

# HFP7N80U / HFS7N80U

## 800V N-Channel MOSFET

### Features

- Originative New Design
- Very Low Intrinsic Capacitances
- Excellent Switching Characteristics
- 100% Avalanche Tested
- RoHS Compliant

### Key Parameters

| Parameter         | Value | Unit     |
|-------------------|-------|----------|
| $BV_{DSS}$        | 800   | V        |
| $I_D$             | 7     | A        |
| $R_{DS(on), Typ}$ | 1.55  | $\Omega$ |
| $Qg, Typ$         | 31    | nC       |

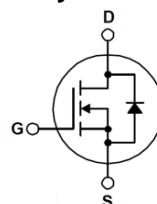
**HFP7N80U**  
TO-220



**HFS7N80U**  
TO-220F



**Symbol**



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

| Symbol         | Parameter   | TO-220      | TO-220F | Unit                |
|----------------|---|-------------|---------|---------------------|
| $V_{DSS}$      | Drain-Source Voltage  | 800         |         | V                   |
| $I_D$          | Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ )                             | 7.0         | 7.0 *   | A                   |
|                | Drain Current - Continuous ( $T_C = 100^\circ\text{C}$ )                            | 4.4         | 4.4 *   | A                   |
| $I_{DM}$       | Drain Current - Pulsed (Note 1)   | 28          | 28 *    | A                   |
| $V_{GS}$       | Gate-Source Voltage   | $\pm 30$    |         | V                   |
| $E_{AS}$       | Single Pulsed Avalanche Energy (Note 2)   | 480         |         | mJ                  |
| $I_{AR}$       | Avalanche Current (Note 1)  | 7.0         |         | A                   |
| $E_{AR}$       | Repetitive Avalanche Energy (Note 1)  | 16.4        |         | mJ                  |
| $dv/dt$        | Peak Diode Recovery $dv/dt$ (Note 3)  | 4.5         |         | V/ns                |
| $P_D$          | Power Dissipation ( $T_C = 25^\circ\text{C}$ )<br>- Derate above $25^\circ\text{C}$ | 164         | 50      | W                   |
|                |   | 1.32        | 0.40    | W/ $^\circ\text{C}$ |
| $T_J, T_{STG}$ | Operating and Storage Temperature Range   | -55 to +150 |         | $^\circ\text{C}$    |
| $T_L$          | Maximum lead temperature for soldering purposes,<br>1/8" from case for 5 seconds    | 300         |         | $^\circ\text{C}$    |

\* Drain current limited by maximum junction temperature

### Thermal Resistance Characteristics

| Symbol          | Parameter                                     | TO-220 | TO-220F | Unit                      |
|-----------------|---|--------|---------|---------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case, Max.    | 0.76   | 2.5     | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JS}$ | Thermal Resistance, Case-to-Sink, Typ.        | 0.5    | --      | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient, Max. | 62.5   | 62.5    | $^\circ\text{C}/\text{W}$ |

