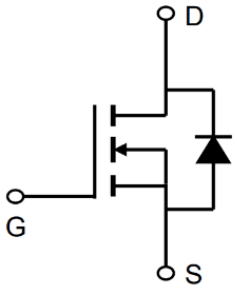
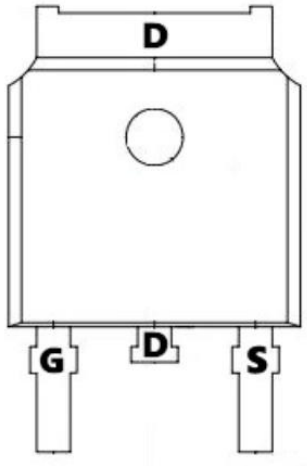
# 120N03

## 30V N-Channel Enhancement Mode MOSFET

### Description

The 120N03 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.




### General Features

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

$R_{DS(ON)}$ < 4mΩ $V_{GS}$=10V **（Type：2.8mΩ）**

### Application

Battery protection

Load switch

Uninterruptible power supply

### Package Marking and Ordering Information

| Product ID | Pack | Marking | Qty(PCS) |
|---|---|---|---|
| 120N03 | TO-252-3L | XX120N03X XXX YYYY | 2500 |

### Absolute Maximum Ratings ($T_C$=25℃unless otherwise noted)

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 30 | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | V |
| $I_D$@$T_C$=25℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 120 | A |
| $I_D$@$T_C$=100℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 65 | A |
| $I_{DM}$ | Pulsed Drain Current[2] | 360 | A |
| EAS | Single Pulse Avalanche Energy[3] | 144.7 | mJ |
| $I_{AS}$ | Avalanche Current | 53.8 | A |
| $P_D$@$T_C$=25℃ | Total Power Dissipation[4] | 43.4 | W |
| $P_D$@$T_A$=25℃ | Total Power Dissipation[4] | 1.67 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | ℃ |
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient [1] | 75 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case[1] | 2.88 | ℃/W |

## Electrical Characteristics ($T_J$=25 ℃, unless otherwise noted)

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| V(BR)DSS | Drain-Source Breakdown Voltage | $V_{GS}$=0V, $I_D$=250μA | 30 | 33 | - | V |
| IDSS | Zero Gate Voltage Drain Current | $V_{DS}$ =30V, $V_{GS}$ = 0V, | - | - | 1.0 | μA |
| IGSS | Gate to Body Leakage Current | $V_{DS}$ =0V, $V_{GS}$ = ±20V | - | - | ±100 | nA |
| VGS(th) | Gate Threshold Voltage | $V_{DS}$= $V_{GS}$, $I_D$=250μA | 1.0 | 1.5 | 2.5 | V |
| RDS(on) | Static Drain-Source on-Resistance note3 | $V_{GS}$ =10V, $I_D$ =30A | - | 2.8 | 4 | mΩ |
| | | $V_{GS}$ =4.5V, $I_D$ =20A | - | 4.8 | 6.5 | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ =15V, $V_{GS}$ =0V, f = 1.0MHz | - | 2680 | - | pF |
| Coss | Output Capacitance | | - | 393 | - | pF |
| Crss | Reverse Transfer Capacitance | | - | 330 | - | pF |
| $Q_g$ | Total Gate Charge | $V_{DS}$ =15V, $I_D$ =30A, $V_{GS}$ =10V | - | 30 | - | nC |
| $Q_{gs}$ | Gate-Source Charge | | - | 7.2 | - | nC |
| $Q_{gd}$ | Gate-Drain(“Miller”) Charge | | - | 10.4 | - | nC |
| td(on) | Turn-on Delay Time | $V_{DS}$=15V, $I_D$=30A, $R_{GEN}$=3Ω, $V_{GS}$ =10V | - | 23 | - | ns |
| $t_r$ | Turn-on Rise Time | | - | 28 | - | ns |
| td(off) | Turn-off Delay Time | | - | 74 | - | ns |
| $t_f$ | Turn-off Fall Time | | - | 36 | - | ns |
| IS | Maximum Continuous Drain to Source Diode Forward Current | | - | - | 120 | A |
| ISM | Maximum Pulsed Drain to Source Diode Forward Current | | - | - | 400 | A |
| VSD | Drain to Source Diode Forward Voltage | $V_{GS}$ = 0V, $I_S$=30A | - | - | 1.2 | V |
| trr | Body Diode Reverse Recovery Time | $I_F$=20A,dI/dt=100A/μs | - | 28 | - | ns |
| Qrr | Body Diode Reverse Recovery Charge | | - | 21 | - | nC |

**Note :**

1、The data tested by surface mounted on a 1 inch$^2$ FR-4 board with 2OZ copper.

