

## N-Channel Enhancement Mode MOSFET

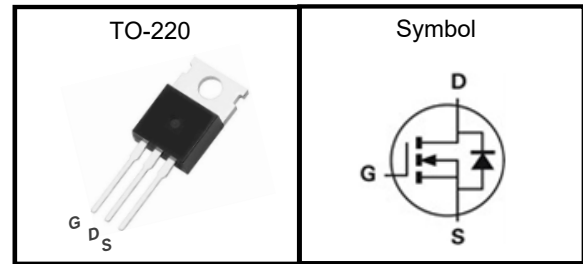
### Feature

- Optimized high performance of  $R_{on}$  and  $Q_g$
- Reliable and Rugged
- ROHS Compliant & Halogen-Free
- 100% UIS and Rg Tested

### Applications

- DC-DC Converter
- Load Switching

### Pin Description



|                  |     |           |
|------------------|-----|-----------|
| $V_{DSS}$        | 120 | V         |
| $R_{DS(ON)-Max}$ | 4.2 | $m\Omega$ |
| $I_D$            | 230 | A         |

### Absolute Maximum Ratings ( $T_J=25^\circ C$ Unless Otherwise Noted)

| Symbol       | Parameter                      | N-Channel                | Unit       |
|--------------|--------------------------------|--------------------------|------------|
| $V_{DSS}$    | Drain-Source Voltage           | 120                      | V          |
| $V_{GSS}$    | Gate-Source Voltage            | $\pm 20$                 |            |
| $T_J$        | Maximum Junction Temperature   | 175                      | $^\circ C$ |
| $T_{STG}$    | Storage Temperature Range      | -55 to 175               | $^\circ C$ |
| $I_{DM}^{①}$ | Pulse Drain Current Tested     | $T_c=25^\circ C$<br>920  | A          |
| $I_D$        | Continuous Drain Current       | $T_c=25^\circ C$<br>230  | A          |
|              |                                | $T_c=100^\circ C$<br>163 |            |
| $P_D$        | Maximum Power Dissipation      | $T_c=25^\circ C$<br>385  | W          |
|              |                                | $T_c=100^\circ C$<br>192 |            |
| $E_{AS}^{②}$ | Avalanche Energy, Single pulse | $L=0.5mH$<br>400         | mJ         |

### Thermal Characteristics

| Symbol              | Parameter                              | Rating               | Unit         |
|---------------------|--|----------------------|--------------|
| $R_{\theta JC}$     | Thermal Resistance-Junction to Case    | Steady State<br>0.39 | $^\circ C/W$ |
| $R_{\theta JA}^{③}$ | Thermal Resistance-Junction to Ambient | Steady State<br>62.5 | $^\circ C/W$ |

Note ① : Max. current is limited by bonding wire

Note ② : UIS tested and pulse width are limited by maximum junction temperature  $150^\circ C$

Note ③ : Surface Mounted on  $1in^2$  FR-4 board with 1oz.



