800V N-Channel Power MOSFET

FEATURES
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

APPLICATIONS
- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)

Parameters Summary

VDS:800V   ID (at VGS=10V) :50A   Rds(on) (at V(at=10V) :120mΩ(Typ.)

SOT-227

Device Ordering Marking Packing Information			
Ordering Number	Package	Marking	Packing
XBP50N80FX	SOT-227	XBP50N80FX	Tube

Absolute Maximum Ratings (T_C = 25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage (V_{GS} = 0V)	V_{DSS}	800	V
Continuous Drain Current	I_D	50	A
Pulsed Drain Current (note1)	I_{DM}	200	A
Gate-Source Voltage	V_{GSS}	±30	V
Single Pulse Avalanche Energy (note2)	E_{AS}	4500	mJ
Repetitive Avalanche Energy (note1)	E_{AR}	60	mJ
Power Dissipation (T_C = 25°C)	P_D	690	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55~+150	°C

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.18	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	40	°C/W

Specifications $T_J = 25°C$, unless otherwise noted

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V$, $I_D = 250\mu A$	800	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 800$, $V_{GS} = 0V$, $T_J = 25°C$	--	--	1.0	μA
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 30V$	--	--	± 100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = 250\mu A$	2.5	--	4.5	V
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	$V_{GS} = 10V$, $I_D = 25A$	--	120	130	mΩ
Dynamic						
Input Capacitance	C_{iss}	$V_{GS} = 0V$, $V_{DS} = 25V$, $f = 1.0MHz$	--	14600	--	pF
Output Capacitance	C_{oss}		--	1300	--	
Reverse Transfer Capacitance	C_{rss}		--	66	--	
Total Gate Charge	Q_g	$V_{DD} = 400V$, $I_D = 50A$, $V_{GS} = 10V$	--	360	--	nC
Gate-Source Charge	Q_{gs}		--	80	--	
Gate-Drain Charge	Q_{gd}		--	120	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 50V$, $I_D = 50A$, $R_G = 10\ \Omega$	--	110	--	ns
Turn-on Rise Time	t_r		--	200	--	
Turn-off Delay Time	$t_{d(off)}$		--	160	--	
Turn-off Fall Time	t_f		--	185	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	$T_J = 25°C$	--	--	50	A
Pulsed Diode Forward Current	I_{SM}		--	--	400	
Body Diode Voltage	V_{SD}	$T_J = 25°C$, $I_{SD} = 25A$, $V_{GS} = 0V$	--	--	1.4	V
Reverse Recovery Time	t_{rr}	$V_{GS} = 0V$, $I_{SD} = 50A$, $di_f/dt = 100A/\mu s$	--	520	--	ns
Reverse Recovery Charge	Q_{rr}		--	5.0	--	uC

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature

2. $V_{DD} = 50V$, $R_G = 25\ \Omega$, Starting $T_J = 25\ °C$

3. Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 1%

Figure 1. Maximum Transient Thermal Impedance
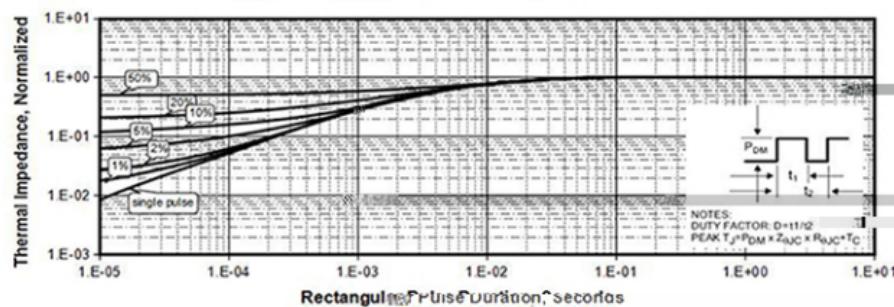
Thermal Impedance, Normalized

