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**April 2013** 

## **FQP47P06**

# P-Channel QFET® MOSFET

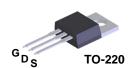
- 60 V, - 47 A, 26 mΩ

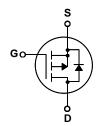
### Description

This P-Channel enhancement mode power MOSFET is produced using Fairchild Semiconducto®'s proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, audio amplifier, DC motor control, and variable switching power applications.

#### **Features**

- 47 A, 60 V,  $R_{DS(on)}$  = 26 m $\Omega$  @  $V_{GS}$  = 10 V,  $I_D$  = 23.5 A
- Low Gate Charge (Typ. 84 nC)
- Low Crss (yp. 320 pF)
- 100% Avalanche Tested
- 175°C Maximum Junction Temrature Rating.





### **Absolute Maximum Ratings** $T_C = 25$ °C unless otherwise noted

| Symbol                            | Parameter   |          | FQP47P06    | Unit |
|-----------------------------------|---|----------|-------------|------|
| V <sub>DSS</sub>                  | Drain-Source Voltage  |          | -60         | V    |
| I <sub>D</sub>                    | Drain Current - Continuous (T <sub>C</sub> = 25                               | °C)      | -47         | А    |
|                                   | - Continuous (T <sub>C</sub> = 10   | 0°C)     | -33.2       | А    |
| I <sub>DM</sub>                   | Drain Current - Pulsed  | (Note 1) | -188        | А    |
| V <sub>GSS</sub>                  | Gate-Source Voltage   |          | ± 25        | V    |
| E <sub>AS</sub>                   | Single Pulsed Avalanche Energy  | (Note 2) | 820         | mJ   |
| I <sub>AR</sub>                   | Avalanche Current   | (Note 1) | -47         | А    |
| E <sub>AR</sub>                   | Repetitive Avalanche Energy   | (Note 1) | 16          | mJ   |
| dv/dt                             | Peak Diode Recovery dv/dt   | (Note 3) | -7.0        | V/ns |
| $P_D$                             | Power Dissipation (T <sub>C</sub> = 25°C)  - Derate above 25°C                |          | 160         | W    |
|                                   |   |          | 1.06        | W/°C |
| T <sub>J</sub> , T <sub>STG</sub> | Operating and Storage Temperature Range                                       |          | -55 to +175 | °C   |
| T <sub>L</sub>                    | Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds |          | 300         | °C   |

### **Thermal Characteristics**

| Symbol          | Parameter                                     | FQP47P06 | Unit |
|-----------------|---|----------|------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case, Max.    | 0.94     | °C/W |
| $R_{\theta CS}$ | Thermal Resistance, Case-to-Sink, Typ.        | 0.5      | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient, Max. | 62.5     | °C/W |

