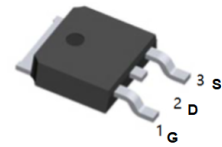
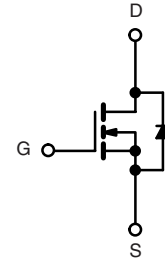


### General Description

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.



TO-252(DPAK) top view

|                                    |                |
|------------------------------------|----------------|
| $V_{DS}$                           | 60V            |
| $I_D$ (at $V_{GS}=10V$ )           | 30A            |
| $R_{DS(ON)}$ (at $V_{GS}=10V$ )    | < 25m $\Omega$ |
| $R_{DS(ON)}$ (at $V_{GS} = 4.5V$ ) | < 30m $\Omega$ |

| ABSOLUTE MAXIMUM RATINGS $T_C = 25\text{ }^\circ\text{C}$ , unless otherwise noted |                                   |                |             |                  |
|------------------------------------------------------------------------------------|-----------------------------------|----------------|-------------|------------------|
| Parameter                                                                          |                                   | Symbol         | Limit       | Unit             |
| Gate-Source Voltage                                                                |                                   | $V_{GS}$       | $\pm 20$    | V                |
| Continuous Drain Current ( $T_J = 175\text{ }^\circ\text{C}$ ) <sup>a</sup>        | $T_C = 25\text{ }^\circ\text{C}$  | $I_D$          | 35          | A                |
|                                                                                    | $T_C = 100\text{ }^\circ\text{C}$ |                | 28          |                  |
| Pulsed Drain Current                                                               |                                   | $I_{DM}$       | 100         |                  |
| Continuous Source Current (Diode Conduction)                                       |                                   | $I_S$          | 23          |                  |
| Avalanche Current                                                                  |                                   | $I_{AS}$       | 20          |                  |
| Single Avalanche Energy (Duty Cycle $\leq 1\%$ )                                   | $L = 0.1\text{ mH}$               | $E_{AS}$       | 20          | mJ               |
| Maximum Power Dissipation                                                          | $T_C = 25\text{ }^\circ\text{C}$  | $P_D$          | 100         | W                |
|                                                                                    | $T_A = 25\text{ }^\circ\text{C}$  |                | 3           |                  |
| Operating Junction and Storage Temperature Range                                   |                                   | $T_J, T_{stg}$ | - 55 to 175 | $^\circ\text{C}$ |

