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FDP3651U

N-Channel PowerTrench® MOSFET

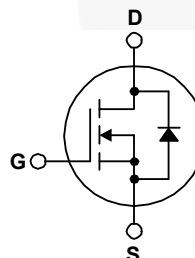
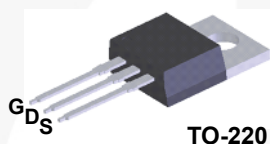
100 V, 80 A, 18 mΩ

Features

- $R_{DS(on)} = 15\text{ m}\Omega$ (Typ.) @ $V_{GS} = 10\text{ V}$, $I_D = 80\text{ A}$
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- Low Miller Charge
- UIS Capability (Single Pulse and Repetitive Pulse)

Applications

- Consumer Appliances
- Synchronous Rectification
- Battery Protection Circuit
- Motor drives and Uninterruptible Power Supplies
- Micro Solar Inverter



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

| Symbol | Parameter | FDP3651U | Unit |
|----------------|---|------------|------------------|
| V_{DSS} | Drain to Source Voltage | 100 | V |
| V_{GSS} | Gate to Source Voltage | ± 20 | V |
| I_D | Drain Current - Continuous | 80 | A |
| | - Pulsed (Note 1) | 320 | |
| P_D | Power Dissipation | 255 | W |
| E_{AS} | Single Pulsed Avalanche Energy (Note 2) | 266 | mJ |
| T_J, T_{STG} | Operating and Storage Temperature | -55 to 175 | $^\circ\text{C}$ |
| T_L | Maximum lead temperature soldering purposes, 1/8" from case for 5 seconds | 300 | $^\circ\text{C}$ |

Thermal Characteristics

| | | | |
|-----------------|---|------|--------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient, Max. | 62 | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case, Max. | 0.59 | $^\circ\text{C/W}$ |

Package Marking and Ordering Information

| Device Marking | Device | Reel Size | Tape Width | Quantity |
|----------------|----------|-----------|------------|----------|
| FDP3651U | FDP3651U | Tube | N/A | 50 units |

Electrical Characteristics $T_J = 25^\circ\text{C}$ 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 |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 80\text{V}$ $V_{GS} = 0\text{V}$ | - | - | 1 | μA |
| | | $T_C = 150^\circ\text{C}$ | - | - | 250 | μA |
| I_{GSS} | Gate to Source Leakage Current | $V_{GS} = \pm 20\text{V}$ | - | - | ± 100 | nA |

On Characteristics

| | | | | | | |
|--------------|----------------------------------|--|-----|-----|-----|------------|
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}, I_D = -250\mu\text{A}$ | 3.5 | 4.5 | 5.5 | V |
| $r_{DS(on)}$ | Drain to Source On Resistance | $V_{GS} = 10\text{V}, I_D = 80\text{A}$ | - | 15 | 18 | m Ω |
| | | $V_{GS} = 10\text{V}, I_D = 40\text{A}$ | - | 13 | 15 | |
| | | $V_{GS} = 10\text{V}, I_D = 40\text{A}, T_J = 175^\circ\text{C}$ | - | 32 | 37 | |

Dynamic Characteristics

| | | | | | | | |
|--------------|------------------------------|--|---|------|------|-----|----|
| C_{iss} | Input Capacitance | $V_{DS} = 25\text{V}, V_{GS} = 0\text{V}$ $f = 1\text{MHz}$ | - | 4152 | 5522 | pF | |
| C_{oss} | Output Capacitance | | - | 485 | 728 | pF | |
| C_{rss} | Reverse Transfer Capacitance | | - | 89 | 118 | pF | |
| $Q_{g(TOT)}$ | Total Gate Charge | $V_{GS} = 0\text{V to } 10\text{V}$ | $V_{DD} = 50\text{V}$ $I_D = 80\text{A}$ | - | 49 | 69 | nC |
| $Q_{g(TH)}$ | Threshold Gate Charge | $V_{GS} = 0\text{V to } 2\text{V}$ | | - | 7 | 9.8 | nC |
| Q_{gs} | Gate to Source Gate Charge | | | - | 23 | - | nC |
| Q_{gd} | Gate to Drain Charge | | | - | 16 | - | nC |