| $ \begin{array}{c} BV_{DSS} \\ \Delta T_{J} \\ Coefficient \\ \\ SS \\ \Delta T_{J} \\ Coefficient \\ \\ SS \\ \Delta T_{J} \\ Coefficient \\ \\ SS \\ Zero Gate Voltage Drain Current \\ \hline \\ V_{DS} = -60 \text{ V}, V_{GS} = 0 \text{ V} \\ \hline \\ V_{DS} = -48 \text{ V}, T_{C} = 150^{\circ}\text{C} \\ \hline \\ V_{DS} = -48 \text{ V}, T_{C} = 150^{\circ}\text{C} \\ \hline \\ V_{DS} = -48 \text{ V}, T_{C} = 150^{\circ}\text{C} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -23.5 \text{ A} \\ \hline \\ V_{DS} = -23.5 \text{ A} \\ \hline \\ V_{DS} = -23.5 \text{ A} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -23.5 \text{ A} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25  $   |   | Parameter  | Test Conditions   | Min              | Тур                                       | Max  | Unit                       |
|--|---|--|---|------------------|---|--|----------------------------|
| VDSS         Drain-Source Breakdown Voltage $V_{GS} = 0 \text{ V}$ , $I_{D} = -250 \mu\text{A}$ $-60$ $$ $V_{C}$ BVDSS AT User Coefficient         Ip = -250 μA, Referenced to 25°C $$ $-0.06$ $$ $V_{C}$ SSS         Zero Gate Voltage Drain Current $V_{DS} = -60 \text{ V}$ , $V_{GS} = 0 \text{ V}$ $$   | Off Cha   | aracteristics  |   |                  |   |  |                            |
| $ \begin{array}{c} BV_{DSS} \\ \Delta T_{J} \\ Coefficient \\ \\ SS \\ \Delta T_{J} \\ Coefficient \\ \\ SS \\ \Delta T_{J} \\ Coefficient \\ \\ SS \\ Zero Gate Voltage Drain Current \\ \hline \\ V_{DS} = -60 \text{ V}, V_{GS} = 0 \text{ V} \\ \hline \\ V_{DS} = -48 \text{ V}, T_{C} = 150^{\circ}\text{C} \\ \hline \\ V_{DS} = -48 \text{ V}, T_{C} = 150^{\circ}\text{C} \\ \hline \\ V_{DS} = -48 \text{ V}, T_{C} = 150^{\circ}\text{C} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -23.5 \text{ A} \\ \hline \\ V_{DS} = -23.5 \text{ A} \\ \hline \\ V_{DS} = -23.5 \text{ A} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -23.5 \text{ A} \\ \hline \\ V_{DS} = -25 \text{ V}, V_{DS} = 0 \text{ V} \\ \hline \\ V_{DS} = -25  $   | BV <sub>DSS</sub>   |  | V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA   | -60              |   |  | V                          |
| Zero Gate Voltage Drain Current   V <sub>DS</sub> = -48 V, T <sub>C</sub> = 150°C       -10   μ/V <sub>DS</sub> = -48 V, T <sub>C</sub> = 150°C       -10   μ/V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V       -100   n/V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V       100   n/V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V       100   n/V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V       100   n/V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V       100   n/V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V       100   n/V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V       100   n/V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V       100   n/V <sub>DS</sub> = -20 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = 0 V, V <sub>DS</sub> = -25 V, V <sub>DS</sub> = 0 V | ΔBV <sub>DSS</sub>  | Breakdown Voltage Temperature  |   |                  | -0.06                                     |  | V/°C                       |
| V <sub>DS</sub> = -48 V, I <sub>C</sub> = 150°C       -10   μ/sss   Gate-Body Leakage Current, Forward   V <sub>GS</sub> = -25 V, V <sub>DS</sub> = 0 V       -100   n/sss   Gate-Body Leakage Current, Reverse   V <sub>GS</sub> = 25 V, V <sub>DS</sub> = 0 V       100   n/s  | I <sub>DSS</sub>  | Zero Onto Valta va Basis Oceana  | V <sub>DS</sub> = -60 V, V <sub>GS</sub> = 0 V  |                  |   | -1   | μΑ                         |