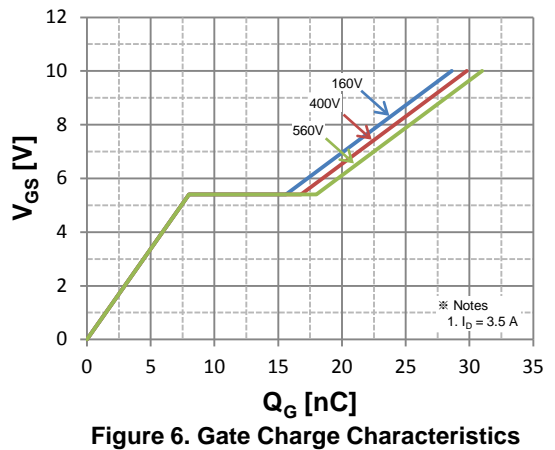
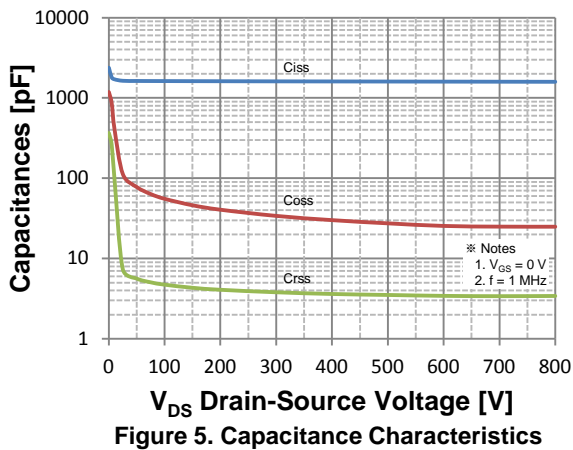
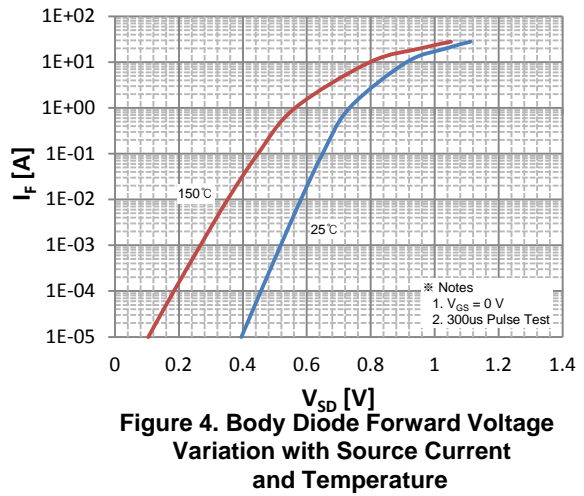
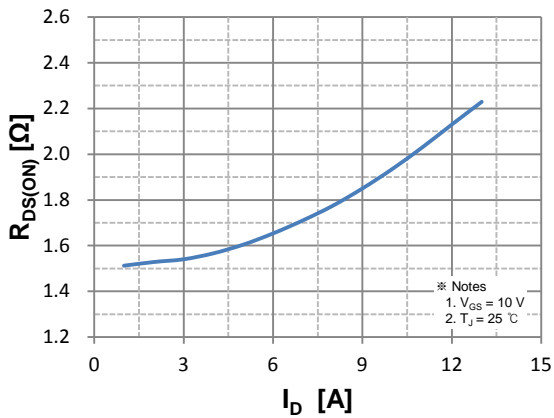
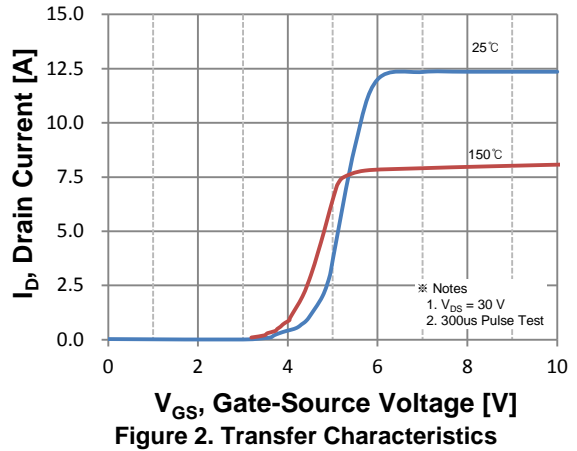
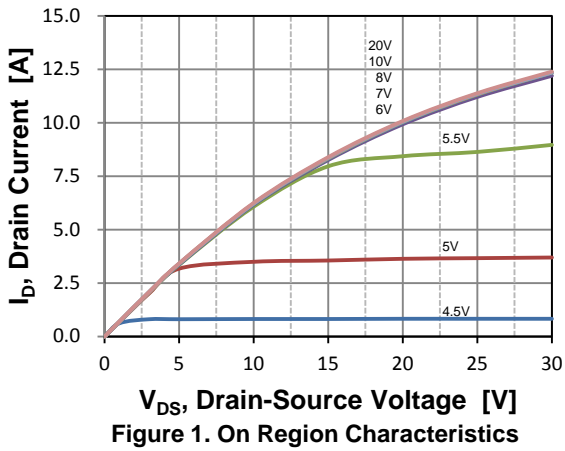
**Electrical Characteristics**  $T_J=25\text{ }^\circ\text{C}$  unless otherwise specified

