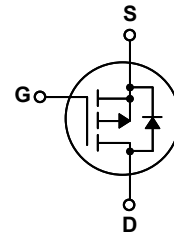


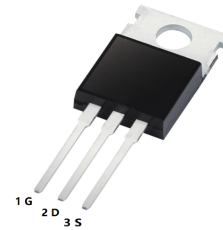
### Description

These devices are suitable for switched mode power supplies, audio amplifier, DC motor control, and variable switching power applications.



### Features

- $V_{DS}$  (V) = -60V
- $I_D$  = -13.5A ( $V_{GS}$  = -10V)
- $R_{DS(ON)}$  < 70m $\Omega$  ( $V_{GS}$  = -10V)



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

| Symbol         | Parameter   | FQP27P06                                   | Unit                |
|----------------|---|--|---------------------|
| $V_{DSS}$      | Drain-Source Voltage  | -60  | V                   |
| $I_D$          | Drain Current   | - Continuous ( $T_C = 25^\circ\text{C}$ )  | -27                 |
|                |   | - Continuous ( $T_C = 100^\circ\text{C}$ ) | -19.1               |
| $I_{DM}$       | Drain Current - Pulsed (Note 1)   | -108                                       | A                   |
| $V_{GSS}$      | Gate-Source Voltage   | $\pm 25$                                   | V                   |
| $E_{AS}$       | Single Pulsed Avalanche Energy (Note 2)                                       | 560  | mJ                  |
| $I_{AR}$       | Avalanche Current (Note 1)  | -27  | A                   |
| $E_{AR}$       | Repetitive Avalanche Energy (Note 1)  | 12   | mJ                  |
| dv/dt          | Peak Diode Recovery dv/dt (Note 3)  | -7.0                                       | V/ns                |
| $P_D$          | Power Dissipation ( $T_C = 25^\circ\text{C}$ )                                | 120  | W                   |
|                | - Derate above $25^\circ\text{C}$   | 0.8  | W/ $^\circ\text{C}$ |
| $T_J, T_{STG}$ | Operating and Storage Temperature Range                                       | -55 to +175                                | $^\circ\text{C}$    |
| $T_L$          | Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds | 300  | $^\circ\text{C}$    |

### Thermal Characteristics

| Symbol          | Parameter                                     | FQP27P06 | Unit                      |
|-----------------|---|----------|---------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case, Max.    | 1.25     | $^\circ\text{C}/\text{W}$ |
| $R_{\theta CS}$ | Thermal Resistance, Case-to-Sink, Typ.        | 0.5      | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient, Max. | 62.5     | $^\circ\text{C}/\text{W}$ |