| Sess   Gate-Body Leakage Current, Reverse   V <sub>GS</sub> = 25 V, V <sub>DS</sub> = 0 V       100   n/s  |   | Zero Gate Voltage Drain Current  | V <sub>DS</sub> = -48 V, T <sub>C</sub> = 150°C   |                  |   | -10  | μΑ                         |
| On Characteristics           GS(th)         Gate Threshold Voltage $V_{DS} = V_{GS}$ , $I_{D} = -250 \mu\text{A}$ -2.0          -4.0         V           DS(on)         Static Drain-Source On-Resistance $V_{GS} = -10 \text{V}$ , $I_{D} = -23.5 \text{A}$ 0.021         0.026         Ω           Con-Resistance $V_{DS} = -30 \text{V}$ , $I_{D} = -23.5 \text{A}$ 21          S           Dynamic Characteristics         Input Capacitance $V_{DS} = -25 \text{V}$ , $V_{GS} = 0 $   | I <sub>GSSF</sub>   | Gate-Body Leakage Current, Forward   | V <sub>GS</sub> = -25 V, V <sub>DS</sub> = 0 V  |                  |   | -100   | nA                         |
| GS(th)         Gate Threshold Voltage $V_{DS} = V_{GS}$ , $I_D = -250  \mu A$ -2.0          -4.0         V           DS(on)         Static Drain-Source On-Resistance $V_{GS} = -10  \text{V}$ , $I_D = -23.5  \text{A}$ 0.021         0.026         Ω           PS         Forward Transconductance $V_{DS} = -30  \text{V}$ , $I_D = -23.5  \text{A}$ (Note 4)          21          S           PS         Input Capacitance $V_{DS} = -25  \text{V}$ , $V_{GS} = 0  \text{V}$ , $V_{GS} = 0 $   | I <sub>GSSR</sub>   | Gate-Body Leakage Current, Reverse   | V <sub>GS</sub> = 25 V, V <sub>DS</sub> = 0 V   |                  |   | 100  | nA                         |
| GS(th)         Gate Threshold Voltage $V_{DS} = V_{GS}$ , $I_D = -250  \mu A$ -2.0          -4.0         V           DS(on)         Static Drain-Source On-Resistance $V_{GS} = -10  \text{V}$ , $I_D = -23.5  \text{A}$ 0.021         0.026         Ω           PS         Forward Transconductance $V_{DS} = -30  \text{V}$ , $I_D = -23.5  \text{A}$ (Note 4)          21          S           PS         Input Capacitance $V_{DS} = -25  \text{V}$ , $V_{GS} = 0  \text{V}$ , $V_{GS} = 0 $   | On Cha  | aracteristics  |   |                  |   |  |                            |
| DS(on)         Static Drain-Source On-Resistance $V_{GS} = -10 \text{ V}$ , $I_D = -23.5 \text{ A}$ 0.021         0.026         Ω           PS         Forward Transconductance $V_{DS} = -30 \text{ V}$ , $I_D = -23.5 \text{ A}$ (Note 4)          21          S           Pynamic Characteristics         Input Capacitance $V_{DS} = -25 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $I_D = -23.5 \text{ A}$ , $I_D =$   | V <sub>GS(th)</sub>   | +  | $V_{DS} = V_{GS}, I_{D} = -250 \mu\text{A}$   | -2.0             |   | -4.0   | V                          |
| tynamic Characteristics           siss         Input Capacitance $V_{DS} = -25 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1.0 \text{ MHz}$   | R <sub>DS(on)</sub>   |  | V <sub>GS</sub> = -10 V, I <sub>D</sub> = -23.5 A   |                  | 0.021                                     | 0.026  | Ω                          |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | 9 <sub>FS</sub>   | Forward Transconductance   | $V_{DS} = -30 \text{ V}, I_D = -23.5 \text{ A}$ (Note 4)  |                  | 21  |  | S                          |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | Coss  | ' '  | f = 1.0 MHz   |                  |   |  | pF                         |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   |   | ' '  | f = 1.0 MHz   |                  |   |  |                            |
