EVVOSEMI®
THINK CHANGE DO

ESD TVS MOS LDO Diode Sensor DC-DC

# Product Specification

| | |
|---|---|
| Domestic Part Number | IRFR15N20D |
| Overseas Part Number | IRFR15N20D |
| Equivalent Part Number | IRFR15N20D |

# 200V N-Channel Enhancement Mode MOSFET

## Features

- Advanced Trench MOS Technology
- Low Gate Charge
- 100% EAS Guaranteed
- Green Device Available

## Product Summary

$V_{DS}$ = 200V $I_D$ =18A

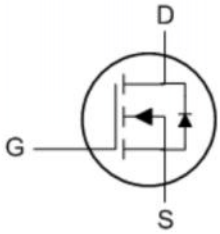
$R_{DS(ON)}$ < 170mΩ @ $V_{GS}$=10V

$R_{DS(ON)}$ < 180mΩ @ $V_{GS}$= 4.5V

## Applications

- Load Switch
- LED Applications
- Networking Applications
- Quick Charger

## TO252-2L Pin Configuration



## Absolute Maximum Ratings

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 200 | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | V |
| $I_D$@$T_C$=25°C | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 18 | A |
| $I_D$@$T_C$=100°C | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 11.7 | A |
| $I_{DM}$ | Pulsed Drain Current[2] | 40 | A |
| EAS | Single Pulse Avalanche Energy[3] | 15 | mJ |
| $I_{AS}$ | Avalanche Current | 10 | A |
| $P_D$@$T_C$=25°C | Total Power Dissipation[3] | 83 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | °C |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | °C |

## Thermal Data

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance Junction-ambient [1] | --- | 60 | °C/W |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case[1] | --- | 1.1 | °C/W |

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

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=250uA | 200 | --- | --- | V |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance[2] | $V_{GS}$=10V , $I_D$=9A | --- | --- | 170 | mΩ |
|  | Static Drain-Source On-Resistance[2] | $V_{GS}$=4.5V , $I_D$=9A | --- | --- | 180 | mΩ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =250uA | 1.2 | --- | 2.5 | V |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=160V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | 1 | uA |
|  |  | $V_{DS}$=160V , $V_{GS}$=0V , $T_J$=55℃ | --- | --- | 5 |  |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±20V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| gfs | Forward Transconductance | $V_{DS}$=5V , $I_D$=9A | --- | 22 | --- | S |
| $R_g$ | Gate Resistance | $V_{DS}$=0V , $V_{GS}$=0V , f=1MHz | --- | 2 | --- | Ω |
| $Q_g$ | Total Gate Charge (10V) | $V_{DS}$=80V , $V_{GS}$=10V , $I_D$=9A | --- | 45 | --- | nC |
| $Q_{gs}$ | Gate-Source Charge |  | --- | 9 | --- |  |
| $Q_{gd}$ | Gate-Drain Charge |  | --- | 10.5 | --- |  |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DD}$=50V , $V_{GS}$=10V , $R_G$=3.3Ω<br>$I_D$=9A | --- | 13 | --- | ns |
| $T_r$ | Rise Time |  | --- | 8.2 | --- |  |
| $T_{d(off)}$ | Turn-Off Delay Time |  | --- | 25 | --- |  |
| $T_f$ | Fall Time |  | --- | 11 | --- |  |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=25V , $V_{GS}$=0V , f=1MHz | --- | 2047 | --- | pF |
| $C_{oss}$ | Output Capacitance |  | --- | 109 | --- |  |
| $C_{rss}$ | Reverse Transfer Capacitance |  | --- | 70 | --- |  |

## Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current[1,5] | $V_G$=$V_D$=0V , Force Current | --- | --- | 18 | A |
| $I_{SM}$ | Pulsed Source Current[2,5] |  | --- | --- | 40 | A |
| $V_{SD}$ | Diode Forward Voltage[2] | $V_{GS}$=0V , $I_S$=1A , $T_J$=25℃ | --- | --- | 1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_F$=10A , dI/dt=100A/μs ,<br>$T_J$=25℃ | --- | 37 | --- | nS |
| $Q_{rr}$ | Reverse Recovery Charge |  | --- | 103 | --- | 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=0.3mH,$I_{AS}$=10A
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