### Elerical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted

| Symbol  | Parameter   | Test Conditions   | Min      | Typ   | Max  | Unit                      |
|---|---|---|----------|-------|------|---------------------------|
| <b>Off Characteristics</b>                                    |   |   |          |       |      |                           |
| $BV_{DSS}$  | Drain-Source Breakdown Voltage                        | $V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$                          | -60      |       |      | V                         |
| $\Delta BV_{DSS} / \Delta T_J$                                | Breakdown Voltage Temperature Coefficient             | $I_D = -250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$            |          | -0.06 |      | $\text{V}/^\circ\text{C}$ |
| $I_{DSS}$   | Zero Gate Voltage Drain Current                       | $V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}$                            |          |       | -1   | $\mu\text{A}$             |
|   |   | $V_{DS} = -48\text{ V}, T_C = 150^\circ\text{C}$                        |          |       | -10  | $\mu\text{A}$             |
| $I_{GSSF}$  | Gate-Body Leakage Current, Forward                    | $V_{GS} = -25\text{ V}, V_{DS} = 0\text{ V}$                            |          |       | -100 | nA                        |
| $I_{GSSR}$  | Gate-Body Leakage Current, Reverse                    | $V_{GS} = 25\text{ V}, V_{DS} = 0\text{ V}$                             |          |       | 100  | nA                        |
| <b>On Characteristics</b>                                     |   |   |          |       |      |                           |
| $V_{GS(th)}$  | Gate Threshold Voltage                                | $V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$                              | -1.1     | -2    | -3.0 | V                         |
| $R_{DS(on)}$  | Static Drain-Source On-Resistance                     | $V_{GS} = -10\text{ V}, I_D = -13.5\text{ A}$                           |          | 55    | 70   | m $\Omega$                |
| $g_{FS}$  | Forward Transconductance                              | $V_{DS} = -30\text{ V}, I_D = -13.5\text{ A}$                           |          | 12.4  |      | S                         |
| <b>Dynamic Characteristics</b>                                |   |   |          |       |      |                           |
| $C_{iss}$   | Input Capacitance                                     | $V_{DS} = -25\text{ V}, V_{GS} = 0\text{ V},$<br>$f = 1.0\text{ MHz}$   |          | 1100  | 1400 | pF                        |
| $C_{oss}$   | Output Capacitance                                    |   |          | 510   | 660  | pF                        |
| $C_{rss}$   | Reverse Transfer Capacitance                          |   |          | 120   | 155  | pF                        |
| <b>Switching Characteristics</b>                              |   |   |          |       |      |                           |
| $t_{d(on)}$   | Turn-On Delay Time                                    | $V_{DD} = -30\text{ V}, I_D = -13.5\text{ A},$<br>$R_G = 25\ \Omega$    |          | 18    | 45   | ns                        |
| $t_r$   | Turn-On Rise Time                                     |   |          | 185   | 380  | ns                        |
| $t_{d(off)}$  | Turn-Off Delay Time                                   |   |          | 30    | 70   | ns                        |
| $t_f$   | Turn-Off Fall Time                                    |   | (Note 4) | 90    | 190  | ns                        |
| $Q_g$   | Total Gate Charge                                     | $V_{DS} = -48\text{ V}, I_D = -27\text{ A},$<br>$V_{GS} = -10\text{ V}$ |          | 33    | 43   | nC                        |
| $Q_{gs}$  | Gate-Source Charge                                    |   |          | 6.8   |      | nC                        |
| $Q_{gd}$  | Gate-Drain Charge                                     |   | (Note 4) | 18    |      | nC                        |
| <b>Drain-Source Diode Characteristics and Maximum Ratings</b> |   |   |          |       |      |                           |
| $I_S$   | Maximum Continuous Drain-Source Diode Forward Current |   |          |       | -27  | A                         |
| $I_{SM}$  | Maximum Pulsed Drain-Source Diode Forward Current     |   |          |       | -108 | A                         |
| $V_{SD}$  | Drain-Source Diode Forward Voltage                    | $V_{GS} = 0\text{ V}, I_S = -27\text{ A}$                               |          |       | -4.0 | V                         |
| $t_{rr}$  | Reverse Recovery Time                                 | $V_{GS} = 0\text{ V}, I_S = -27\text{ A},$                              |          | 105   |      | ns                        |
| $Q_{rr}$  | Reverse Recovery Charge                               | $dI_F / dt = 100\text{ A}/\mu\text{s}$                                  |          | 0.41  |      | $\mu\text{C}$             |

**Notes:**

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $L = 0.9\text{mH}, I_{AS} = -27\text{A}, V_{DD} = -25\text{V}, R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq -27\text{A}, di/dt \leq 300\text{A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Essentially independent of operating temperature