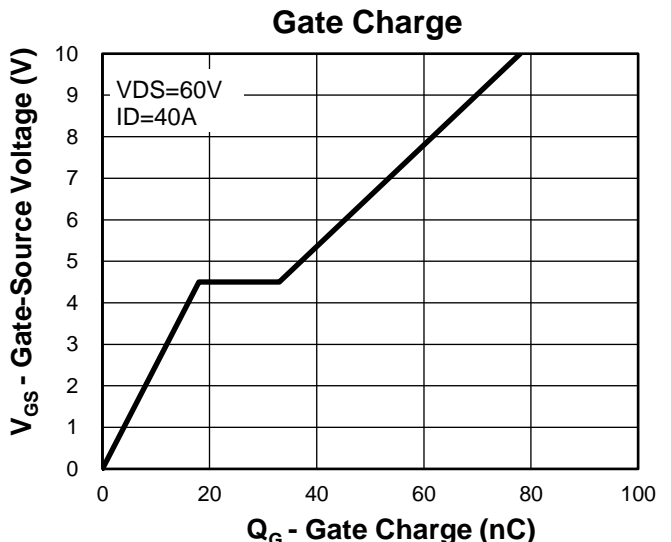
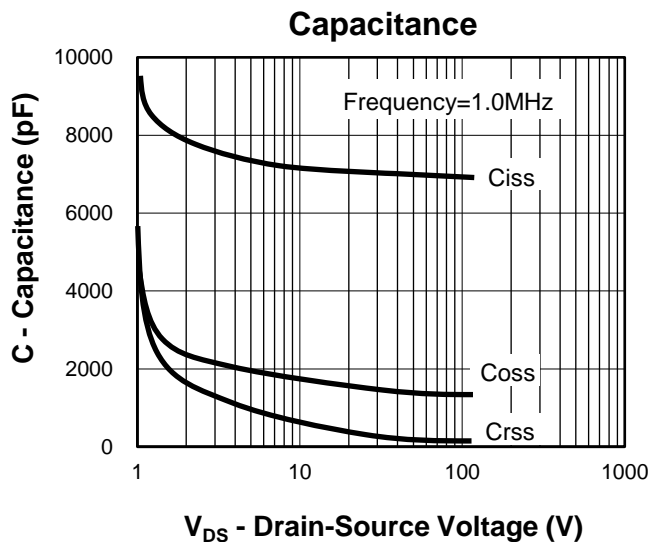
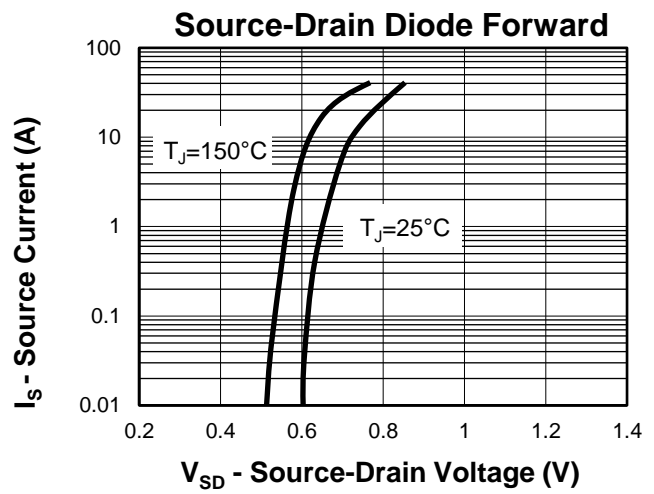
