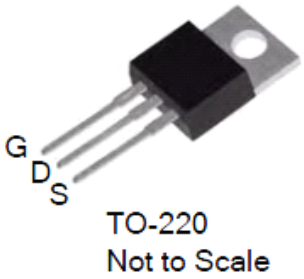
## DESCRIPTION

The 120N03 uses advanced trench technology And design to provide excellent $R_{DS(ON)}$ with Low gate charge . It can be used in a wide Vanety of applications .

| $V_{DS}$ | $R_{DS(ON)}$ | $I_D$ |
|---|---|---|
| 30V | 2.5mΩ | 120A |

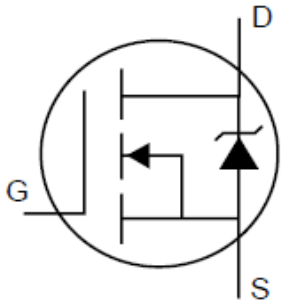



TO-220
Not to Scale

## GENERAL FEATURES

- $V_{DS}$ = 30 V, $I_D$ = 120 A

  $R_{DS(ON)}$ < 4 mΩ @ $V_{GS}$ = 10 V (Typ:2.5mΩ )
- High density cell design for ultra low Rdson
- Fully characterized Avalanche voltage and current
- Good stabilty and unifomity with high EAS
- Excellent package for good heat dissipation
- Special process technology for high ESD capability




## Application

- Power switching application
- Hard Switched and High Frequency Circuits
- Uninterruptible Power Supply

## Ordering Information

| PART NUMBER | PACKAGE | BRAND |
|---|---|---|
| 120N03 | TO-220 | OGFD |

## Absolute Maximum Ratings (TC=25℃, unless otherwise noted)

| Symbol | Parameter | 120N03 | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-to-Source Voltage | 30 | V |
| $I_D$ | Continuous Drain Current | 120 | A |
| | Drain Current-Continuous(Tc=100℃) | 84 | |
| $I_{DM}$ | Pulsed Drain Current@VG=10V | 400 | |
| $P_D$ | Power Dissipation | 120 | W |
| $V_{GS}$ | Gate-to-Source Voltage | ± 20 | V |
| $E_{AS}$ | Single PulseAvalanche Energy (L=1mH, IAS=40A)C | 350 | mJ |
| $T_J$ and $T_{STG}$ | Operating Junction and Storage Temperature Range | -55 to 175 | ℃ |

## Thermal Resistance

| Symbol | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $R_{\theta JC}$ | Junction-to-Case | -- | -- | 1.25 | ℃/W | Water cooled heatsink, PD adjusted for a peak junction temperature of +175℃. |

## OFF Characteristics TJ=25℃ unless otherwise specified

| Symbol | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $B_{VDSS}$ | Drain-to-Source Breakdown Voltage | 30 | -- | -- | V | $V_{GS}$=0, $I_D$=250μA |
| $I_{GSS}$ | Gate-to-Source Forward Leakage | -- | -- | ±100 | nA | $V_{DS}$=0V, $V_{GS}$=±20V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | -- | -- | 1 | μA | $V_{DS}$=30V, $V_{GS}$=0V |

## ON Characteristics TJ=25℃ unless otherwise specified

| Symbol | Parameter | Min. | Typ. | Max | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $R_{DS(ON)}$ | Static Drain-to-Source On-Resistance | -- | 2.5 | 4.0 | mΩ | $V_{GS}$=10V,$I_D$=20A |
| $V_{GS(TH)}$ | Gate Threshold Voltage, Figure 12. | 1.0 | 1.6 | 3.0 | V | $V_{DS}$=10V, $I_D$=250μA |
| $G_{fs}$ | Forward Transconductance | 50 | --- | -- | S | $V_{DS}$=10V, $I_D$=20A |

## Dynamic Characteristics Essentially independent of operating temperature

| Symbol | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $C_{iss}$ | Input Capacitance | -- | 3550 | -- | pF | $V_{DS}$=25V,$V_{GS}$=0V, f=1.0MHZ |
| $C_{oss}$ | Output Capacitance | -- | 1350 | -- | | |
| $C_{rss}$ | Reverse Transfer Capacitance | -- | 120 | -- | | |
| $Q_g$ | Total Gate Charge | -- | 48 | -- | nC | $V_{DS}$=15V, $V_{GS}$=10V, $I_D$=20A |
| $Q_{gs}$ | Gate-to-Source Charge | -- | 11 | -- | | |
| $Q_{gd}$ | Gate-to-Drain (“Miller”) Charge | -- | 10 | -- | | |

