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# FDP3651U

## N-Channel PowerTrench® MOSFET

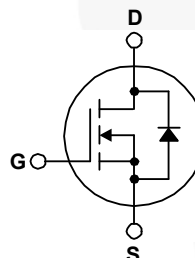
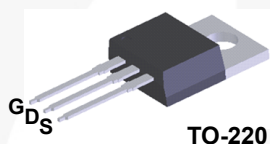
100 V, 80 A, 18 mΩ

### 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	$\pm 20$	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
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**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	$\mu\text{A}$
		$T_C = 150^\circ\text{C}$	-	-	250	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}$	-	-	$\pm 100$	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 $\Omega$
		$V_{GS} = 10\text{V}, I_D = 40\text{A}$	-	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

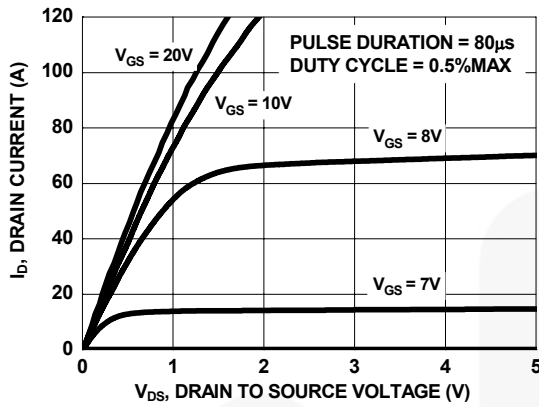


Figure 1. On Region Characteristics

