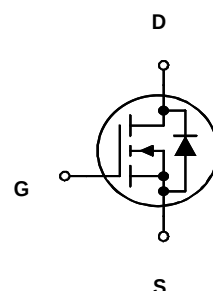
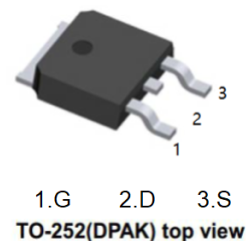


### Description

This N-Channel MOSFET is produced using ductor's advanced process that has been tai-lored to minimize the on-state resistance and maintain superior switching performance.

### Features

- $V_{DS} = 100V$
- $R_{DS(ON)} (at V_{GS}=10V) < 124m\Omega$
- $R_{DS(ON)} (at V_{GS} = 5V) < 175m\Omega$
- Low Gate Charge (Typ.2.78 nC)
- Fast Switching
- Improved dv/dt Capability
- RoHS Compliant



### Application

- Consumer Appliances
- LED TV and Monitor
- Synchronous Rectification
- Uninterruptible Power Supply
- Micro Solar Inverter

### MOSFET Maximum Ratings $T_C = 25^\circ C$ unless otherwise noted.

| Symbol         | Parameter                                                            | FDD1600N10ALZ                        | Unit          |
|----------------|----------------------------------------------------------------------|--------------------------------------|---------------|
| $V_{DSS}$      | Drain to Source Voltage                                              | 100                                  | V             |
| $V_{GSS}$      | Gate to Source Voltage                                               | $\pm 20$                             | V             |
| $I_D$          | Drain Current                                                        | - Continuous ( $T_C = 25^\circ C$ )  | A             |
|                |                                                                      | - Continuous ( $T_C = 100^\circ C$ ) |               |
| $I_{DM}$       | Drain Current                                                        | - Pulsed (Note 1)                    | A             |
| $E_{AS}$       | Single Pulsed Avalanche Energy                                       | (Note 2)                             | mJ            |
| dv/dt          | Peak Diode Recovery dv/dt                                            | (Note 3)                             | V/ns          |
| $P_D$          | Power Dissipation                                                    | ( $T_C = 25^\circ C$ )               | W             |
|                |                                                                      | - Derate Above $25^\circ C$          | W/ $^\circ C$ |
| $T_J, T_{STG}$ | Operating and Storage Temperature Range                              | -55 to +150                          | $^\circ C$    |
| $T_L$          | Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds | 300                                  | $^\circ C$    |

### Thermal Characteristics

| Symbol          | Parameter                                     | FDD1600N10ALZ | Unit         |
|-----------------|-----------------------------------------------|---------------|--------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case, Max.    | 8.4           | $^\circ C/W$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient, Max. | 87            |              |

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

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------|-----------|-----------------|------|------|------|------|
|--------|-----------|-----------------|------|------|------|------|

### Off Characteristics

|                                |                                           |                                                                                                                                  |     |     |          |                     |
|--------------------------------|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-----|-----|----------|---------------------|
| $BV_{DSS}$                     | Drain to Source Breakdown Voltage         | $I_D = 250\ \mu\text{A}$ , $V_{GS} = 0\ \text{V}$                                                                                | 100 |     |          | V                   |
| $\Delta BV_{DSS} / \Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$                                                                      |     | 0.1 |          | V/ $^\circ\text{C}$ |
| $I_{DSS}$                      | Zero Gate Voltage Drain Current           | $V_{DS} = 80\ \text{V}$ , $V_{GS} = 0\ \text{V}$<br>$V_{DS} = 80\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $T_C = 125^\circ\text{C}$ |     |     | 1<br>500 | $\mu\text{A}$       |
| $I_{GSS}$                      | Gate to Source Leakage Current            | $V_{GS} = \pm 20\ \text{V}$ , $V_{DS} = 0\ \text{V}$                                                                             |     |     | $\pm 10$ | $\mu\text{A}$       |

### On Characteristics

|              |                                      |                                                                                                   |     |            |            |            |
|--------------|--------------------------------------|---------------------------------------------------------------------------------------------------|-----|------------|------------|------------|
| $V_{GS(th)}$ | Gate Threshold Voltage               | $V_{GS} = V_{DS}$ , $I_D = 250\ \mu\text{A}$                                                      | 1.0 | 1.6        | 2.5        | V          |
| $R_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS} = 10\ \text{V}$ , $I_D = 3.4\ \text{A}$<br>$V_{GS} = 5\ \text{V}$ , $I_D = 2.1\ \text{A}$ |     | 124<br>175 | 160<br>375 | m $\Omega$ |
| $g_{FS}$     | Forward Transconductance             | $V_{DS} = 10\ \text{V}$ , $I_D = 6.8\ \text{A}$                                                   |     | 19.6       |            | S          |