## Drain-Source Diode Characteristics

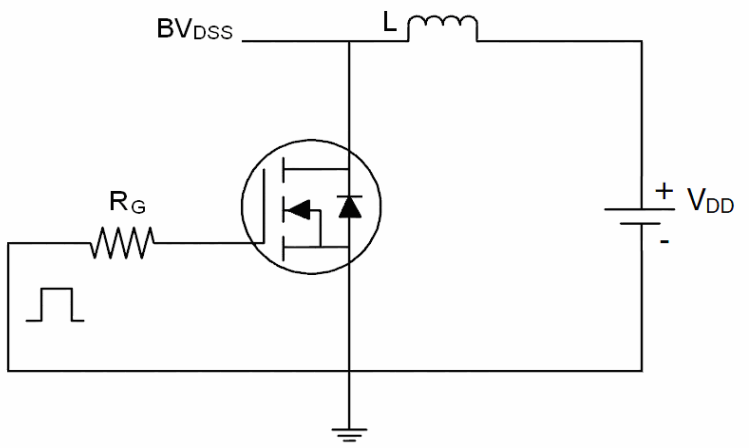
| | | | | | | |
|---|---|---|---|---|---|---|
| Diode Forward Voltage | $V_{SD}$ | $V_{GS}$=0V,$I_S$=20A | -- | -- | 1.2 | V |
| Diode Forward Current | $I_S$ | -- | -- | -- | 120 | A |
| Reverse Recovery Time | $t_{rr}$ | TJ=25℃,IF=20A Di/dt = 100 A/μs | -- | 21 | -- | nS |
| Reverse Recovery Charge | $Q_{rr}$ | | -- | 58 | -- | nC |
| Forword Turn-On Time | $t_{on}$ | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD | | | | |

## Notes:

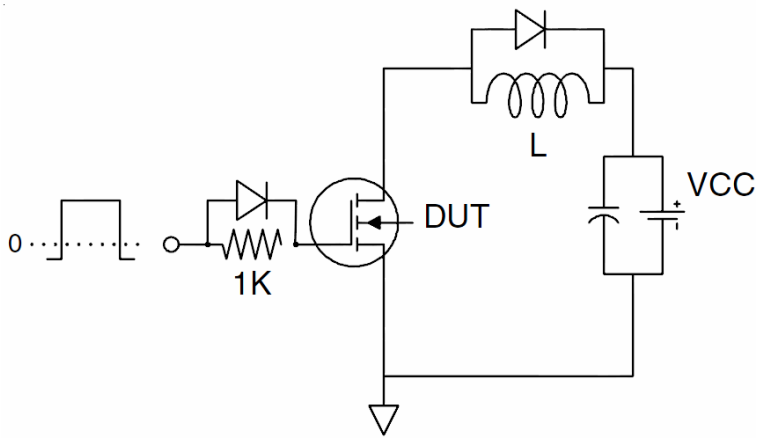
1. Repetitive Rating:Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤10 sec.
3. Pulse Test:Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production.
5. EAS condition: Tj=25℃,VDD=100V,VG=10V,L=0.5mH,Rg=25Ω.

# Test circuit

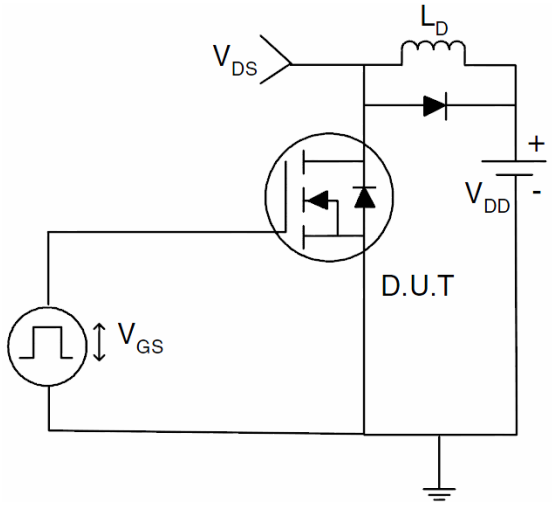
**1）$E_{AS}$ test Circuits**




**2）Gate charge test Circuit:**




**3）Switch Time Test Circuit：**



## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (Curves)

