



# 10N60

## 600V N-Channel Power MOSFET

### Features

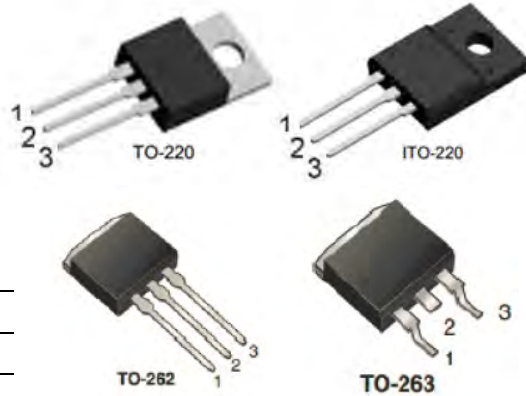
- $R_{DS(ON)} < 0.9\Omega$  @  $V_{GS} = 10V$
- Fast switching capability
- Low gate charge
- Lead free in compliance with EU RoHS directive.
- Green molding compound

### PRODUCT SUMMARY

| $V_{DS}$ (V) | $R_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) |
|--------------|---------------------------|-----------|
| 600          | 0.9 @ $V_{GS} = 10V$      | 10        |

Pin Definition:

1. Gate
2. Drain
3. Source



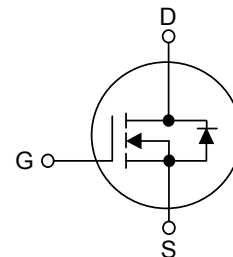
### Mechanical Data

- Case: TO-220, ITO-220, TO-262, TO-263 Package

### Ordering Information

| Part No.    | Package | Packing           |
|-------------|---------|-------------------|
| DMT10N60-TU | TO-220  | 50pcs / Tube      |
| DMF10N60-TU | ITO-220 | 50pcs / Tube      |
| DMK10N60-TU | TO-262  | 50pcs / Tube      |
| DMG10N60-TU | TO-263  | 50pcs / Tube      |
| DMG10N60-TR | TO-263  | 800pcs / 13" Reel |

### Block Diagram



### ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ C$ , unless otherwise specified)

| PARAMETER                     | SYMBOL                 | RATINGS    | UNIT       |    |
|-------------------------------|------------------------|------------|------------|----|
| Drain-Source Voltage          | $V_{DSS}$              | 600        | V          |    |
| Gate-Source Voltage           | $V_{GSS}$              | $\pm 30$   | V          |    |
| Continuous Drain Current      | $I_D$                  | 10         | A          |    |
| Pulsed Drain Current (Note 2) | $I_{DM}$               | 38         | A          |    |
| Avalanche Energy              | Single Pulsed (Note 3) | $E_{AS}$   | 700        | mJ |
| Power Dissipation             | TO-220/TO-262/TO-263   | $P_D$      | 156        | W  |
|                               | ITO-220                |            | 50         | W  |
| Junction Temperature          | $T_J$                  | +150       | $^\circ C$ |    |
| Operating Temperature         | $T_{OPR}$              | -55 ~ +150 | $^\circ C$ |    |
| Storage Temperature           | $T_{STG}$              | -55 ~ +150 | $^\circ C$ |    |

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Repetitive Rating : Pulse width limited by  $T_J$

3.  $L = 30mH$ ,  $I_{AS} = 6.4A$ ,  $V_{DD} = 50V$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ C$



### THERMAL DATA

| PARAMETER           |                                 | SYMBOL        | RATING | UNIT                 |
|---------------------|---------------------------------|---------------|--------|----------------------|
| Junction to Ambient | TO-220/ITO-220<br>TO-262/TO-263 | $\theta_{JA}$ | 62.5   | $^{\circ}\text{C/W}$ |
| Junction to Case    | TO-220                          | $\theta_{JC}$ | 0.85   | $^{\circ}\text{C/W}$ |
|                     | ITO-220                         |               | 2.6    |                      |