Typical Characteristics

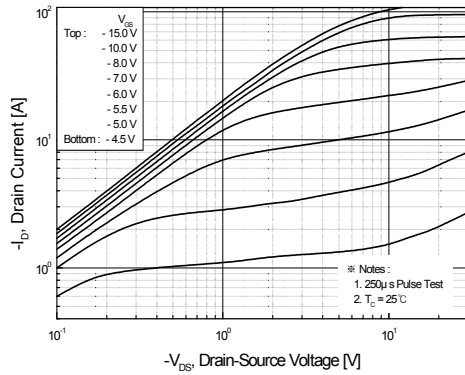


Figure 1. On-Region Characteristics

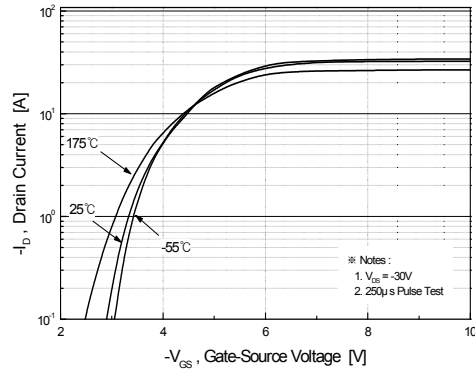


Figure 2. Transfer Characteristics

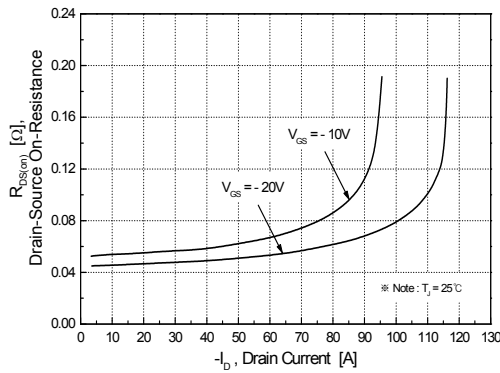


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

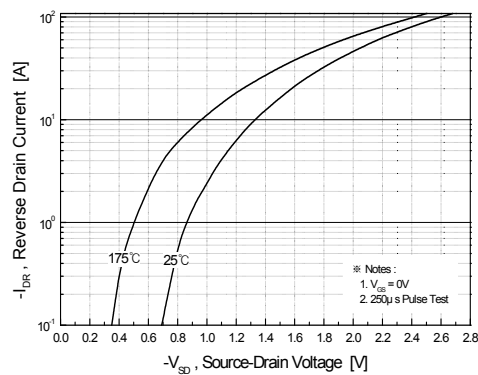


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

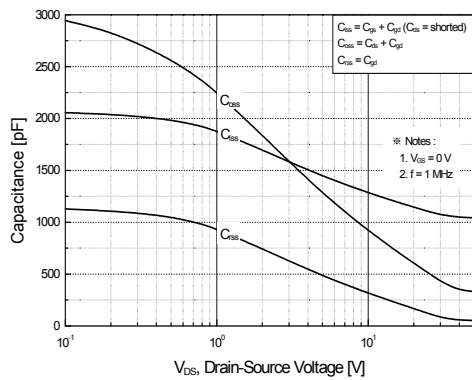


Figure 5. Capacitance Characteristics

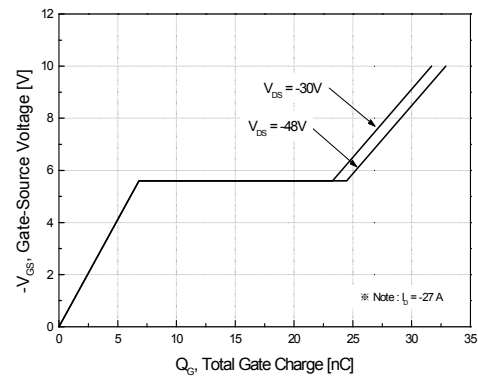


Figure 6. Gate Charge Characteristics

Typical Characteristics

