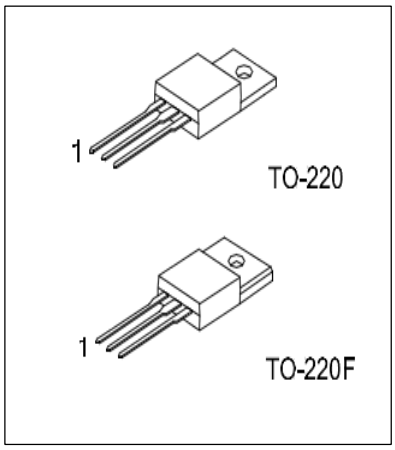
# 7.8 Amps，800Volts N-Channel MOSFET



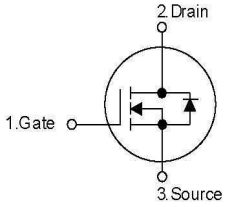

## ■ Description

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

- $R_{DS(ON)}$ = 1.75Ω@$V_{GS}$ = 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

| | |
|---|---|
| HX8N80(C)L-TA3-T<br>（1）Packing Type<br>（2）Package Type<br>（3）Lead Plating | (1)T:Tube,R:Tape Reel<br>(2)TA3:TO-220,TF3:TO-220F<br>(3)L:Lead Free Plating Blank：Pb/Sn |

## ■ Absolute Maximum Ratings($T_c$=25℃,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 Currenet Continuous | $T_c$=25℃ | $I_D$ | 7.8 | 7.8* | A |
| | $T_c$=100℃ | | 4.5 | 4.5* | A |
| Drain Current Pulsed (Note 1) | | $I_{DP}$ | 26.4 | 26.4* | A |
| Avalanche Energy | Repetitive (Note 1) | $E_{AR}$ | 6.6 | | mJ |
| | Single Pulse (Note 2) | $E_{AS}$ | 580 | | mJ |
| Peak Diode Recovery dv/dt (Note 3) | | dv/dt | 4.5 | | V/ns |
| Total Power Dissipation | $T_c$=25℃ | $P_D$ | 167 | 56 | W |
| | Derate above 25℃ | | 1.33 | 0.44 | W/℃ |
| Junction Temperature | | $T_J$ | +150 | | ℃ |

| | | | |
|---|---|---|---|
| Storage Temperature | $T_{STG}$ | -55~+150 | ℃ |

*Drain current limited by maximum junction temperature.

## ■ Thermal Characteristics

| Parameter | Symbol | Ratings | | Units |
|---|---|---|---|---|
| | | TO-220 | TO-220F | |
| Thermal Resistance Junction-Ambient | $R_{thJA}$ | 62.5 | | ℃/W |
| Thermal Resistance, Case-to-Sink Typ. | $R_{thCS}$ | 0.5 | -- | |
| Thermal Resistance Junction-Case | $R_{thJC}$ | 0.75 | 2.25 | |

