- ★ Super Low Gate Charge
- ★ 100% EAS Guaranteed
- ★ Green Device Available
- ★ Excellent CdV/dt effect decline
- ★ Advanced high cell density Trench technology

## Product Summary

Green

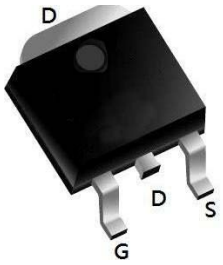
| BVDSS | RDSON | ID |
|---|---|---|
| 30V | 3.0mΩ | 120 A |

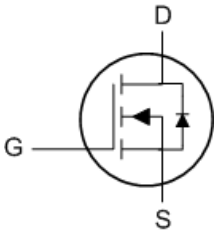
## Description

The XR120N03 is the high cell density trenched N-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The XR120N03 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

## TO252-3L Pin Configuration




## Absolute Maximum Ratings

| Symbol | Parameter | Rating | | Units |
|---|---|---|---|---|
| | | 10s | Steady State | |
| $V_{DS}$ | 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] | 75 | | A |
| $I_{DM}$ | Pulsed Drain Current[2] | 384 | | A |
| EAS | Single Pulse Avalanche Energy[3] | 198 | | mJ |
| $I_{AS}$ | Avalanche Current | 53.8 | | A |
| $P_D$@$T_C$=25℃ | Total Power Dissipation[4] | 62.5 | | W |
| $P_D$@$T_A$=25℃ | Total Power Dissipation[4] | 6 | 2.42 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 175 | | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 175 | | ℃ |

## Thermal Data

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient [1] | --- | 62 | ℃/W |
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient [1] (t ≤10s) | --- | 25 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case[1] | --- | 2.4 | ℃/W |

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

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V, $I_{DS}$=250μA | 30 | - | - | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=24V, $V_{GS}$=0V | - | - | 1 | μA |
| | | $T_J$=85°C | - | - | 30 | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$, $I_{DS}$=250μA | 1.4 | 1.7 | 2.5 | V |
| $I_{GSS}$ | Gate Leakage Current | $V_{GS}$=±20V, $V_{DS}$=0V | - | - | ±100 | nA |
| $R_{DS(ON)}$ [d] | Drain-Source On-state Resistance | $V_{GS}$=10V, $I_{DS}$=20A | - | 3 | 3.8 | mΩ |
| | | $T_J$=125°C | - | 4.4 | - | |
| | | $V_{GS}$=4.5V, $I_{DS}$=15A | - | 4.0 | 5.5 | |
| Gfs | Forward Transconductance | $V_{DS}$=5V, $I_{DS}$=10A | - | 24.6 | - | S |
| **Diode Characteristics** | | | | | | |
| $V_{SD}$ [d] | Diode Forward Voltage | $I_{SD}$=20A, $V_{GS}$=0V | - | 0.8 | 1.1 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_{DS}$=20A, $dI_{SD}/dt$=100A/μs | - | 35.6 | - | ns |
| $t_a$ | Charge Time | | - | 19.3 | - | |
| $t_b$ | Discharge Time | | - | 16.3 | - | |
| $Q_{rr}$ | Reverse Recovery Charge | | - | 26 | - | nC |
| **Dynamic Characteristics** [e] | | | | | | |
| $R_G$ | Gate Resistance | $V_{GS}$=0V,$V_{DS}$=0V,F=1MHz | - | 1 | 2 | Ω |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=15V, Frequency=1.0MHz | - | 2485 | 2971 | pF |
| $C_{oss}$ | Output Capacitance | | - | 850 | - | |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 85 | - | |
| $t_{d(ON)}$ | Turn-on Delay Time | $V_{DD}$=15V, $R_L$=15Ω, $I_{DS}$=1A, $V_{GEN}$=10V, $R_G$=6Ω | - | 12.4 | 23 | ns |
| $t_r$ | Turn-on Rise Time | | - | 9.5 | 18 | |
| $t_{d(OFF)}$ | Turn-off Delay Time | | - | 27.2 | 49 | |
| $t_f$ | Turn-off Fall Time | | - | 35.2 | 64 | |
| **Gate Charge Characteristics** [e] | | | | | | |
| $Q_g$ | Total Gate Charge | $V_{DS}$=15V, $V_{GS}$=10V, $I_{DS}$=20A | - | 20.6 | 28.8 | nC |
| $Q_g$ | Total Gate Charge | $V_{DS}$=15V, $V_{GS}$=4.5V, $I_{DS}$=20A | - | 9.8 | - | |
| $Q_{gth}$ | Threshold Gate Charge | | - | 1.8 | - | |
| $Q_{gs}$ | Gate-Source Charge | | - | 3.8 | - | |
| $Q_{gd}$ | Gate-Drain Charge | | - | 3.7 | - | |

Note d：Pulse test ; pulse width≤300μs, duty cycle≤2%.
Note e：Guaranteed by design, not subject to production testing.