Resistive Switching Characteristics

| | | | | | | |
|--------------|---------------------|--|---|----|----|----|
| $t_{(on)}$ | Turn-On Time | $V_{DD} = 50\text{V}, I_D = 80\text{A}$ $V_{GS} = 10\text{V}, R_{GS} = 5.0\Omega$ | - | - | 64 | ns |
| $t_{d(on)}$ | Turn-On Delay Time | | - | 15 | 27 | ns |
| t_r | Rise Time | | - | 16 | 29 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 32 | 52 | ns |
| t_f | Fall Time | | - | 14 | 26 | ns |
| $t_{(off)}$ | Turn-Off Time | | - | - | 78 | ns |

Drain-Source Diode Characteristics

| | | | | | | |
|----------|---------------------------------------|---|---|------|------|----|
| V_{SD} | Source to Drain Diode Forward Voltage | $I_{SD} = 80\text{A}$ | - | 0.99 | 1.25 | V |
| | | $I_{SD} = 40\text{A}$ | - | 0.88 | 1.0 | V |
| t_{rr} | Reverse Recovery Time | $I_s = 40\text{A}, di/dt = 100\text{A}/\mu\text{s}$ | - | 70 | 105 | ns |
| Q_{rr} | Reverse Recovery Charge | | - | 202 | 303 | nC |

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $L = 0.13\text{mH}, I_{AS} = 64\text{A}, V_{DD} = 50\text{V}, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