| Turn-On Rise Time $V_{DD} = -30 \text{ V, } I_{D} = -23.5 \text{ A,}$ $C_{DD} = -30 \text{ V, } I_{D} = $  | C <sub>rss</sub>  | <u>'</u>   |   |                  | 0_0                                       | 420  | рі                         |
| Turn-On Rise Time $R_{G} = 25 \ \Omega$ 450 910 ns   |   | ing Characteristics  |   |                  | 020                                       | 420  | рі                         |
| (off)         Turn-Off Delay Time          100         210         ns           Turn-Off Fall Time         (Note 4, 5)          195         400         ns   | Switchi   | 1  | V-n = -30 V In = -23 5 A  |                  |   | 1  | ns                         |
|  |   | Turn-On Delay Time   |   |                  | 50  | 110  | •                          |
| g Total Gate Charge V <sub>DS</sub> = -48 V, I <sub>D</sub> = -47 A, 84 110 nC   | Switchi   | Turn-On Delay Time Turn-On Rise Time   |   |                  | 50<br>450                                 | 110<br>910   | ns                         |
|  | Switchi $t_{d(on)}$ $t_r$ $t_{d(off)}$  | Turn-On Delay Time Turn-On Rise Time Turn-Off Delay Time   | $R_G = 25 \Omega$   |                  | 50<br>450<br>100                          | 110<br>910<br>210  | ns                         |
| Gate-Source Charge $V_{GS} = -10 \text{ V}$ 18 nC  | Switchi $t_{d(on)}$ $t_r$ $t_{d(off)}$  | Turn-On Delay Time Turn-On Rise Time Turn-Off Delay Time Turn-Off Fall Time  | $R_G = 25 \Omega$   |                  | 50<br>450<br>100<br>195                   | 110<br>910<br>210<br>400                                       | ns<br>ns                   |
|  | Switchi td(on) tr tf td(off) tg Qg  | Turn-On Delay Time Turn-On Rise Time Turn-Off Delay Time Turn-Off Fall Time Total Gate Charge  | $R_G = 25 \ \Omega$ (Note 4, 5) $V_{DS} = -48 \ V$ , $I_D = -47 \ A$ ,  | <br><br>         | 50<br>450<br>100<br>195<br>84             | 110<br>910<br>210<br>400<br>110                                | ns<br>ns<br>ns             |
|  |   |  |   |                  | 323                                       | 420  |                            |
|  | Switchi td(on) tr td(off) tf Qg Qgs   | Turn-On Delay Time Turn-On Rise Time Turn-Off Delay Time Turn-Off Fall Time Total Gate Charge Gate-Source Charge   | $R_G = 25 \Omega$ (Note 4, 5) $V_{DS} = -48 \text{ V}, I_D = -47 \text{ A}, V_{GS} = -10 \text{ V}$   | <br><br>         | 50<br>450<br>100<br>195<br>84<br>18       | 110<br>910<br>210<br>400<br>110                                | ns<br>ns<br>ns<br>ns       |
|  | Switchi td(on) tr td(off) tf Qg Qgs   | Turn-On Delay Time Turn-On Rise Time Turn-Off Delay Time Turn-Off Fall Time Total Gate Charge Gate-Source Charge   | $R_G = 25 \Omega$ (Note 4, 5) $V_{DS} = -48 \text{ V}, I_D = -47 \text{ A}, V_{GS} = -10 \text{ V}$   | <br><br>         | 50<br>450<br>100<br>195<br>84<br>18       | 110<br>910<br>210<br>400<br>110                                | ns<br>ns<br>ns<br>ns       |
| gd Gate-Drain Charge (Note 4, 5) 44 nC   | Switchi t <sub>d(on)</sub> t <sub>r</sub> t <sub>d(off)</sub> t <sub>f</sub> Q <sub>g</sub> Q <sub>gs</sub> Q <sub>gd</sub>   | Turn-On Delay Time Turn-On Rise Time Turn-Off Delay Time Turn-Off Fall Time Total Gate Charge Gate-Source Charge Gate-Drain Charge   | $R_G = 25~\Omega \label{eq:reconstruction}$ (Note 4, 5) $V_{DS} = -48~V, I_D = -47~A, \label{eq:vgs}$ $V_{GS} = -10~V \label{eq:vgs}$ (Note 4, 5)   | <br><br>         | 50<br>450<br>100<br>195<br>84<br>18       | 110<br>910<br>210<br>400<br>110                                | ns<br>ns<br>ns<br>ns       |