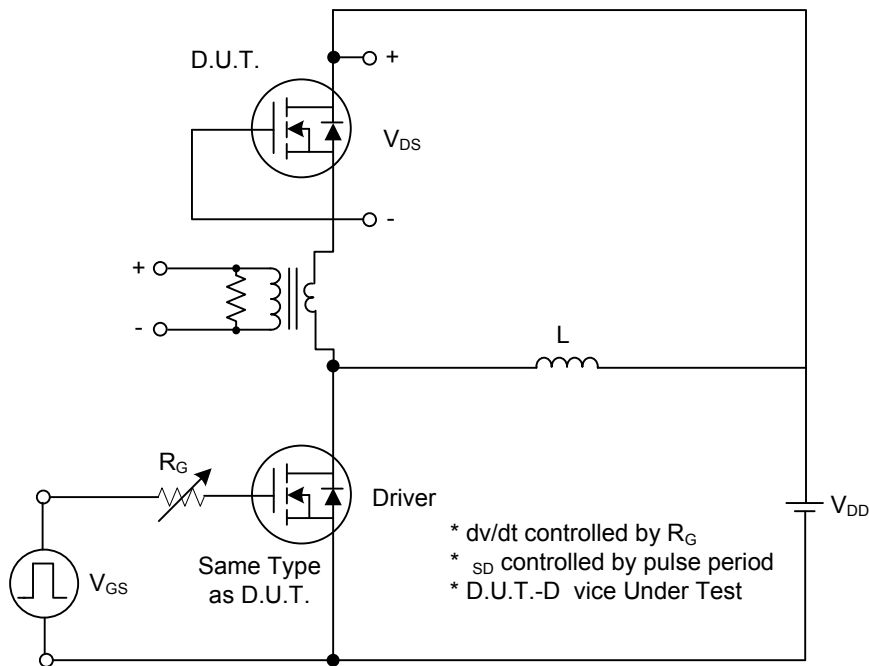
### ELECTRICAL CHARACTERISTICS ( $T_C=25^{\circ}\text{C}$ , unless otherwise specified)

| PARAMETER   |         | SYMBOL       | TEST CONDITIONS                                  | MIN | TYP  | MAX  | UNIT          |    |
|---|---------|--------------|--|-----|------|------|---------------|----|
| <b>OFF CHARACTERISTICS</b>                                    |         |              |  |     |      |      |               |    |
| Drain-Source Breakdown Voltage                                |         | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$                        | 600 |      |      | V             |    |
| Drain-Source Leakage Current                                  |         | $I_{DSS}$    | $V_{DS}=600V, V_{GS}=0V$                         |     |      | 1    | $\mu A$       |    |
| Gate- Source Leakage Current                                  | Forward | $I_{GSS}$    | $V_{GS}=30V, V_{DS}=0V$                          |     |      | 100  | nA            |    |
|   | Reverse |              | $V_{GS}=-30V, V_{DS}=0V$                         |     |      | -100 | nA            |    |
| <b>ON CHARACTERISTICS</b>                                     |         |              |  |     |      |      |               |    |
| Gate Threshold Voltage  |         | $V_{GS(TH)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$                    | 2.0 |      | 4.0  | V             |    |
| Static Drain-Source On-State Resistance                       |         | $R_{DS(ON)}$ | $X_{\theta S}=10V, I_D=5A$                       |     | 0.76 | 0.9  | $\Omega$      |    |
| <b>DYNAMIC CHARACTERISTICS</b>                                |         |              |  |     |      |      |               |    |
| Input Capacitance   |         | $C_{ISS}$    | $V_{DS}=25V, V_{GS}=0V, f=1.0\text{ MHz}$        |     | 1570 |      | pF            |    |
| Output Capacitance  |         | $C_{OSS}$    |  |     |      | 166  |               | pF |
| Reverse Transfer Capacitance                                  |         | $C_{RSS}$    |  |     |      | 18   |               | pF |
| <b>SWITCHING CHARACTERISTICS</b>                              |         |              |  |     |      |      |               |    |
| Turn-On Delay Time  |         | $t_{D(ON)}$  | $V_{DD}=300V, I_D=10A, R_G=25\Omega$ (Note 1, 2) |     | 23   |      | ns            |    |
| Turn-On Rise Time   |         | $t_R$        |  |     |      | 69   |               | ns |
| Turn-Off Delay Time   |         | $t_{D(OFF)}$ |  |     |      | 144  |               | ns |
| Turn-Off Fall Time  |         | $t_F$        |  |     |      | 77   |               | ns |
| Total Gate Charge   |         | $Q_G$        | $V_{DS}=480V, I_D=10A, V_{GS}=10V$ (Note 1, 2)   |     | 44   |      | nC            |    |
| Gate-Source Charge  |         | $Q_{GS}$     |  |     |      | 6.7  |               | nC |
| Gate-Drain Charge   |         | $Q_{GD}$     |  |     |      | 18.5 |               | nC |
| <b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b> |         |              |  |     |      |      |               |    |
| Drain-Source Diode Forward Voltage                            |         | $V_{SD}$     | $V_{GS}=0V, I_S=10A$                             |     |      | 1.4  | V             |    |
| Maximum Continuous Drain-Source Diode Forward Current         |         | $I_S$        |  |     |      | 10   | A             |    |
| Maximum Pulsed Drain-Source Diode Forward Current             |         | $I_{SM}$     |  |     |      | 40   | A             |    |
| Reverse Recovery Time   |         | $t_{rr}$     | $V_{GS}=0V, I_S=10A,$                            |     | 450  |      | ns            |    |
| Reverse Recovery Charge                                       |         | $Q_{RR}$     | $di_F/dt=100\text{ A}/\mu\text{s}$ (Note 1)      |     | 4.2  |      | $\mu\text{C}$ |    |

