

# 7.8 Amps, 800Volts N-Channel MOSFET

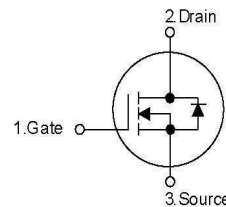
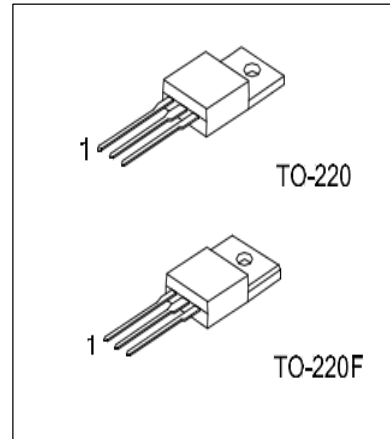
## ■ Description

The HX8N80(C) N-Channel enhancement mode silicon gate power MOSFET is designed for high voltage, high speed power switching applications such as switching regulators, switching converters, solenoid, motor drivers, relay drivers.

## ■ Features

- $R_{DS(ON)} = 1.75 \Omega @ V_{GS} = 10 V$
- Low gate charge ( typical 27nC)
- High ruggedness
- Fast switching capability
- Avalanche energy specified
- Improved dv/dt capability

## ■ Symbol



## ■ Ordering Information

Order Number		Package	Pin Assignment			Packing
Normal	Lead Free Plating		1	2	3	
HX8N80(C)-TA3-T	HX8N80(C)L-TA3-T	TO-220	G	D	S	Tube
HX8N80(C)-TF3-T	HX8N80(C)L-TF3-T	TO-220F	G	D	S	Tube

Note: Pin Assignment: G:Gate D:Drain S:Source

	(1) T:Tube, R:Tape Reel
	(2) TA3:TO-220, TF3:TO-220F
	(3) L:Lead Free Plating Blank: Pb/Sn

## ■ Absolute Maximum Ratings ( $T_c=25^\circ C$ , unless otherwise specified)

Parameter	Symbol	Ratings		Units	
		TO-220	TO-220F		
Drain-Source Voltage	$V_{DSS}$	800		V	
Gate-Source Voltage	$V_{GSS}$	±30		V	
Drain Current Continuous	$I_D$	$T_c=25^\circ C$	7.8	7.8*	A
		$T_c=100^\circ C$	4.5	4.5*	A
Drain Current Pulsed (Note 1)	$I_{DP}$	26.4	26.4*	A	
Avalanche Energy	Repetitive (Note 1)	6.6		mJ	
	Single Pulse (Note 2)	580		mJ	
Peak Diode Recovery dv/dt (Note 3)	dv/dt	4.5		V/ns	
Total Power Dissipation	$P_D$	$T_c=25^\circ C$	167	56	W
		Derate above 25°C	1.33	0.44	W/°C
Junction Temperature	$T_J$	+150		°C	

Storage Temperature	T <sub>STG</sub>	-55~+150	°C
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\* Drain current limited by maximum junction temperature.

## ■ Thermal Characteristics

Parameter	Symbol	Ratings		Units
		TO-220	TO-220F	
Thermal Resistance Junction-Ambient	R <sub>thJA</sub>	62.5		°C/W
Thermal Resistance, Case-to-Sink Typ.	R <sub>thCS</sub>	0.5	--	
Thermal Resistance Junction-Case	R <sub>thJC</sub>	0.75	2.25	