| gd Gate-Drain Charge (Note 4, 5) 44 nC  Prain-Source Diode Characteristics and Maximum Ratings   | Switchi t <sub>d(on)</sub> t <sub>r</sub> t <sub>d(off)</sub> t <sub>f</sub> Q <sub>g</sub> Q <sub>gs</sub> Q <sub>gd</sub> Drain-S   | Turn-On Delay Time Turn-On Rise Time Turn-Off Delay Time Turn-Off Fall Time Total Gate Charge Gate-Source Charge Gate-Drain Charge   | $R_G = 25~\Omega \label{eq:RG}$ (Note 4, 5) $V_{DS} = -48~V,~I_D = -47~A,~V_{GS} = -10~V \label{eq:VDS}$ (Note 4, 5)  | <br><br><br><br> | 50<br>450<br>100<br>195<br>84<br>18<br>44 | 110<br>910<br>210<br>400<br>110<br>                            | ns<br>ns<br>ns<br>ns       |
| Gate-Drain Charge (Note 4, 5) 44 nCertain-Source Diode Characteristics and Maximum Ratings  Maximum Continuous Drain-Source Diode Forward Current47 A  | $\begin{array}{c} \textbf{Switchi} \\ \textbf{t}_{d(on)} \\ \textbf{t}_{r} \\ \textbf{t}_{d(off)} \\ \textbf{t}_{f} \\ \textbf{Q}_{g} \\ \textbf{Q}_{gs} \\ \textbf{Q}_{gd} \\ \end{array}$ | Turn-On Delay Time Turn-On Rise Time Turn-Off Delay Time Turn-Off Fall Time Total Gate Charge Gate-Source Charge Gate-Drain Charge  Source Diode Characteristics ar Maximum Continuous Drain-Source Dio  | $R_G = 25 \ \Omega$ $V_{DS} = -48 \ V, \ I_D = -47 \ A,$ $V_{GS} = -10 \ V$ (Note 4, 5)  and Maximum Ratings and Forward Current  | <br><br><br>     | 50<br>450<br>100<br>195<br>84<br>18<br>44 | 110<br>910<br>210<br>400<br>110<br>                            | ns<br>ns<br>ns<br>nc<br>nC |
| Grain-Source Diode Characteristics and Maximum Ratings  Maximum Continuous Drain-Source Diode Forward Current  Maximum Pulsed Drain-Source Diode Forward Current   | Switchi t <sub>d(on)</sub> t <sub>r</sub> t <sub>d(off)</sub> t <sub>f</sub> Q <sub>g</sub> Q <sub>gs</sub> Q <sub>gd</sub> Drain-S I <sub>S</sub>  | Turn-On Delay Time Turn-On Rise Time Turn-Off Delay Time Turn-Off Fall Time Total Gate Charge Gate-Source Charge Gate-Drain Charge  Source Diode Characteristics ar Maximum Continuous Drain-Source Diode Fall Time                            | $R_G = 25 \Omega$ (Note 4, 5) $V_{DS} = -48 \text{ V}, I_D = -47 \text{ A},$ $V_{GS} = -10 \text{ V}$ (Note 4, 5)  and Maximum Ratings  ode Forward Current  Forward Current  | <br><br><br>     | 50<br>450<br>100<br>195<br>84<br>18<br>44 | 110<br>910<br>210<br>400<br>110<br><br>                        | ns<br>ns<br>ns<br>nc<br>nC |
| Gate-Drain Charge  (Note 4, 5)  44  note  (Prain-Source Diode Characteristics and Maximum Ratings  Maximum Continuous Drain-Source Diode Forward Current  Maximum Pulsed Drain-Source Diode Forward Current 47  A  Maximum Pulsed Drain-Source Diode Forward Current 48  A  Drain-Source Diode Forward Voltage  V <sub>GS</sub> = 0 V, I <sub>S</sub> = -47 A 4.0  V   | Switchi t <sub>d(on)</sub> t <sub>r</sub> t <sub>d(off)</sub> t <sub>f</sub> Q <sub>g</sub> Q <sub>gs</sub> Q <sub>gd</sub> Drain-S   | Turn-On Delay Time Turn-On Rise Time Turn-Off Delay Time Turn-Off Fall Time Total Gate Charge Gate-Source Charge Gate-Drain Charge  Source Diode Characteristics ar Maximum Continuous Drain-Source Diode F Drain-Source Diode Forward Voltage | $R_{G} = 25 \ \Omega$ $V_{DS} = -48 \ V, I_{D} = -47 \ A,$ $V_{GS} = -10 \ V$ $(Note 4, 5)$ $Note 4, 5$ $Note 5, 5$ $Note 6, 7$ $Note 6, 7$ $Note 6, 7$ $Note 6, 7$ $Note 7, 7$ $N$ | <br><br><br><br> | 50<br>450<br>100<br>195<br>84<br>18<br>44 | 110<br>910<br>210<br>400<br>110<br><br><br>-47<br>-188<br>-4.0 | ns<br>ns<br>ns<br>nC<br>nC |