| Symbol  | Parameter   | Test Conditions  | Min | Typ  | Max       | Unit          |
|---|---|--|-----|------|-----------|---------------|
| <b>On Characteristics</b>                                     |   |  |     |      |           |               |
| $V_{GS}$  | Gate Threshold Voltage                                | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$  | 2.5 | --   | 4.5       | V             |
| $R_{DS(ON)}$  | Static Drain-Source On-Resistance                     | $V_{GS} = 10\text{ V}, I_D = 3.5\text{ A}$   | --  | 1.55 | 1.9       | $\Omega$      |
| $g_{FS}$  | Forward Transconductance                              | $V_{DS} = 30\text{ V}, I_D = 3.5\text{ A}$   | --  | 7    | --        | S             |
| <b>Off Characteristics</b>                                    |   |  |     |      |           |               |
| $BV_{DSS}$  | Drain-Source Breakdown Voltage                        | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$  | 800 | --   | --        | V             |
| $I_{DSS}$   | Zero Gate Voltage Drain Current                       | $V_{DS} = 800\text{ V}, V_{GS} = 0$  | --  | --   | 1         | $\mu\text{A}$ |
|   |   | $V_{DS} = 640\text{ V}, T_C = 125\text{ }^\circ\text{C}$                                   | --  | --   | 100       | $\mu\text{A}$ |
| $I_{GSS}$   | Gate-Body Leakage Current                             | $V_{GS} = \pm 30\text{ V}, V_{DS} = 0\text{ V}$  | --  | --   | $\pm 100$ | nA            |
| <b>Dynamic Characteristics</b>                                |   |  |     |      |           |               |
| $C_{iss}$   | Input Capacitance                                     | $V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$<br>$f = 1.0\text{ MHz}$                       | --  | 1620 | --        | pF            |
| $C_{oss}$   | Output Capacitance                                    |  | --  | 113  | --        | pF            |
| $C_{rss}$   | Reverse Transfer Capacitance                          |  | --  | 7.3  | --        | pF            |
| <b>Switching Characteristics</b>                              |   |  |     |      |           |               |
| $t_{d(on)}$   | Turn-On Time  | $V_{DS} = 400\text{ V}, I_D = 7.0\text{ A},$<br>$R_G = 25\text{ }\Omega$<br><br>(Note 4,5) | --  | 46   | --        | ns            |
| $t_r$   | Turn-On Rise Time                                     |  | --  | 23   | --        | ns            |
| $t_{d(off)}$  | Turn-Off Delay Time                                   |  | --  | 130  | --        | ns            |
| $t_f$   | Turn-Off Fall Time                                    |  | --  | 23   | --        | ns            |
| $Q_{g(}$  | Total Gate Charge                                     | $V_{DS} = 640\text{ V}, I_D = 7.0\text{ A},$<br>$V_{GS} = 10\text{ V}$<br><br>(Note 4,5)   | --  | 31   | 40        | nC            |
| $Q_{gs}$  | Gate-Source Charge                                    |  | --  | 8    | --        | nC            |
| $Q_{gd}$  | Gate-Drain Charge                                     |  | --  | 10   | --        | nC            |
| <b>Drain-Source Diode Characteristics and Maximum Ratings</b> |   |  |     |      |           |               |
| $I_S$   | Maximum Continuous Drain-Source Diode Forward Current |  | --  | --   | 7.0       | A             |
| $I_{SM}$  | Maximum Pulsed Drain-Source Diode Forward Current     |  | --  | --   | 28        | A             |
| $V_{SD}$  | Drain-Source Diode Forward Voltage                    | $V_{GS} = 0\text{ V}, I_S = 7.0\text{ A}$  | --  | --   | 1.4       | V             |
| $t_{rr}$  | Reverse Recovery Time                                 | $V_{GS} = 0\text{ V}, I_S = 7.0\text{ A}$<br>$di_F/dt = 100\text{ A}/\mu\text{s}$          | --  | 525  | --        | ns            |
| $Q_{rr}$  | Reverse Recovery Charge                               |  | --  | 5.3  | --        | $\mu\text{C}$ |