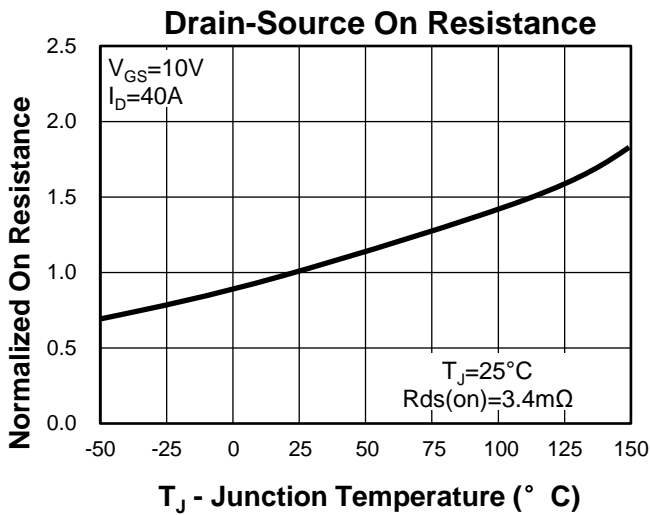
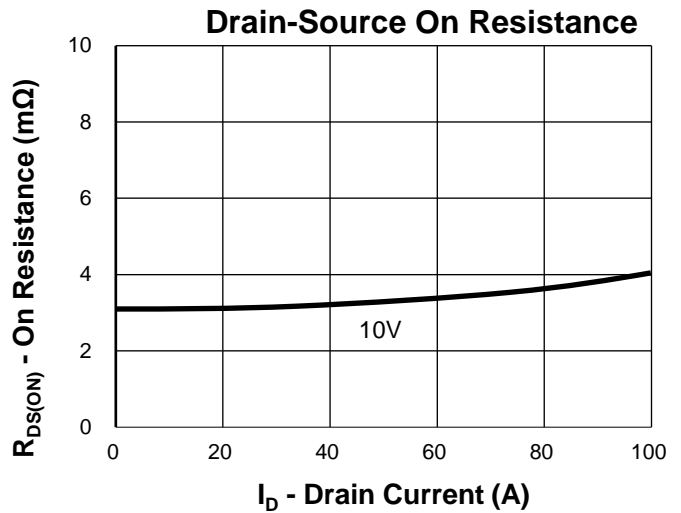
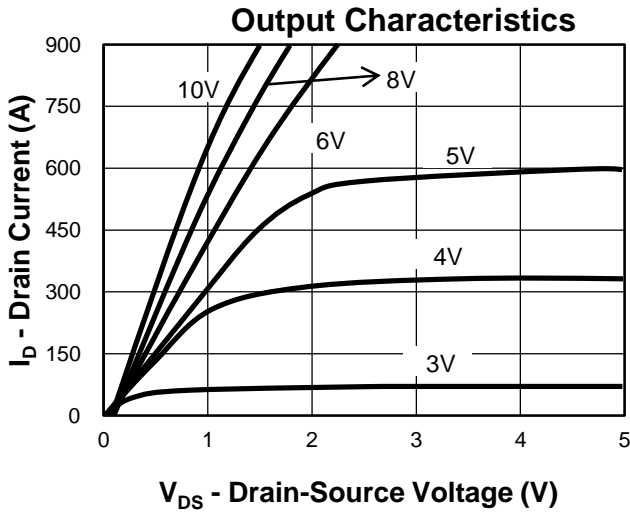
**N-Channel Enhancement Mode MOSFET**