- **Notes:**1. Repetitive Rating : Pulse width limited by maximum junction temperature 2. L = 0.43mH, I<sub>AS</sub> = -47A, V<sub>DD</sub> = -25V, R<sub>G</sub> = 25 Ω, Starting T<sub>J</sub> = 25°C 3. I<sub>SD</sub> ≤ -47A, di/dt ≤ 300A/µs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>J</sub> = 25°C 4. Pulse Test : Pulse width ≤ 300µs, Duty cycle ≤ 2% 5. Essentially independent of operating temperature

## **Typical Characteristics**

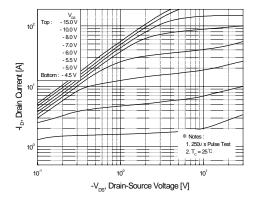


Figure 1. On-Region Characteristics

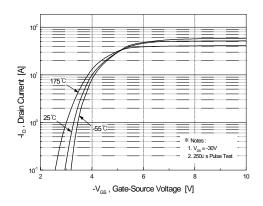


Figure 2. Transfer Characteristics

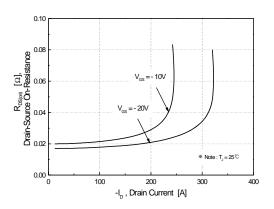


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

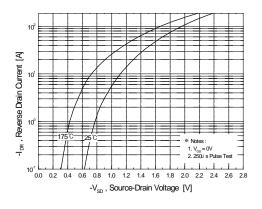


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

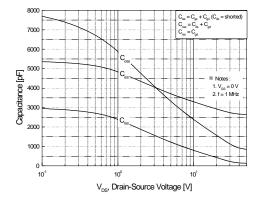


Figure 5. Capacitance Characteristics

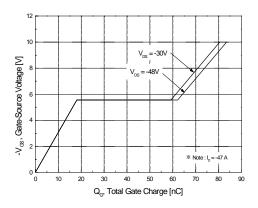


Figure 6. Gate Charge Characteristics

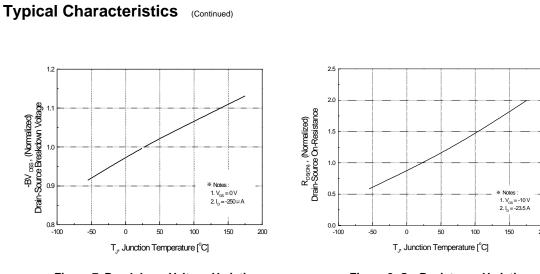