### Dynamic Characteristics

|               |                                    |                                                                           |                                                                |      |      |          |
|---------------|------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------|------|------|----------|
| $C_{iss}$     | Input Capacitance                  | $V_{DS} = 50\ \text{V}$ , $V_{GS} = 0\ \text{V}$ ,<br>$f = 1\ \text{MHz}$ |                                                                | 169  | 225  | pF       |
| $C_{oss}$     | Output Capacitance                 |                                                                           |                                                                | 43   | 55   | pF       |
| $C_{rss}$     | Reverse Transfer Capacitance       |                                                                           |                                                                | 2.04 |      | pF       |
| $C_{oss(er)}$ | Energy Related Output Capacitance  | $V_{DS} = 50\ \text{V}$ , $V_{GS} = 0\ \text{V}$                          |                                                                | 85   |      | pF       |
| $Q_{g(tot)}$  | Total Gate Charge at 10V           | $V_{GS} = 10\ \text{V}$                                                   | $V_{DD} = 50\ \text{V}$ ,<br>$I_D = 6.8\ \text{A}$<br>(Note 4) | 2.78 | 3.61 | nC       |
| $Q_{g(tot)}$  | Total Gate Charge at 5V            | $V_{GS} = 5\ \text{V}$                                                    |                                                                | 1.5  | 1.95 | nC       |
| $Q_{gs}$      | Gate to Source Gate Charge         |                                                                           |                                                                | 0.72 |      | nC       |
| $Q_{gd}$      | Gate to Drain "Miller" Charge      |                                                                           |                                                                | 0.56 |      | nC       |
| $V_{plateau}$ | Gate Plateau Voltage               |                                                                           |                                                                | 4.02 |      | V        |
| $Q_{sync}$    | Total Gate Charge Sync.            | $V_{DS} = 0\ \text{V}$ , $I_D = 3.4\ \text{A}$                            |                                                                | 2.5  |      | nC       |
| $Q_{oss}$     | Output Charge                      | $V_{DS} = 50\ \text{V}$ , $V_{GS} = 0\ \text{V}$                          |                                                                | 5.2  |      | nC       |
| ESR           | Equivalent Series Resistance (G-S) | $f = 1\ \text{MHz}$                                                       |                                                                | 2.1  |      | $\Omega$ |

### Switching Characteristics

|              |                     |                                                                                                                |  |    |    |    |
|--------------|---------------------|----------------------------------------------------------------------------------------------------------------|--|----|----|----|
| $t_{d(on)}$  | Turn-On Delay Time  | $V_{DD} = 50\ \text{V}$ , $I_D = 6.8\ \text{A}$ ,<br>$V_{GS} = 10\ \text{V}$ , $R_G = 4.7\ \Omega$<br>(Note 4) |  | 7  | 24 | ns |
| $t_r$        | Turn-On Rise Time   |                                                                                                                |  | 2  | 14 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time |                                                                                                                |  | 13 | 36 | ns |
| $t_f$        | Turn-Off Fall Time  |                                                                                                                |  | 2  | 14 | ns |

### Drain-Source Diode Characteristics

|          |                                                          |                                                                                                                        |  |      |    |
|----------|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--|------|----|
| $I_S$    | Maximum Continuous Drain to Source Diode Forward Current |                                                                                                                        |  | 6.8  | A  |
| $I_{SM}$ | Maximum Pulsed Drain to Source Diode Forward Current     |                                                                                                                        |  | 13.6 | A  |
| $V_{SD}$ | Drain to Source Diode Forward Voltage                    | $V_{GS} = 0\ \text{V}$ , $I_{SD} = 6.8\ \text{A}$                                                                      |  | 1.3  | V  |
| $t_{rr}$ | Reverse Recovery Time                                    | $V_{GS} = 0\ \text{V}$ , $I_{SD} = 6.8\ \text{A}$ , $V_{DS} = 50\ \text{V}$ ,<br>$di_F/dt = 100\ \text{A}/\mu\text{s}$ |  | 37   | ns |
| $Q_{rr}$ | Reverse Recovery Charge                                  |                                                                                                                        |  | 42   | nC |

#### Notes:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2.  $L = 1\ \text{mH}$ ,  $I_{AS} = 3.18\ \text{A}$ ,  $R_G = 25\ \Omega$ , starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 6.8\ \text{A}$ ,  $di/dt \leq 200\ \text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature typical characteristics.

