



August 2001

FDP2570/FDB2570

150V N-Channel PowerTrench[®] MOSFET

General Description

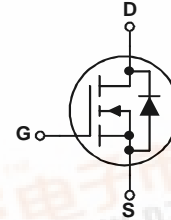
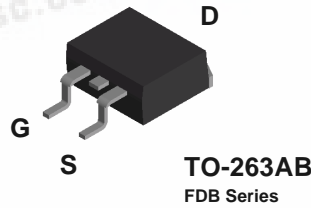
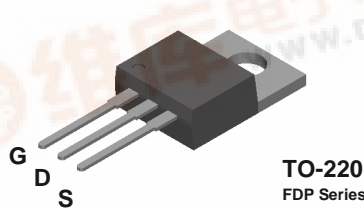
This N-Channel MOSFET has been designed specifically for switching on the primary side in the isolated DC/DC converter application. Any application requiring a 150V MOSFETs with low on-resistance and fast switching will benefit.

These MOSFETs feature faster switching and lower gate charge than other MOSFETs with comparable $R_{DS(ON)}$ specifications.

The result is a MOSFET that is easy and safer to drive (even at very high frequencies), and DC/DC power supply designs with higher overall efficiency.

Features

- 22 A, 150 V. $R_{DS(ON)} = 80\text{ m}\Omega @ V_{GS} = 10\text{ V}$
 $R_{DS(ON)} = 90\text{ m}\Omega @ V_{GS} = 6\text{ V}$
- Low gate charge (40nC typical)
- Fast switching speed
- High performance trench technology for extremely low $R_{DS(ON)}$
- 175°C maximum junction temperature rating



Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter	Rated	Units
V_{DSS}	Drain-Source Voltage	150	V
V_{GSS}	Gate-Source Voltage	± 20	V
I_D	Drain Current – Continuous (Note 1)	22	A
	– Pulsed (Note 1)	50	A
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	93	W
	Derate above 25°C	0.63	W/°C
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-65 to +175	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.6	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDB2570	FDB2570	13"	24mm	800 units
FDP2570	FDP2570	Tube	n/a	45 units



Electrical Characteristics $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Drain-Source Avalanche Ratings (Note 1)

W_{DSS}	Single Pulse Drain-Source Avalanche Energy	$V_{DD} = 75\text{ V}$, $I_D = 11\text{ A}$			375	mJ
I_{AR}	Maximum Drain-Source Avalanche Current				11	A

Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}$, $I_D = 250\ \mu\text{A}$	150			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C		154		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 120\text{ V}$, $V_{GS} = 0\text{ V}$			1	μA
I_{GSSF}	Gate-Body Leakage, Forward	$V_{GS} = 20\text{ V}$, $V_{DS} = 0\text{ V}$			100	nA
I_{GSSR}	Gate-Body Leakage, Reverse	$V_{GS} = -20\text{ V}$, $V_{DS} = 0\text{ V}$			-100	nA

On Characteristics (Note 2)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	2	2.6	4	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C		-7		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}$, $I_D = 11\text{ A}$ $V_{GS} = 6.0\text{ V}$, $I_D = 10\text{ A}$ $V_{GS} = 10\text{ V}$, $I_D = 11\text{ A}$, $T_J = 125^\circ\text{C}$		61 63 127	80 90 175	m Ω
$I_{D(on)}$	On-State Drain Current	$V_{GS} = 10\text{ V}$, $V_{DS} = 10\text{ V}$	25			A
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{ V}$, $I_D = 11\text{ A}$		39		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 75\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$		1911		pF
C_{oss}	Output Capacitance			106		pF
C_{riss}	Reverse Transfer Capacitance			33		pF

Switching Characteristics (Note 2)

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 75\text{ V}$, $I_D = 1\text{ A}$, $V_{GS} = 10\text{ V}$, $R_{GEN} = 6\ \Omega$		12	22	ns
t_r	Turn-On Rise Time			5	10	ns
$t_{d(off)}$	Turn-Off Delay Time			33	53	ns
t_f	Turn-Off Fall Time			23	37	ns
Q_g	Total Gate Charge	$V_{DS} = 75\text{ V}$, $I_D = 11\text{ A}$, $V_{GS} = 10\text{ V}$		40	56	nC
Q_{gs}	Gate-Source Charge			7		nC
Q_{gd}	Gate-Drain Charge			12		nC