2、The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%

3、The EAS data shows Max. rating . The test condition is $V_{DD}$=25V,$V_{GS}$=10V,L=0.1mH,$I_{AS}$=53.8A

4、The power dissipation is limited by 150℃ junction temperature

5、The data is theoretically the same as $I_D$ and $I_{DM}$ , in real applications , should be limited by total power dissipation.

## Typical Characteristics

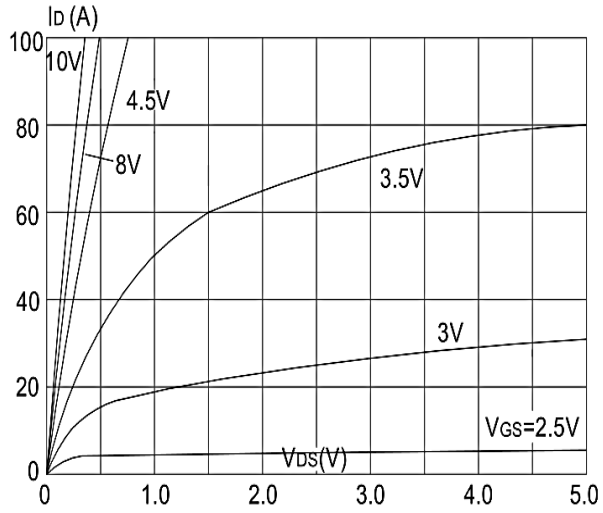