## ■ Electrical Characteristics (T<sub>J</sub>=25°C, unless Otherwise specified.)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units	
<b>Off Characteristics</b>							
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	800	--	--	V	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =800V, V <sub>GS</sub> =0V	--	--	10	μA	
		V <sub>DS</sub> =640V, T <sub>C</sub> =125°C	--	--	100	μA	
Gate-Body Leakage Current	Forward	I <sub>GSS</sub>	V <sub>GS</sub> =30V, V <sub>DS</sub> =0V	--	--	100	nA
	Reverse			V <sub>GS</sub> =-30V, V <sub>DS</sub> =0V	--	--	-100
Breakdown Voltage Temperature Coefficient	ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	I <sub>D</sub> =250μA	--	0.93	--	V/°C	
<b>On Characteristics</b>							
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	3.0	--	5.0	V	
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =3.9A	--	1.57	1.75	Ω	
<b>Dynamic Characteristics</b>							
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz	--	1290	1680	pF	
Output Capacitance	C <sub>OSS</sub>		--	120	155	pF	
Reverse Transfer Capacitance	C <sub>RSS</sub>		--	10	13	pF	
<b>Switching Characteristics</b>							
Turn-On Delay Time	t <sub>D(ON)</sub>	V <sub>DD</sub> =400V, I <sub>D</sub> =7.8A, R <sub>G</sub> =25Ω (Note 4, 5)	--	35	80	ns	
Rise Time	t <sub>r</sub>		--	100	210	ns	
Turn-Off Delay Time	t <sub>D(OFF)</sub>		--	50	110	ns	
Fall Time	t <sub>f</sub>		--	60	130	ns	
Total Gate Charge	Q <sub>G</sub>	V <sub>DS</sub> =640V, I <sub>D</sub> =7.8A, V <sub>GS</sub> =10V (Note 4, 5)	--	27	35	nC	
Gate-Source Charge	Q <sub>GS</sub>		--	8.2	--	nC	
Gate-Drain Charge	Q <sub>GD</sub>		--	11	--	nC	
<b>Drain-Source Diode Characteristics</b>							
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>SD</sub> =7.8A	--	--	1.4	V	
Continuous Drain-Source Current	I <sub>SD</sub>		--	--	7.8	A	
Pulsed Drain-Source Current	I <sub>SM</sub>		--	--	26.4	A	
Reverse Recovery Time	t <sub>RR</sub>	I <sub>SD</sub> =7.8A, di <sub>SD</sub> /dt=100A/μs	--	650	--	ns	
Reverse Recovery Charge	Q <sub>RR</sub>	(Note 4)	--	7.0	--	μC	

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L=25 mH, I<sub>AS</sub> = 7.8A, V<sub>DD</sub> = 50V, R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C
3. I<sub>SD</sub>≤7.8 A, di/dt ≤200A/μs, V<sub>DD</sub>≤BV<sub>DSS</sub>, Starting T<sub>J</sub>=25°C
4. Pulse Test : Pulse width ≤300 μs, Duty cycle≤2%
5. Essentially independent of operating temperature