## Typical Performance Characteristics

Figure 1. On-Region Characteristics

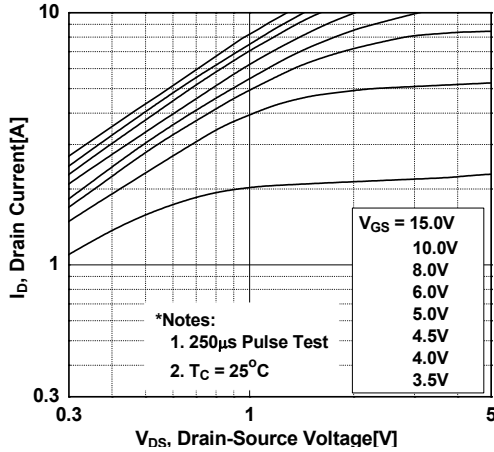


Figure 2. Transfer Characteristics

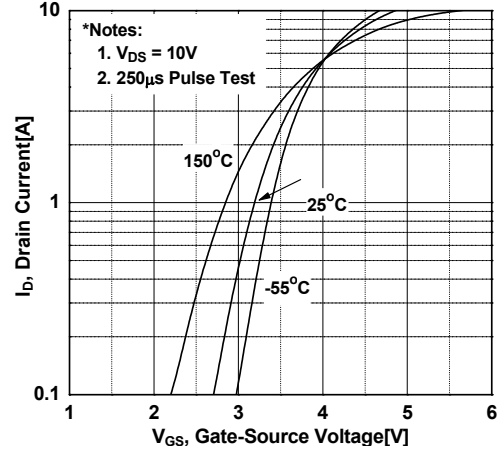


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

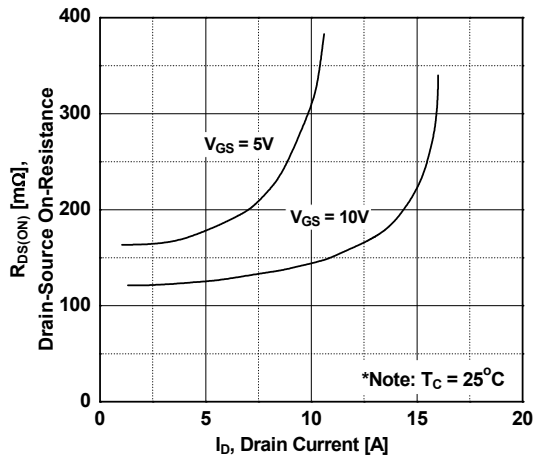


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

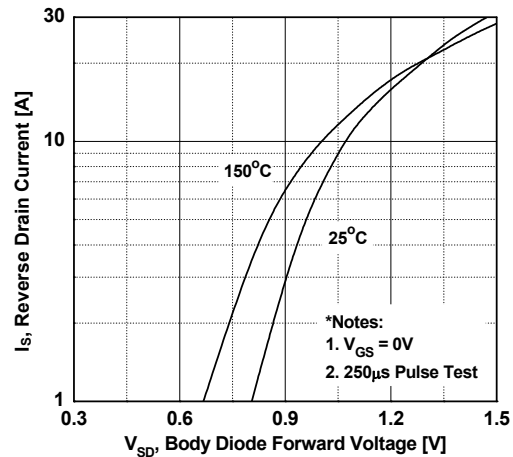


Figure 5. Capacitance Characteristics

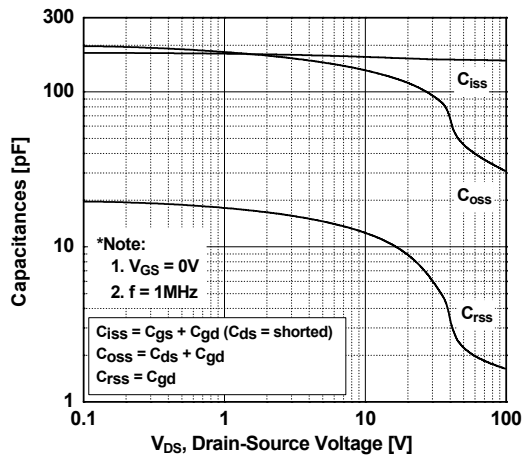
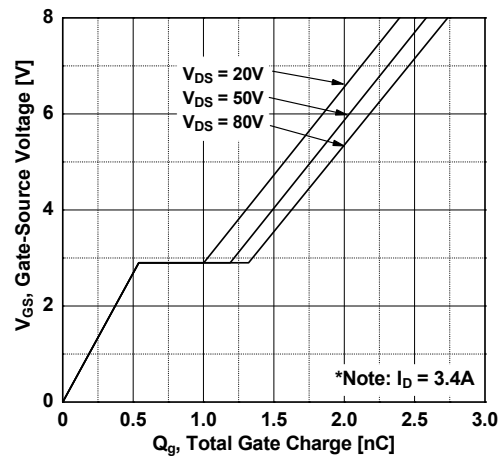