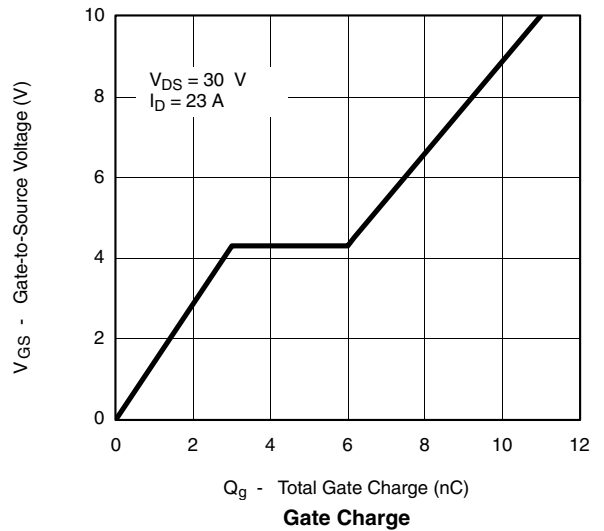
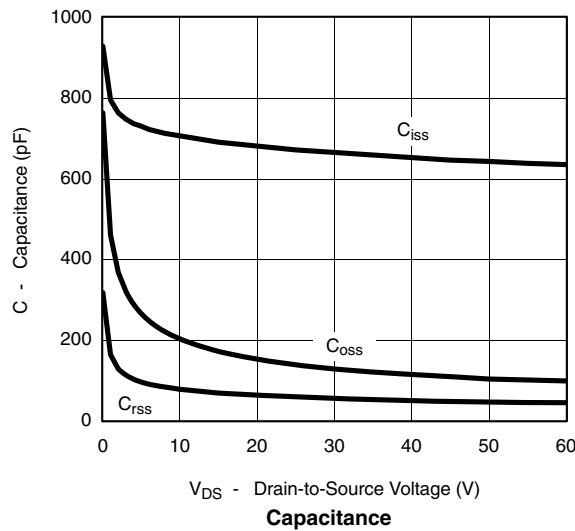
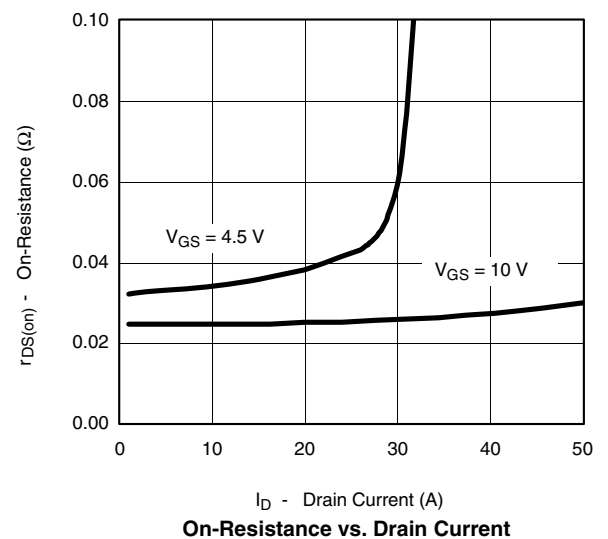
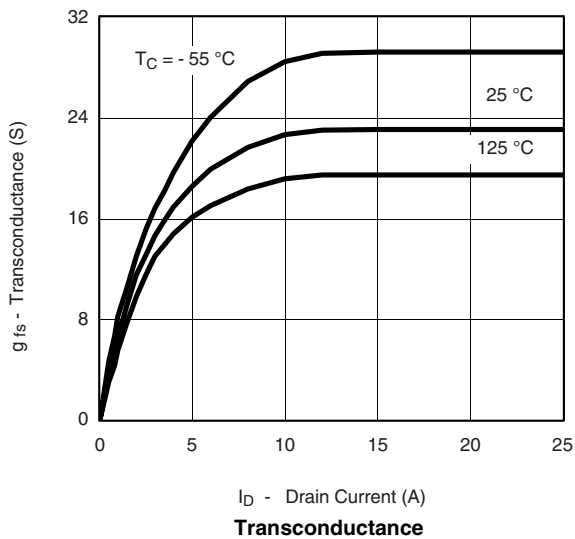
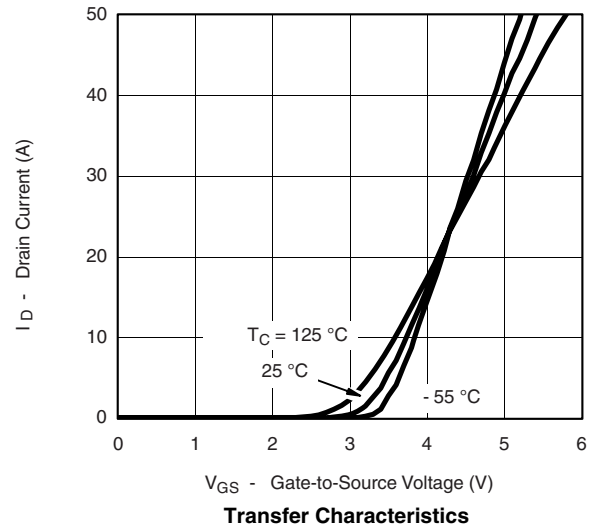
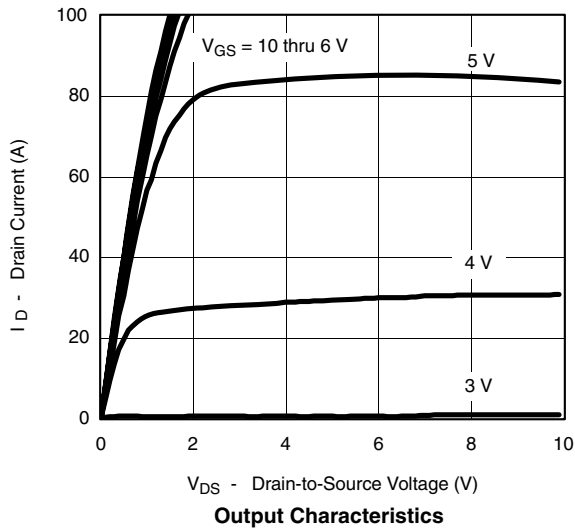
| THERMAL RESISTANCE RATINGS  |                        |            |         |         |                    |
|-----------------------------|------------------------|------------|---------|---------|--------------------|
| Parameter                   |                        | Symbol     | Typical | Maximum | Unit               |
| Maximum Junction-to-Ambient | $t \leq 10\text{ sec}$ | $R_{thJA}$ | 18      | 22      | $^\circ\text{C/W}$ |
|                             | Steady State           |            | 40      | 50      |                    |
| Maximum Junction-to-Case    |                        | $R_{thJC}$ | 3.2     | 4       |                    |

| SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted            |               |                                                                                                                            |     |     |           |               |
|---------------------------------------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------|-----|-----|-----------|---------------|
| Parameter                                                                             | Symbol        | Test Conditions                                                                                                            | Min | Typ | Max       | Unit          |
| Static                                                                                |               |                                                                                                                            |     |     |           |               |
| Drain-Source Breakdown Voltage                                                        | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$                                                                        | 60  |     |           | V             |
| Gate Threshold Voltage                                                                | $V_{GS(th)}$  | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$                                                                            | 1.0 | 2.0 | 3.0       |               |
| Gate-Body Leakage                                                                     | $I_{GSS}$     | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$                                                                            |     |     | $\pm 100$ | nA            |
| Zero Gate Voltage Drain Current                                                       | $I_{DSS}$     | $V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$                                                                                |     |     | 1         | $\mu\text{A}$ |
|                                                                                       |               | $V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^{\circ}\text{C}$                                             |     |     | 50        |               |
|                                                                                       |               | $V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^{\circ}\text{C}$                                             |     |     | 250       |               |
| On-State Drain Current <sup>a</sup>                                                   | $I_{D(on)}$   | $V_{DS} = 5\text{ V}, V_{GS} = 10\text{ V}$                                                                                | 50  |     |           | A             |
| Drain-Source On-State Resistance <sup>a</sup>                                         | $r_{DS(on)}$  | $V_{GS} = 10\text{ V}, I_D = 15\text{ A}$                                                                                  |     | 25  | 31        | m $\Omega$    |
|                                                                                       |               | $V_{GS} = 10\text{ V}, I_D = 15\text{ A}, T_J = 125\text{ }^{\circ}\text{C}$                                               |     |     | 55        |               |
|                                                                                       |               | $V_{GS} = 10\text{ V}, I_D = 15\text{ A}, T_J = 175\text{ }^{\circ}\text{C}$                                               |     |     | 69        |               |
|                                                                                       |               | $V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$                                                                                 |     | 30  | 45        |               |
| Forward Transconductance <sup>a</sup>                                                 | $g_{fs}$      | $V_{DS} = 15\text{ V}, I_D = 15\text{ A}$                                                                                  |     | 20  |           | S             |
| Dynamic                                                                               |               |                                                                                                                            |     |     |           |               |
| Input Capacitance                                                                     | $C_{iss}$     | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$                                                              |     | 670 |           | pF            |
| Output Capacitance                                                                    | $C_{oss}$     |                                                                                                                            |     | 140 |           |               |
| Reverse Transfer Capacitance                                                          | $C_{rss}$     |                                                                                                                            |     | 60  |           |               |
| Total Gate Charge <sup>b</sup>                                                        | $Q_g$         | $V_{DS} = 30\text{ V}, V_{GS} = 10\text{ V}, I_D = 23\text{ A}$                                                            |     | 11  | 17        | nC            |
| Gate-Source Charge <sup>b</sup>                                                       | $Q_{gs}$      |                                                                                                                            |     | 3   |           |               |
| Gate-Drain Charge <sup>b</sup>                                                        | $Q_{gd}$      |                                                                                                                            |     | 3   |           |               |
| Turn-On Delay Time <sup>b</sup>                                                       | $t_{d(on)}$   | $V_{DD} = 30\text{ V}, R_L = 1.3\text{ }\Omega$<br>$I_D \cong 23\text{ A}, V_{GEN} = 10\text{ V}, R_g = 2.5\text{ }\Omega$ |     | 8   | 15        | ns            |
| Rise Time <sup>b</sup>                                                                | $t_r$         |                                                                                                                            |     | 15  | 25        |               |
| Turn-Off Delay Time <sup>b</sup>                                                      | $t_{d(off)}$  |                                                                                                                            |     | 30  | 45        |               |
| Fall Time <sup>b</sup>                                                                | $t_f$         |                                                                                                                            |     | 25  | 40        |               |
| Source-Drain Diode Ratings and Characteristics ( $T_C = 25\text{ }^{\circ}\text{C}$ ) |               |                                                                                                                            |     |     |           |               |
| Pulsed Current                                                                        | $I_{SM}$      |                                                                                                                            |     |     | 50        | A             |
| Diode Forward Voltage                                                                 | $V_{SD}$      | $I_F = 15\text{ A}, V_{GS} = 0\text{ V}$                                                                                   |     | 1.0 | 1.5       | V             |
| Reverse Recovery Time                                                                 | $t_{rr}$      | $I_F = 15\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$                                                                      |     | 30  | 60        | ns            |