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

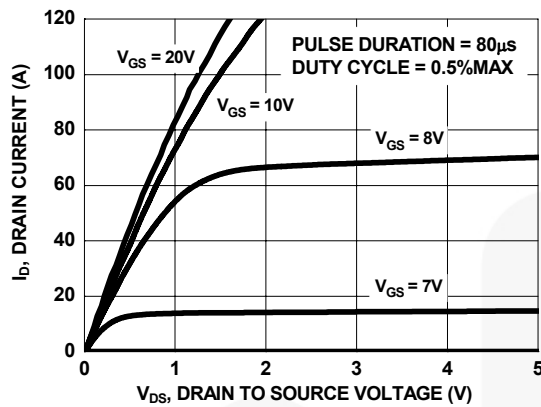


Figure 1. On Region Characteristics

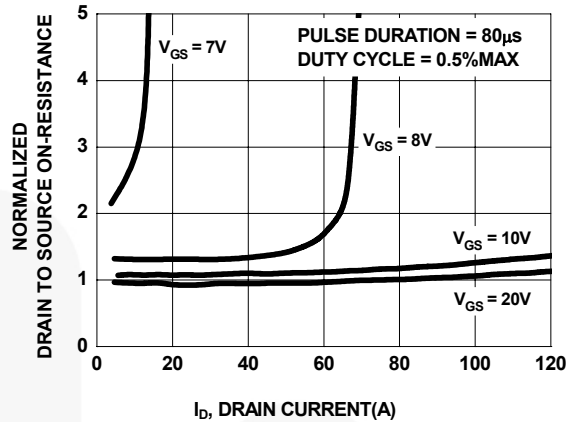


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

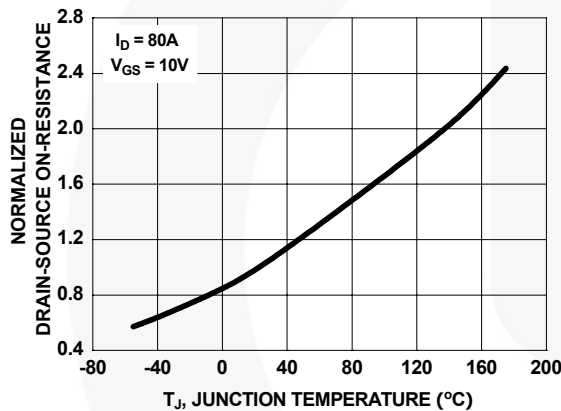


Figure 3. Normalized On Resistance vs Junction Temperature

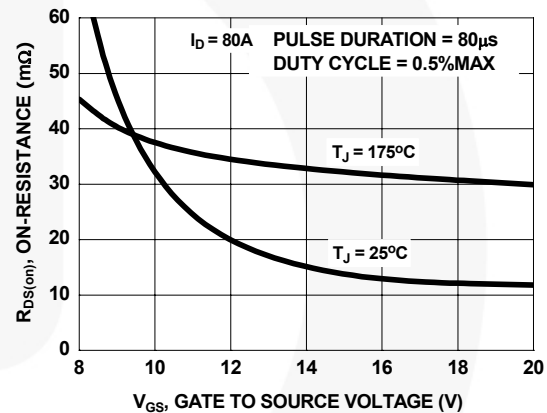


Figure 4. On-Resistance vs Gate to Source Voltage

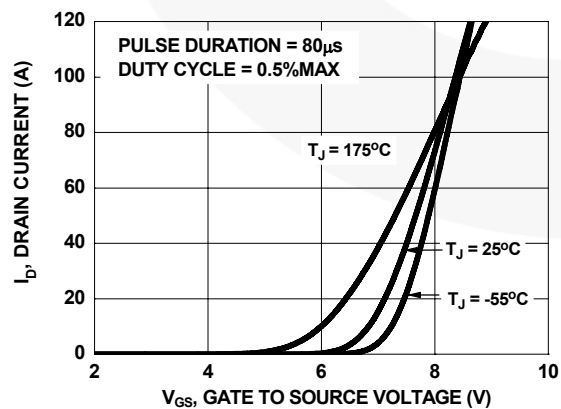


Figure 5. Transfer Characteristics

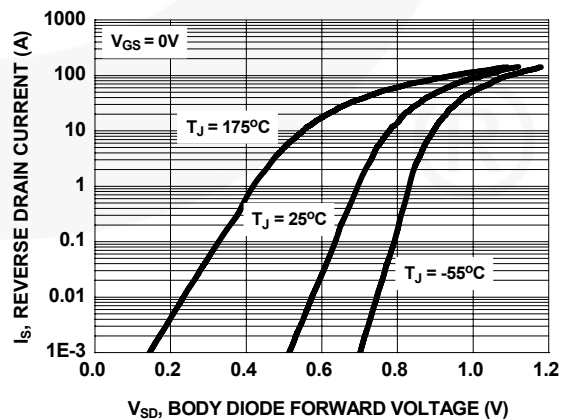


