS}$     | $V_{DS}=600V, V_{GS}=0V, T_J=25^{\circ}\text{C}$    | --- | ---  | 1         | $\mu A$    |
| Gate-Source Leakage Current       | $I_{GSS}$     | $V_{GS}=\pm 30V, V_{DS}=0V$                         | --- | ---  | $\pm 100$ | nA         |
| Gate Resistance                   | $R_G$         | $f = 1.0MHz, \text{open drain}$                     | --- | 5.5  | ---       | $\Omega$   |
| Total Gate Charge                 | $Q_g$         | $V_{DD}=400V, V_{GS}=10V, I_D=11.3A$                | --- | 37.8 | ---       | nC         |
| Gate-Source Charge                | $Q_{gs}$      |   | --- | 8.04 | ---       |            |
| Gate-Drain Charge                 | $Q_{gd}$      |   | --- | 29.3 | ---       |            |
| Gate Plateau Voltage              | $V_{plateau}$ |   | --- | 7.5  | ---       | V          |
| Turn-On Delay Time                | $T_{d(on)}$   | $V_{DD}=400V, V_{GS}=13V, R_G=1.7\Omega, I_D=11.3A$ | --- | 11.4 | ---       | ns         |
| Rise Time                         | $T_r$         |   | --- | 21.8 | ---       |            |
| Turn-Off Delay Time               | $T_{d(off)}$  |   | --- | 43   | ---       |            |
| Fall Time                         | $T_f$         |   | --- | 18.8 | ---       |            |
| Input Capacitance                 | $C_{iss}$     | $V_{DS}=50V, V_{GS}=0V, f=1MHz$                     | --- | 1760 | ---       | pF         |
| Output Capacitance                | $C_{oss}$     |   | --- | 176  | ---       |            |
| Reverse Transfer Capacitance      | $C_{rss}$     |   | --- | 3.8  | ---       |            |

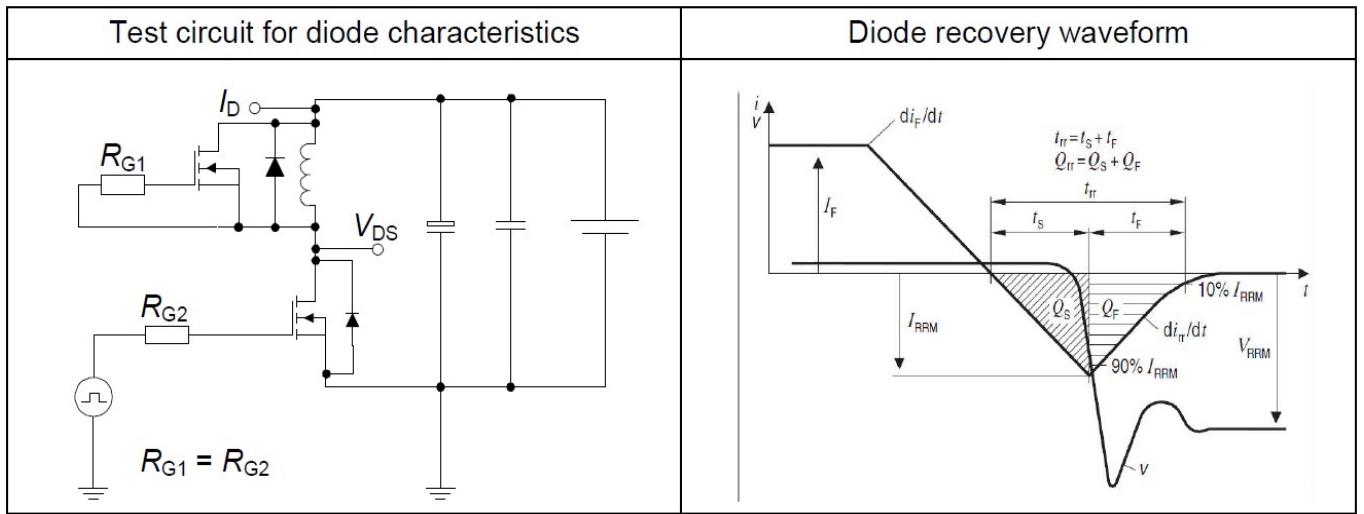
**Drain-Source Diode Characteristics**

| Parameter                     | Symbol    | Conditions                                | Min | Typ  | Max | Unit    |
|-------------------------------|-----------|---|-----|------|-----|---------|
| Diode Forward Voltage         | $V_{SD}$  | $V_G=0V, I_F=1A, T_J=25^{\circ}\text{C}$  | --- | 0.71 | --- | V       |
| Reverse Recovery Time         | $t_{rr}$  | $V_R=400V, I_F=11.3A, di_F/dt=100A/\mu s$ | --- | 320  | --- | ns      |
| Reverse Recovery Charge       | $Q_{rr}$  |   | --- | 4.77 | --- | $\mu C$ |
| Peak Reverse Recovery Current | $I_{rrm}$ |   | --- | 29.1 | --- | A       |