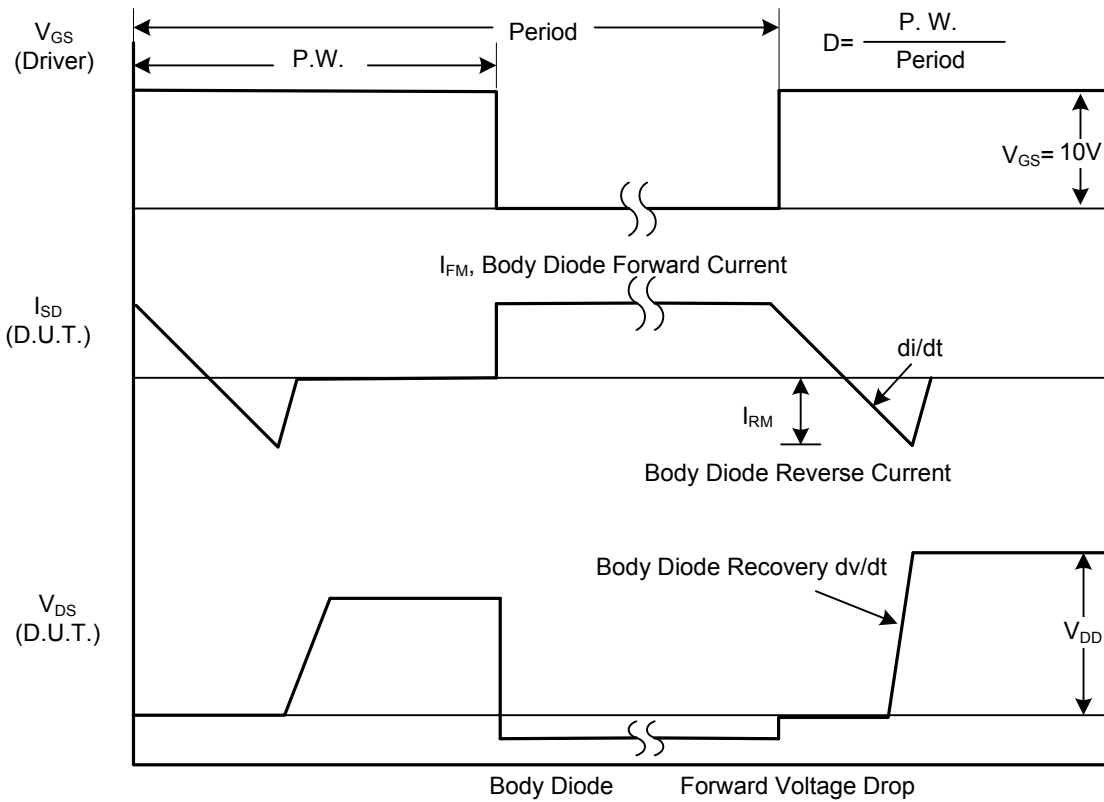
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ .  
 2. Essentially independent of operating temperature.