Drain-Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain-Source Diode Forward Current			22		A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = 11\text{ A}$ (Note 2)		0.83	1.3	V

Notes:

1. Calculated continuous current based on maximum allowable junction temperature.
2. Pulse Test: Pulse Width < 300 μs , Duty Cycle < 2.0%

Typical Characteristics

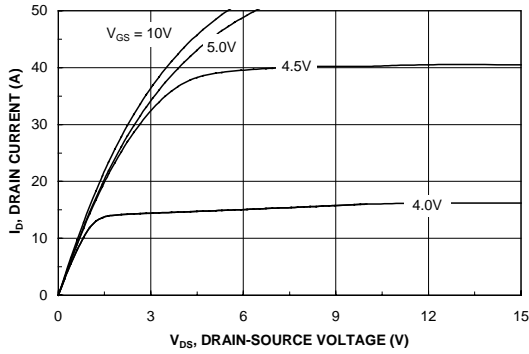


Figure 1. On-Region Characteristics.

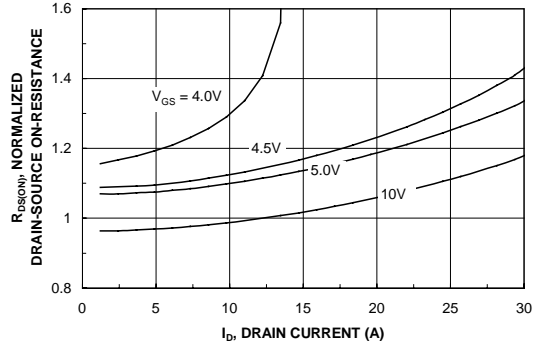


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

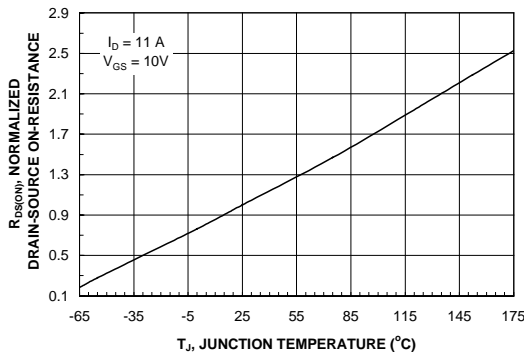


Figure 3. On-Resistance Variation with Temperature.

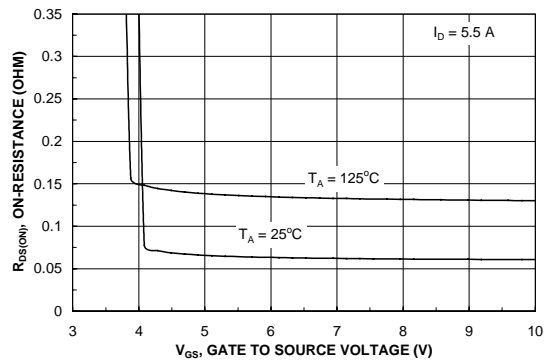


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

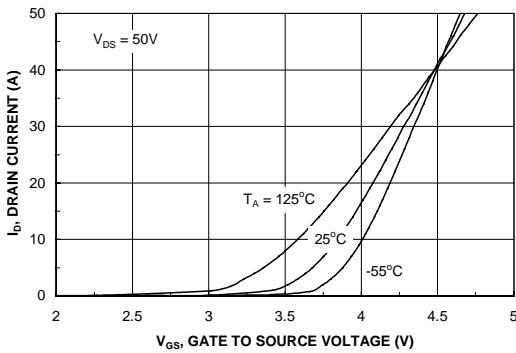


Figure 5. Transfer Characteristics.