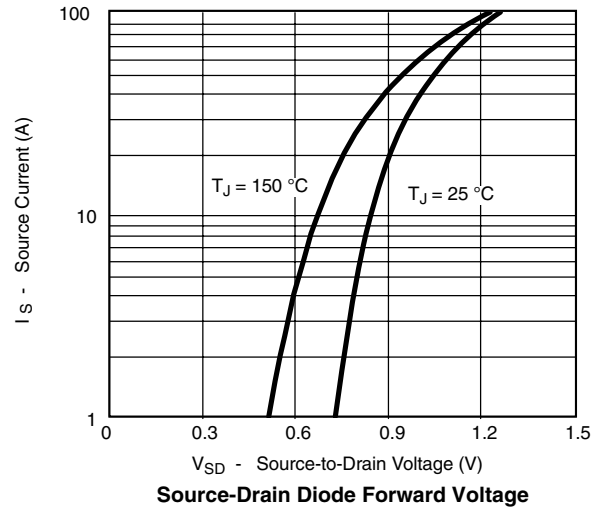
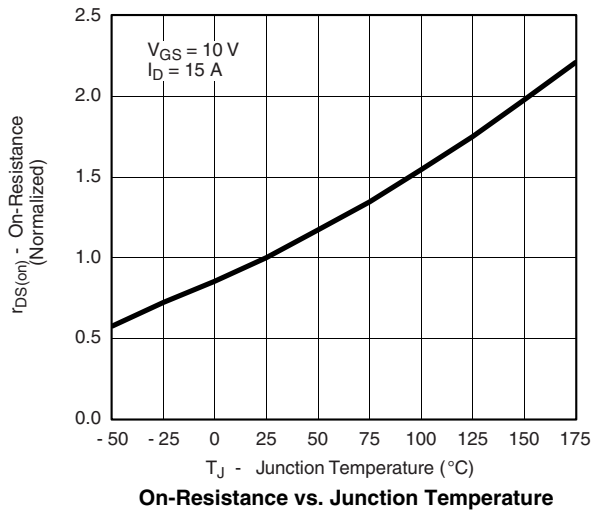
a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

b. Independent of operating temperature.