### TEST CIRCUITS AND WAVEFORMS



**Peak Diode Recovery dv/dt Test Circuit**



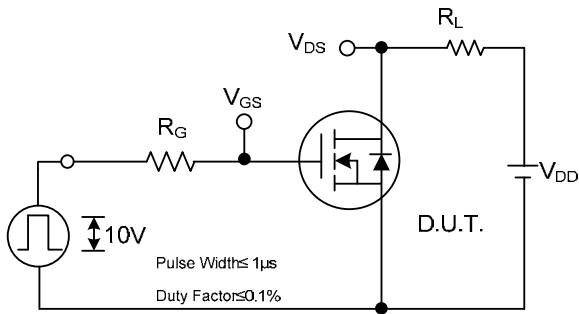
**Peak Diode Recovery dv/dt Waveforms**



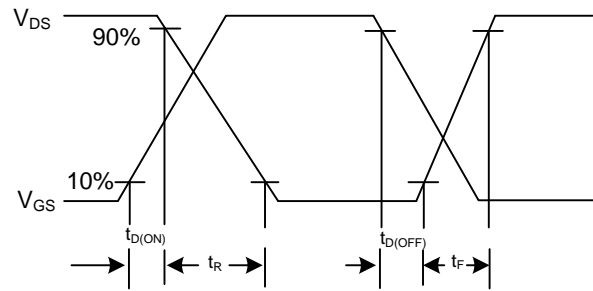
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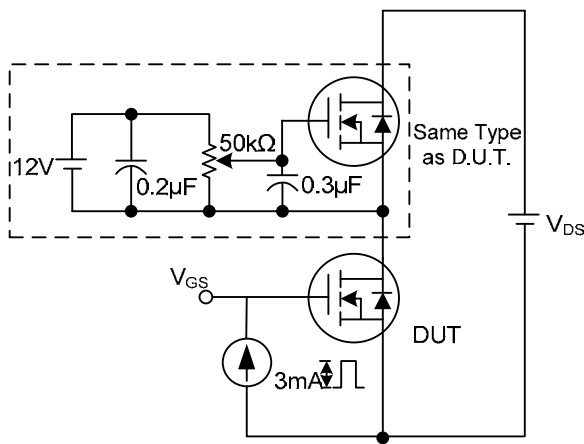
### TEST CIRCUITS AND WAVEFORMS(Cont.)



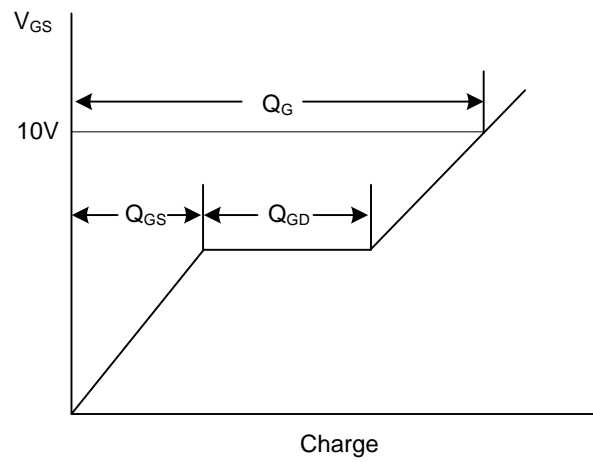
Switching Test Circuit



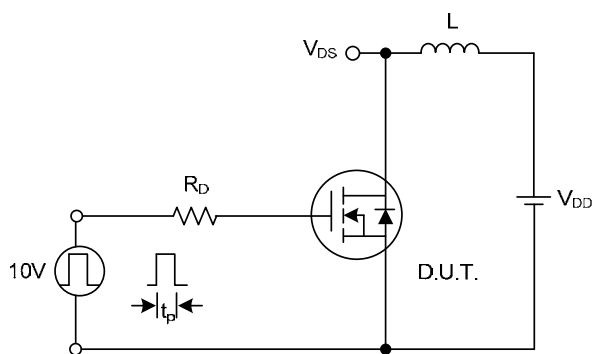
Switching Waveforms



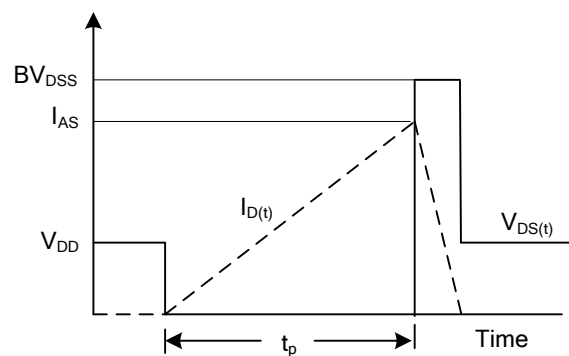
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

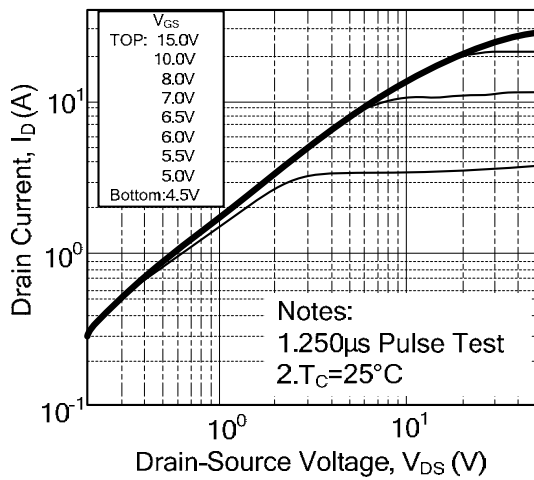


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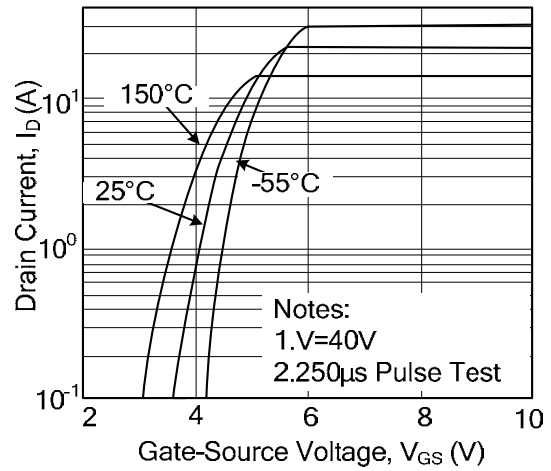
## 600V N-Channel Power MOSFET