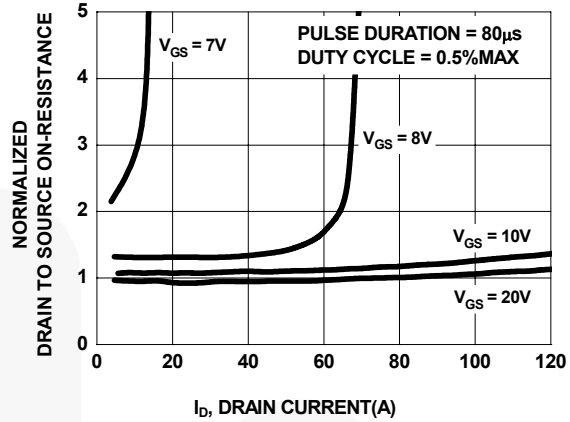


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

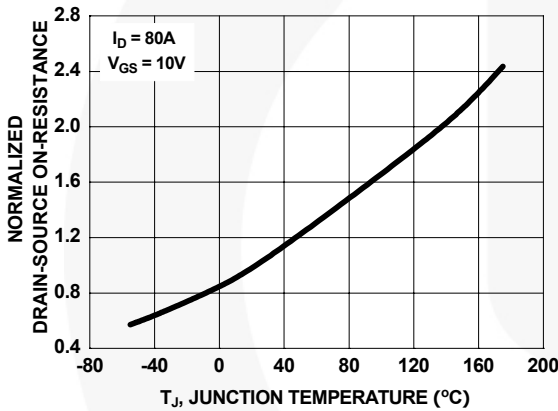


Figure 3. Normalized On Resistance vs Junction Temperature

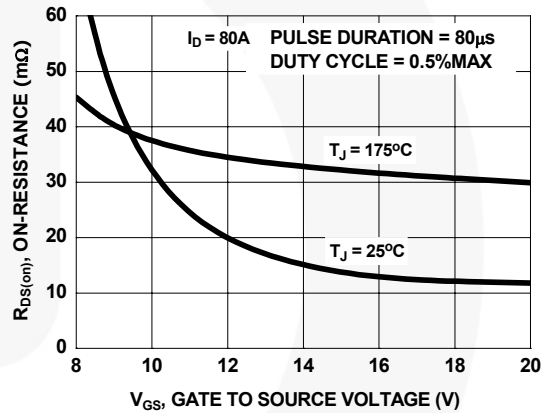


Figure 4. On-Resistance vs Gate to Source Voltage

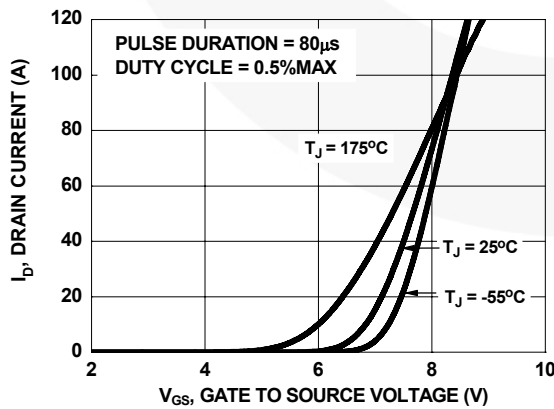


Figure 5. Transfer Characteristics

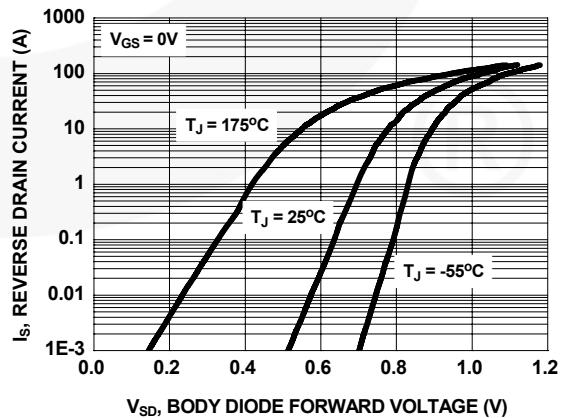
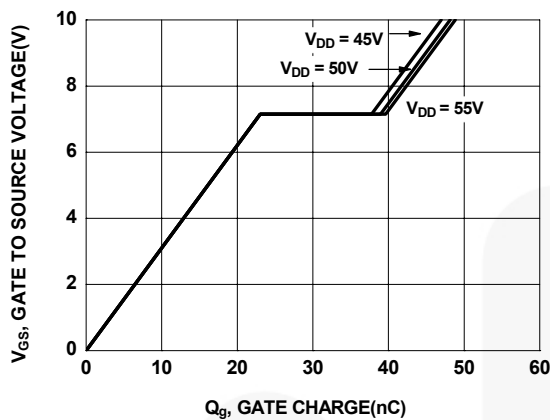
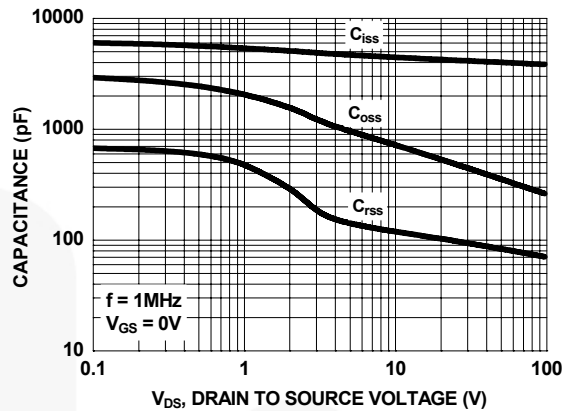


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

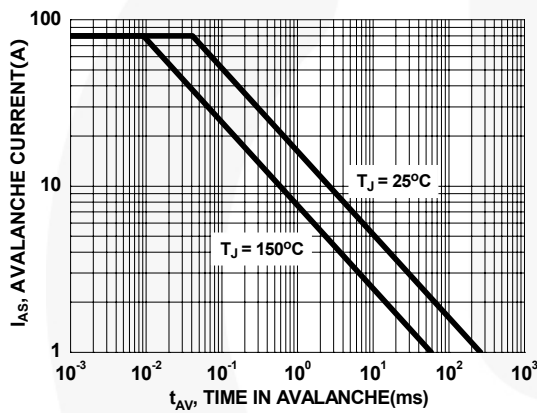
**Typical Characteristics**  $T_C = 25^\circ\text{C}$  unless otherwise noted



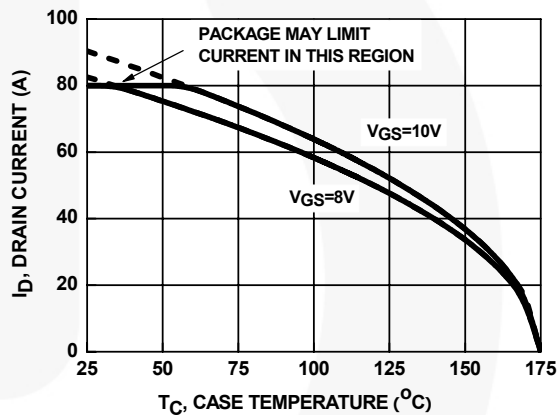
**Figure 7. Gate Charge Characteristics**