**Notes :**

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $L=18.5\text{mH}, I_{AS}=7\text{A}, V_{DD}=50\text{V}, R_G=25\Omega,$  Starting  $T_J=25\text{ }^\circ\text{C}$
3.  $I_{SD}\leq 7\text{A}, di/dt\leq 200\text{A}/\mu\text{s}, V_{DD}\leq BV_{DSS},$  Starting  $T_J=25\text{ }^\circ\text{C}$
4. Pulse Test : Pulse Width  $\leq 300\mu\text{s},$  Duty Cycle  $\leq 2\%$
5. Essentially Independent of Operating Temperature

### Typical Characteristics



Typical Characteristics (continued)

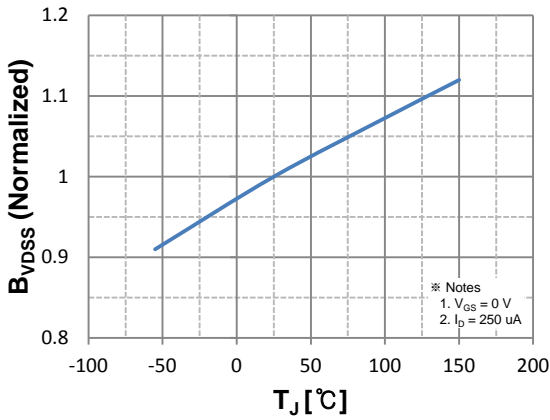


Figure 7. Breakdown Voltage Variation vs Temperature

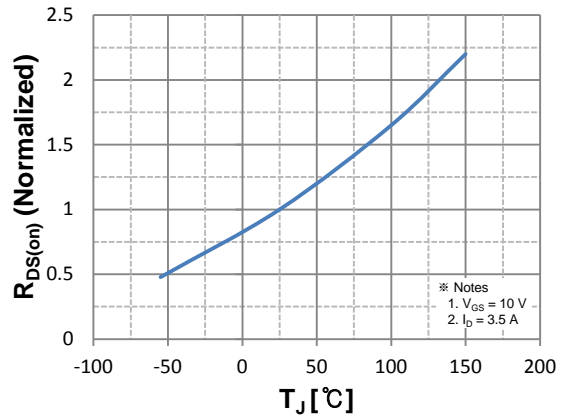


Figure 8. On-Resistance Variation vs Temperature

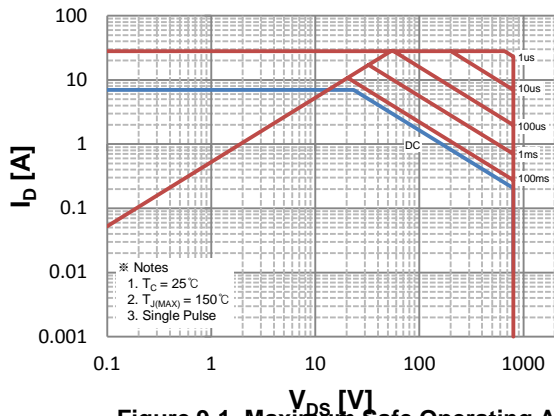


Figure 9-1. Maximum Safe Operating Area for TO-220

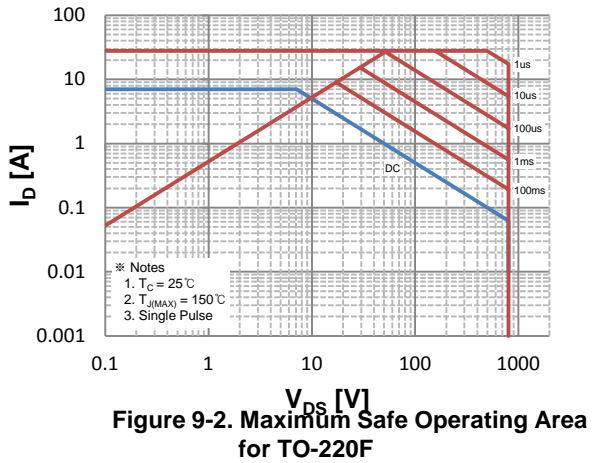


Figure 9-2. Maximum Safe Operating Area for TO-220F

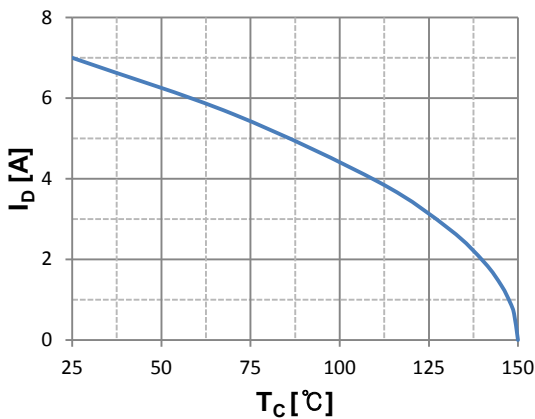


Figure 10. Maximum Drain Current vs Case Temperature

Typical Characteristics (continued)