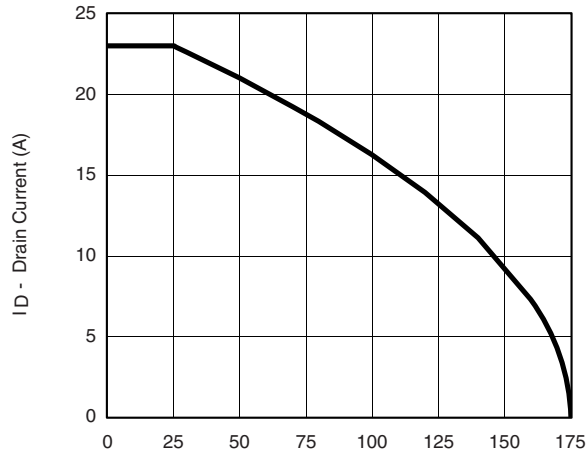
TYPICAL CHARACTERISTICS 25 °C unless noted



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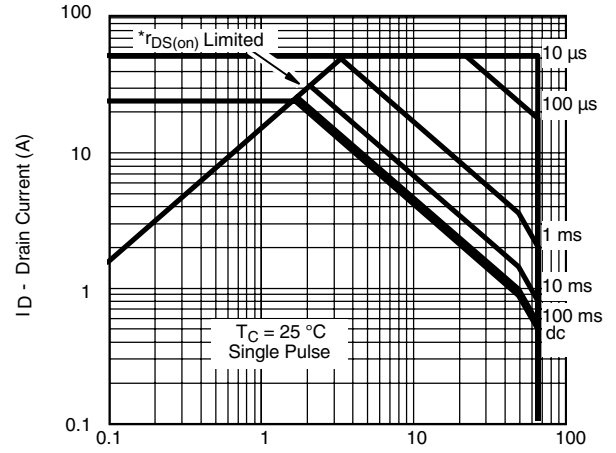


## THERMAL RATINGS



$T_A$  - Ambient Temperature (°C)

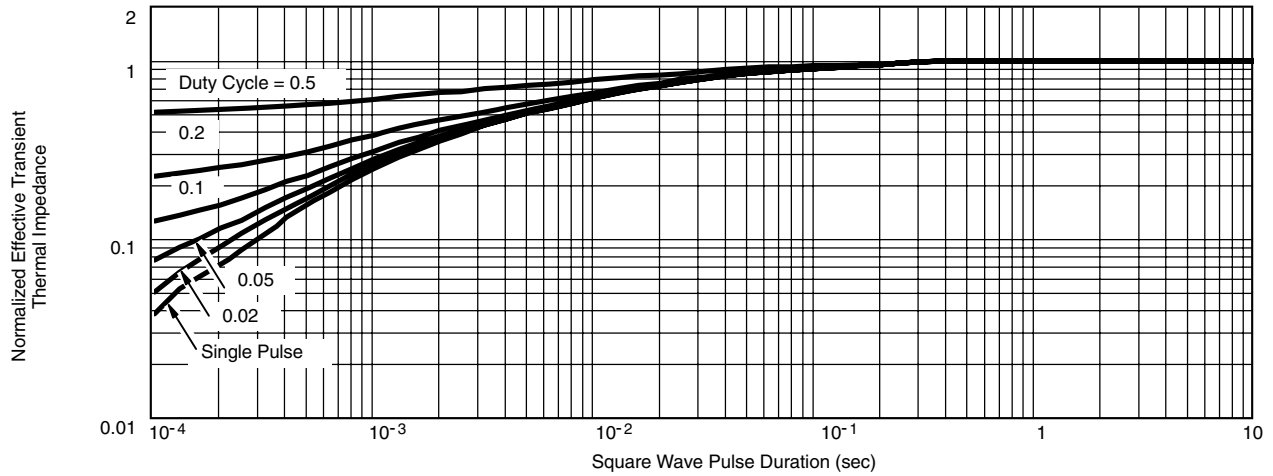
**Maximum Drain Current  
vs. Ambient Temperature**