**N-Channel Electrical Characteristics** (T<sub>J</sub>=25°C Unless Otherwise Noted)

| Symbol                                     | Parameter                        | Test Conditions   | Min. | Typ. | Max. | Unit |
|--|----------------------------------|---|------|------|------|------|
| <b>Static Electrical Characteristics</b>   |                                  |   |      |      |      |      |
| <b>BV<sub>DSS</sub></b>                    | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>DS</sub> =250uA   | 120  | -    | -    | V    |
| <b>I<sub>DSS</sub></b>                     | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =120V, V <sub>GS</sub> =0V  | -    | -    | 1    | uA   |
| <b>V<sub>GS(th)</sub></b>                  | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250uA                             | 2    | 3    | 4    | V    |
| <b>I<sub>GSS</sub></b>                     | Gate Leakage Current             | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V  | -    | -    | ±100 | nA   |
| <b>R<sub>DS(ON)</sub><sup>④</sup></b>      | Drain-Source On-state Resistance | V <sub>GS</sub> =10V, I <sub>DS</sub> =40A  | -    | 3.6  | 4.2  | mΩ   |
| <b>gfs</b>                                 | Forward Transconductance         | V <sub>DS</sub> =5V, I <sub>DS</sub> =50A   | -    | 95   | -    | S    |
| <b>Dynamic Characteristics<sup>⑥</sup></b> |                                  |   |      |      |      |      |
| <b>R<sub>G</sub></b>                       | Gate Resistance                  | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, Freq.=1MHz                                  | -    | 2.3  | -    | Ω    |
| <b>C<sub>iss</sub></b>                     | Input Capacitance                | V <sub>GS</sub> =0V, V <sub>DS</sub> =60V, Freq.=1MHz                                 | -    | 6955 | -    | pF   |
| <b>C<sub>OSS</sub></b>                     | Output Capacitance               |   | -    | 1630 | -    |      |
| <b>C<sub>rss</sub></b>                     | Reverse Transfer Capacitance     |   | -    | 70   | -    |      |
| <b>t<sub>d(ON)</sub></b>                   | Turn-on Delay Time               | V <sub>GS</sub> =10V, V <sub>DD</sub> =60V, I <sub>D</sub> =40A, R <sub>GEN</sub> =3Ω | -    | 18   | -    | nS   |
| <b>t<sub>r</sub></b>                       | Turn-on Rise Time                |   | -    | 24   | -    |      |
| <b>t<sub>d(OFF)</sub></b>                  | Turn-off Delay Time              |   | -    | 55   | -    |      |
| <b>t<sub>f</sub></b>                       | Turn-off Fall Time               |   | -    | 29   | -    |      |
| <b>Q<sub>g</sub></b>                       | Total Gate Charge                | V <sub>GS</sub> =4.5V, V <sub>DS</sub> =60V, I <sub>D</sub> =40A                      | -    | 35   | -    | nC   |
| <b>Q<sub>g</sub></b>                       | Total Gate Charge                | V <sub>GS</sub> =10V, V <sub>DS</sub> =60V, I <sub>D</sub> =40A                       | -    | 78   | -    |      |
| <b>Q<sub>gs</sub></b>                      | Gate-Source Charge               |   | -    | 17.5 | -    |      |
| <b>Q<sub>gd</sub></b>                      | Gate-Drain Charge                |   | -    | 14.5 | -    |      |
| <b>Source-Drain Characteristics</b>        |                                  |   |      |      |      |      |
| <b>V<sub>SD</sub><sup>④</sup></b>          | Diode Forward Voltage            | I <sub>D</sub> =40A, V <sub>GS</sub> =0V  | -    | 0.8  | 1.2  | V    |
| <b>t<sub>rr</sub></b>                      | Reverse Recovery Time            | I <sub>F</sub> =40A, dI <sub>F</sub> /  | -    | 54   | -    | nS   |
| <b>Q<sub>rr</sub></b>                      | Reverse Recovery Charge          | dt=100A/μs  | -    | 78   | -    | nC   |