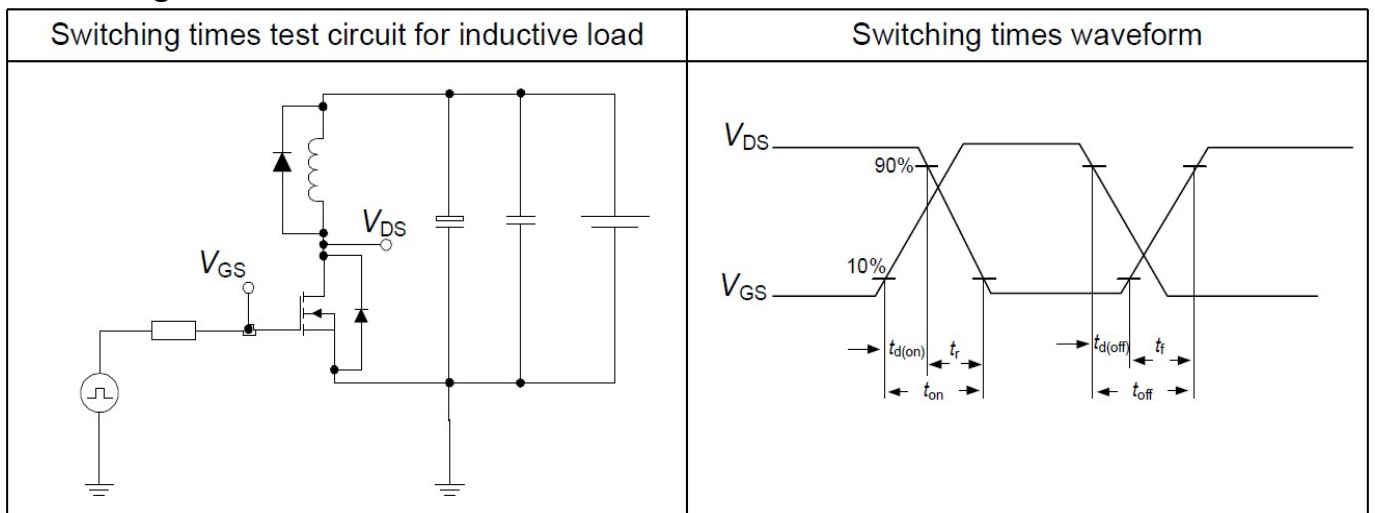
**Note:**

- Limited by  $T_{j,max}$ . Maximum Duty Cycle  $D = 0.50$
- Pulse width  $t_p$  limited by  $T_{j,max}$
- Identical low side and high side switch with identical  $R_G$