## N- Channel Typical Characteristics

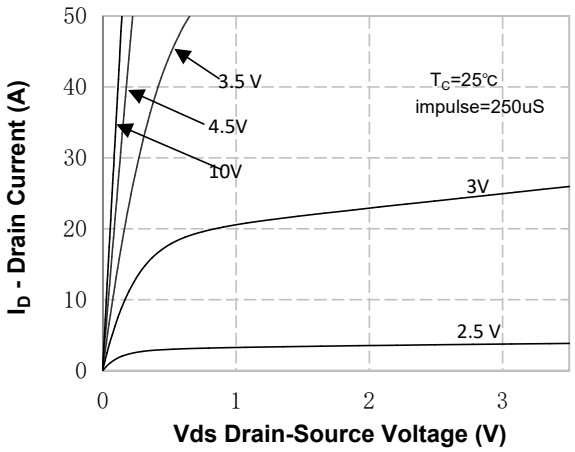



Figure 1. On-Region Characteristics

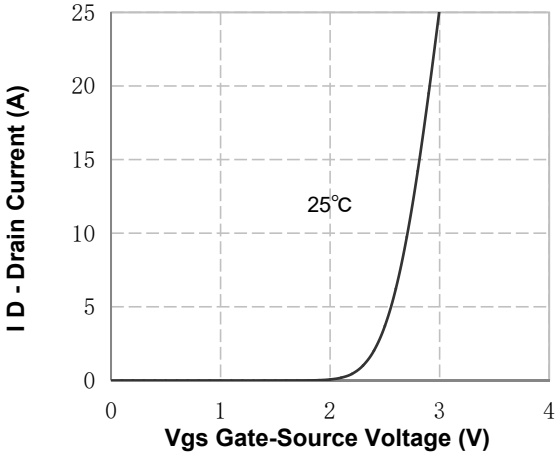



Figure 2. Transfer Characteristics

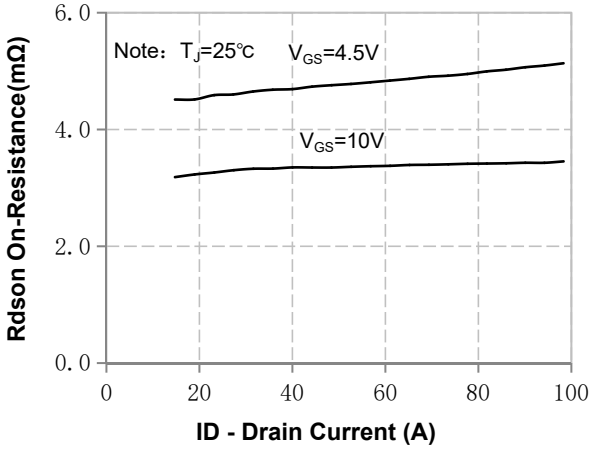



Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

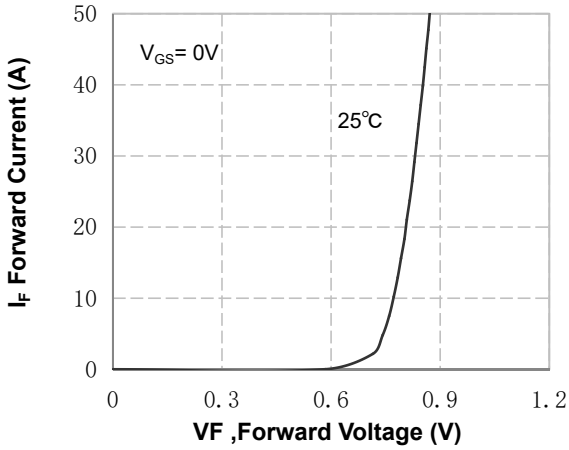



Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

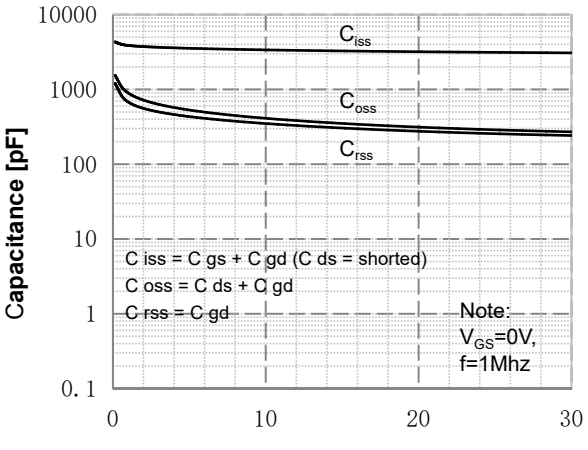