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

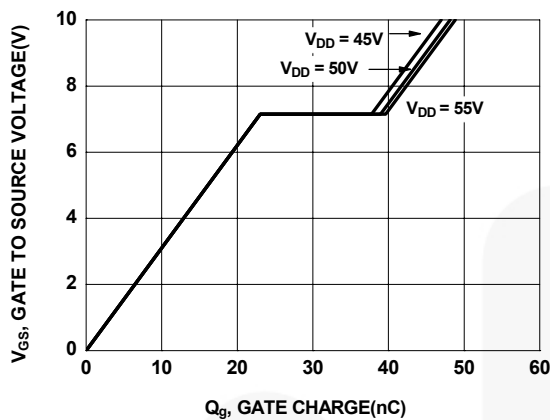


Figure 7. Gate Charge Characteristics

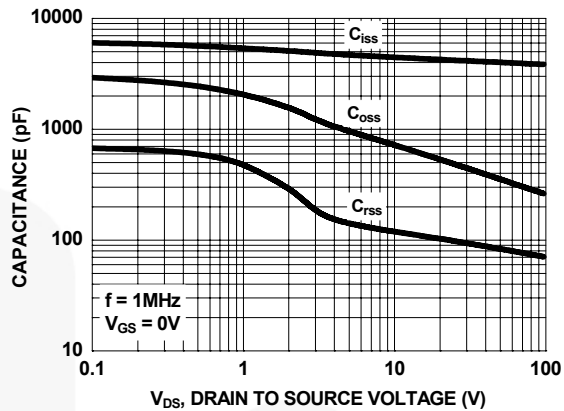


Figure 8. Capacitance vs Drain to Source Voltage

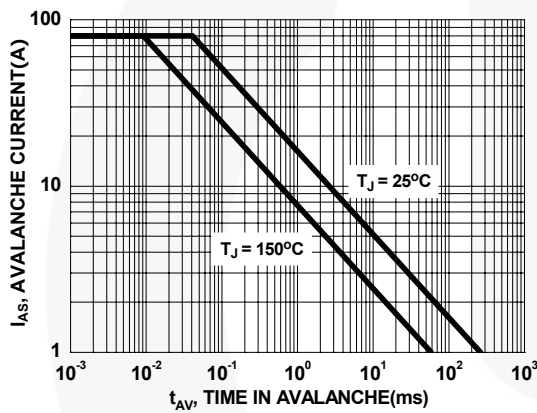


Figure 9. Unclamped Inductive Switching Capability

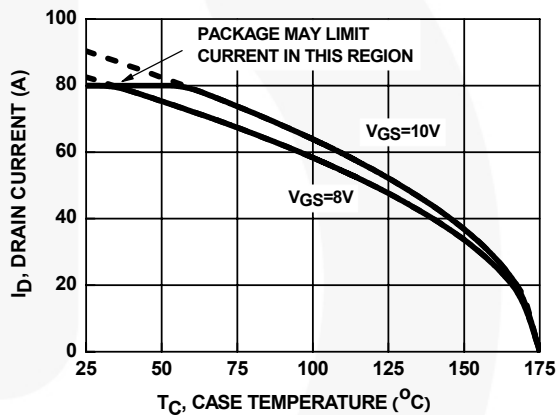


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

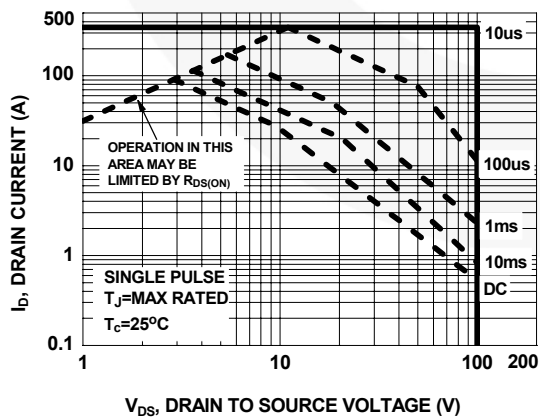


Figure 11. Forward Bias Safe Operating Area

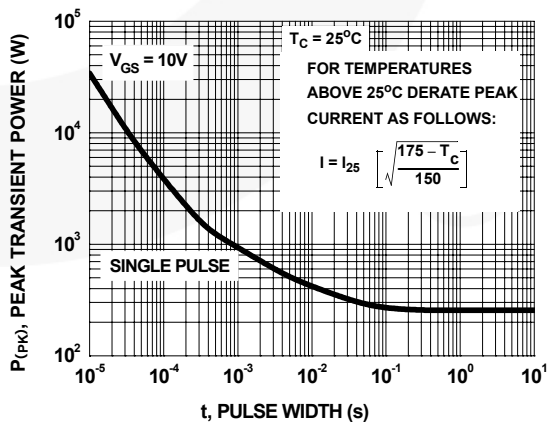
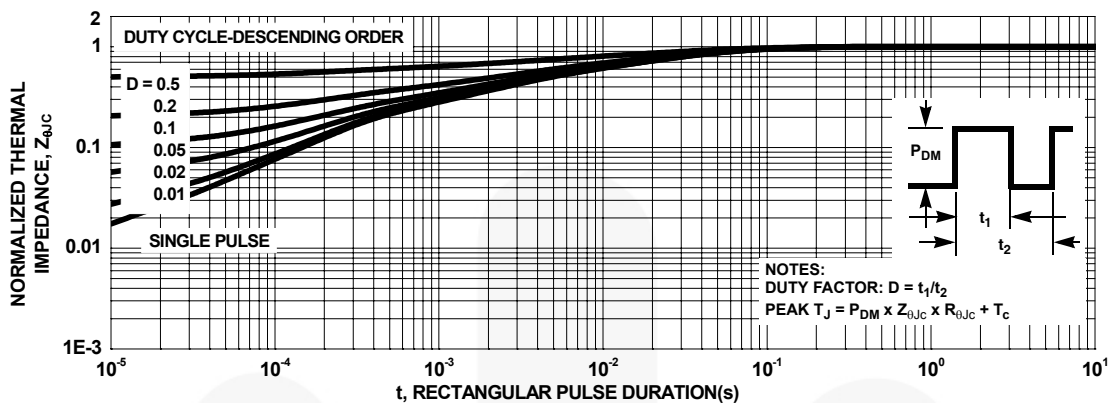