## ■ Electrical Characteristics（$T_J$=25℃,unless Otherwise specified.）

| Parameter | | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | | |
| Drain-Source Breakdown Voltage | | $BV_{DSS}$ | $V_{GS}$=0V,$I_D$=250μA | 800 | -- | -- | V |
| Zero Gate Voltage Drain Current | | $I_{DSS}$ | $V_{DS}$=800V,$V_{GS}$=0V | -- | -- | 10 | μA |
| | | | $V_{DS}$=640V,$T_C$=125℃ | -- | -- | 100 | μA |
| Gate-Body Leakage Current | Forward | $I_{GSS}$ | $V_{GS}$=30V,$V_{DS}$=0V | -- | -- | 100 | nA |
| | Reverse | | $V_{GS}$=-30V,$V_{DS}$=0V | -- | -- | -100 | nA |
| Breakdown Voltage Temperature Coefficient | | $\triangle BV_{DSS}/\triangle T_J$ | $I_D$=250μA | -- | 0.93 | -- | V/℃ |
| **On Characteristics** | | | | | | | |
| Gate Threshold Voltage | | $V_{GS(TH)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 3.0 | -- | 5.0 | V |
| Static Drain-Source On-Resistance | | $R_{DS(ON)}$ | VGS=10V,$I_D$=3.9A | -- | 1.57 | 1.75 | Ω |
| **Dynamic Characteristics** | | | | | | | |
| Input Capacitance | | $C_{ISS}$ | $V_{DS}$=25V,$V_{GS}$=0V, f=1MHz | -- | 1290 | 1680 | pF |
| Output Capacitance | | $C_{OSS}$ | | -- | 120 | 155 | pF |
| Reverse Transfer Capacitance | | $C_{RSS}$ | | -- | 10 | 13 | pF |
| **Switching Characteristics** | | | | | | | |
| Turn-On Delay Time | | $t_{D(ON)}$ | $V_{DD}$=400V,$I_D$=7.8A, $R_G$=25Ω (Note 4, 5) | -- | 35 | 80 | ns |
| Rise Time | | $t_R$ | | -- | 100 | 210 | ns |
| Turn-Off Delay Time | | $t_{D(OFF)}$ | | -- | 50 | 110 | ns |
| Fall Time | | $t_F$ | | -- | 60 | 130 | ns |
| Total Gate Charge | | $Q_G$ | $V_{DS}$=640V, $I_D$=7.8A $V_{GS}$=10V (Note 4, 5) | -- | 27 | 35 | nC |
| Gate-Source Charge | | $Q_{GS}$ | | -- | 8.2 | -- | nC |
| Gate-Drain Charge | | $Q_{GD}$ | | -- | 11 | -- | nC |
| **Drain-Source Diode Characteristics** | | | | | | | |
| Drain-Source Diode Forward Voltage | | $V_{SD}$ | $V_{GS}$=0V,$I_{SD}$=7.8A | -- | -- | 1.4 | V |
| Continuous Drain-Source Current | | $I_{SD}$ | | -- | -- | 7.8 | A |
| Pulsed Drain-Source Current | | $I_{SM}$ | | -- | -- | 26.4 | A |
| Reverse Recovery Time | | $t_{RR}$ | $I_{SD}$=7.8A, $dI_{SD}/dt$=100A/μs (Note 4) | -- | 650 | -- | ns |
| Reverse Recovery Charge | | $Q_{RR}$ | | -- | 7.0 | -- | μC |

Notes:
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L=25 mH, $I_{AS}$ = 7.8A, $V_{DD}$ = 50V, $R_G$=25Ω,Starting TJ=25°C
3. $I_{SD}$≤7.8 A, di/dt ≤200A/μs, $V_{DD}$≤$BV_{DSS}$, Starting TJ=25°C
4. Pulse Test : Pulse width ≤300μs, Duty cycle≤2%
5. Essentially independent of operating temperature