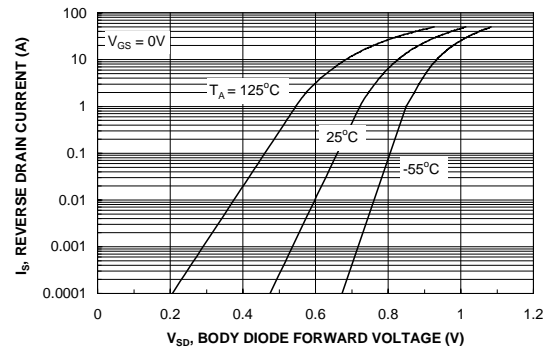


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

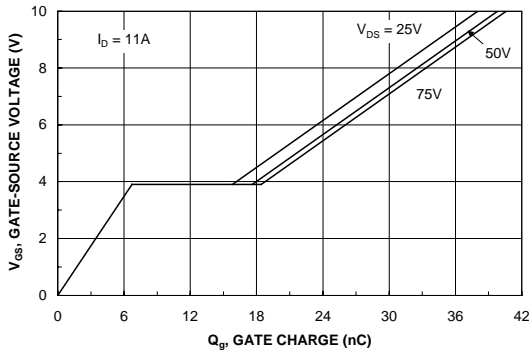


Figure 7. Gate Charge Characteristics.

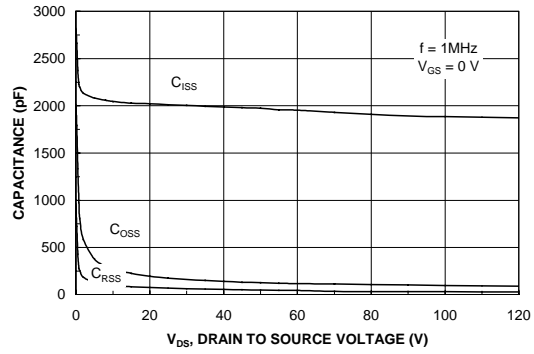


Figure 8. Capacitance Characteristics.

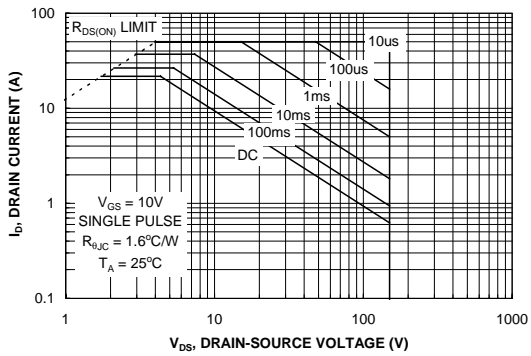


Figure 9. Maximum Safe Operating Area.

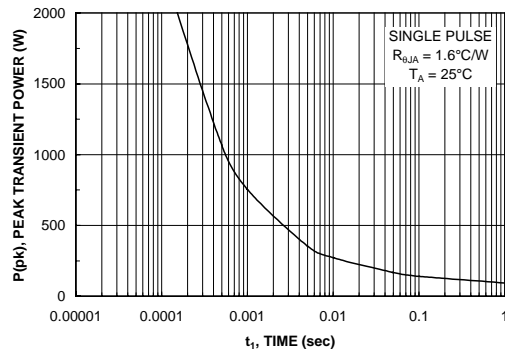


Figure 10. Single Pulse Maximum Power Dissipation.

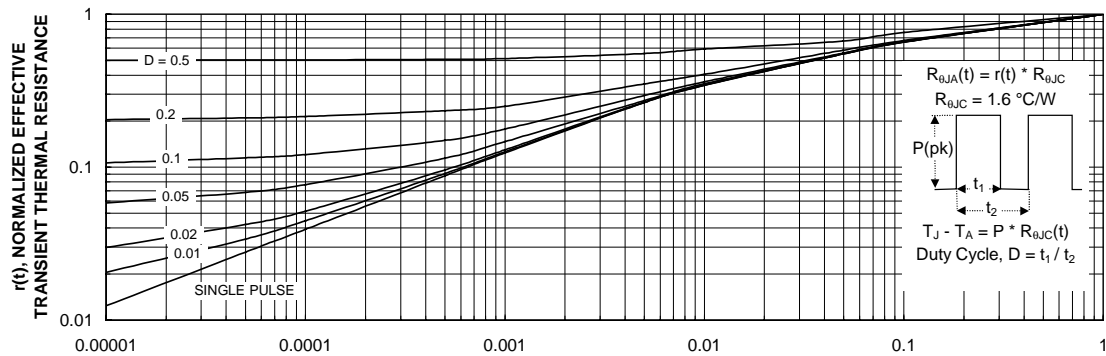


Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1.
Transient thermal response will change depending on the circuit board design.

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