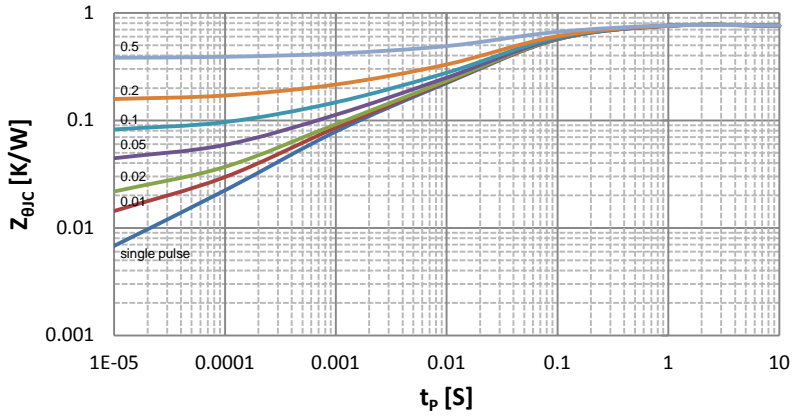


Figure 11-1. Transient Thermal Response Curve for TO-220

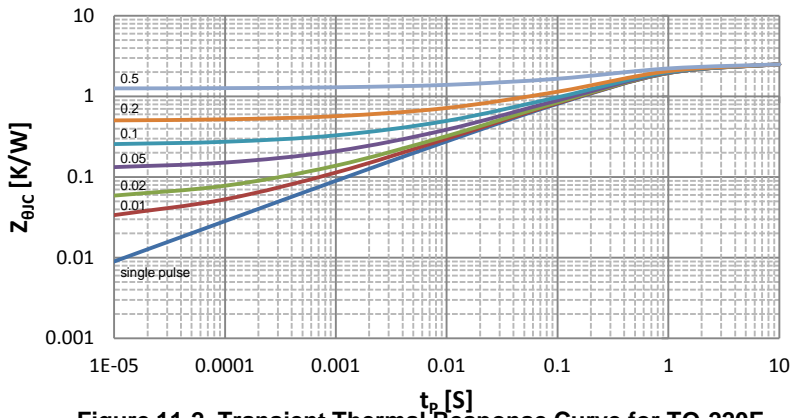


Figure 11-2. Transient Thermal Response Curve for TO-220F

Fig 12. Gate Charge Test Circuit & Waveform