Figure 5. Capacitance Characteristics

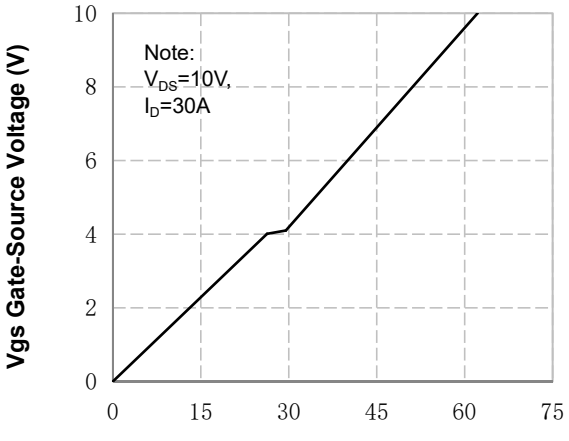



Figure 6. Gate Charge Characteristics

## N- Channel Typical Characteristics (Continued)

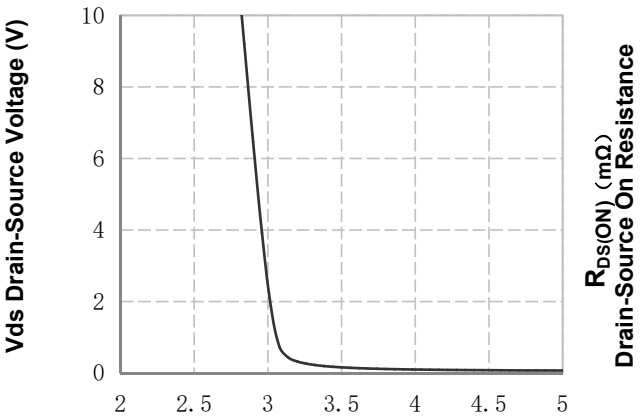



Figure 7. Vds Drain-Source Voltage vs Gate Voltage

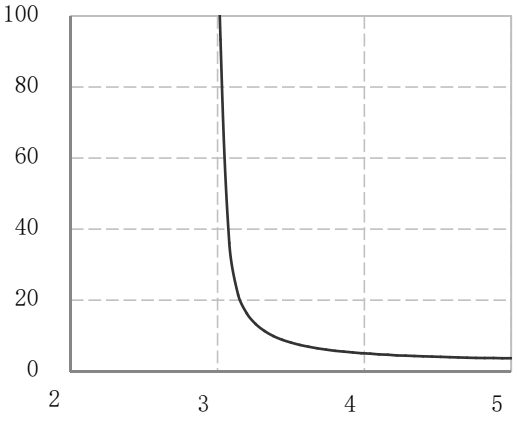



Figure 8. On-Resistance vs Gate Voltage



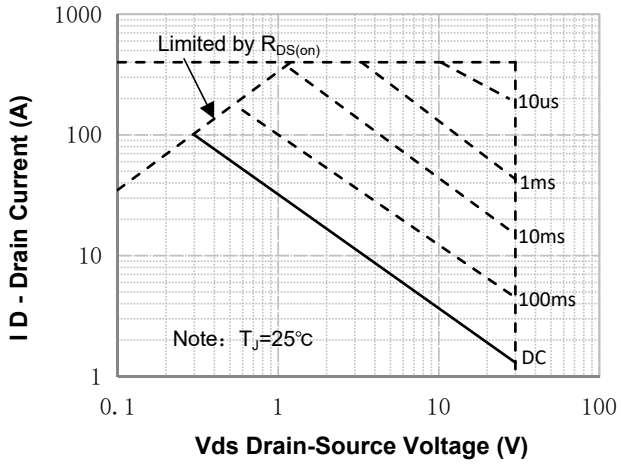



Figure 9. Maximum Safe Operating Area