**Figure1: Output Characteristics**

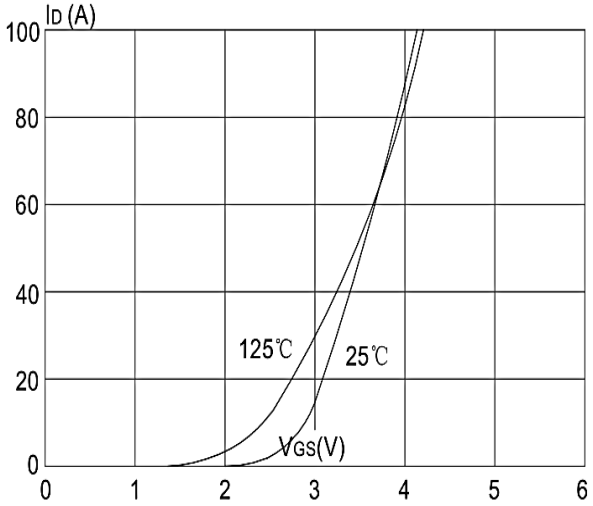



**Figure 2: Typical Transfer Characteristics**

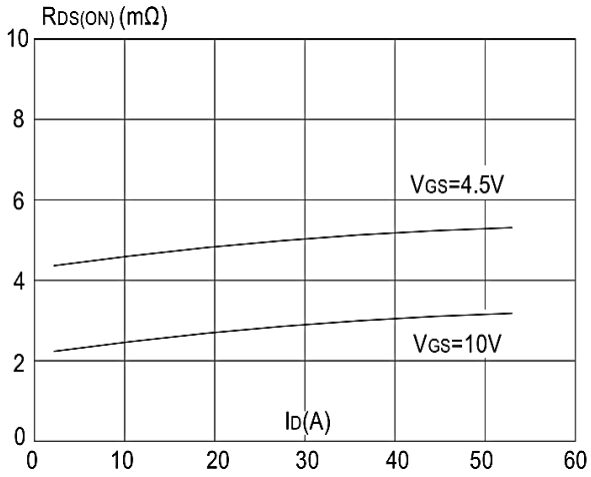



**Figure 3:On-resistance vs. Drain Current**

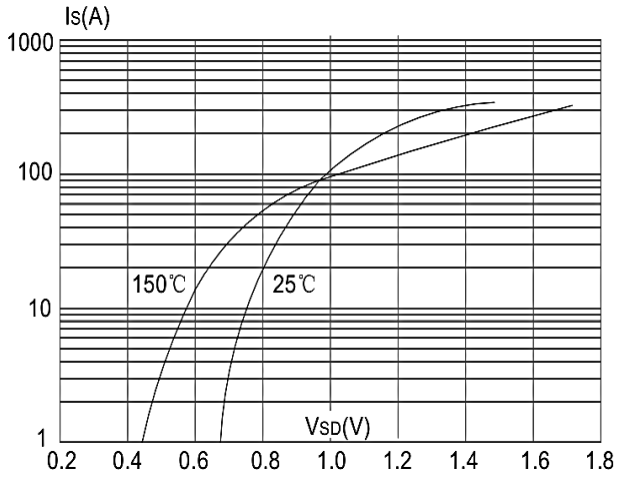



**Figure 4: Body Diode Characteristics**

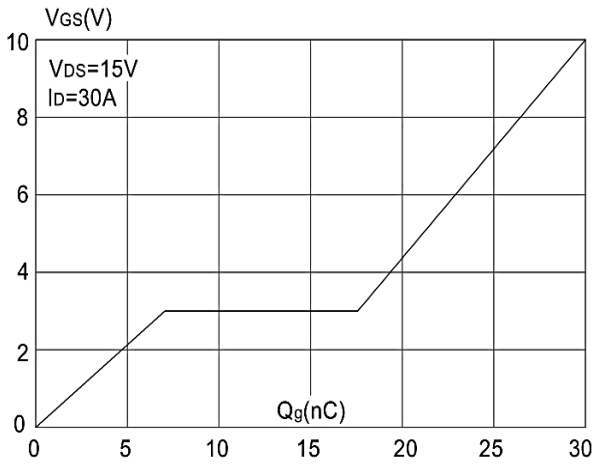



**Figure 5: Gate Charge Characteristics**

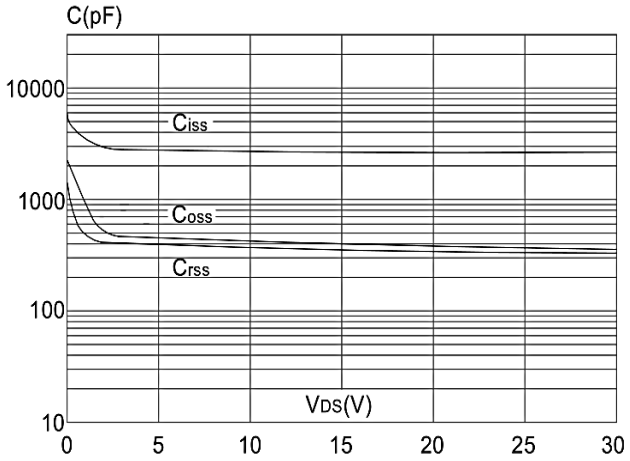



**Figure 6: Capacitance Characteristics**

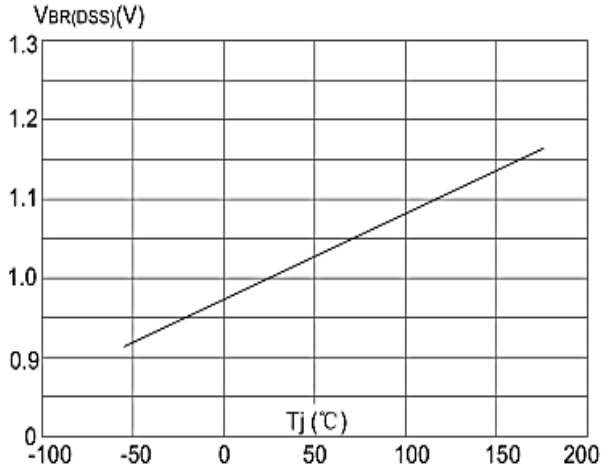



