

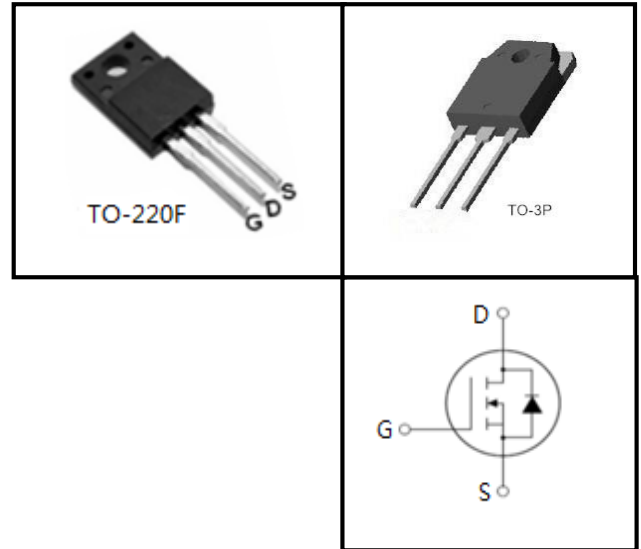
## 700V N-Channel MOSFET

### FEATURES

- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

### APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)



### Device Marking and Package Information

| Device   | Package | Marking  |
|----------|---------|----------|
| CS18N70F | TO-220F | CS18N70F |
| CS18N70V | TO-3P   | CS18N70V |

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

| Parameter                                        | Symbol         | Value           |       | Unit             |
|--------------------------------------------------|----------------|-----------------|-------|------------------|
|                                                  |                | TO-220F         | TO-3P |                  |
| Drain-Source Voltage ( $V_{GS} = 0V$ )           | $V_{DSS}$      | 700             |       | V                |
| Continuous Drain Current                         | $I_D$          | 18              |       | A                |
| Pulsed Drain Current (note1)                     | $I_{DM}$       | 72              |       | A                |
| Gate-Source Voltage                              | $V_{GSS}$      | $\pm 30$        |       | V                |
| Single Pulse Avalanche Energy (note2)            | $E_{AS}$       | 352.8           |       | mJ               |
| Avalanche Current (note1)                        | $I_{AR}$       | 8.4             |       | A                |
| Repetitive Avalanche Energy (note1)              | $E_{AR}$       | 211.68          |       | mJ               |
| Power Dissipation ( $T_C = 25^\circ\text{C}$ )   | $P_D$          | 25              | 70    | W                |
| Operating Junction and Storage Temperature Range | $T_J, T_{stg}$ | $-55 \sim +150$ |       | $^\circ\text{C}$ |

### Thermal Resistance

| Parameter                               | Symbol     | Value   |       | Unit |
|-----------------------------------------|------------|---------|-------|------|
|                                         |            | TO-220F | TO-3P |      |
| Thermal Resistance, Junction-to-Case    | $R_{thJC}$ | 5       | 1.78  | K/W  |
| Thermal Resistance, Junction-to-Ambient | $R_{thJA}$ | 62.5    | 60    |      |