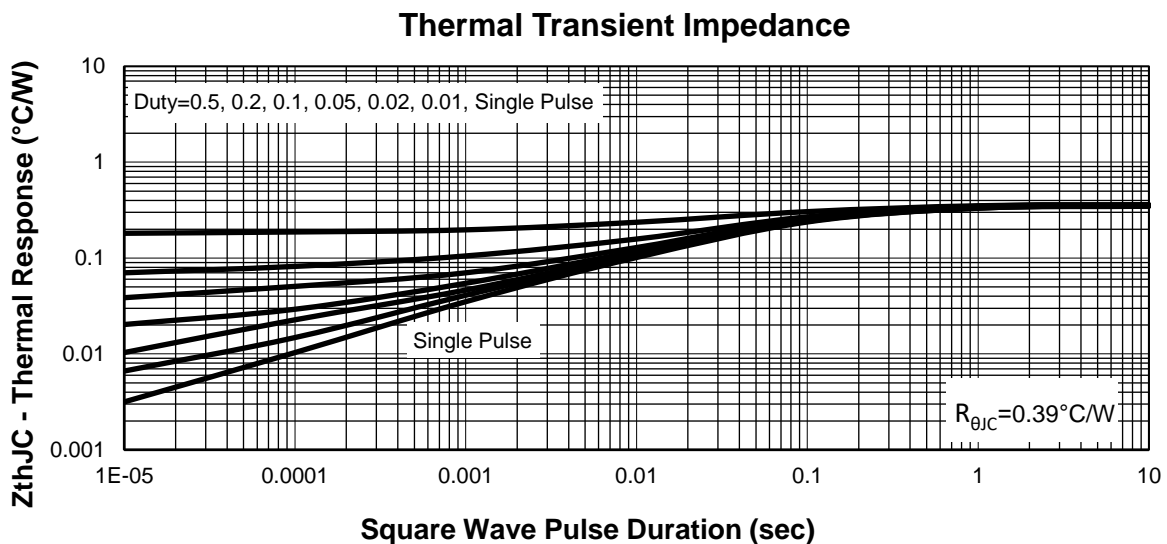
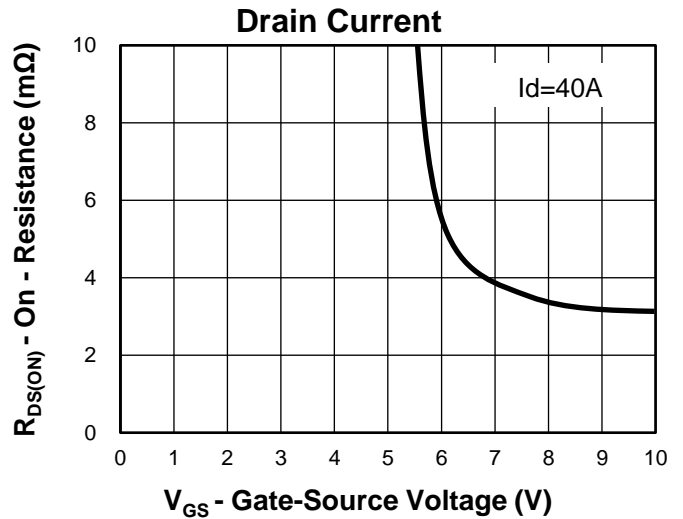
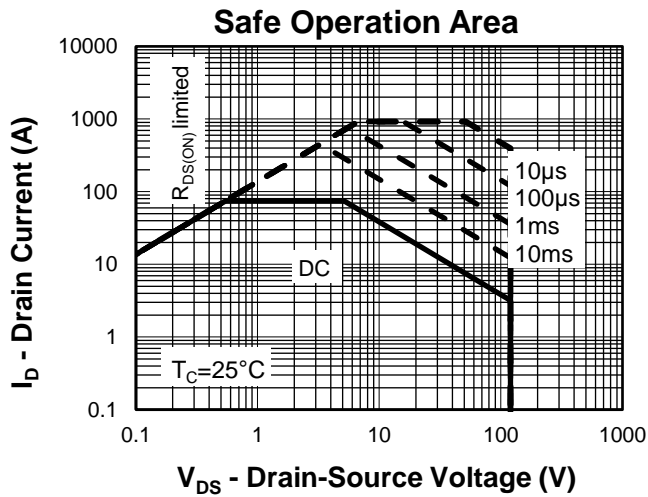
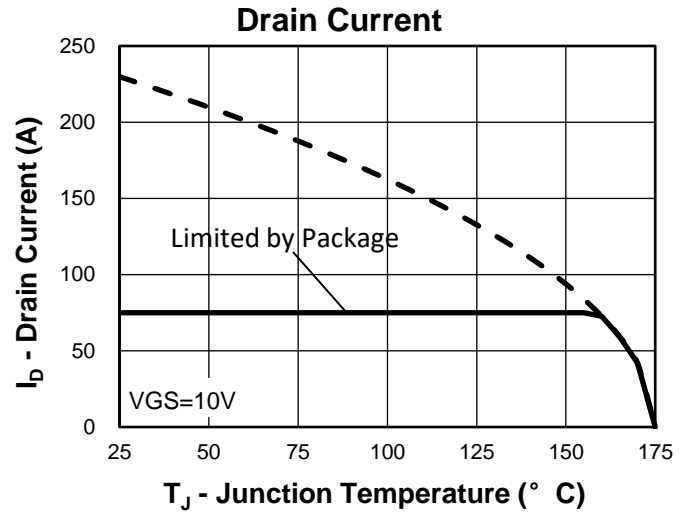
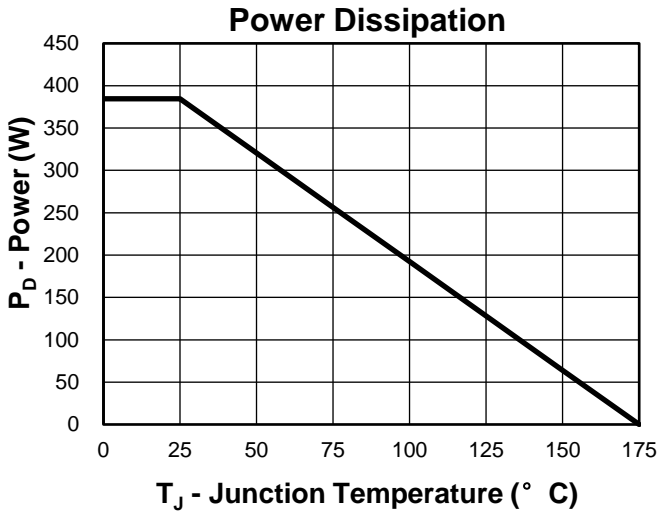
Note ④ : Pulse test (pulse width≤300us, duty cycle≤2%).