■ Typical Characteristics

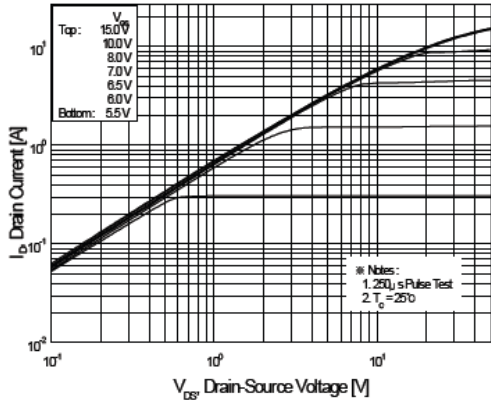


Figure 1. On-Region Characteristics

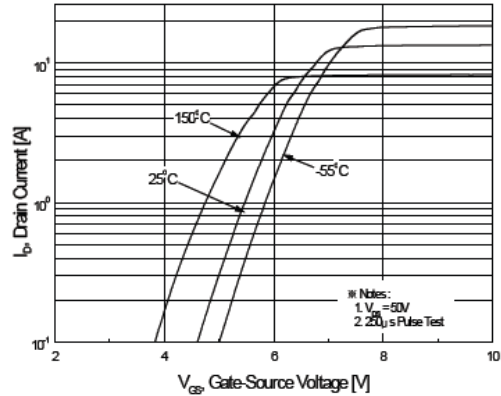


Figure 2. Transfer Characteristics

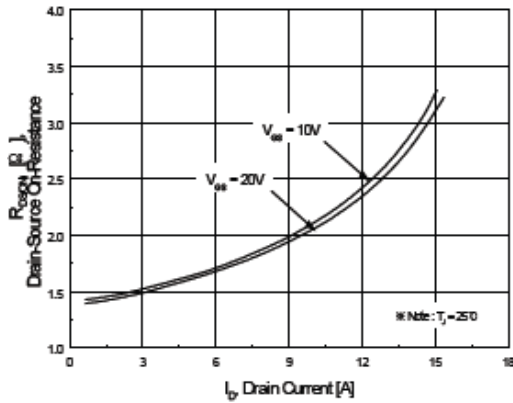


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

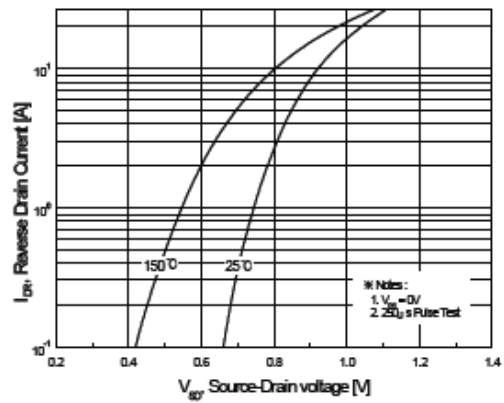


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

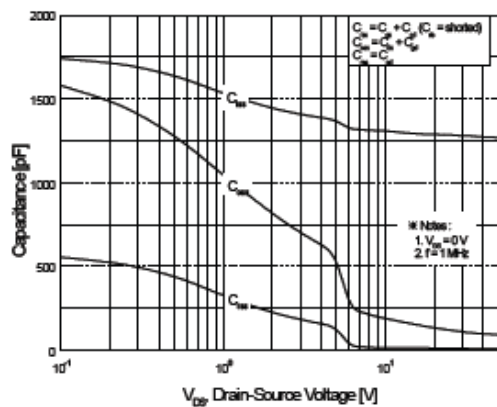


Figure 5. Capacitance Characteristics

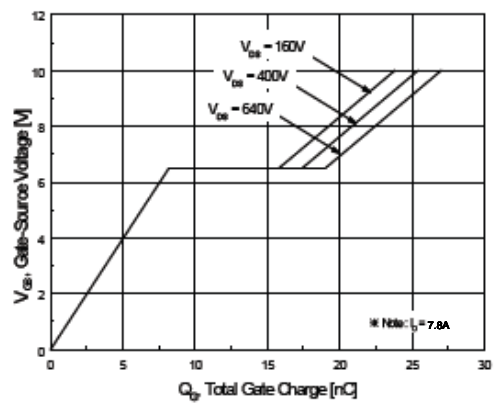
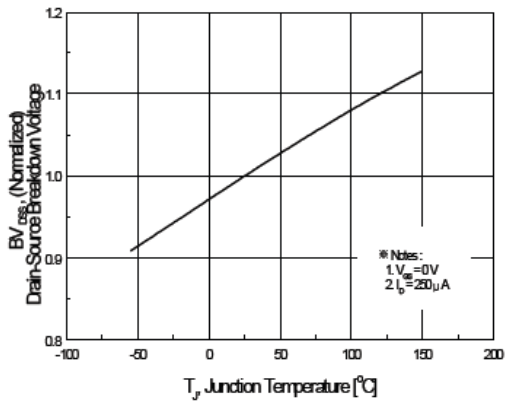
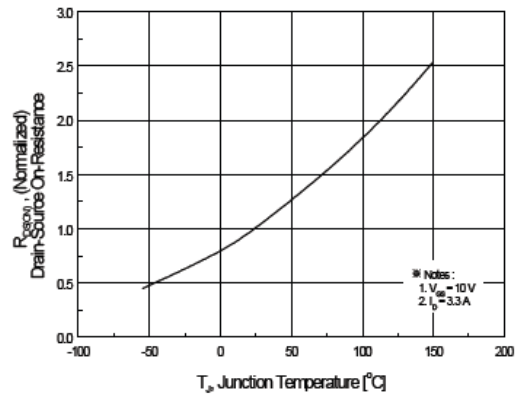


Figure 6. Gate Charge Characteristics

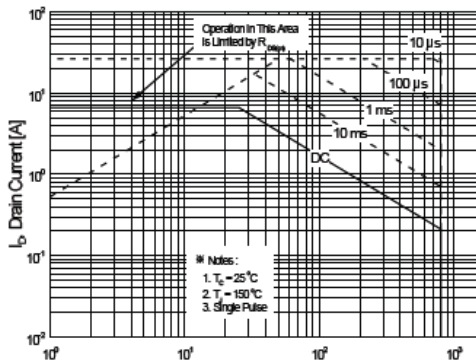
■ **Typical Characteristics** (Continued)