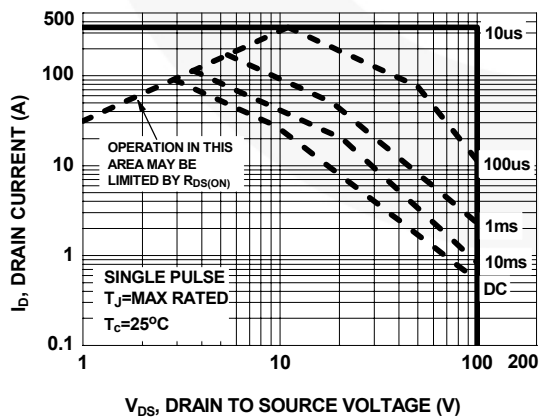
**Figure 8. Capacitance vs Drain to Source Voltage**



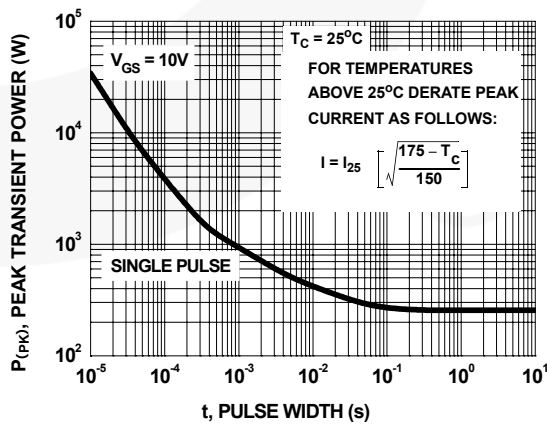
**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Maximum Continuous Drain Current vs Ambient Temperature**