**Specifications**  $T_J = 25^{\circ}\text{C}$ , unless otherwise noted

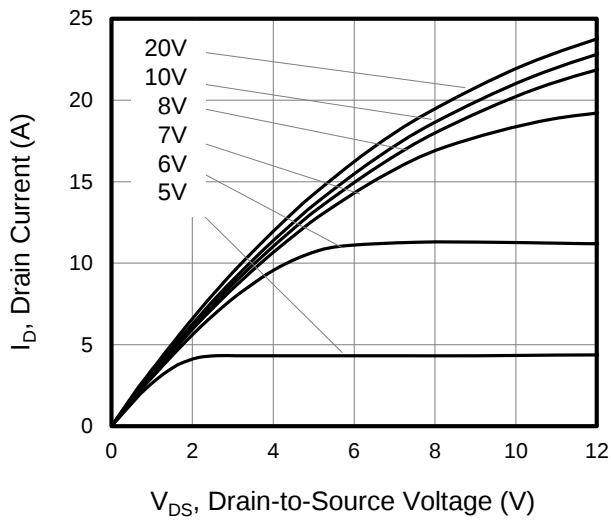
| Parameter                               | Symbol               | Test Conditions                                                              | Value |       |      | Unit |
|-----------------------------------------|----------------------|------------------------------------------------------------------------------|-------|-------|------|------|
|                                         |                      |                                                                              | Min.  | Typ.  | Max. |      |
| Static                                  |                      |                                                                              |       |       |      |      |
| Drain-Source Breakdown Voltage          | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                                 | 700   | --    | --   | V    |
| Zero Gate Voltage Drain Current         | I <sub>DSS</sub>     | V <sub>DS</sub> = 700V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 25°C          | --    | --    | 1    | μA   |
| Gate-Source Leakage                     | I <sub>GSS</sub>     | V <sub>GS</sub> = ±30V                                                       | --    | --    | ±100 | nA   |
| Gate-Source Threshold Voltage           | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                   | 3.0   | --    | 4.0  | V    |
| Drain-Source On-Resistance (Note3)      | R <sub>DS(on)</sub>  | V <sub>GS</sub> = 10V, I <sub>D</sub> = 9A                                   | --    | 0.45  | 0.55 | Ω    |
| Dynamic                                 |                      |                                                                              |       |       |      |      |
| Input Capacitance                       | C <sub>iss</sub>     | V <sub>GS</sub> = 0V,<br>V <sub>DS</sub> = 25V,<br>f = 1.0MHz                | --    | 2589  | --   | pF   |
| Output Capacitance                      | C <sub>oss</sub>     |                                                                              | --    | 233.5 | --   |      |
| Reverse Transfer Capacitance            | C <sub>rss</sub>     |                                                                              | --    | 28.6  | --   |      |
| Total Gate Charge                       | Q <sub>g</sub>       | V <sub>DD</sub> =560V, I <sub>D</sub> = 18A,<br>V <sub>GS</sub> = 10V        | --    | 73.5  | --   | nC   |
| Gate-Source Charge                      | Q <sub>gs</sub>      |                                                                              | --    | 10.2  | --   |      |
| Gate-Drain Charge                       | Q <sub>gd</sub>      |                                                                              | --    | 35    | --   |      |
| Turn-on Delay Time                      | t <sub>d(on)</sub>   | V <sub>DD</sub> = 350V, I <sub>D</sub> =18A,<br>R <sub>G</sub> = 25 Ω        | --    | 54    | --   | ns   |
| Turn-on Rise Time                       | t <sub>r</sub>       |                                                                              | --    | 25.7  | --   |      |
| Turn-off Delay Time                     | t <sub>d(off)</sub>  |                                                                              | --    | 334   | --   |      |
| Turn-off Fall Time                      | t <sub>f</sub>       |                                                                              | --    | 57.7  | --   |      |
| Drain-Source Body Diode Characteristics |                      |                                                                              |       |       |      |      |
| Continuous Body Diode Current           | I <sub>S</sub>       | T <sub>C</sub> = 25 °C                                                       | --    | --    | 18   | A    |
| Pulsed Diode Forward Current            | I <sub>SM</sub>      |                                                                              | --    | --    | 72   |      |
| Body Diode Voltage                      | V <sub>SD</sub>      | T <sub>J</sub> = 25°C, I <sub>SD</sub> = 9A, V <sub>GS</sub> = 0V            | --    | --    | 1.4  | V    |
| Reverse Recovery Time                   | t <sub>rr</sub>      | V <sub>GS</sub> = 0V, I <sub>S</sub> = 18A,<br>di <sub>F</sub> /dt =100A /μs | --    | 770   | --   | ns   |
| Reverse Recovery Charge                 | Q <sub>rr</sub>      |                                                                              | --    | 5.4   | --   | μC   |