## ■ Typical Characteristics

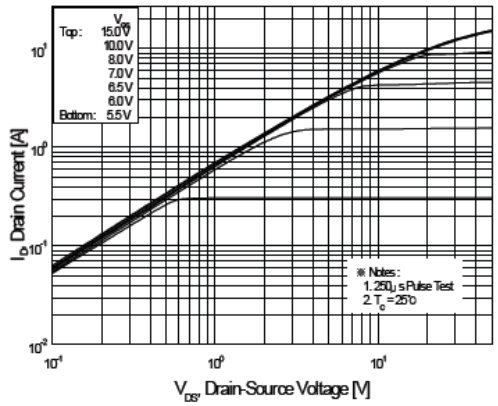



**Figure 1. On-Region Characteristics**

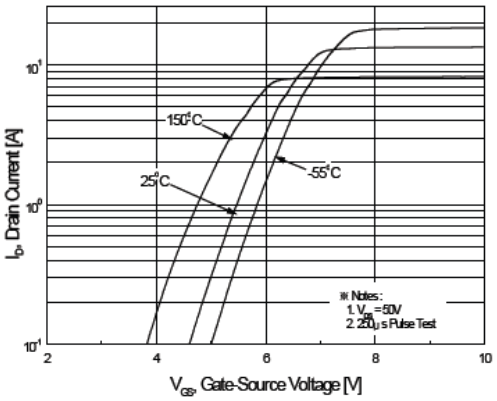



**Figure 2. Transfer Characteristics**

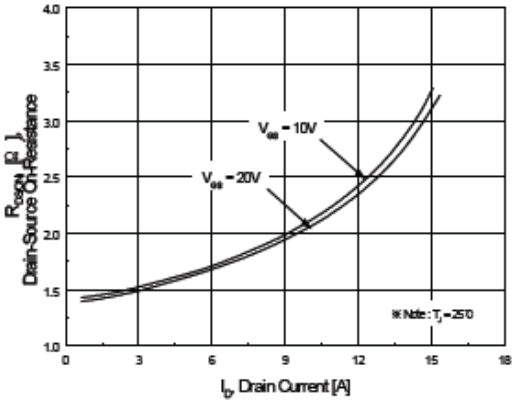



**Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage**

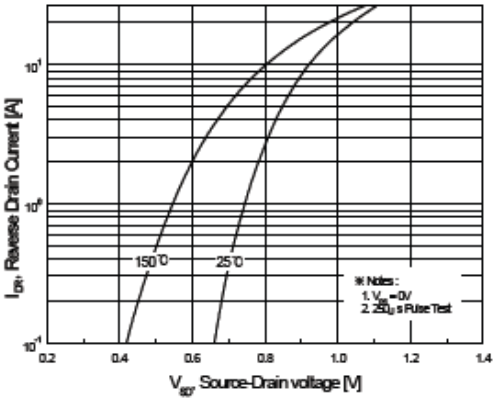



**Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature**

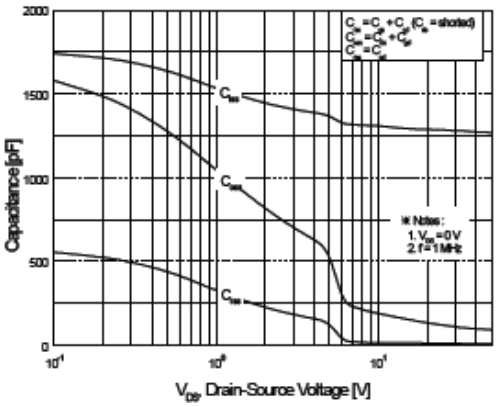



**Figure 5. Capacitance Characteristics**

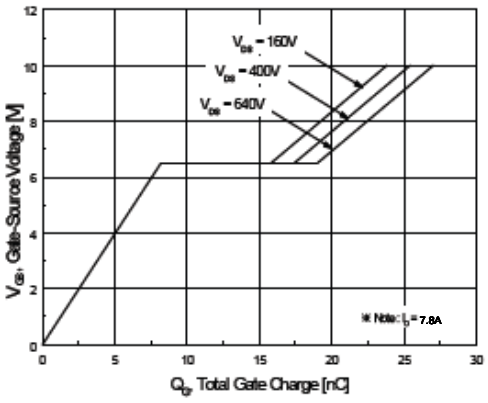