### TYPICAL CHARACTERISTICS

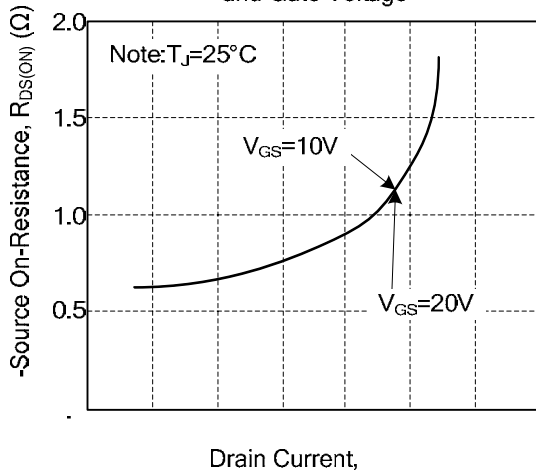
On-Region Characteristics



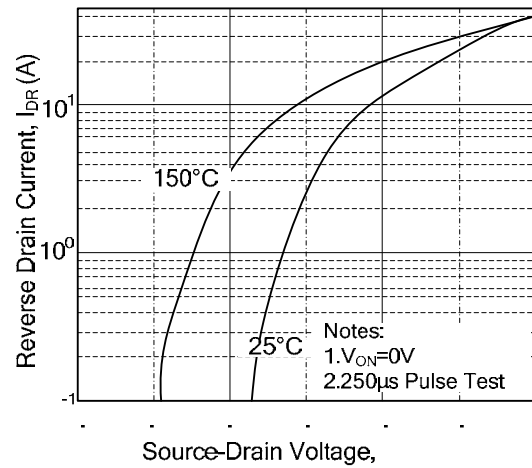
Transfer Characteristics



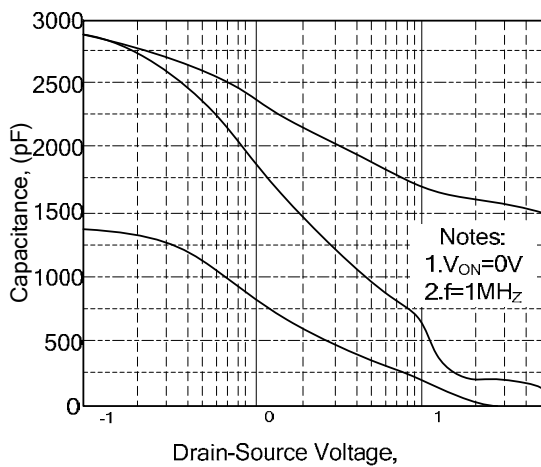
On-Resistance Variation vs. Drain Current and Gate Voltage



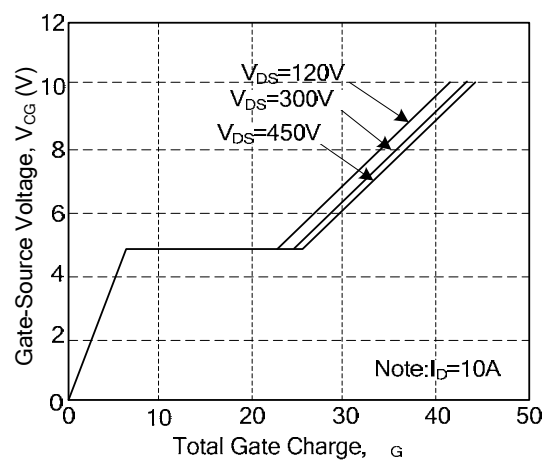
Body Diode Forward Voltage Variation with Source Current and Temperature