$V_{DS}$  - Drain-to-Source Voltage (V)

\* $V_{GS}$  > minimum  $V_{GS}$  at which  $r_{DS(on)}$  is specified

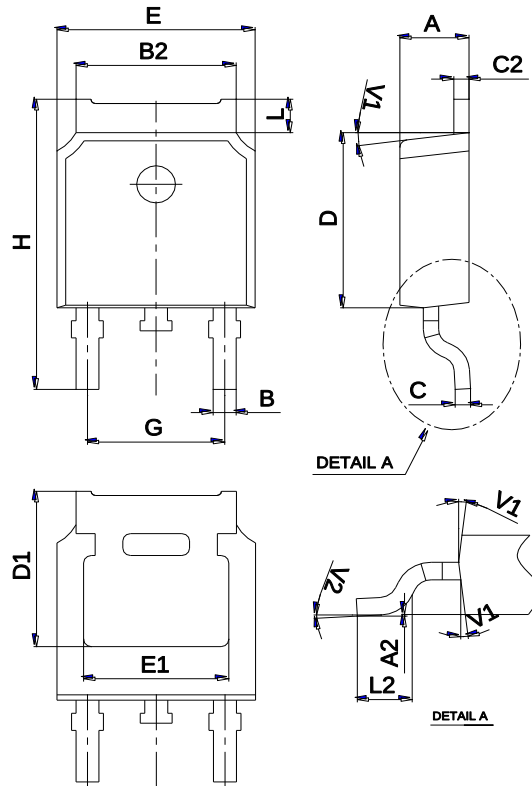
**Safe Operating Area**



**Normalized Thermal Transient Impedance, Junction-to-Case**

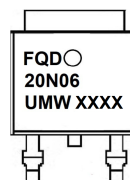
## Package Mechanical Data TO-252

60V N-Channel MOSFET



| Ref. | Dimensions  |      |       |          |      |       |
|------|-------------|------|-------|----------|------|-------|
|      | Millimeters |      |       | Inches   |      |       |
|      | Min.        | Typ. | Max.  | Min.     | Typ. | Max.  |
| A    | 2.10        |      | 2.50  | 0.083    |      | 0.098 |
| A2   | 0           |      | 0.10  | 0        |      | 0.004 |
| B    | 0.66        |      | 0.86  | 0.026    |      | 0.034 |
| B2   | 5.18        |      | 5.48  | 0.202    |      | 0.216 |
| C    | 0.40        |      | 0.60  | 0.016    |      | 0.024 |
| C2   | 0.44        |      | 0.58  | 0.017    |      | 0.023 |
| D    | 5.90        |      | 6.30  | 0.232    |      | 0.248 |
| D1   | 5.30REF     |      |       | 0.209REF |      |       |
| E    | 6.40        |      | 6.80  | 0.252    |      | 0.268 |
| E1   | 4.63        |      |       | 0.182    |      |       |
| G    | 4.47        |      | 4.67  | 0.176    |      | 0.184 |
| H    | 9.50        |      | 10.70 | 0.374    |      | 0.421 |
| L    | 1.09        |      | 1.21  | 0.043    |      | 0.048 |
| L2   | 1.35        |      | 1.65  | 0.053    |      | 0.065 |
| V1   |             | 7°   |       |          | 7°   |       |
| V2   | 0°          |      | 6°    | 0°       |      | 6°    |

## Marking



## Ordering information

| Order code   | Package | Baseqty | Delivery mode |
|--------------|---------|---------|---------------|
| UMW FQD20N06 | TO-252  | 2500    | Tape and reel |