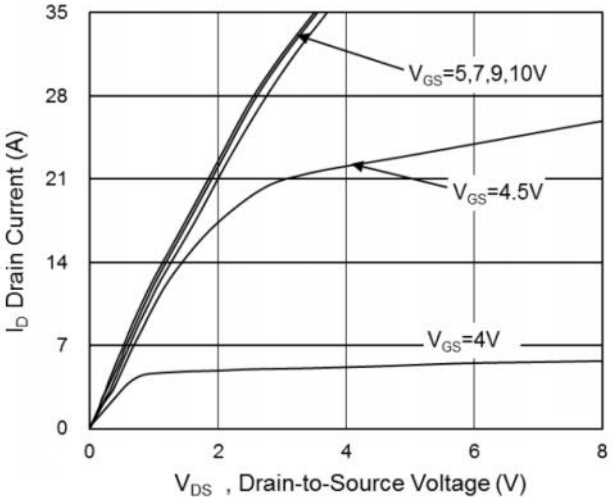


Fig.1 Typical Output Characteristics

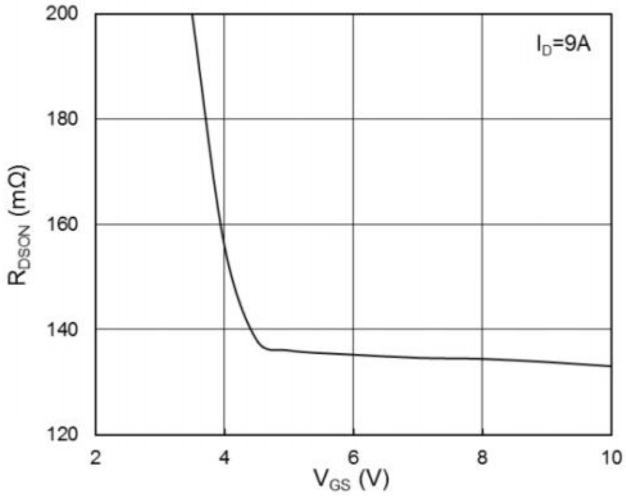


Fig.2 On-Resistance vs G-S Voltage

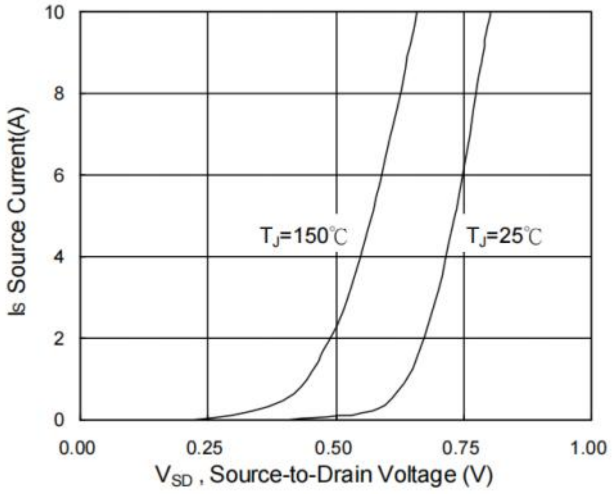


Fig.3 Source Drain Forward Characteristics

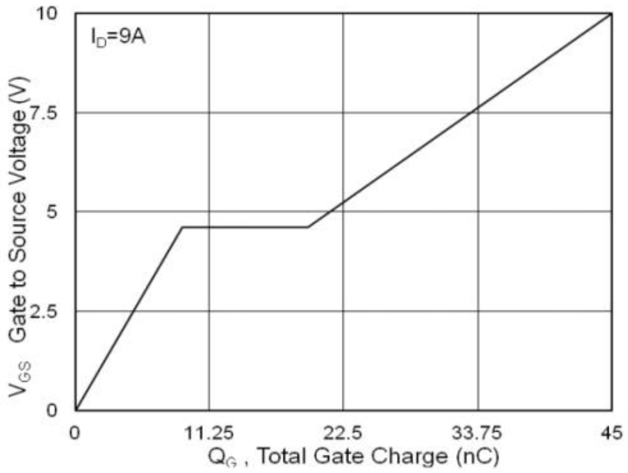