Capacitance Characteristics

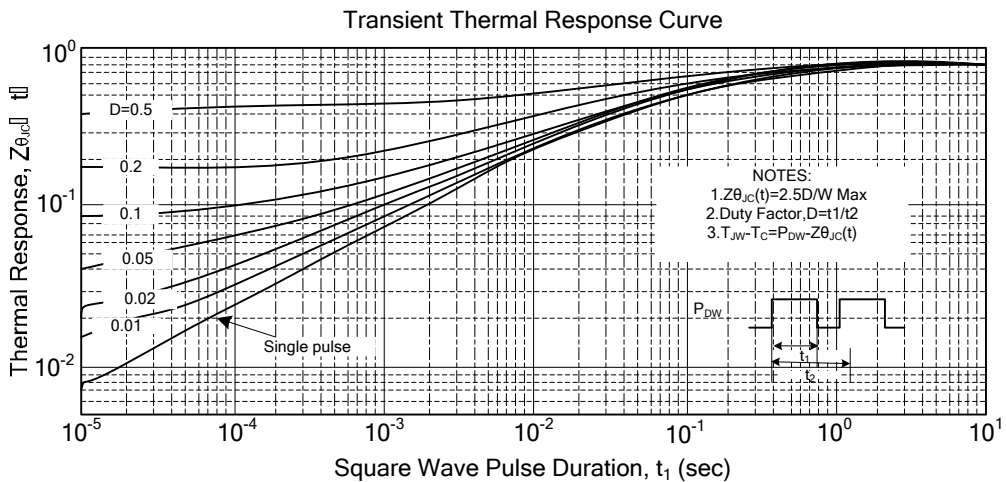
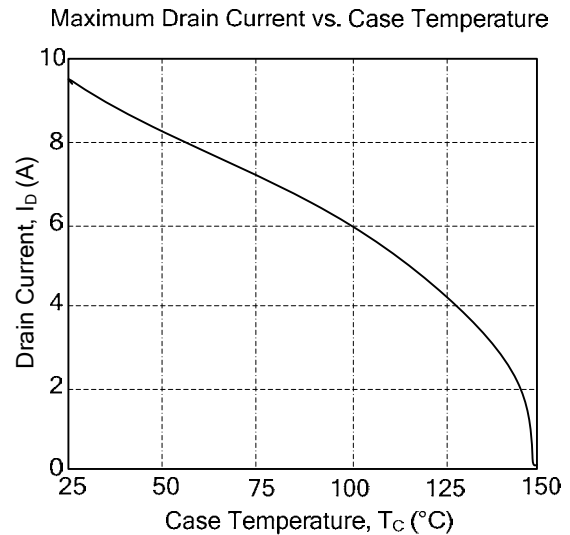
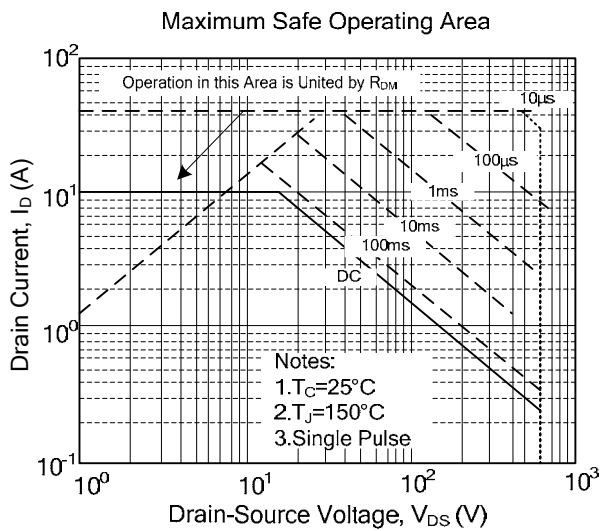
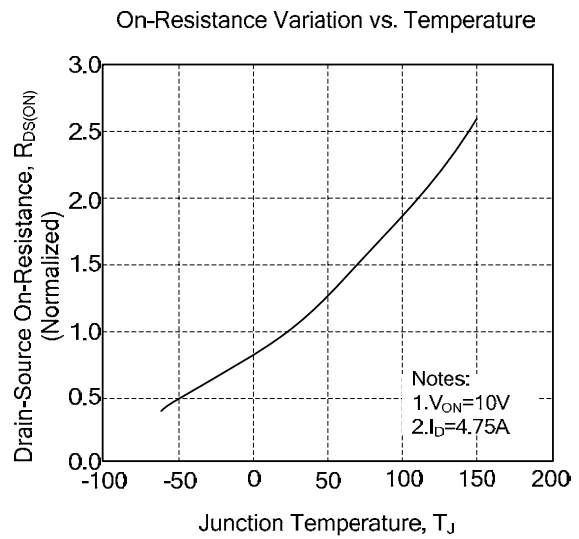
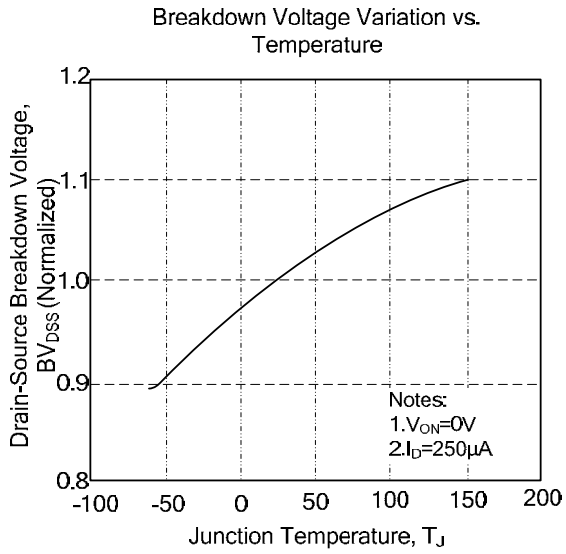