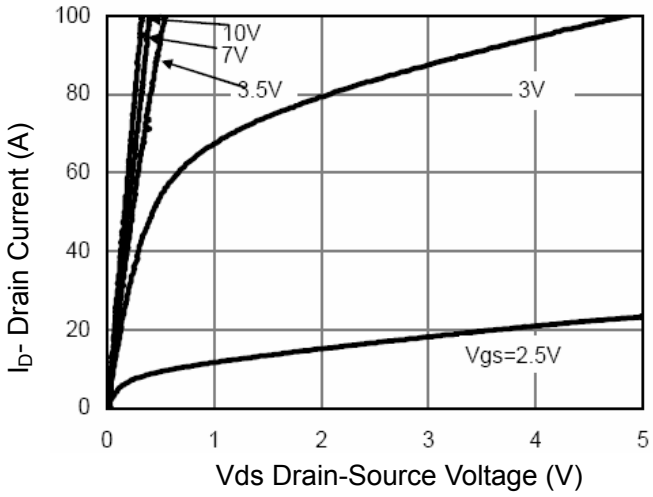



**Figure 1 Output Characteristics**

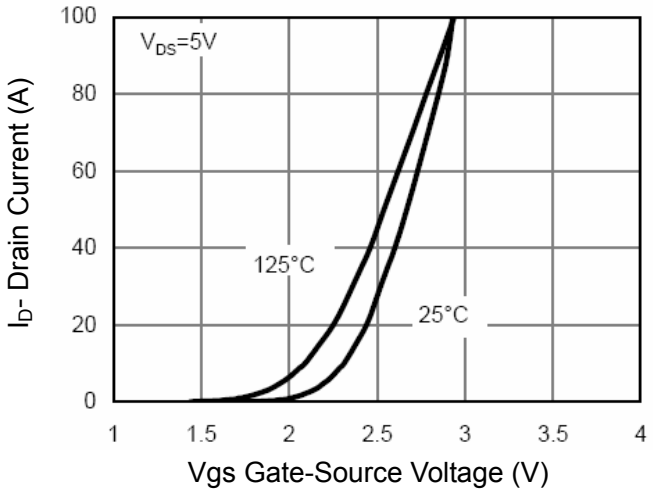



**Figure 2 Transfer Characteristics**

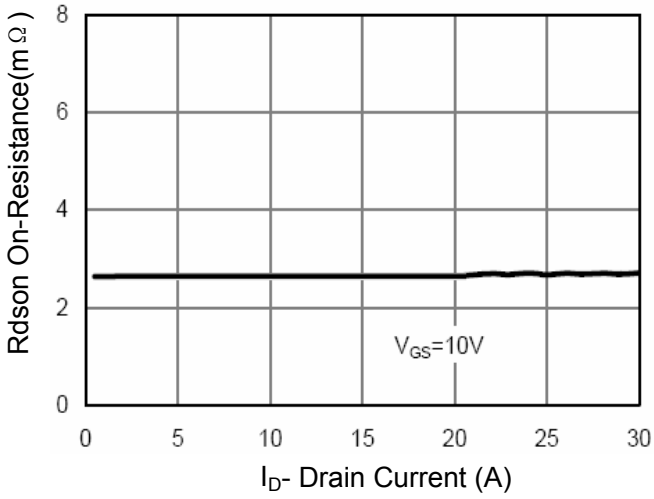



**Figure 3 Rdson- Drain Current**

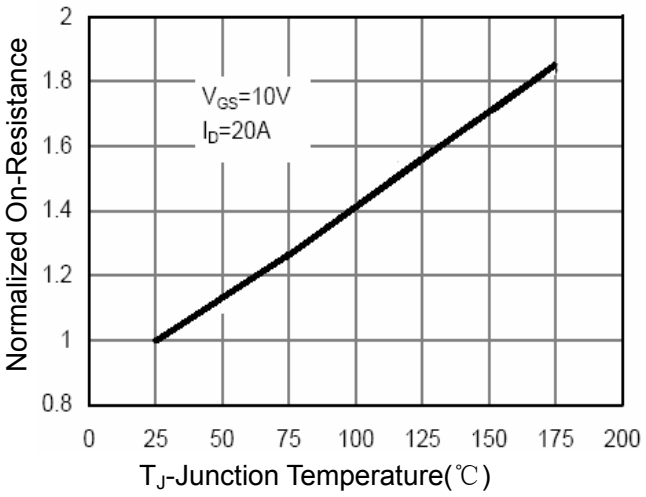