**Figure 7: Normalized Breakdown Voltage vs. Junction Temperature**

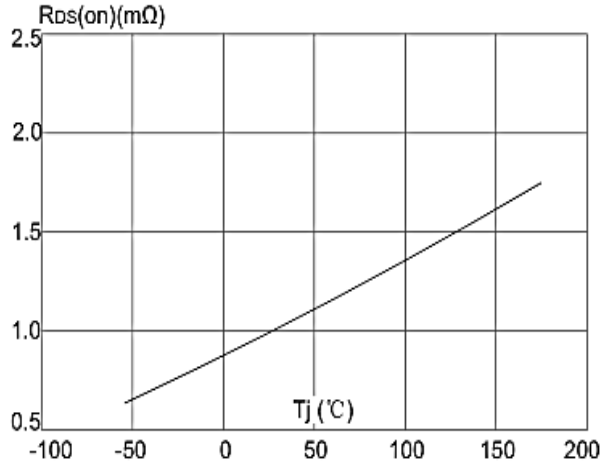



**Figure 8: Normalized on Resistance vs Junction Temperature**

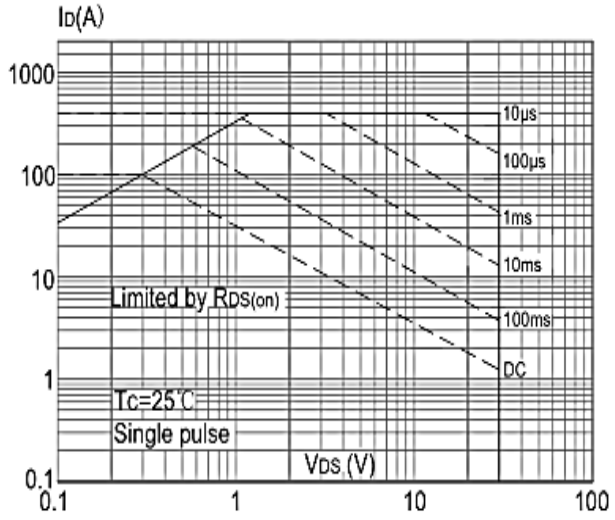



**Figure 9: Maximum Safe Operating Area vs. Case Temperature**

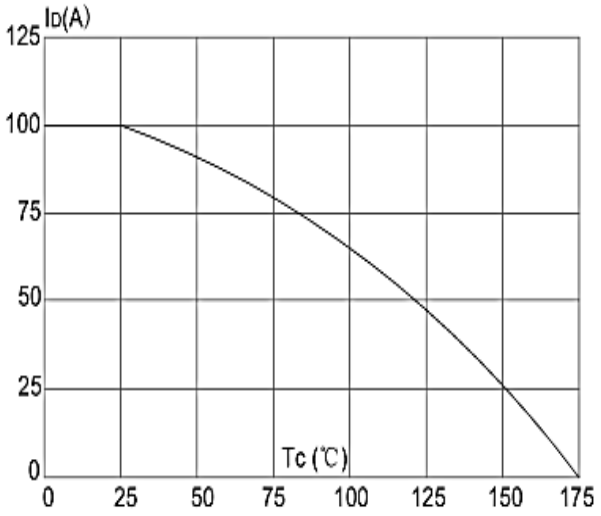



**Figure 10: Maximum Continuous Drain Current**

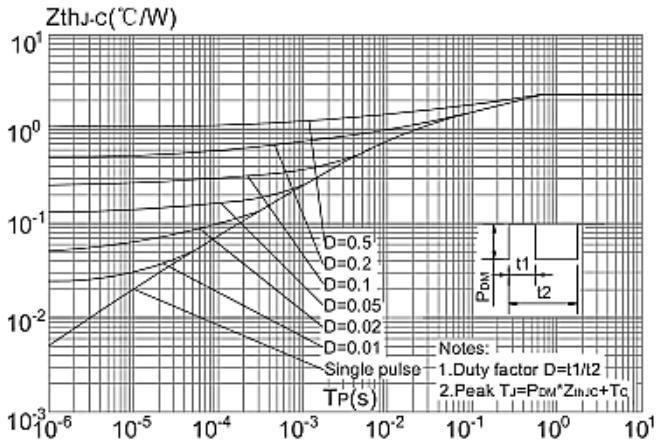
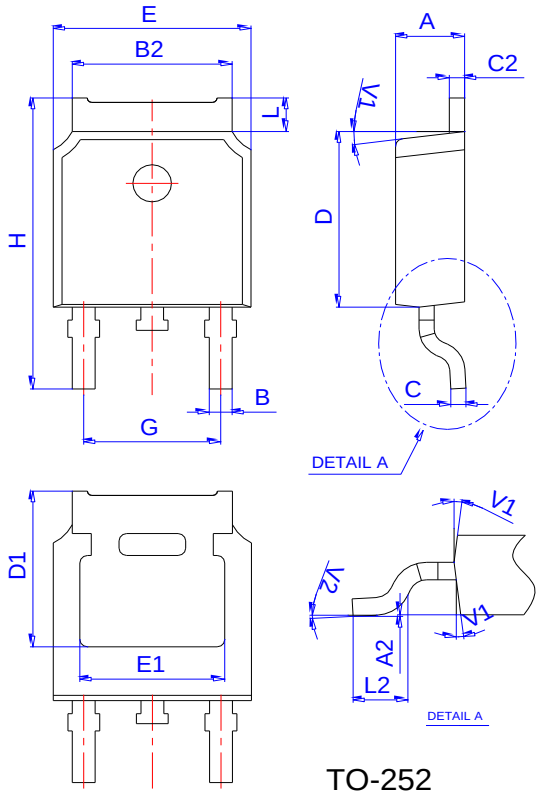



**Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case**

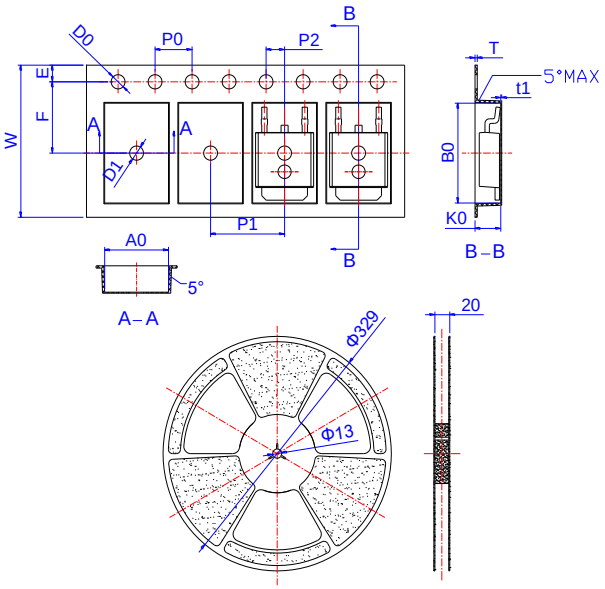
## Package Mechanical Data:TO-252-3L




TO-252

| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 2.10 | | 2.50 | 0.083 | | 0.098 |
| A2 | 0 | | 0.10 | 0 | | 0.004 |
| B | 0.66 | | 0.86 | 0.026 | | 0.034 |
| B2 | 5.18 | | 5.48 | 0.202 | | 0.216 |
| C | 0.40 | | 0.60 | 0.016 | | 0.024 |
| C2 | 0.44 | | 0.58 | 0.017 | | 0.023 |
| D | 5.90 | | 6.30 | 0.232 | | 0.248 |
| D1 | 5.30REF | | | 0.209REF | | |
| E | 6.40 | | 6.80 | 0.252 | | 0.268 |
| E1 | 4.63 | | | 0.182 | | |
| G | 4.47 | | 4.67 | 0.176 | | 0.184 |
| H | 9.50 | | 10.70 | 0.374 | | 0.421 |
| L | 1.09 | | 1.21 | 0.043 | | 0.048 |
| L2 | 1.35 | | 1.65 | 0.053 | | 0.065 |
| V1 | | 7° | | | 7° | |
| V2 | 0° | | 6° | 0° | | 6° |

## Reel Spectification-TO-252




| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| W | 15.90 | 16.00 | 16.10 | 0.626 | 0.630 | 0.634 |
| E | 1.65 | 1.75 | 1.85 | 0.065 | 0.069 | 0.073 |
| F | 7.40 | 7.50 | 7.60 | 0.291 | 0.295 | 0.299 |
| D0 | 1.40 | 1.50 | 1.60 | 0.055 | 0.059 | 0.063 |
| D1 | 1.40 | 1.50 | 1.60 | 0.055 | 0.059 | 0.063 |
| P0 | 3.90 | 4.00 | 4.10 | 0.154 | 0.157 | 0.161 |
| P1 | 7.90 | 8.00 | 8.10 | 0.311 | 0.315 | 0.319 |
| P2 | 1.90 | 2.00 | 2.10 | 0.075 | 0.079 | 0.083 |
| A0 | 6.85 | 6.90 | 7.00 | 0.270 | 0.271 | 0.276 |
| B0 | 10.45 | 10.50 | 10.60 | 0.411 | 0.413 | 0.417 |
| K0 | 2.68 | 2.78 | 2.88 | 0.105 | 0.109 | 0.113 |
| T | 0.24 | | 0.27 | 0.009 | | 0.011 |
| t1 | 0.10 | | | 0.004 | | |
| 10P0 | 39.80 | 40.00 | 40.20 | 1.567 | 1.575 | 1.583 |