**Notes**

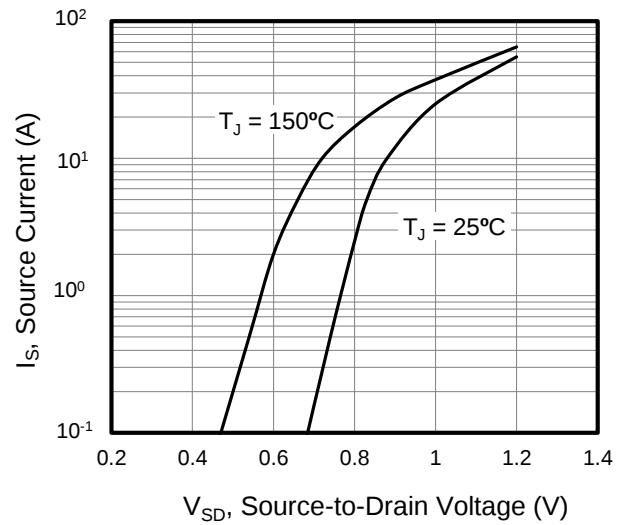
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $L = 10.0\text{mH}, V_{DD} = 50V, R_G = 25\Omega$ , Starting  $T_J = 25^{\circ}\text{C}$
3. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty Cycle  $\leq 1\%$

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

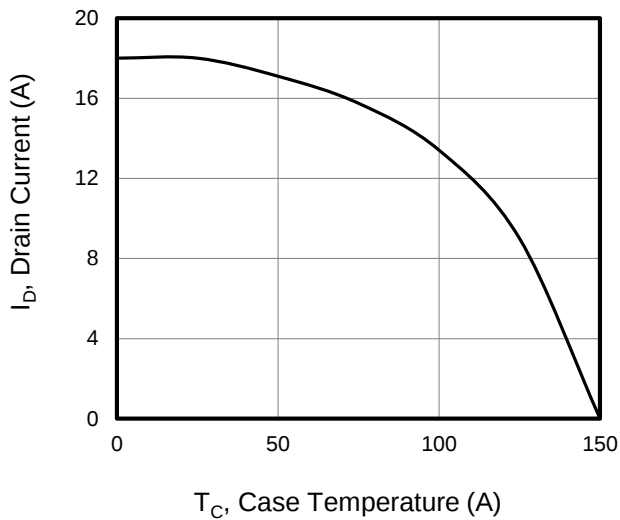
**Figure 1. Output Characteristics ( $T_J = 25^\circ\text{C}$ )**



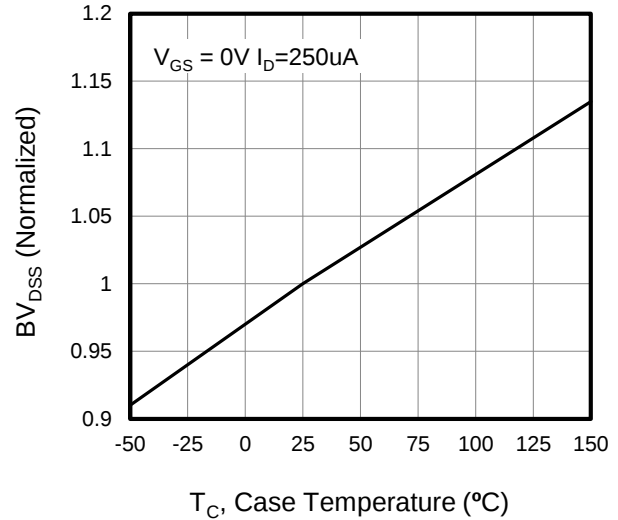
**Figure 2. Body Diode Forward Voltage**



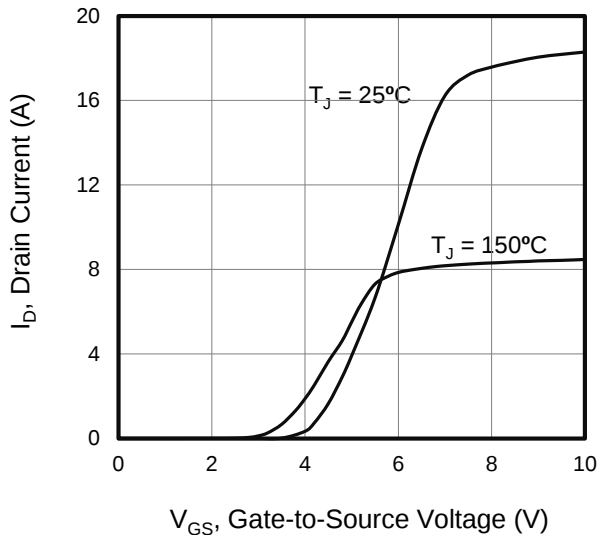
**Figure 3. Drain Current vs. Temperature**