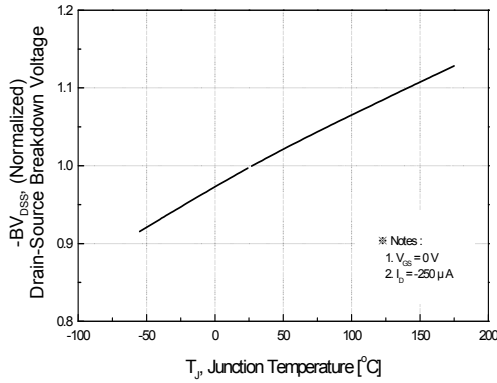


Figure 7. Breakdown Voltage Variation vs. Temperature

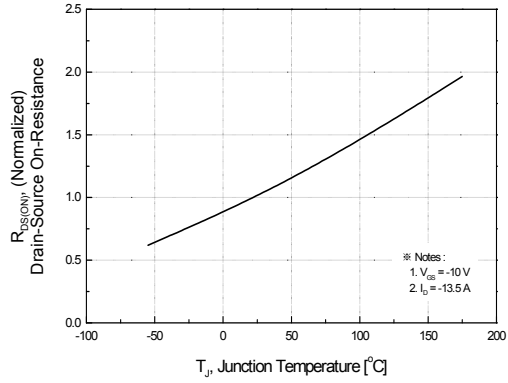


Figure 8. On-Resistance Variation vs. Temperature

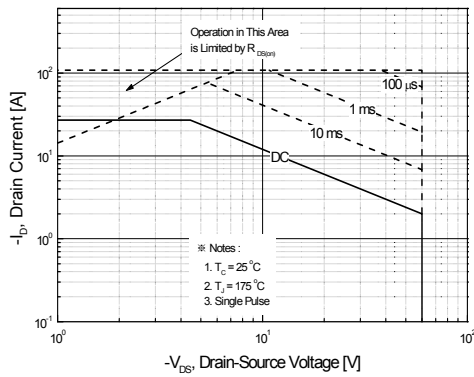


Figure 9. Maximum Safe Operating Area

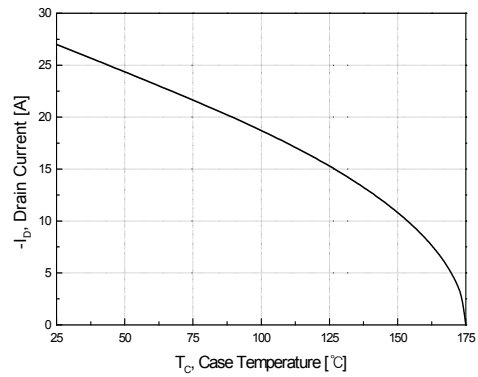


Figure 10. Maximum Drain Current vs. Case Temperature

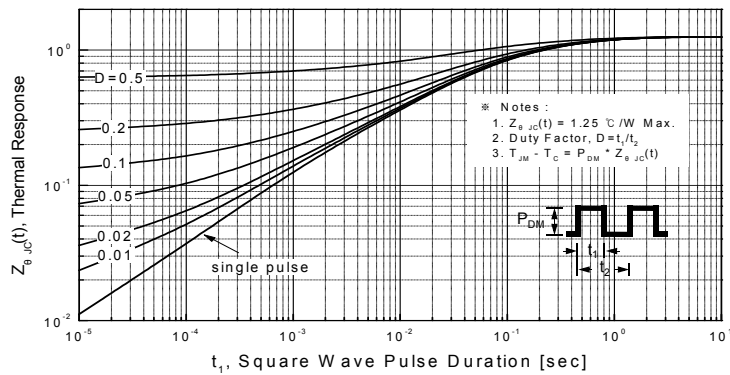
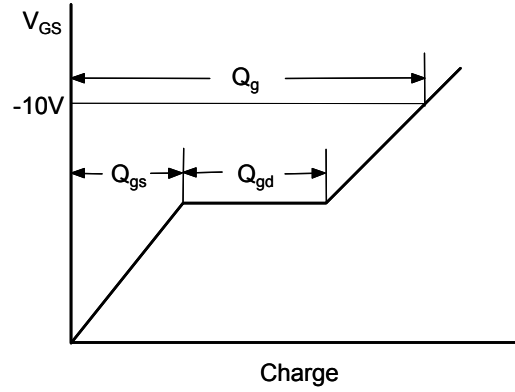
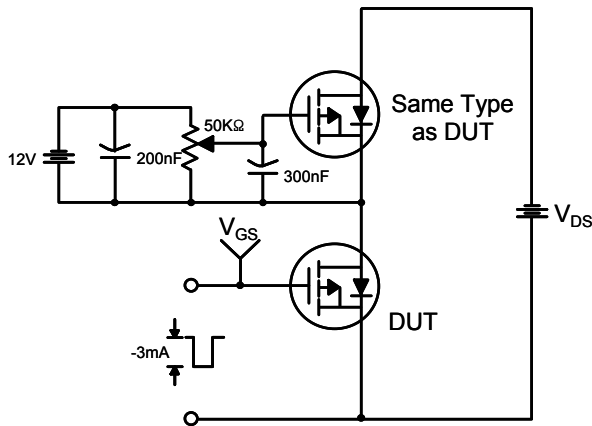
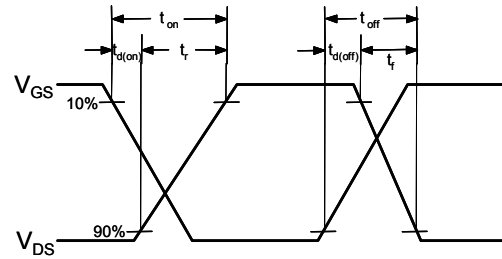
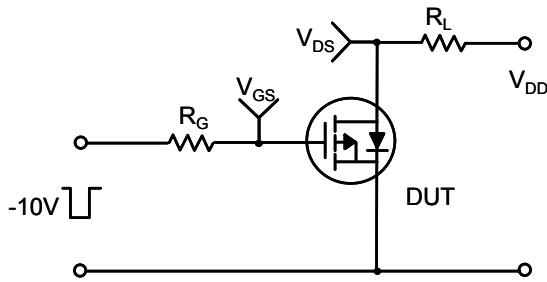