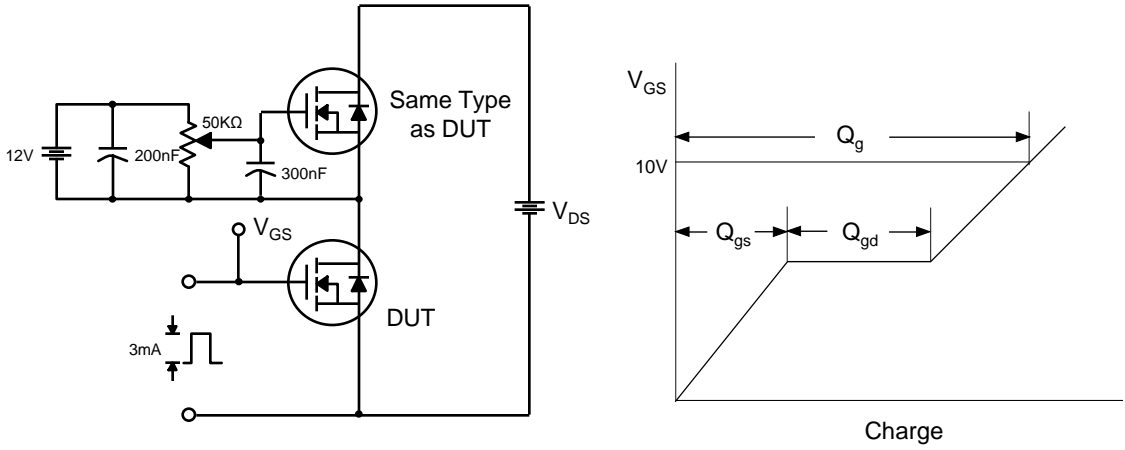


Fig 13. Resistive Switching Test Circuit & Waveforms

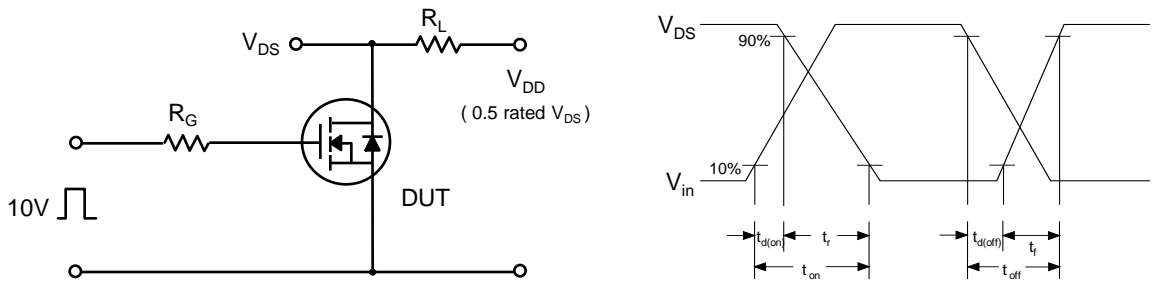


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