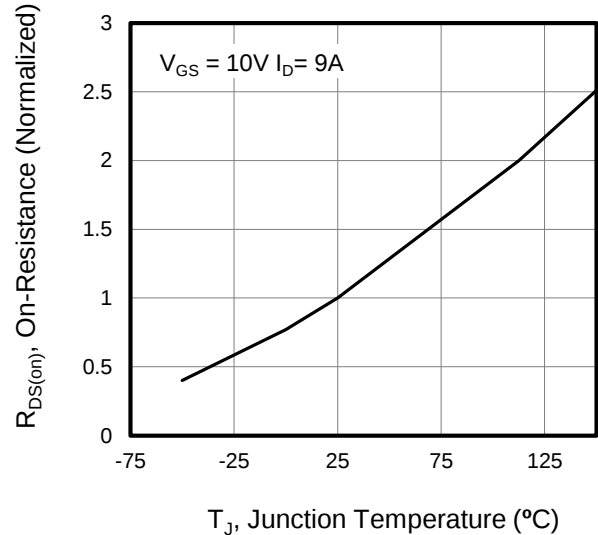
**Figure 4.  $BV_{DSS}$  Variation vs. Temperature**



**Figure 5. Transfer Characteristics**



**Figure 6. On-Resistance vs. Temperature**



Typical Characteristics  $T_j = 25^\circ\text{C}$ , unless otherwise noted

Figure 7. Capacitance

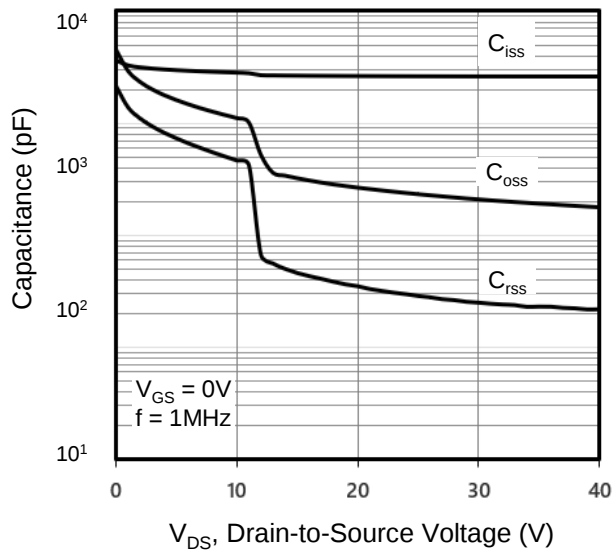


Figure 8. Gate Charge

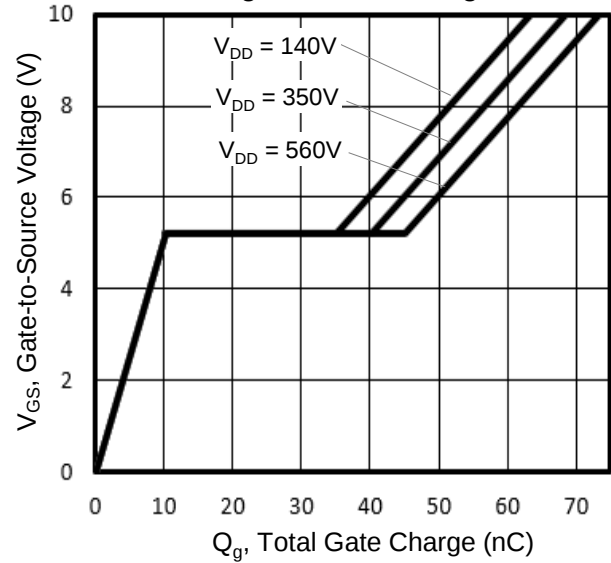


Figure 9. Transient Thermal Impedance  