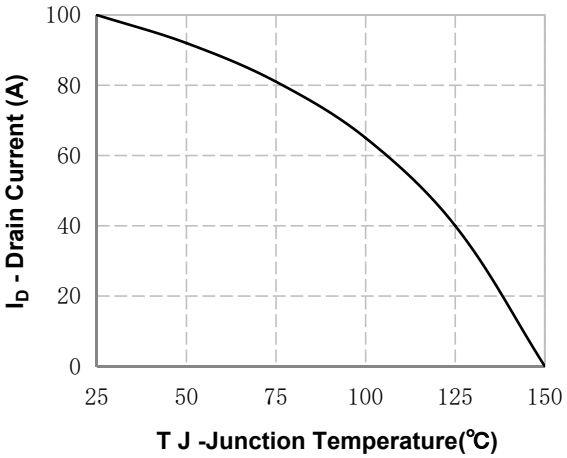



Figure 10. Maximum Continuous Drain Current vs Temperature

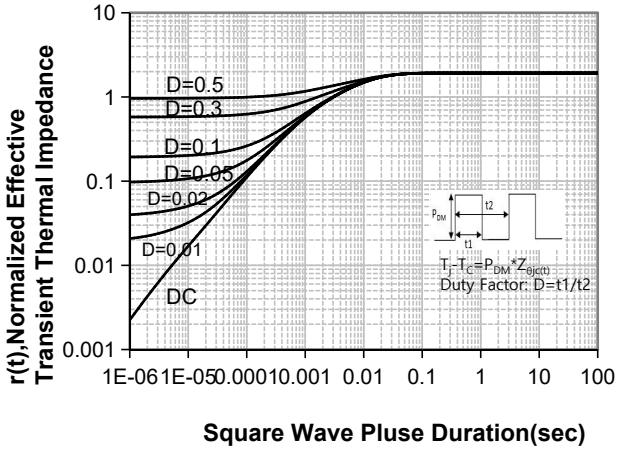
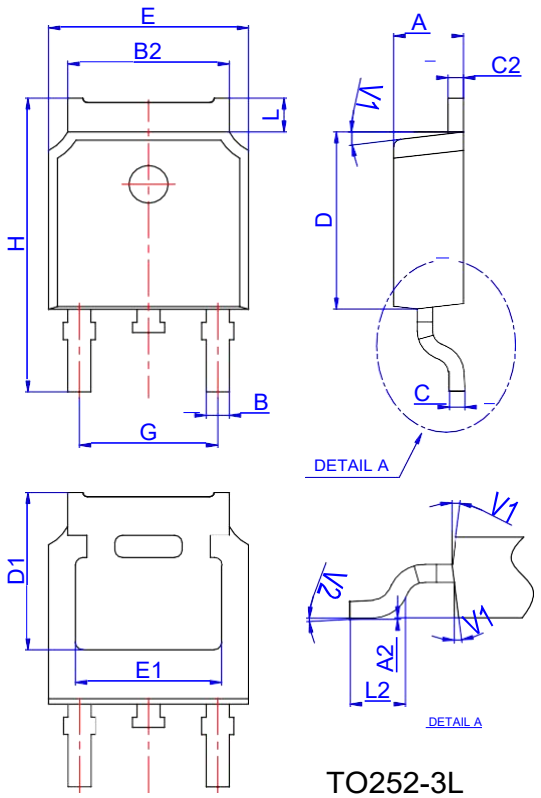



Figure 11. Transient Thermal Response Curve

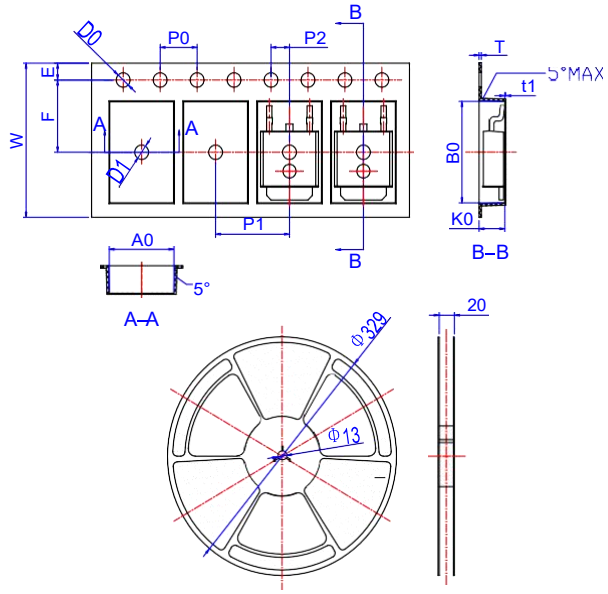
## Package Mechanical Data TO252-3L




TO252-3L

| 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-TO252-3L




| 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 |