**Figure 6. Gate Charge Characteristics**

## ■ Typical Characteristics (Continued)

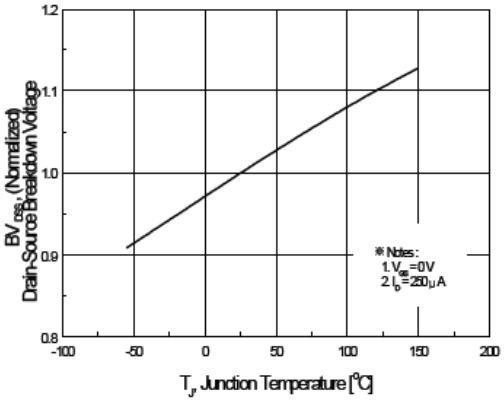



**Figure 7. Breakdown Voltage Variation vs Temperature**

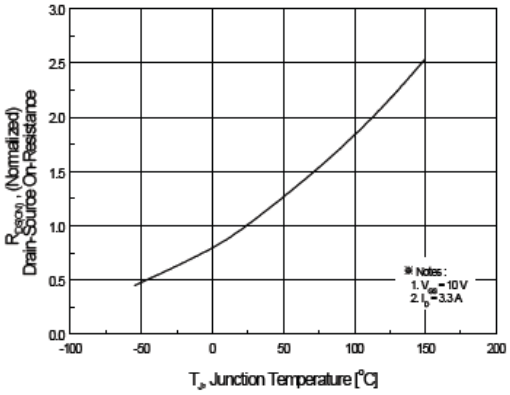



**Figure 8. On-Resistance Variation vs Temperature**

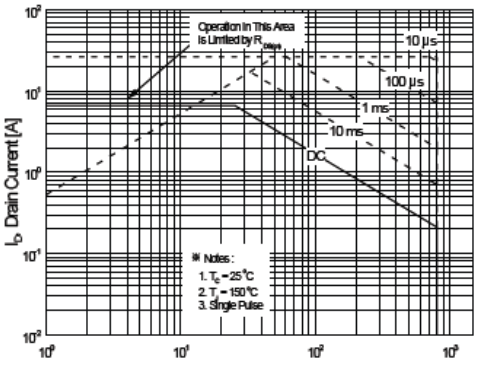



**Figure 9-1. Maximum Safe Operating Area for TO220**

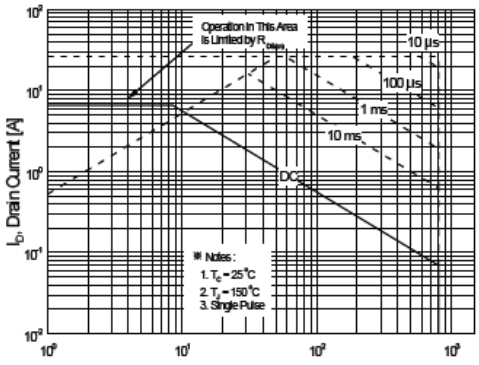