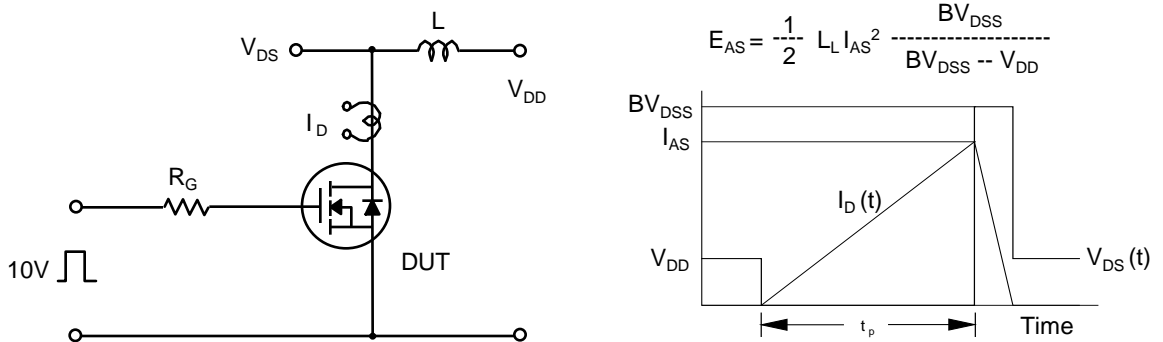
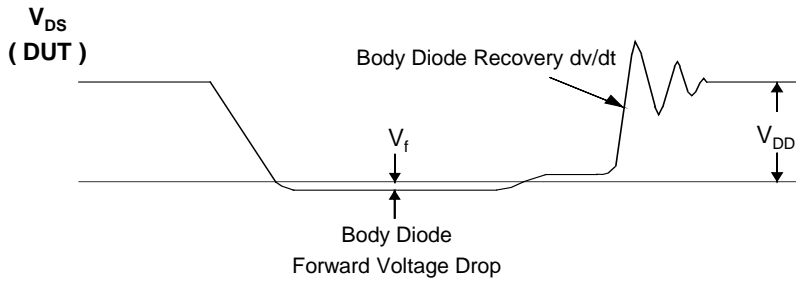
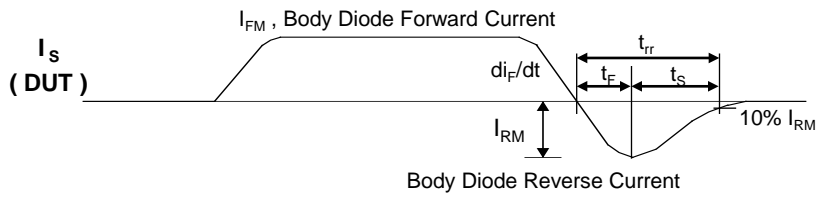
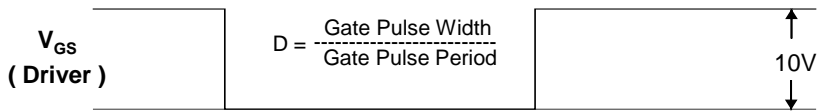
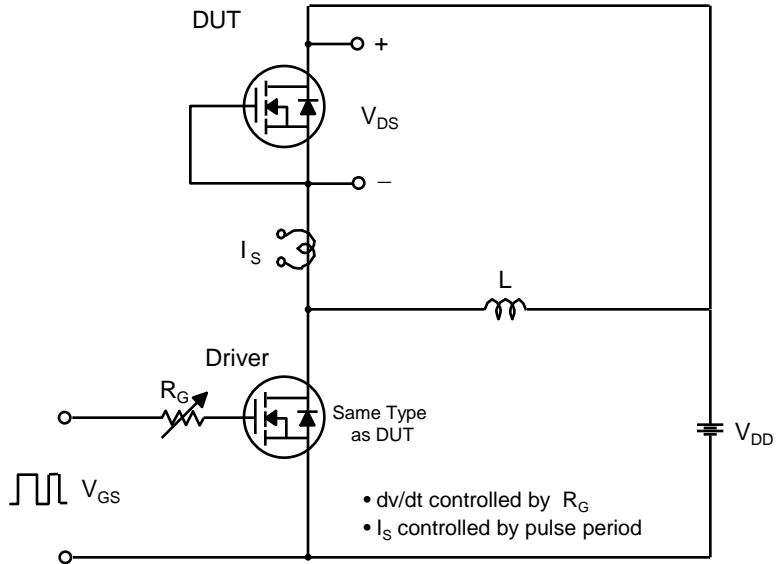
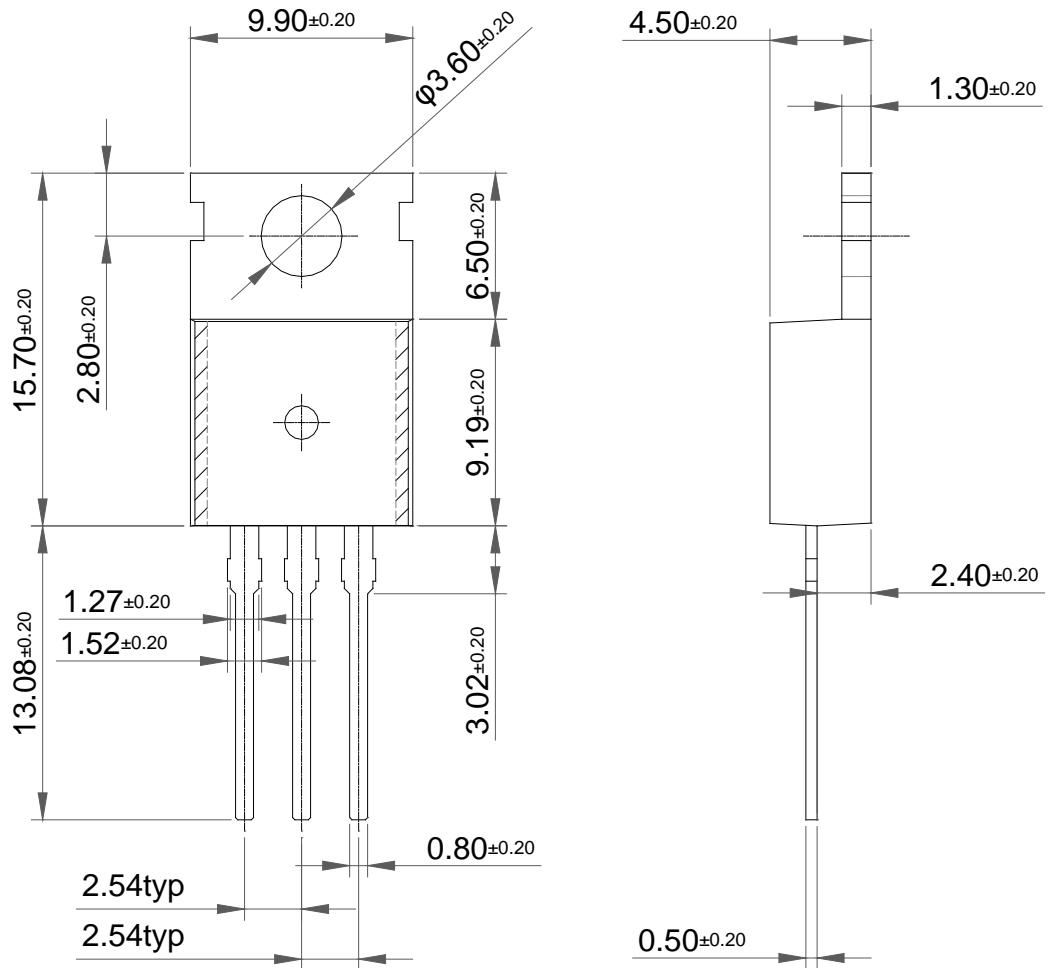