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

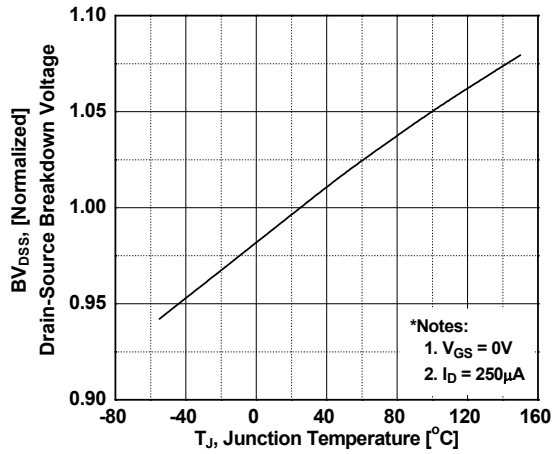


Figure 8. On-Resistance Variation vs. Temperature

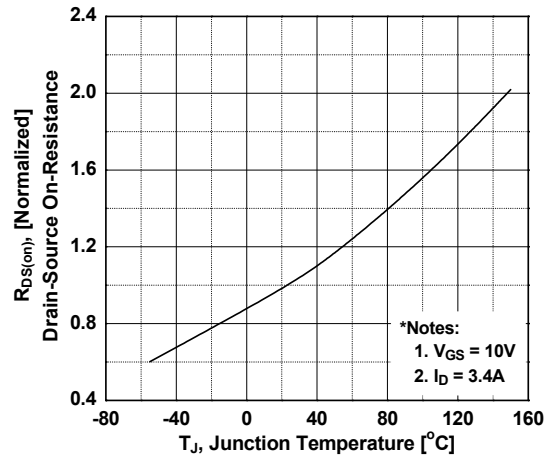


Figure 9. Maximum Safe Operating Area

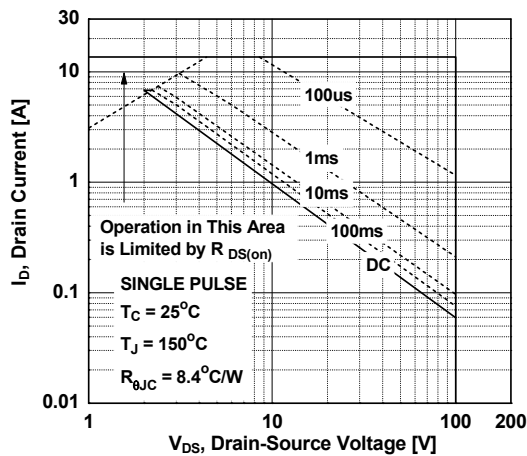


Figure 10. Maximum Drain Current vs. Case Temperature

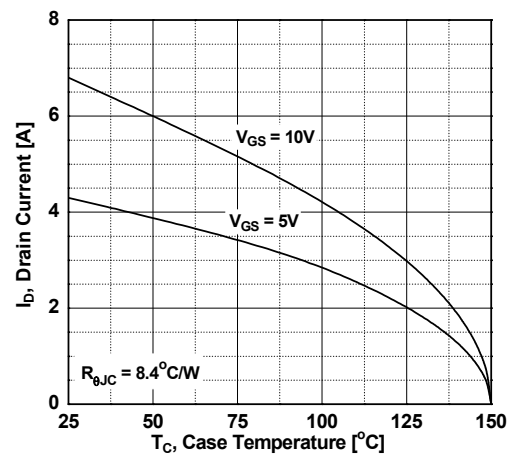


Figure 11. E\_oss vs. Drain to Source Voltage

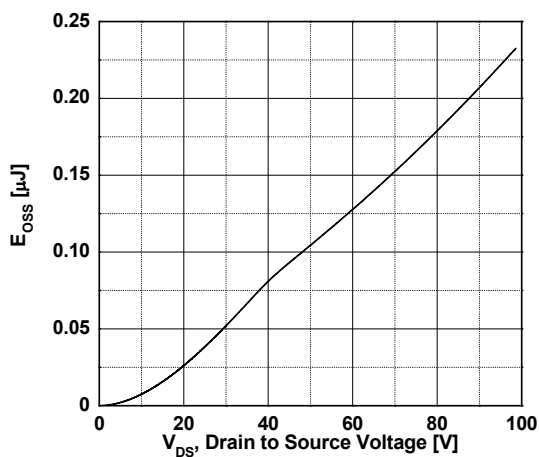
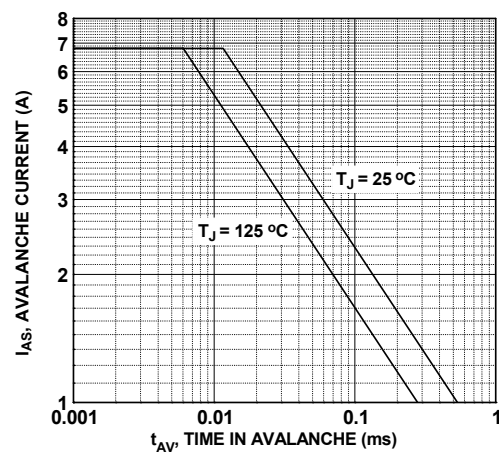