Figure 12. Single Pulse Maximum Power Dissipation

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



Mechanical Dimensions

TO-220 3L

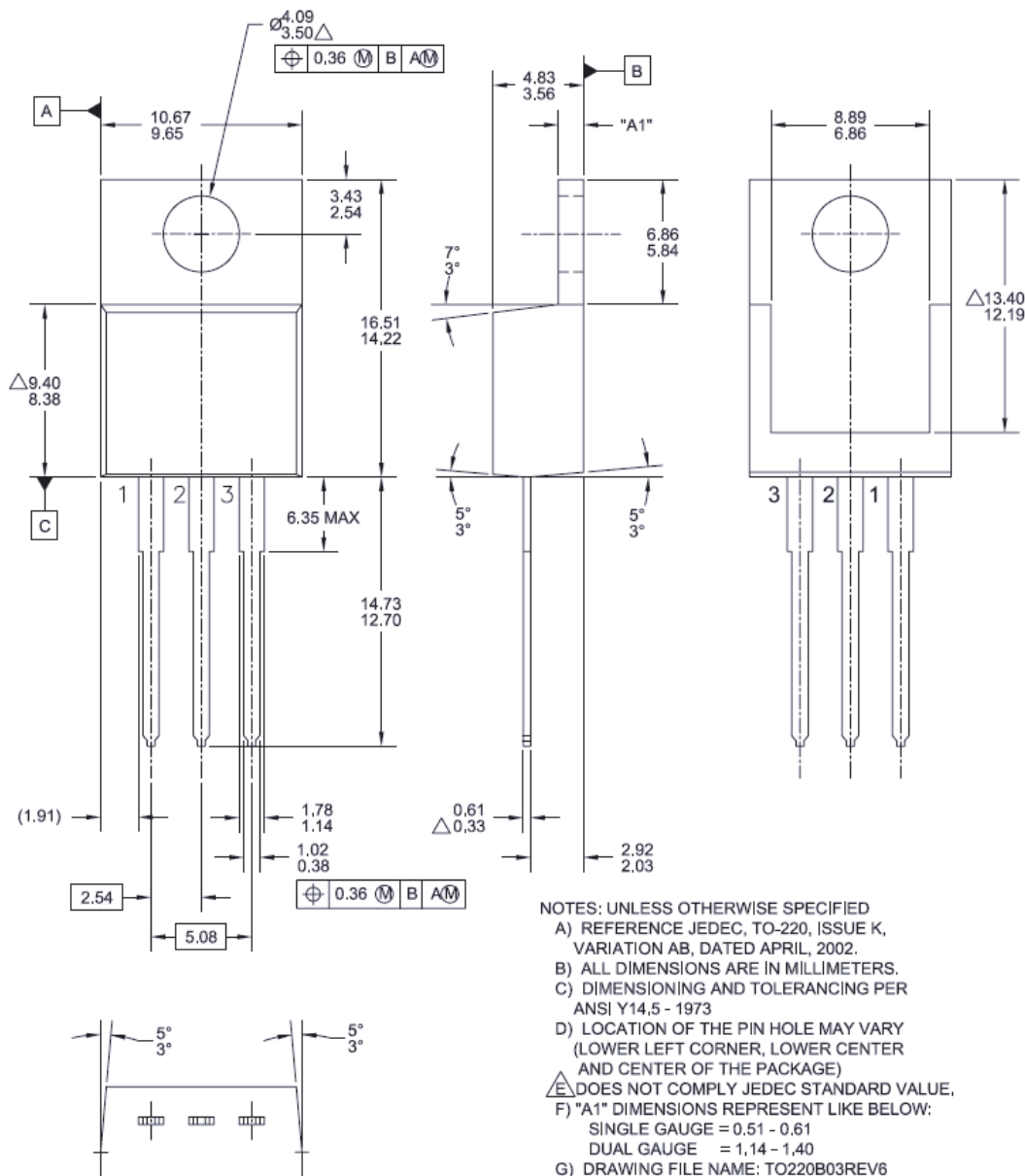


Figure 14. TO-220, Molded, 3Lead, Jedec Variation AB

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Dimension in Millimeters



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