Figure 11. Transient Thermal Response Curve

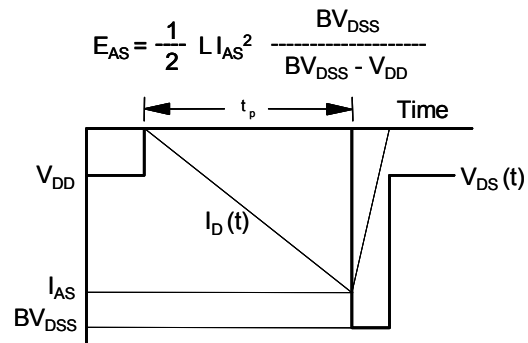
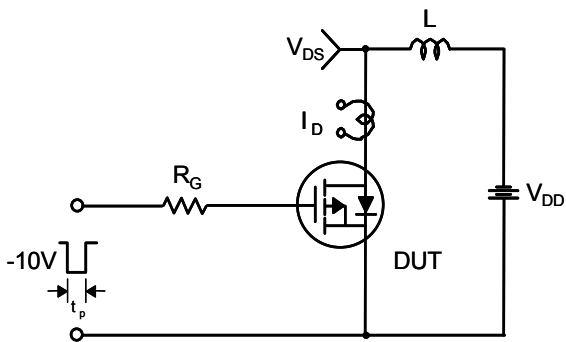
Gate Charge Test Circuit & Waveform



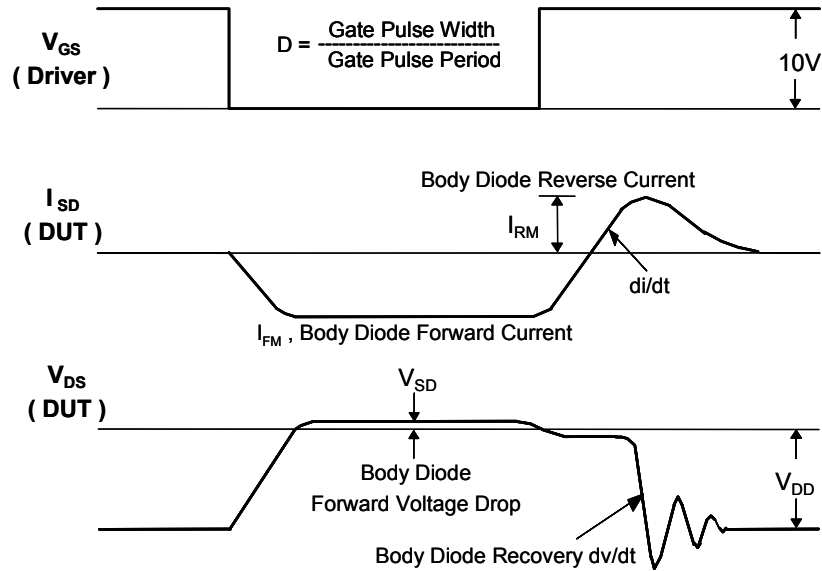
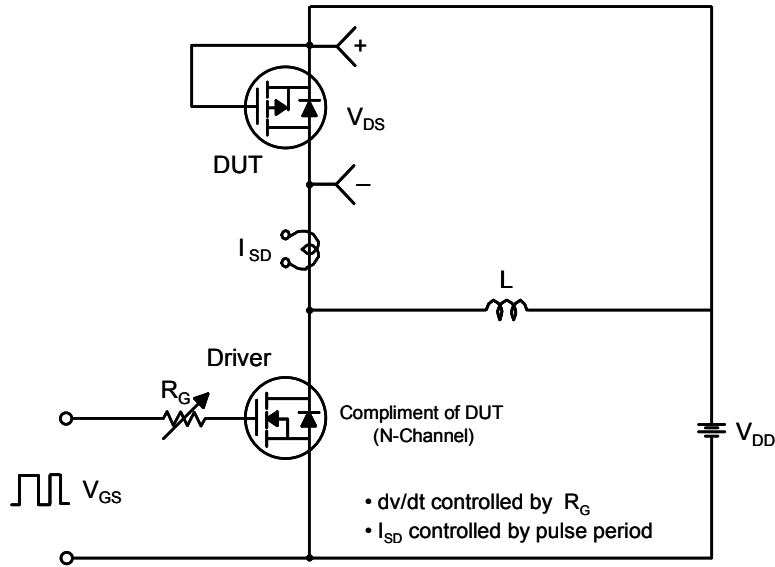
Resistive Switching Test Circuit & Waveforms