Figure 7. Breakdown Voltage Variation vs. Temperature

Figure 8. On-Resistance Variation vs. Temperature

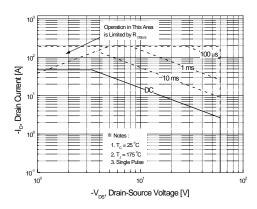


Figure 9. Maximum Safe Operating Area

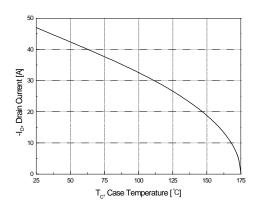


Figure 10. Maximum Drain Current vs. Case Temperature

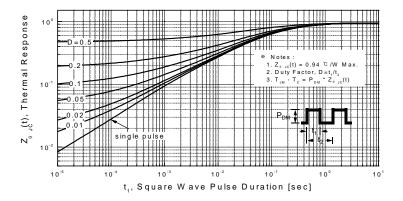
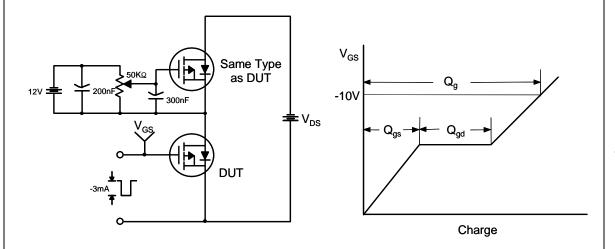
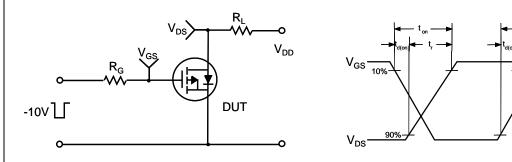


Figure 11. Transient Thermal Response Curve

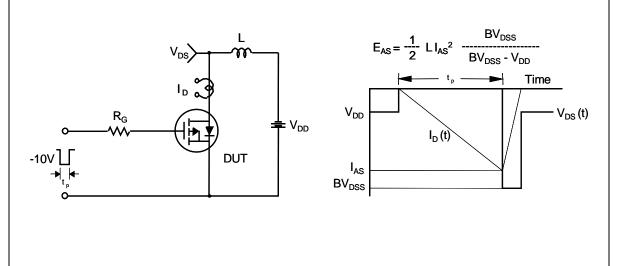
#### **Gate Charge Test Circuit & Waveform**



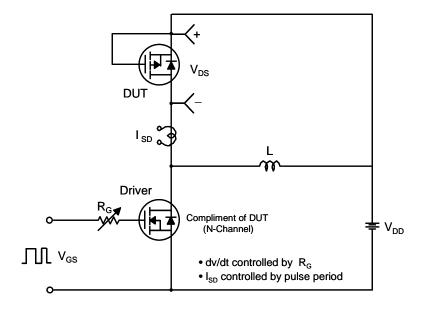
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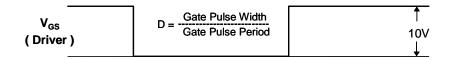


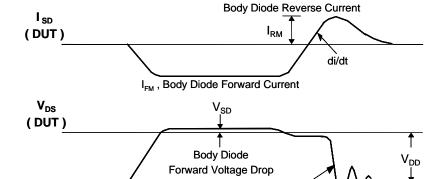
#### **Unclamped Inductive Switching Test Circuit & Waveforms**



# Peak Diode Recovery dv/dt Test Circuit & Waveforms



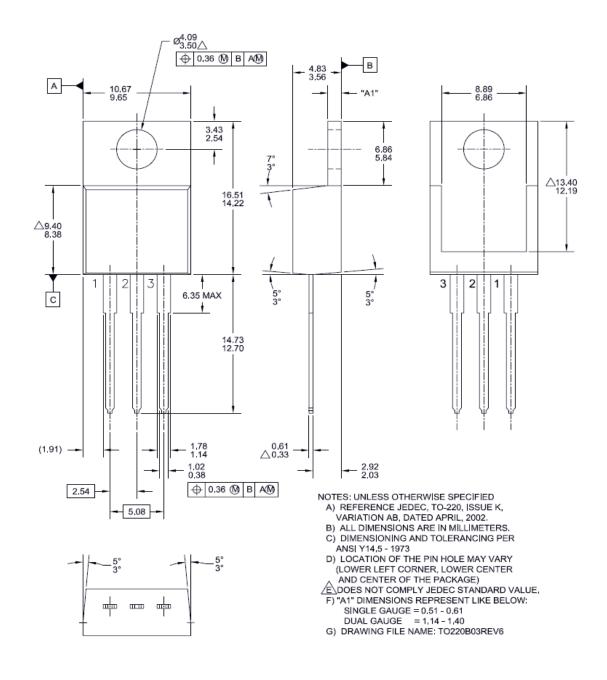




Body Diode Recovery dv/dt

### **Mechanical Dimensions**

# TO-220B03



**Dimensions in Millimeters** 





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