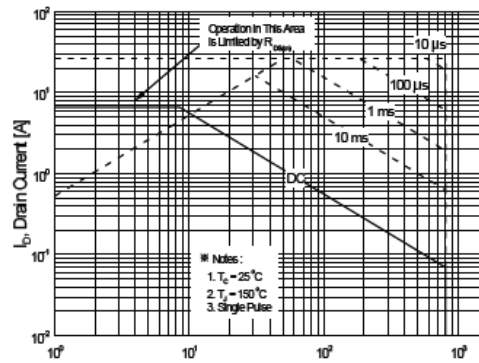
**Figure 7. Breakdown Voltage Variation vs Temperature**



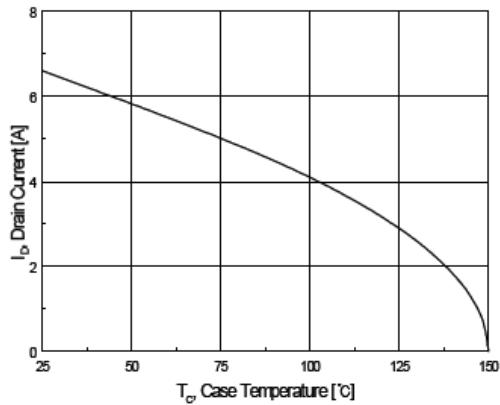
**Figure 8. On-Resistance Variation vs Temperature**



**Figure 9-1. Maximum Safe Operating Area for TO220**



**Figure 9-2. Maximum Safe Operating Area for TO220F**



**Figure 10. Maximum Drain Current vs Case Temperature**

■ Typical Characteristics (Continued)