Fig.4 Gate-Charge Characteristics

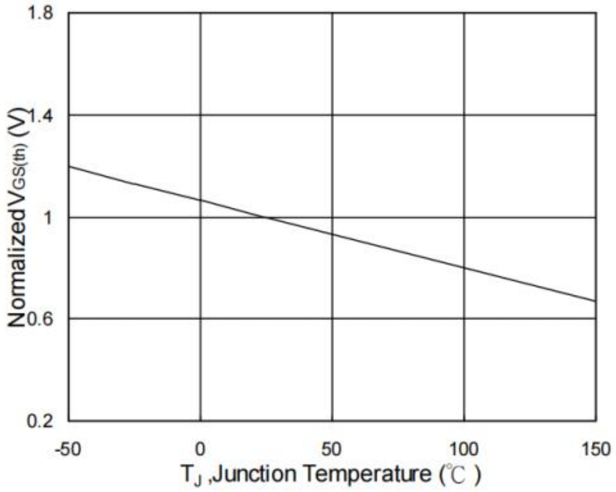


Fig.5 Normalized $V_{GS(th)}$ vs $T_J$

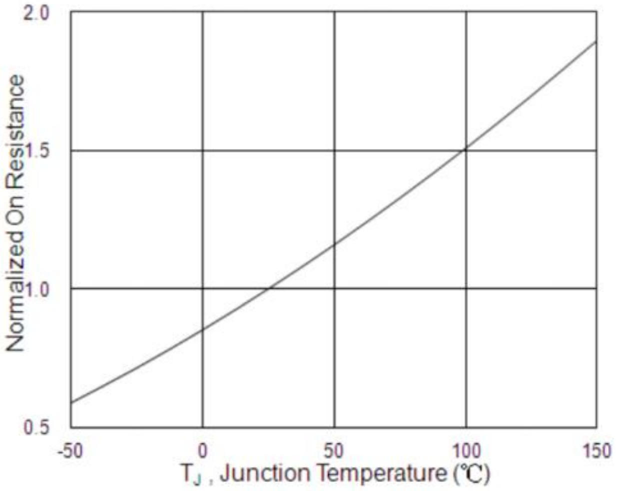


Fig.6 Normalized $R_{DSON}$ vs $T_J$

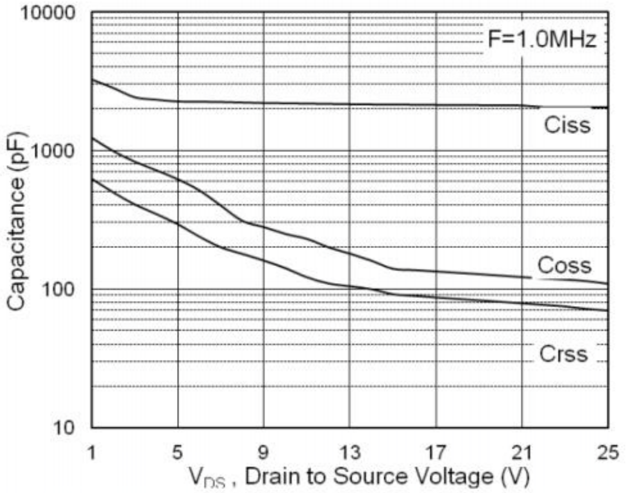


Fig.7 Capacitance