**Figure 4 Rdson-Junction Temperature**

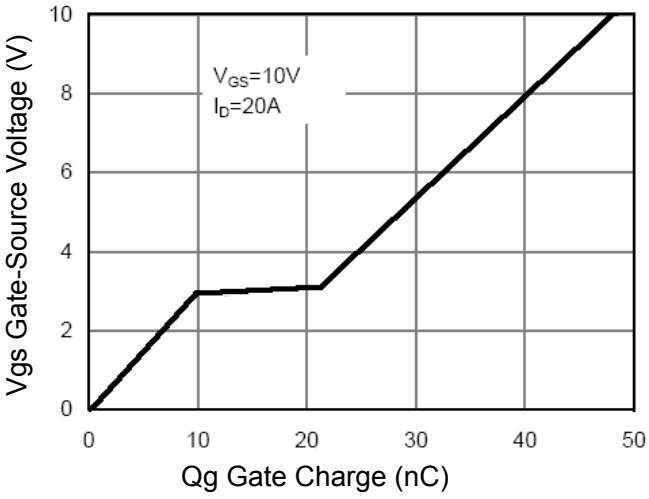



**Figure 5 Gate Charge**

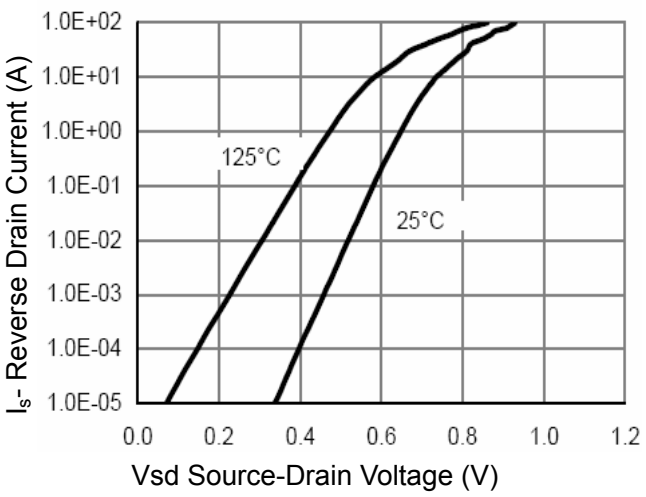



**Figure 6 Source- Drain Diode Forward**

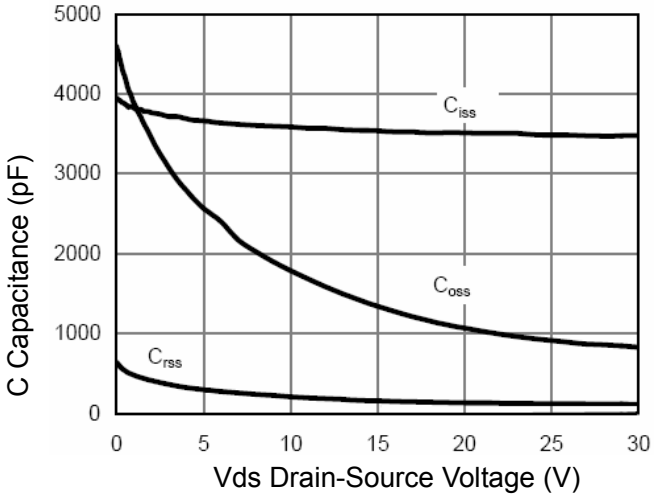



**Figure 7 Capacitance vs Vds**

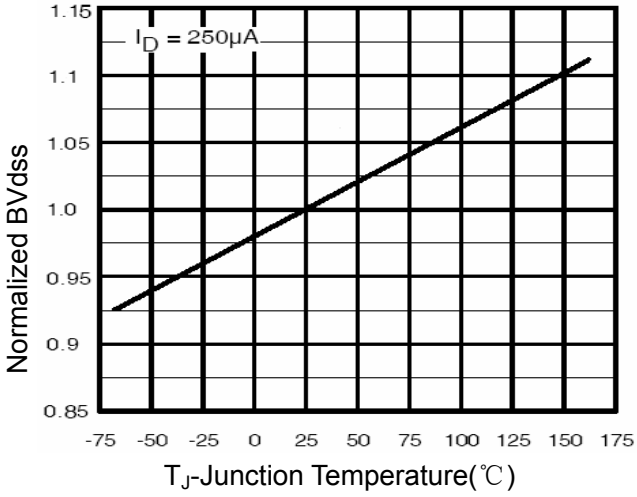