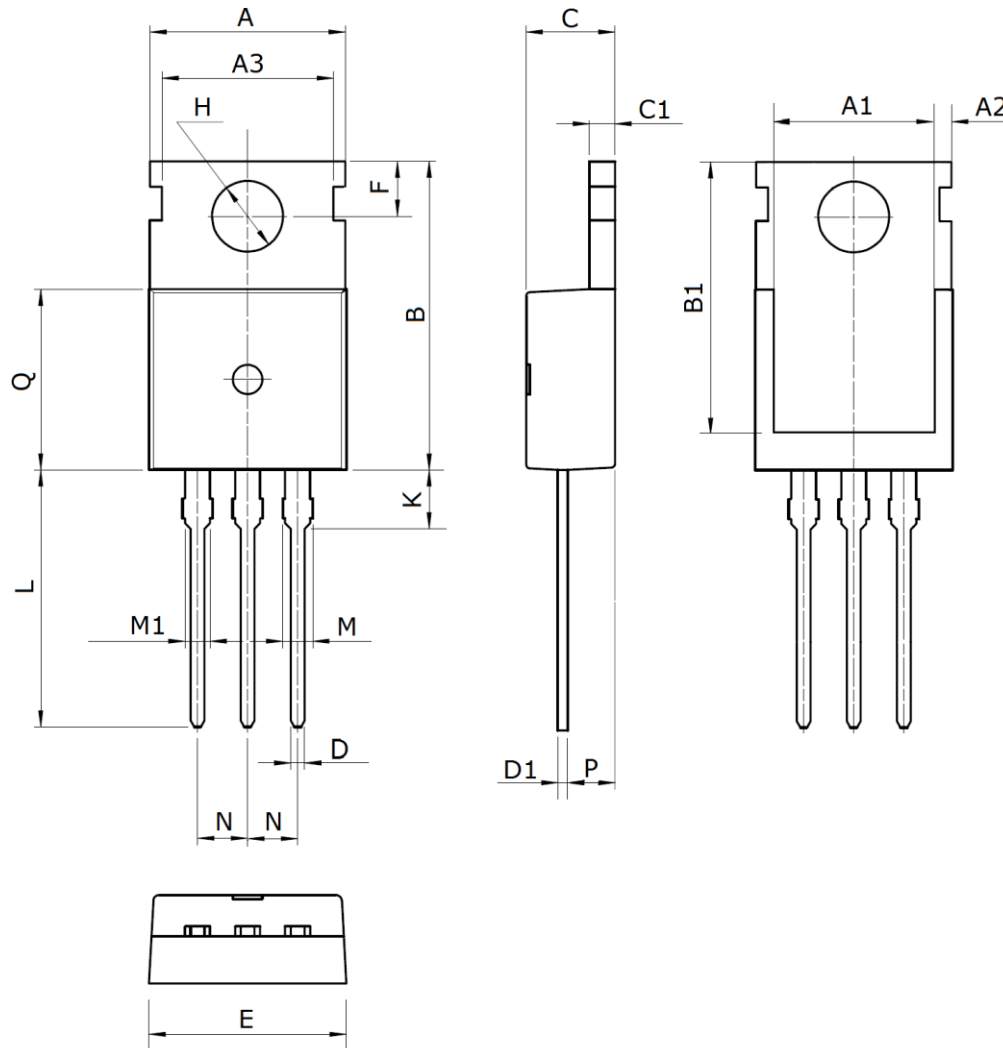
Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms

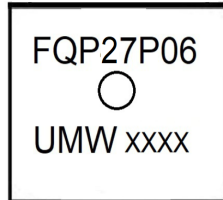


Package Mechanical Data TO-220



| Symbol | Dimensions (mm) | Symbol | Dimensions (mm) | Symbol | Dimensions (mm) |
|--------|-----------------|--------|-----------------|--------|-----------------|
| A      | 10.0±0.3        | C1     | 1.3±0.2         | L      | 13.2±0.4        |
| A1     | 8.0±0.2         | D      | 0.8±0.2         | M      | 1.38±0.1        |
| A2     | 0.94±0.1        | D1     | 0.5±0.1         | M1     | 1.28±0.1        |
| A3     | 8.7±0.1         | E      | 10.0±0.3        | N      | 2.54(typ)       |
| B      | 15.6±0.4        | F      | 2.8 ±0.1        | P      | 2.4±0.3         |
| B1     | 13.2±0.2        | H      | 3.6±0.1         | Q      | 9.15±0.25       |
| C      | 4.5±0.2         | K      | 3.1±0.2         |        |                 |

**Marking**



**Ordering information**

| Order code   | Package | Baseqty | Deliverymode  |
|--------------|---------|---------|---------------|
| UMW FQP27P06 | TO-220  | 1000    | Tape and reel |



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