Rectangular Pulse Duration, Seconds

NOTES:
DUTY FACTOR: D=t1/t2
PEAK T_J = P_DM × Z_thJC × R_thJC + T_C

Figure 2 . Maximum Power Dissipation vs Tc

Pd, Power Dissipation, Watts

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Tc, Case Temperature, °C

Figure 3 .Maximum Continuous Drain Current vs Tc
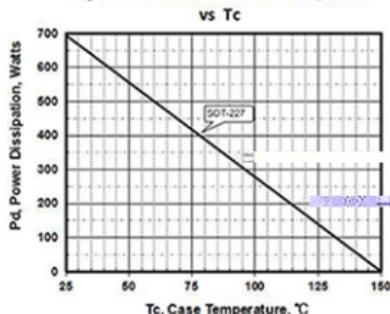
Id, Drain Current, Amps

Tc, Case Temperature, °C

Figure 4. Output Characteristics

Id, Drain Current, Amps

PULSE DURATION = 100 µS
DUTY FACTOR = 0.5%

Vgs=10V
Vgs=9V
Vgs=8V
Vgs=7V
Vgs=6V
Vgs=5V
Vgs=4.5V
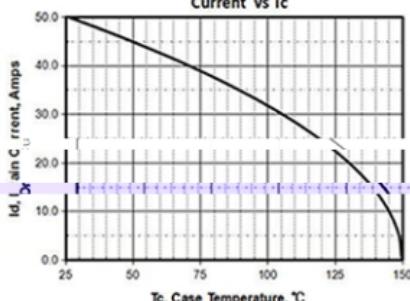
Vds, Drain-Source Voltage, Volts
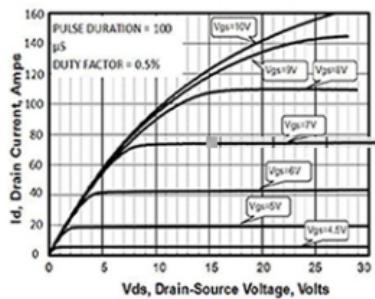
Figure 5. Rdson vs Gate Voltage

Rds(on), Ohms, Typical

PULSE DURATION = 100 µS
DUTY FACTOR = 0.5%

Id=50A
Id=25A

Vgs, Gate-Source Voltage, Volts
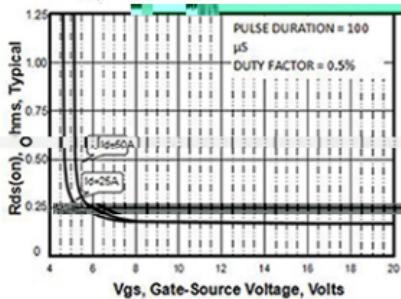
Figure 6. Peak Current Capability

FOR TEMPERATURES ABOVE 25°C DERATE PEAK CURRENT AS FOLLOWS:

$$I = I_{25}\sqrt{\frac{150 - T_c}{125}}$$

TRANSCONDUCTANCE MAY LIMIT CURRENT IN THIS REGION

Idm, Peak Current, Amps (vertical axis): 1.0E+03, 1.0E+02, 1.0E+01

t, Pulse Width, Seconds (horizontal axis): 1.0E-6, 1.0E-5, 1.0E-4, 1.0E-3, 1.0E-2, 1.0E-1, 1.0E+0, 1.0E+1
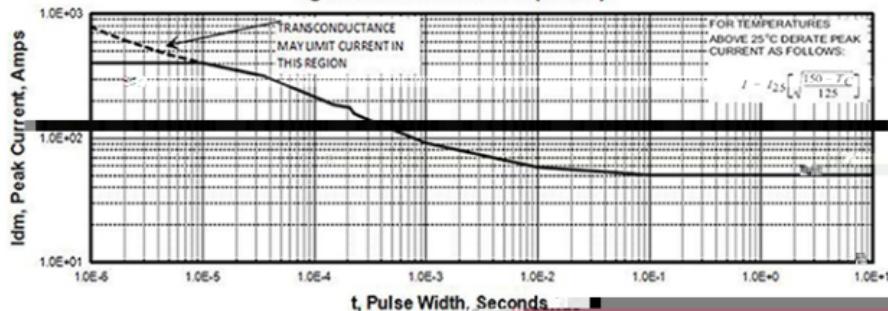
Figure 7. Transfer Characteristics