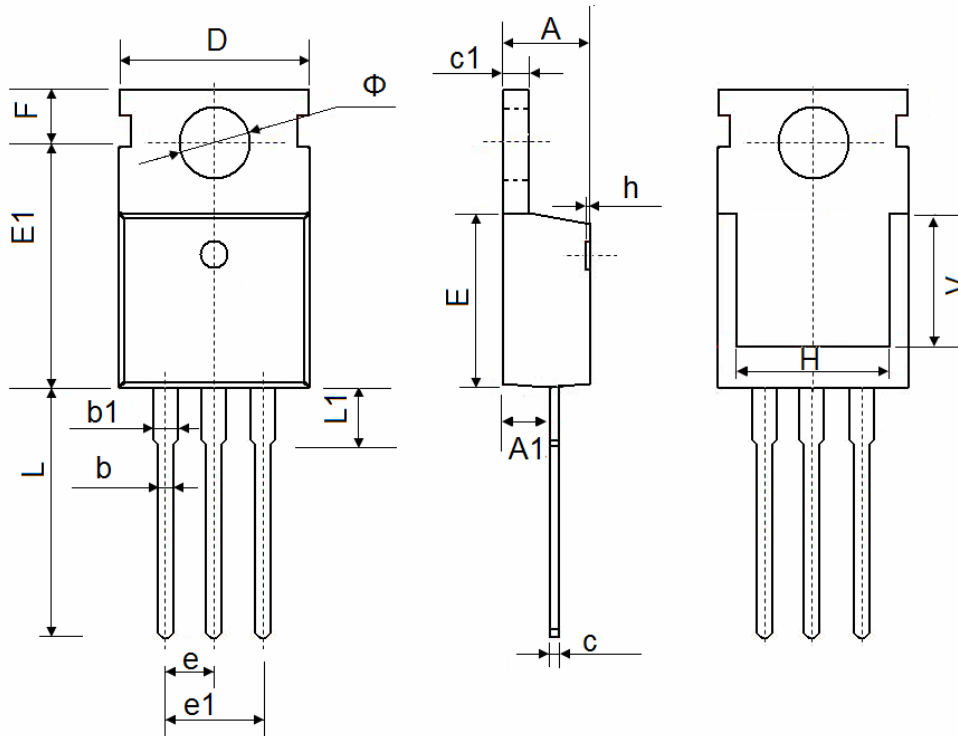
Note ⑤ : Guaranteed by design, not subject to production testing.

**N-Channel Enhancement Mode MOSFET**
**N-Channel Typical Characteristics**




**N-Channel Enhancement Mode MOSFET**



**N-Channel Enhancement Mode MOSFET**
**TO-220 Package Outline Data**


| Symbol | Dimensions In Millimeters |        |
|--------|---------------------------|--------|
|        | Min.                      | Max.   |
| A      | 4.10                      | 4.60   |
| A1     | 2.250                     | 2.550  |
| b      | 0.710                     | 0.910  |
| b1     | 1.170                     | 1.160  |
| c      | 0.330                     | 0.650  |
| c1     | 1.200                     | 1.400  |
| D      | 9.910                     | 10.250 |
| E      | 8.9500                    | 9.750  |
| E1     | 12.650                    | 12.950 |
| e      | 2.540 TYP.                |        |
| e1     | 4.980                     | 5.180  |
| F      | 2.650                     | 2.950  |
| H      | 7.900                     | 8.100  |
| h      | 0.000                     | 0.300  |
| L      | 12.100                    | 13.100 |
| L1     | 2.850                     | 3.250  |
| V      | 7.500 REF.                |        |
| $\Phi$ | 3.400                     | 3.800  |