TO-220F

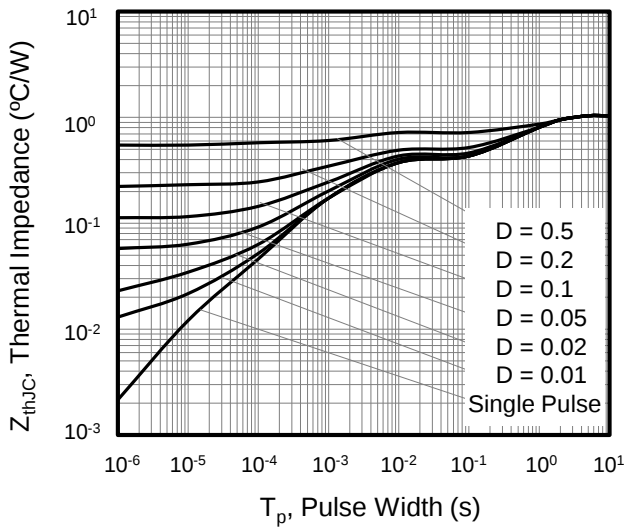
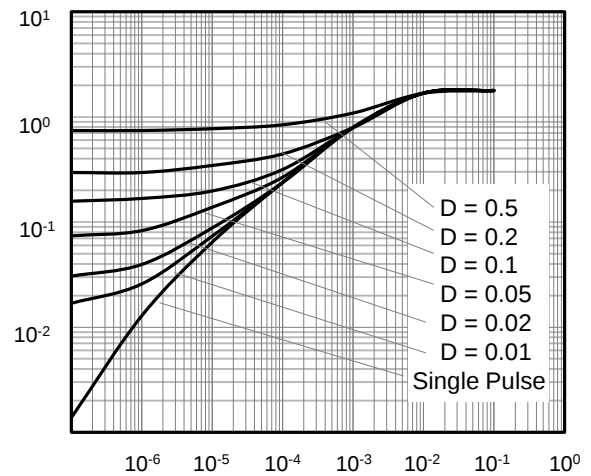
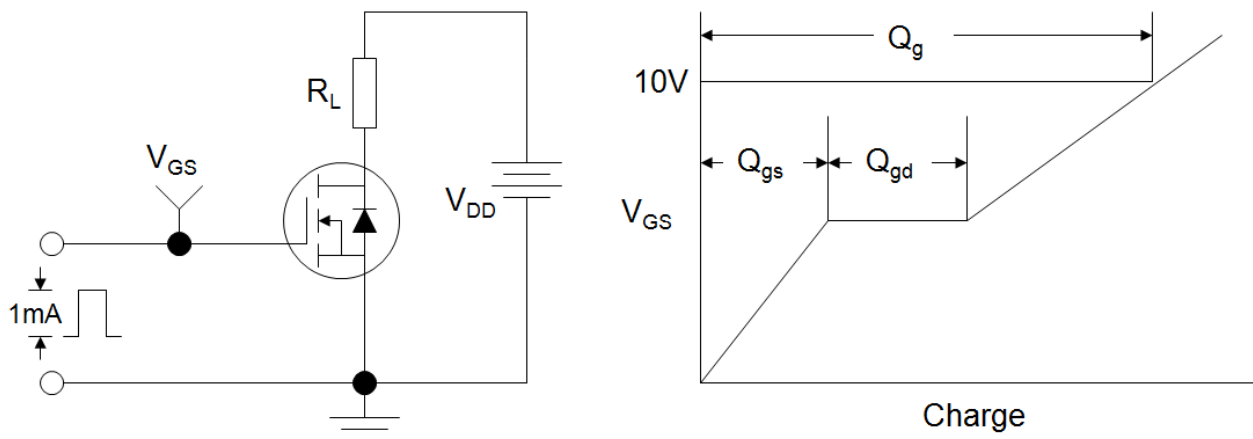
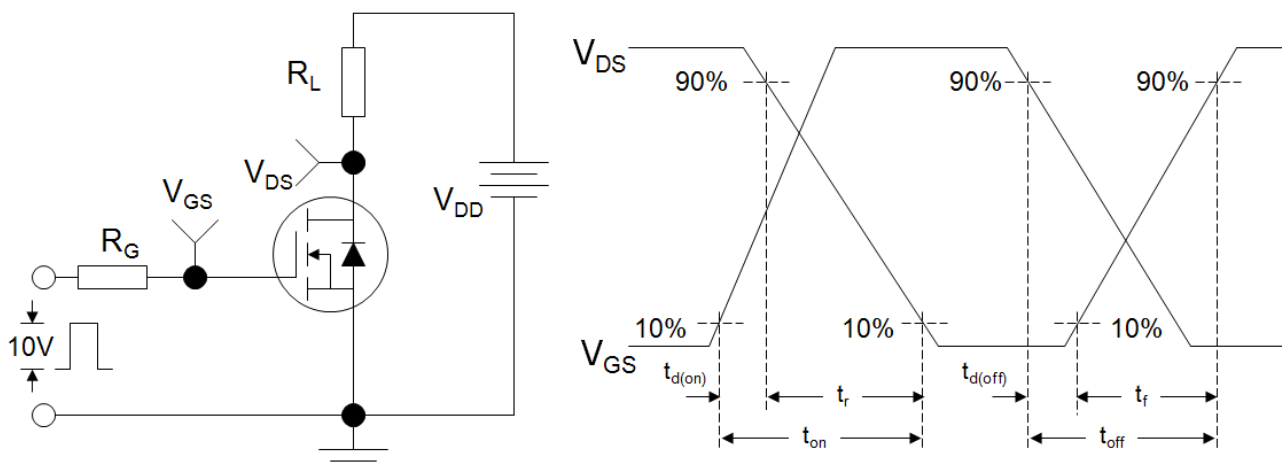
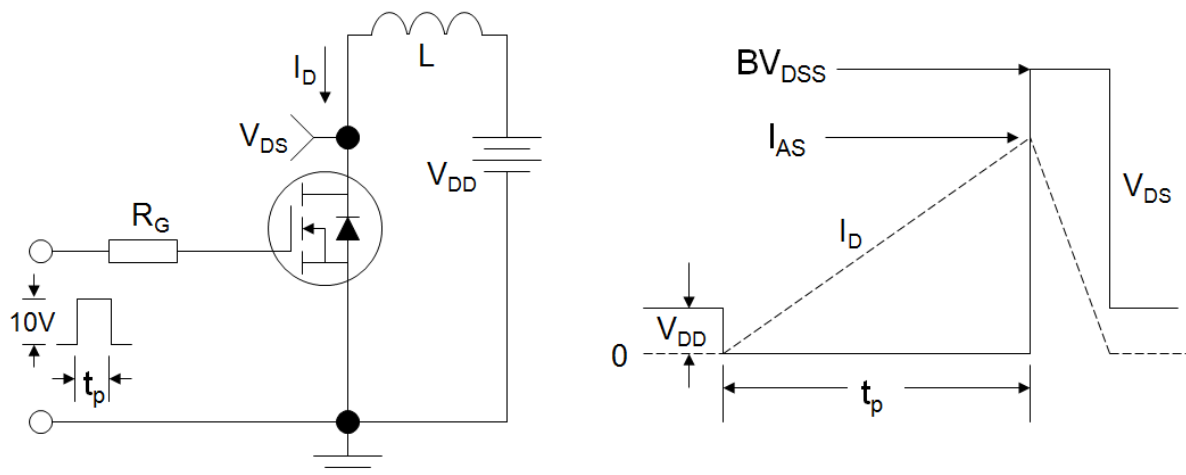