**Figure 9-2. Maximum Safe Operating Area for TO220F**

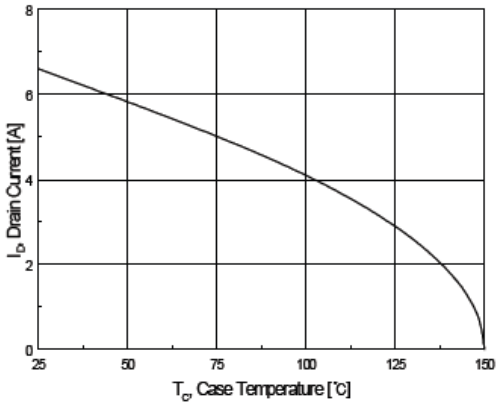



**Figure 10. Maximum Drain Current vs Case Temperature**

## ■ Typical Characteristics (Continued)

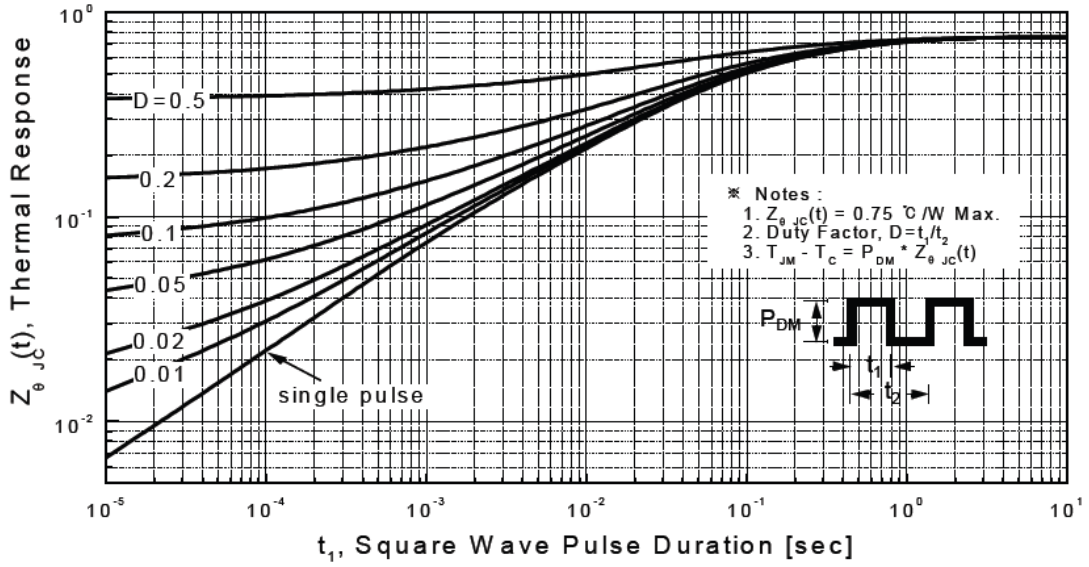



**Figure 11-1. Transient Thermal Response Curve**

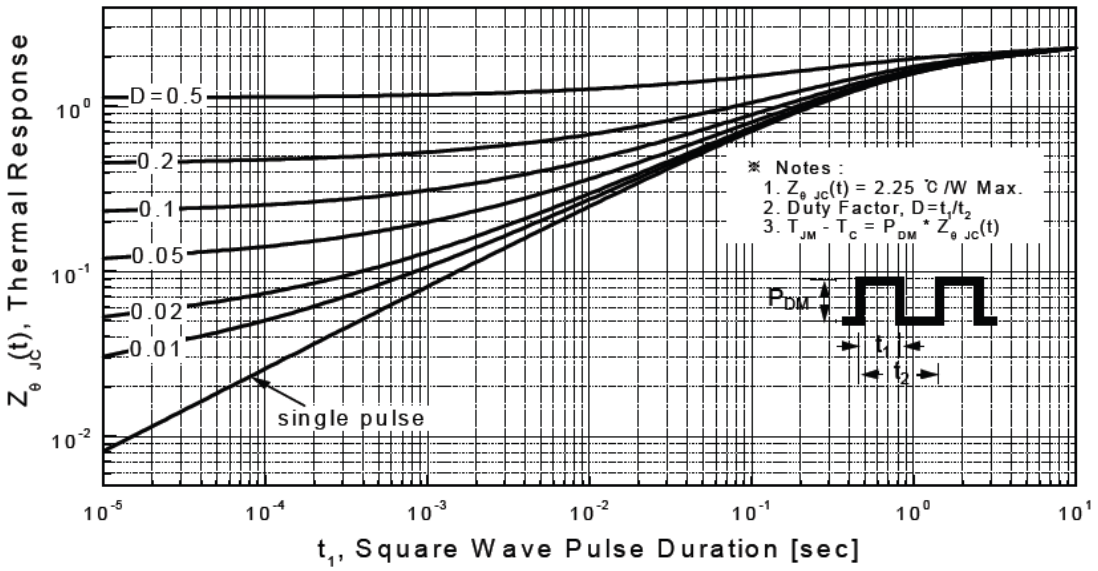
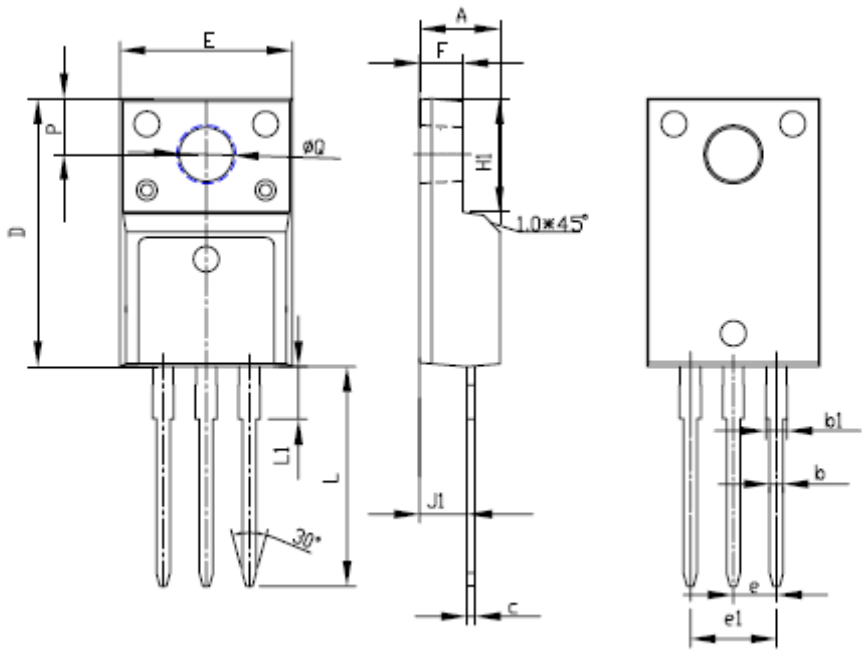



**Figure 11-2. Transient Thermal Response Curve for TO220F**

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 |
| ΦQ | 2.98 | 3.38 | 0.117 | 0.133 |