Gate Charge Characteristics



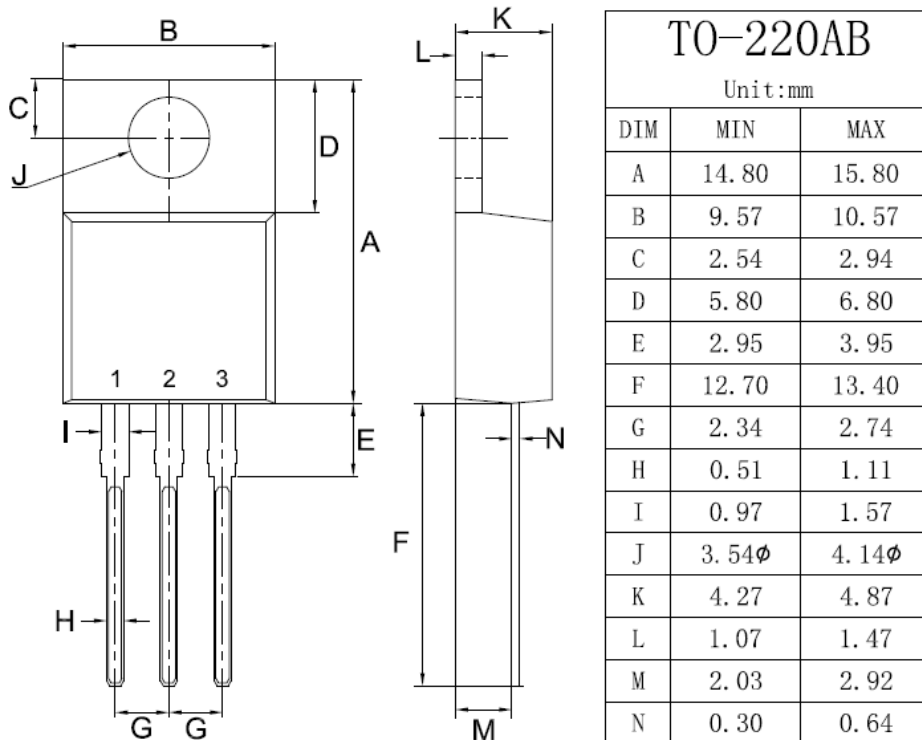


### TYPICAL CHARACTERISTICS

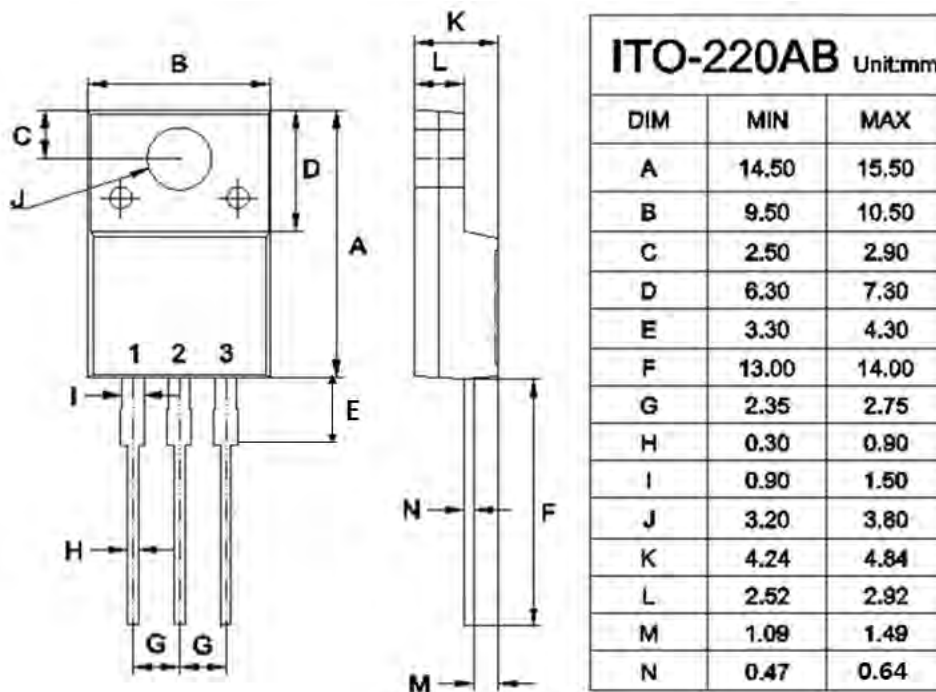




### TO-220 Mechanical Drawing

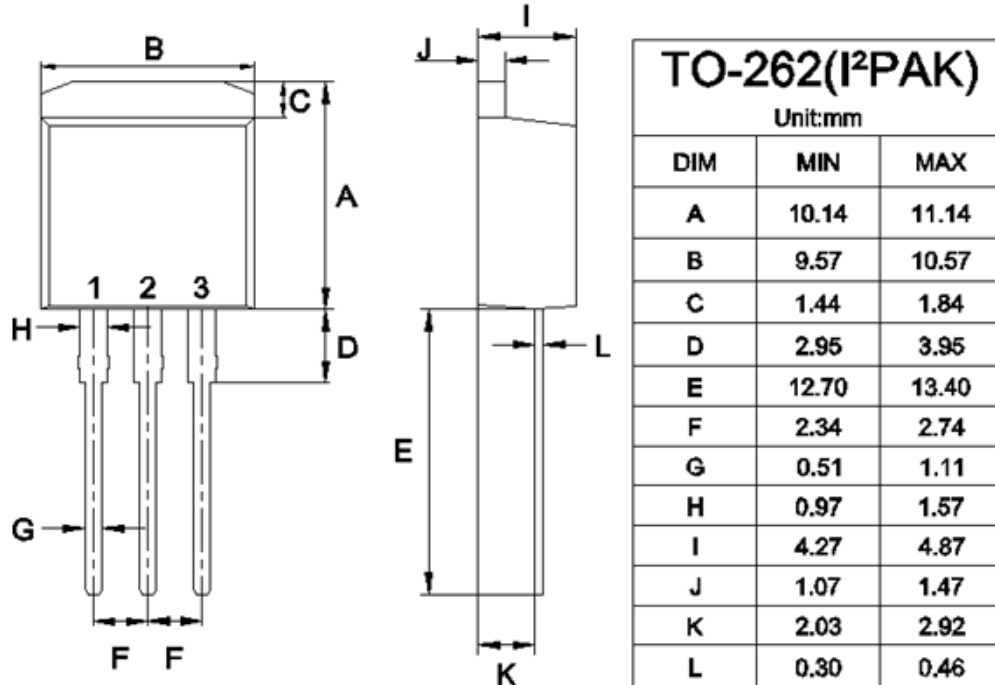