PULSE DURATION = 10 μS
DUTY FACTOR = 0.5%
MAX

-66°C, +25°C, +175°C

Id, Drain to Source Current, Amps (vertical axis): 0, 10, 20, 30, 40, 50, 60, 70

Vgs, Gate to Source Voltage, Volts (horizontal axis): 3.0, 4.0, 5.0, 6.0, 7.0
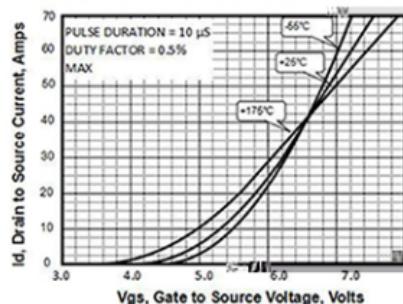
Figure 8. Unclamped Inductive Switching Capability

Id, Drain Current, Amps (vertical axis): 1.0E-01, 1.0E+00, 1.0E+01, 1.0E+02

tav, Time in Avalanche, Seconds (horizontal axis): 1.0E-06, 1.0E-05, 1.0E-04, 1.0E-03, 1.0E-02, 1.0E-01
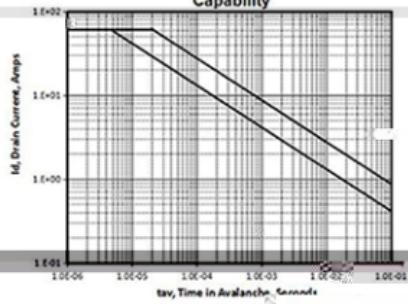
Figure 9. Drain to Source ON Resistance vs Drain Current

PULSE DURATION = 10 μS
DUTY FACTOR = 0.5%

Vcs = 10V

Rds(on), Ohms (vertical axis): 0, 0.13, 0.26, 0.39, 0.52

Id, Drain Current, Amps (horizontal axis): 0, 15, 30, 45, 60, 75
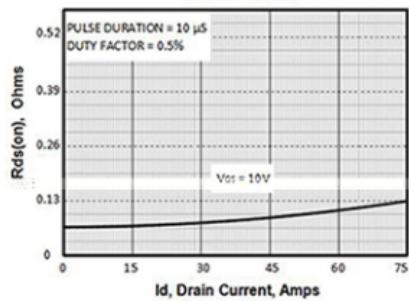
Figure 10. Rdson vs Junction Temperature

PULSE DURATION = 2 μS
DUTY FACTOR = 0.5%

Rds(on), Drain to Source ON Resistance, Normalized (vertical axis): 0.50, 0.75, 1.00, 1.25, 1.50, 1.75, 2.00, 2.25, 2.50

Tj, Junction Temperature, °C (horizontal axis): -50, -25, 0, 25, 50, 75, 100, 125, 150
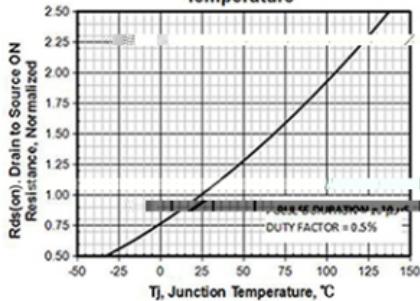
Figure 11.Breakdown Voltage vs Temperature

Bvdss, Drain to Source Breakdown Voltage, Normalized (y-axis: 0.90 to 1.20)

Vgs = 0V
Id = 250 μA

Tj, Junction Temperature, °C (x-axis: -75 to 150)

Figure 12. Threshold Voltage_vs Temperature

Vgs(th), Normalized (y-axis: 0.75 to 1.15)

Vgs = Vds
Id = 250 μA

Tj, Junction Temperature, °C (x-axis: -75 to 150)