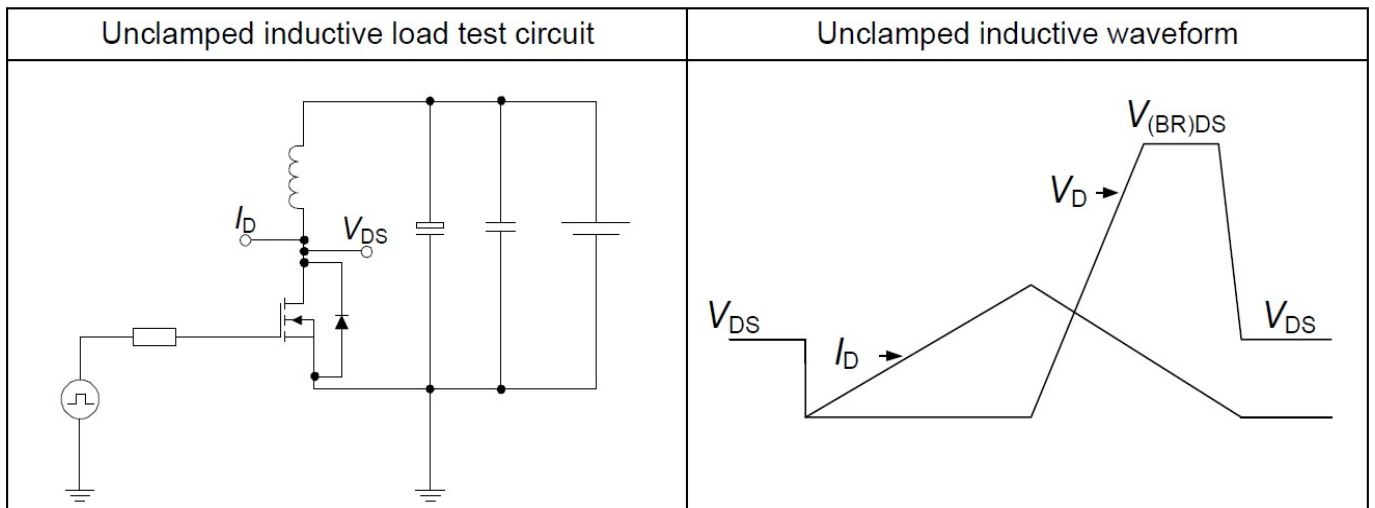
**Test Circuits**



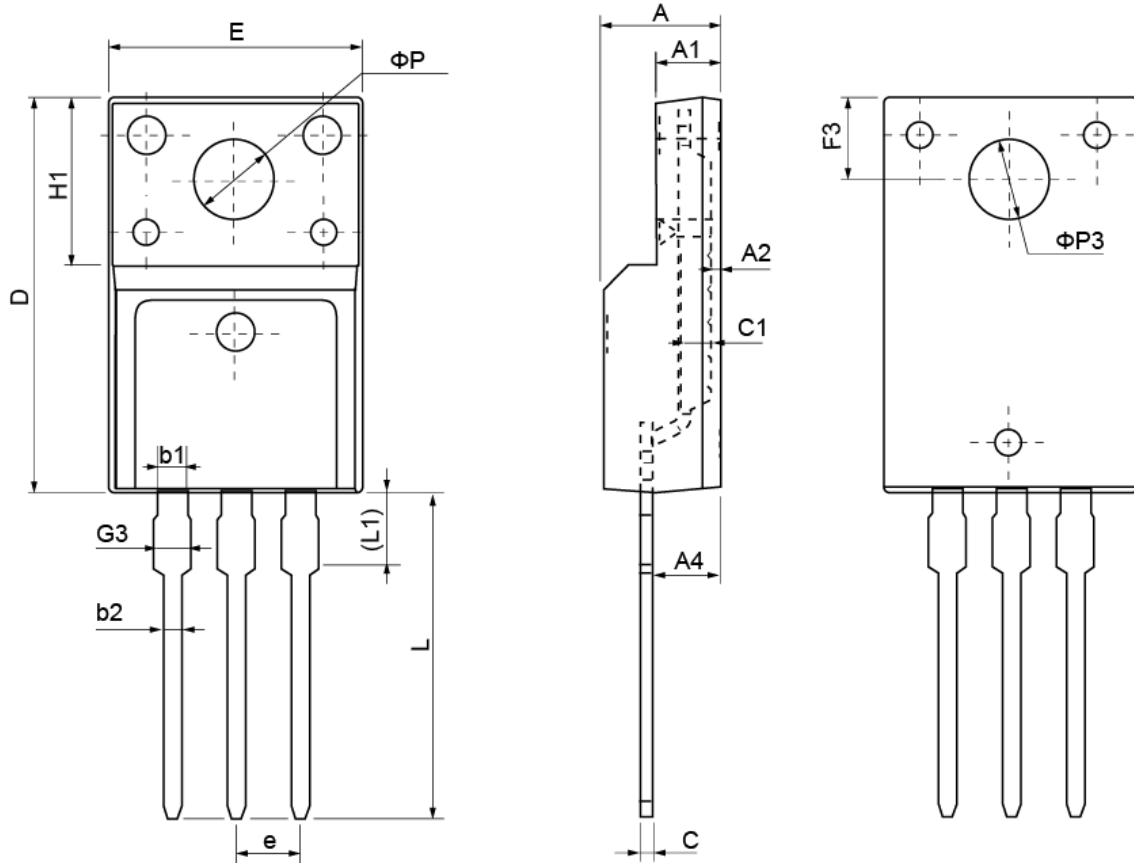
**Switching times**



**Unclamped inductive load**



**TO-220F Package Outline Dimensions**



| Symbol    | Dimensions (unit:mm) |       |       | Symbol        | Dimensions (unit:mm) |       |       |
|-----------|----------------------|-------|-------|---------------|----------------------|-------|-------|
|           | Min                  | Typ   | Max   |               | Min                  | Typ   | Max   |
| <b>A</b>  | 4.40                 | 4.70  | 5.00  | <b>H1</b>     | 6.70 REF             |       |       |
| <b>A1</b> | 2.30                 | 2.55  | 2.80  | <b>L</b>      | 12.30                | 12.98 | 13.30 |
| <b>A2</b> | 0.30                 | 0.50  | 0.70  | <b>L1</b>     | 2.95                 | 3.10  | 3.50  |
| <b>A4</b> | 2.45                 | 2.80  | 3.05  | <b>phi P</b>  | 3.03                 | 3.20  | 3.50  |
| <b>c</b>  | 0.30                 | 0.50  | 0.70  | <b>phi P3</b> | 3.15                 | 3.45  | 3.65  |
| <b>c1</b> | 1.20                 | 1.30  | 1.40  | <b>b1</b>     | 1.10                 | 1.30  | 1.45  |
| <b>D</b>  | 15.40                | 15.90 | 16.40 | <b>b2</b>     | 0.60                 | 0.80  | 1.00  |
| <b>E</b>  | 9.86                 | 10.16 | 10.46 | <b>F3</b>     | 3.05                 | 3.30  | 3.55  |
| <b>e</b>  | 2.54 BSC             |       |       | <b>G3</b>     | 1.15                 | 1.35  | 1.55  |