**Figure 9 $BV_{DSS}$ vs Junction Temperature**

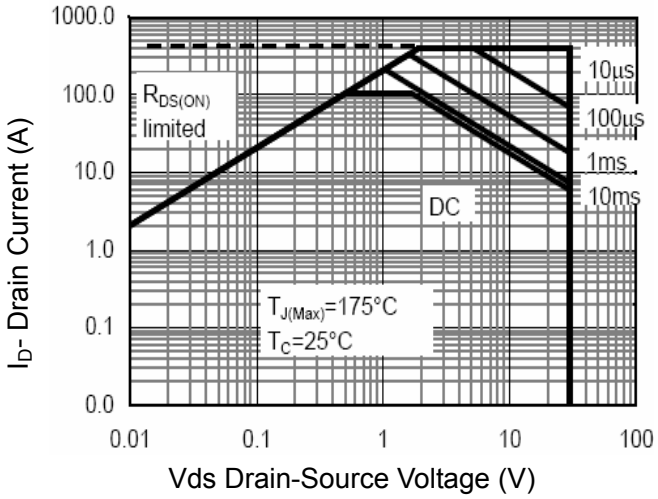



**Figure 8 Safe Operation Area**

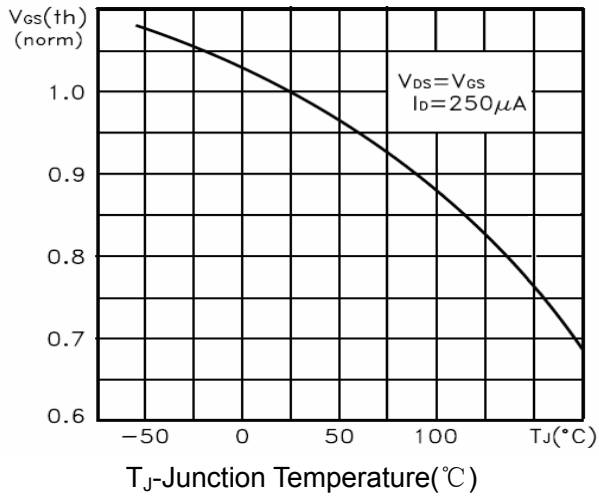



**Figure 10 $V_{GS(th)}$ vs Junction Temperature**

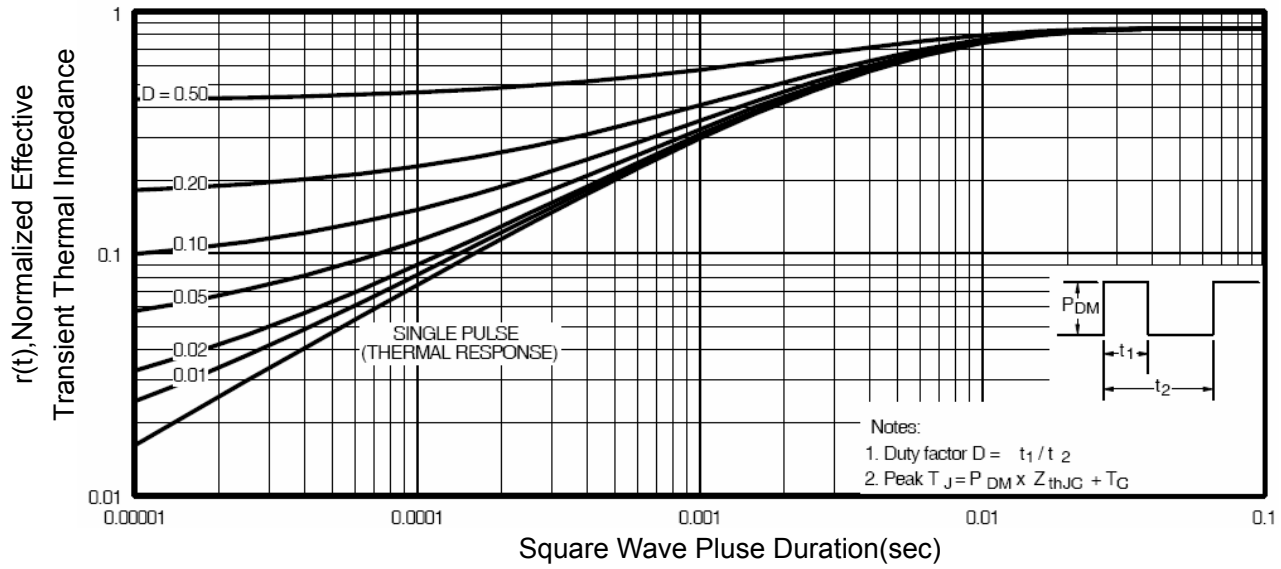



**Figure 11 Normalized Maximum Transient Thermal Impedance**