Figure 13 . Maximum Safe Operating Area

Id, Drain Current, Amps

OPERATION IN THIS AREA MAY BE
LIMITED BY RDS(ON)
TJ = MAX RATED
TC = 25°C

Vds, Drain Source Voltage. Volts
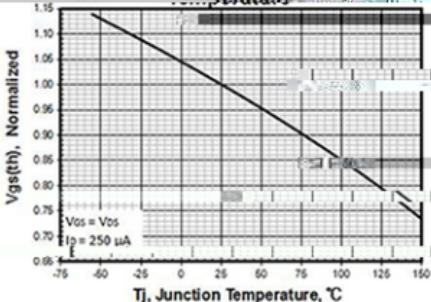
Figure 14. Capacitance vs Vds

Capacitance, pF

Ciss
Coss
Crss

VGS = 0V , f = 1MHZ ;
Ciss = Cgs + Cgd
Coss Cds + Cgd
Crss = Cgd

Vds, Drain to Source Voltage, Volts

Figure 15 .Typical Gate Charge

Vgs, gate to source voltage (v) (y-axis: 0 to 10)

Vdd=100V,Id=50A

Qg, Total gate charge (nC) (x-axis: 0 to 400)
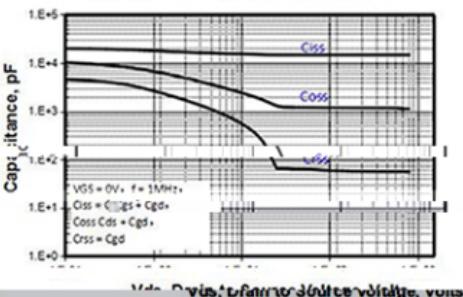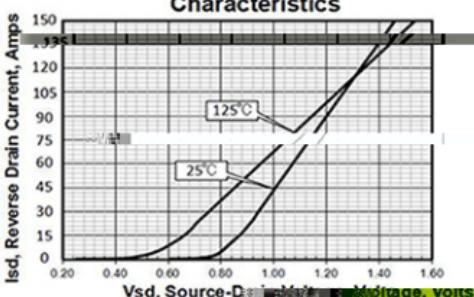
Figure 16.Body Diode Transfer Characteristics

Isd, Reverse Drain Current, Amps (y-axis: 0 to 150)

125°C
25°C

Vsd, Source-Drain Voltage, volts (x-axis: 0.20 to 1.60)

Figure A: Gate Charge Test Circuit and Waveform
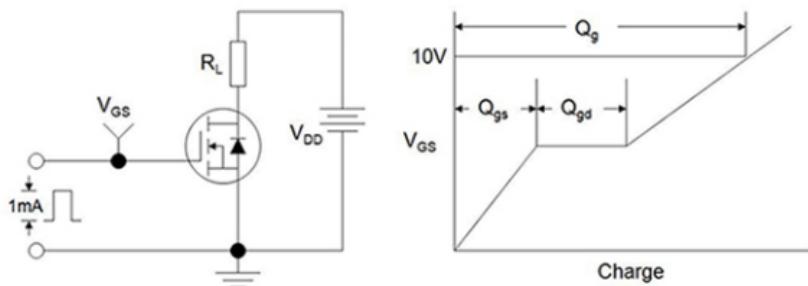

## Figure B: Resistive Switching Test Circuit and Waveform
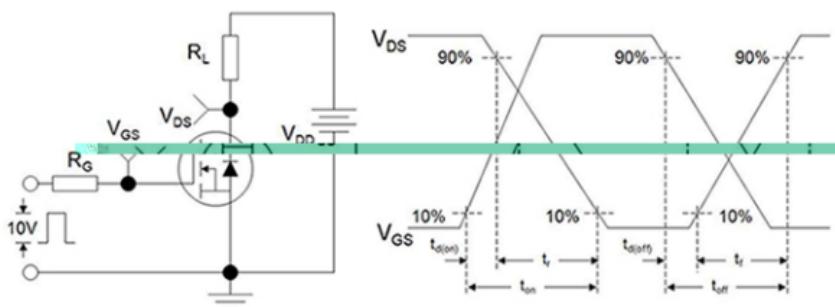
Figure C: Unclamped Inductive Switching Test Circuit and Waveform