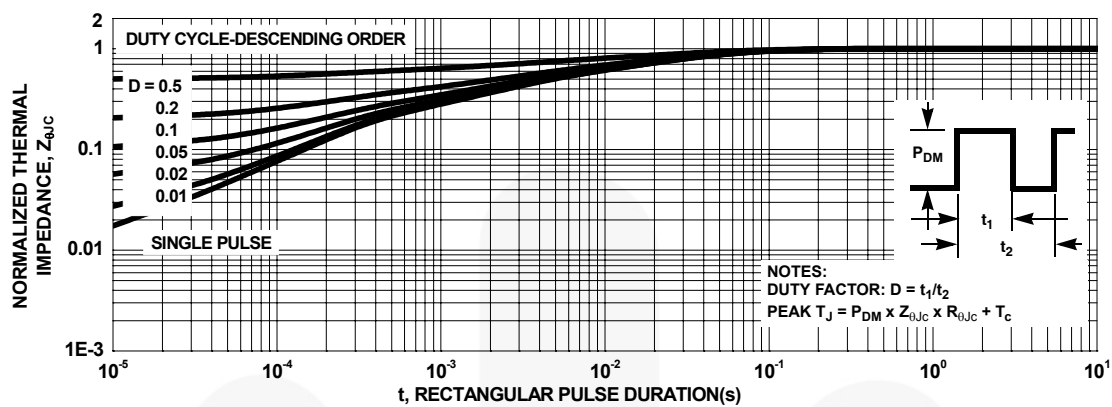


**Figure 11. Forward Bias Safe Operating Area**



**Figure 12. Single Pulse Maximum Power Dissipation**

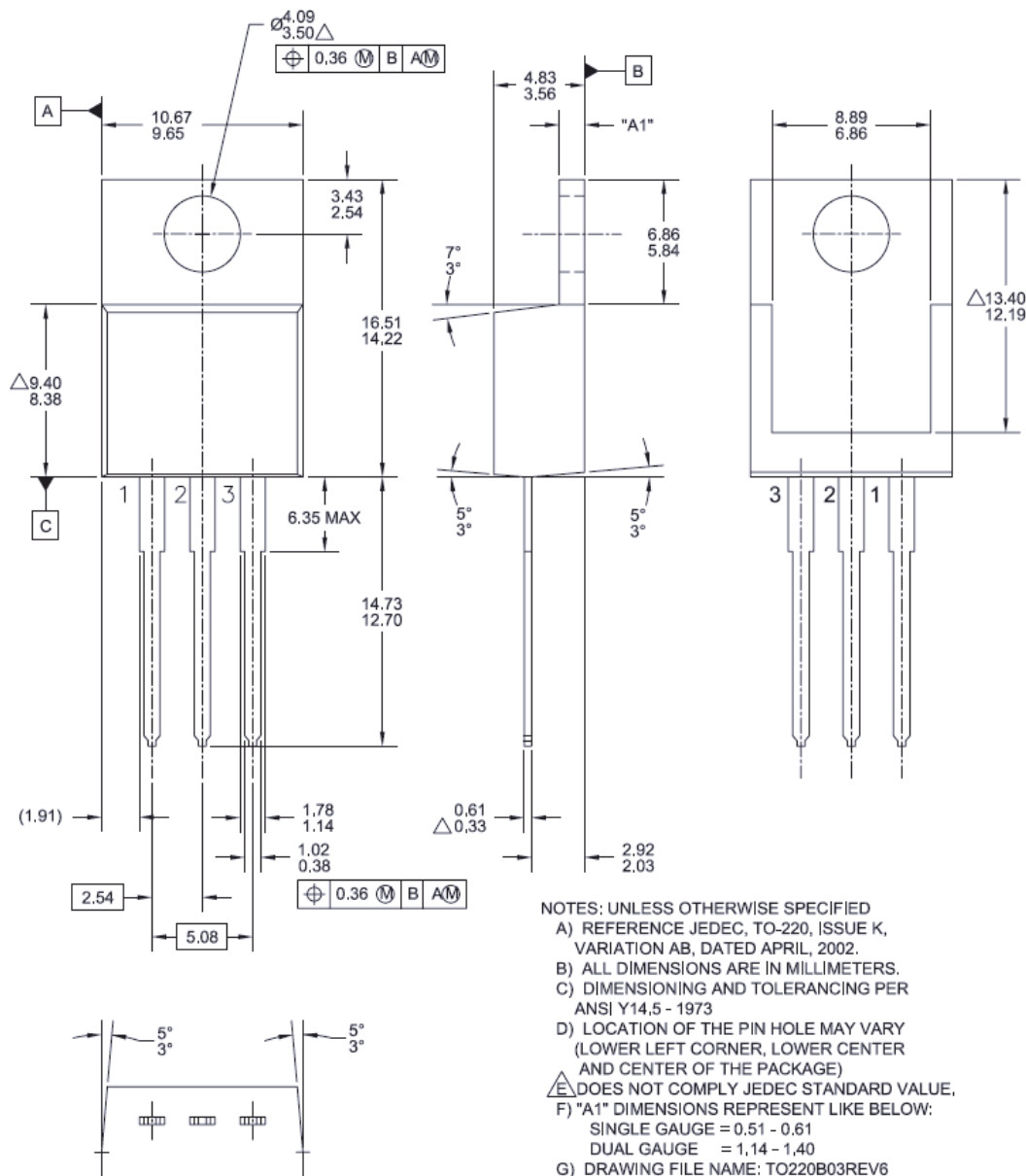
**Typical Characteristics**  $T_C = 25^\circ\text{C}$  unless otherwise noted



**Figure 13. Transient Thermal Response Curve**

## 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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| DEUXPEED®                | ISOPLANAR™                                      | TinyWire™                 |
| Dual Cool™               | Marking Small Speakers Sound Louder and Better™ | TranSiC™                  |
| EcoSPARK®                | MegaBuck™                                       | TriFault Detect™          |
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| FACT®                    | mWSaver®  | VCX™                      |
| FAST®                    | OptoHiT™  | VisualMax™                |
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| FETBench™                | OPTOPLANAR®                                     | XS™                       |
| FPS™                     |   |                           |
|                          | PowerTrench®                                    |                           |
|                          | PowerXS™  |                           |
|                          | Programmable Active Droop™                      |                           |
|                          | QFET®   |                           |
|                          | QS™   |                           |
|                          | Quiet Series™                                   |                           |
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|                          | SuperFET®                                       |                           |
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|                          | SuperSOT™-6                                     |                           |
|                          | SuperSOT™-8                                     |                           |
|                          | SupreMOS®                                       |                           |
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