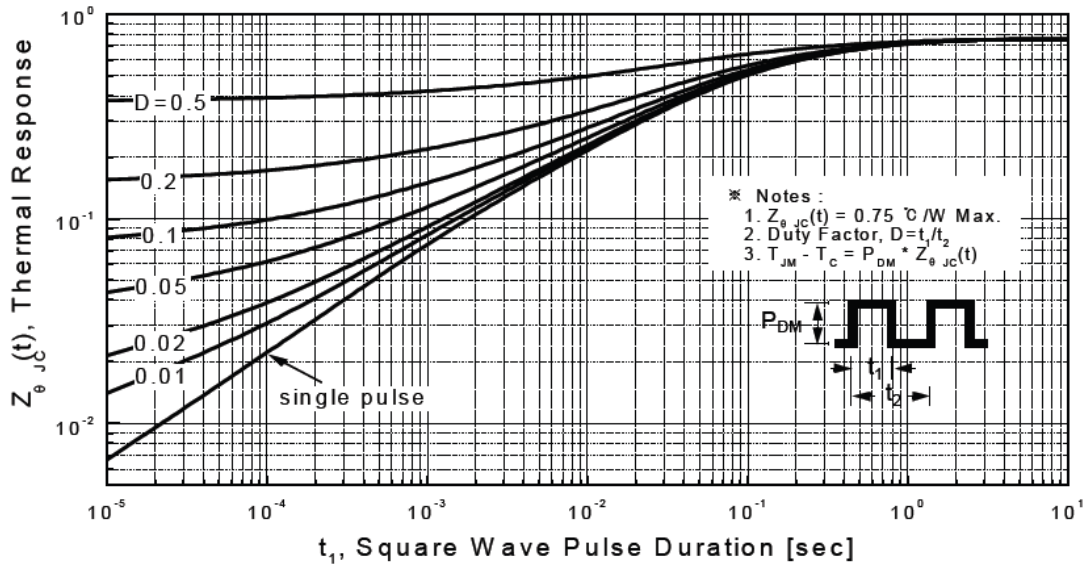


Figure 11-1. Transient Thermal Response Curve

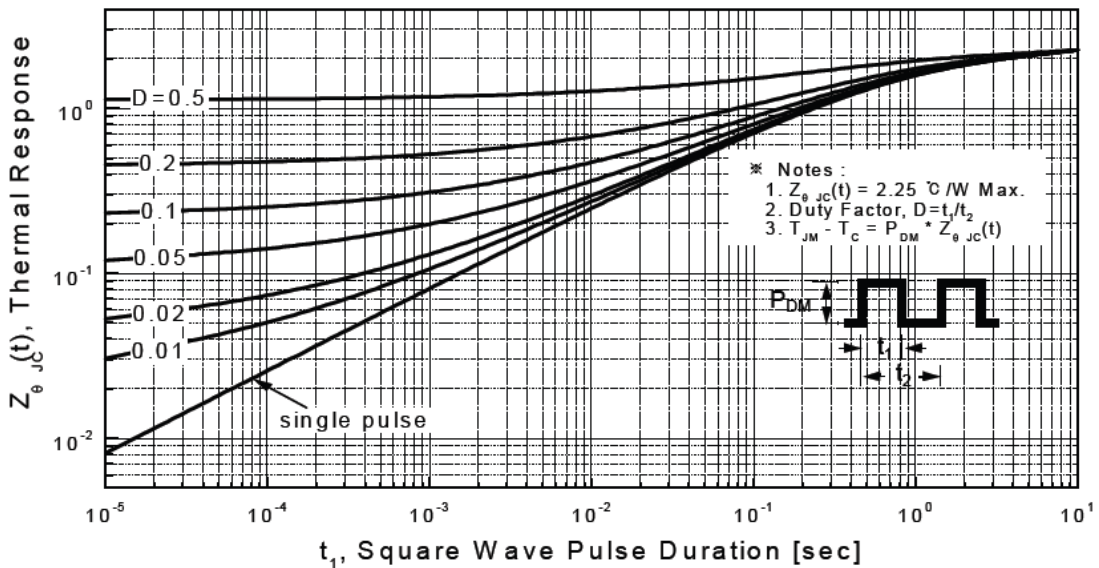
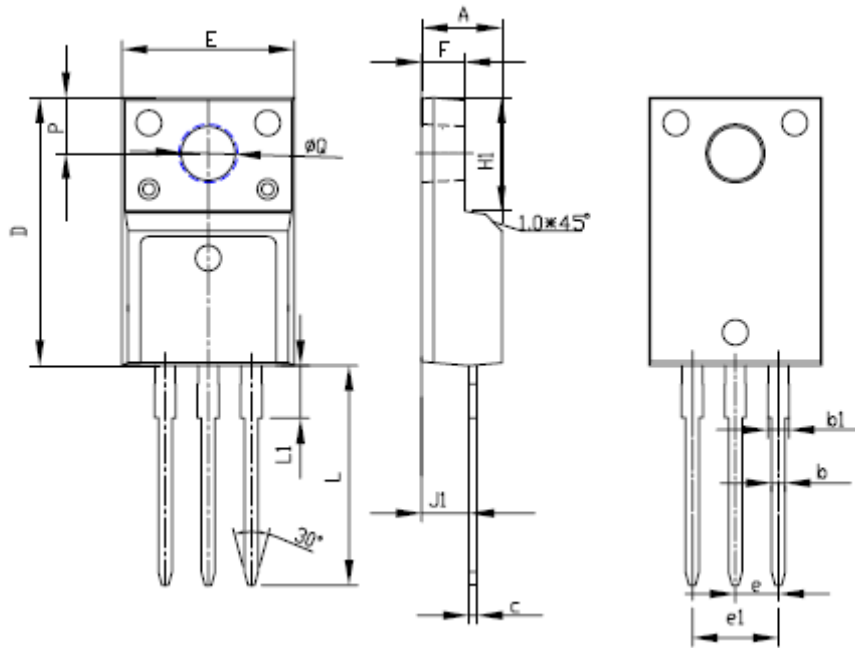


Figure 11-2. Transient Thermal Response Curve for TO220F

TO-220F



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.53	4.93	0.178	0.194
b	0.71	0.91	0.028	0.036
b1	1.15	1.39	0.035	0.055
c	0.45	0.60	0.018	0.024
D	13.07	15.67	0.515	0.617
E	9.96	10.36	0.392	0.408
F	2.34	2.74	0.921	0.108
e	2.54TYP		0.100TYP	
e1	5.08TYP		0.200TYP	
H1	6.5	6.9	0.256	0.272
J1	2.56	2.96	0.101	0.117
L	12.50	13.50	0.492	0.531
L1	2.90	3.45	0.114	0.138
p	3.1	3.5	0.122	0.138
$\phi Q$	2.98	3.38	0.117	0.133