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



# Package Dimension

## TO-220

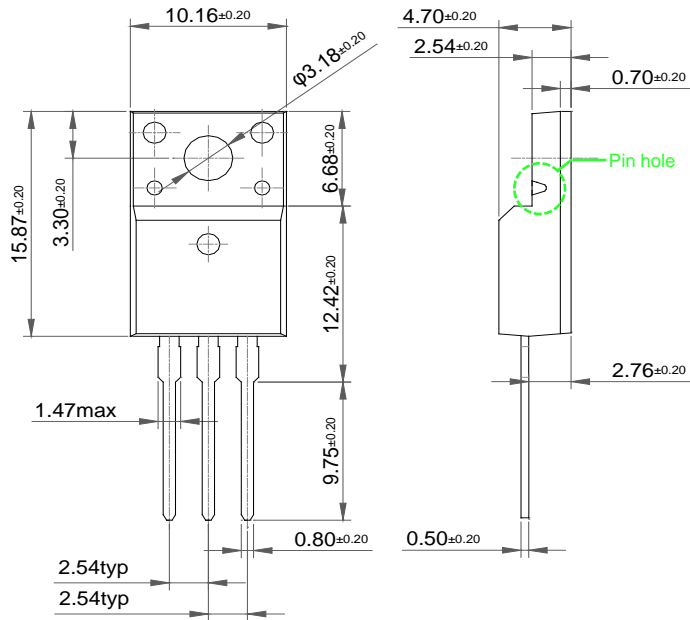


HFP7N80U\_HFS7N80U



Package Dimension

TO-220F



TO-220F-FM(Full Mold)