### ITO-220 Mechanical Drawing

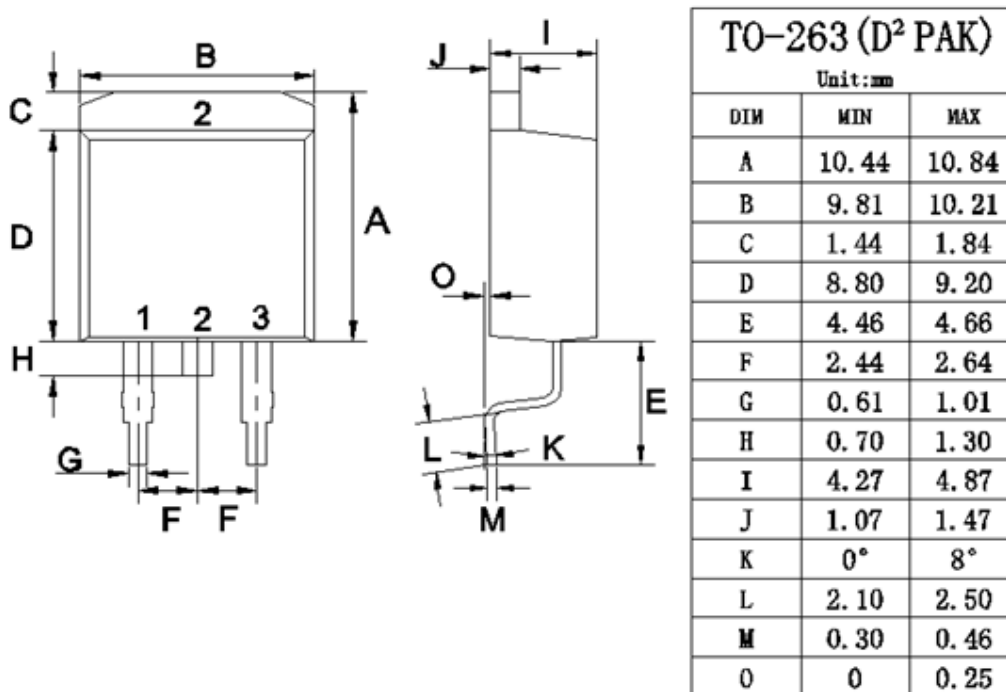




**TO-262 Mechanical Drawing**



**TO-263 Mechanical Drawing**





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