Figure 10. Transient Thermal Impedance  
TO-3P

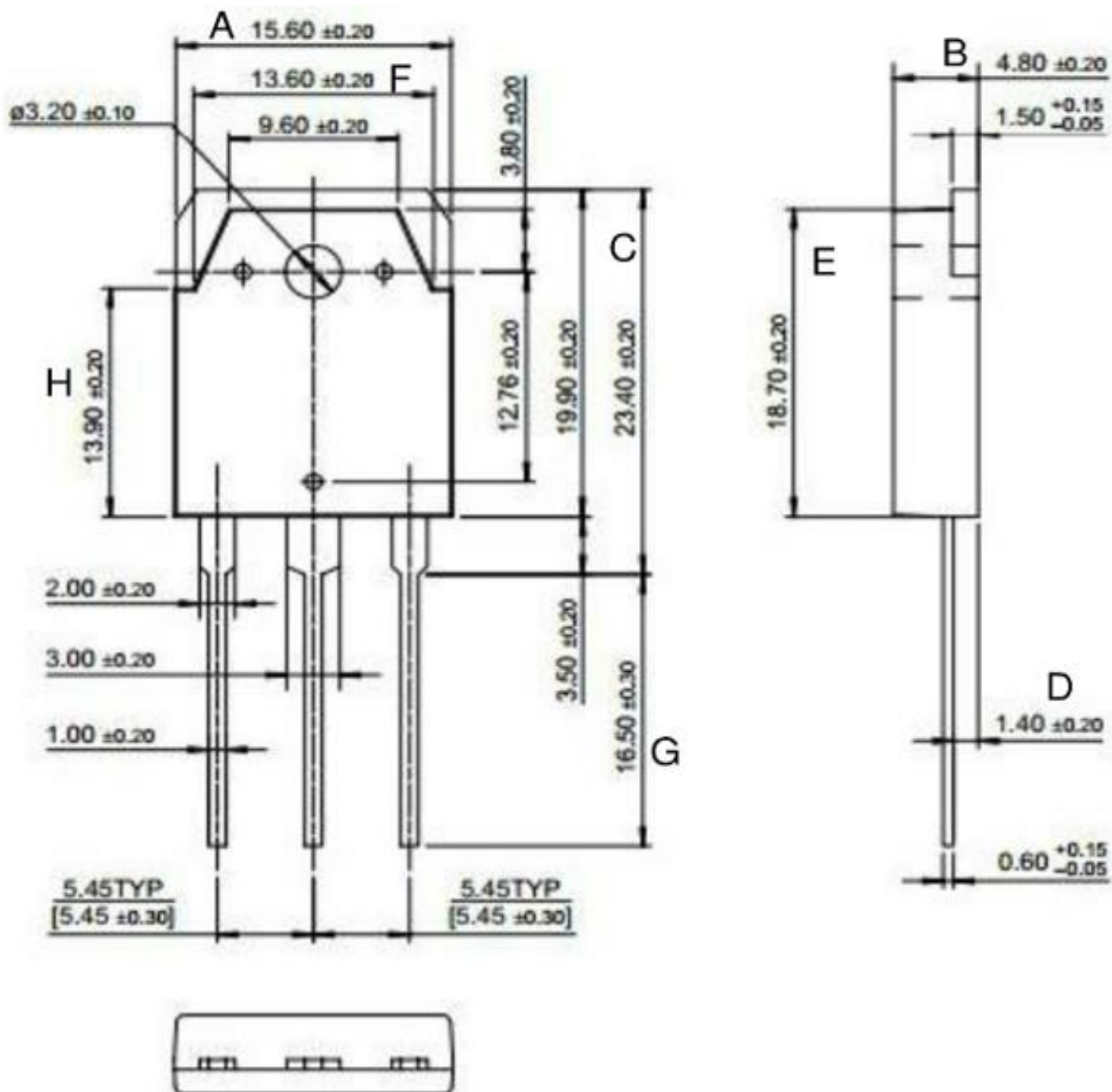


**Figure A: Gate Charge Test Circuit and Waveform**

**Figure B: Resistive Switching Test Circuit and Waveform**

**Figure C: Unclamped Inductive Switching Test Circuit and Waveform**


# TO-220F



## TO-3P



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