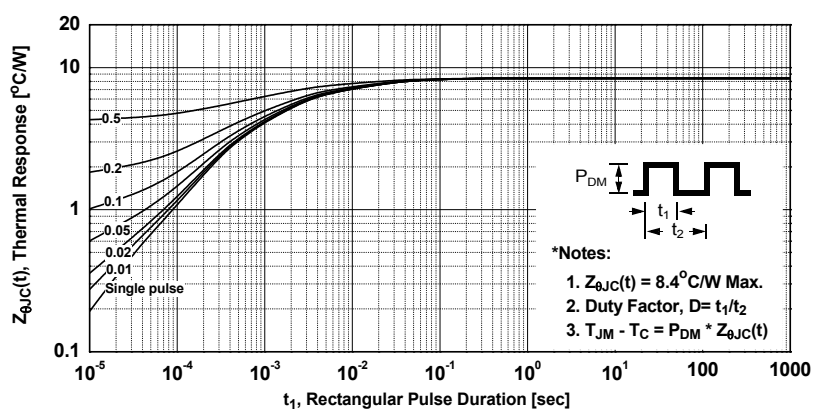


Figure 12. Unclamped Inductive Switching Capability

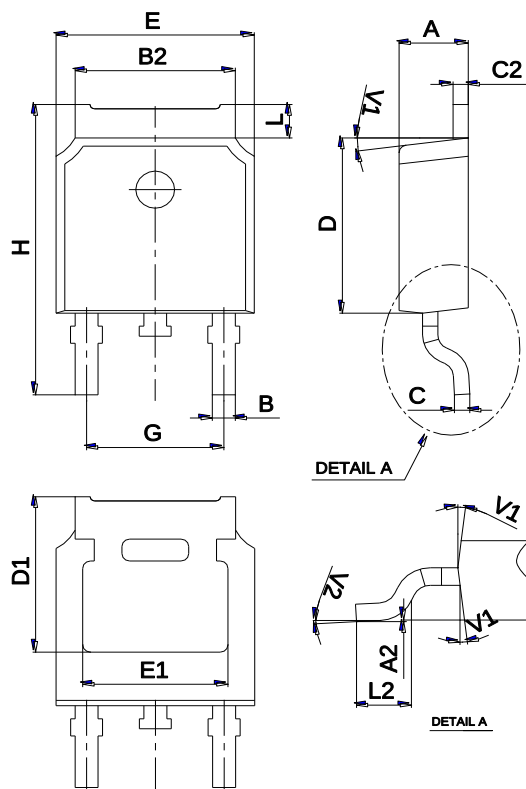


## Typical Performance Characteristics

Figure 13. Transient Thermal Response Curve

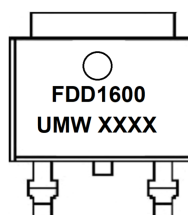


## Package Mechanical Data TO-252



| 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 | Deliverymode  |
|-------------------|---------|---------|---------------|
| UMW FDD1600N10ALZ | TO-252  | 2500    | Tape and reel |