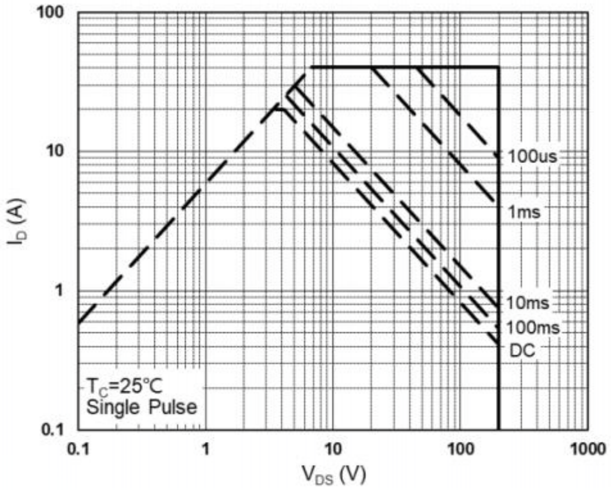


Fig.8 Safe Operating Area

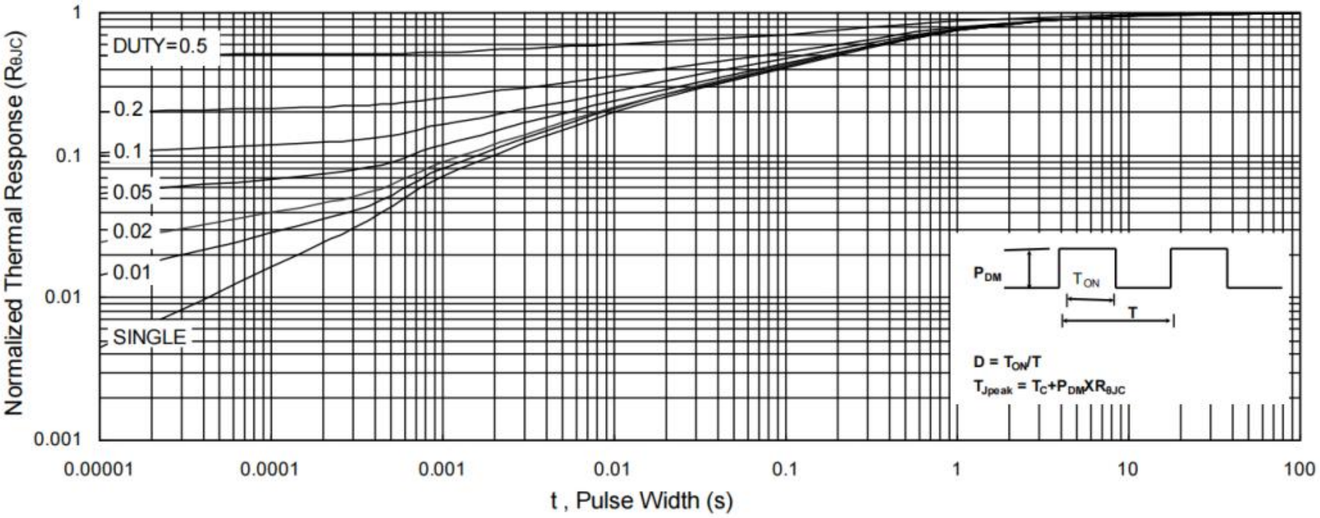


Fig.9 Normalized Maximum Transient Thermal Impedance

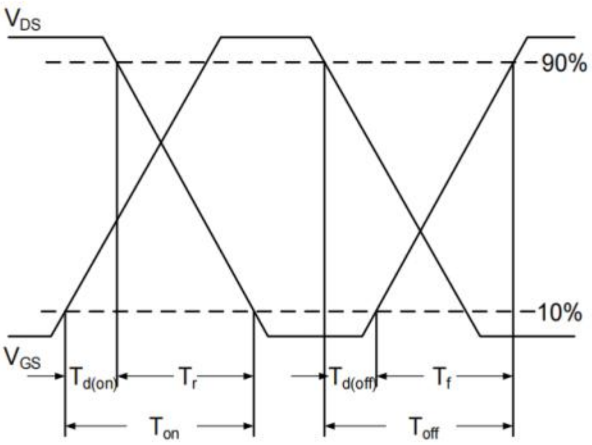


Fig.10 Switching Time Waveform

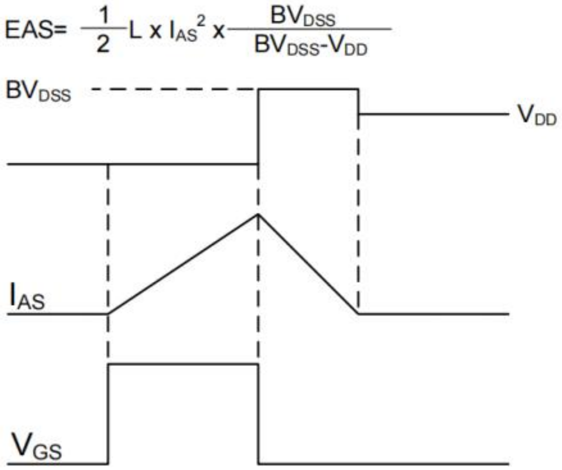
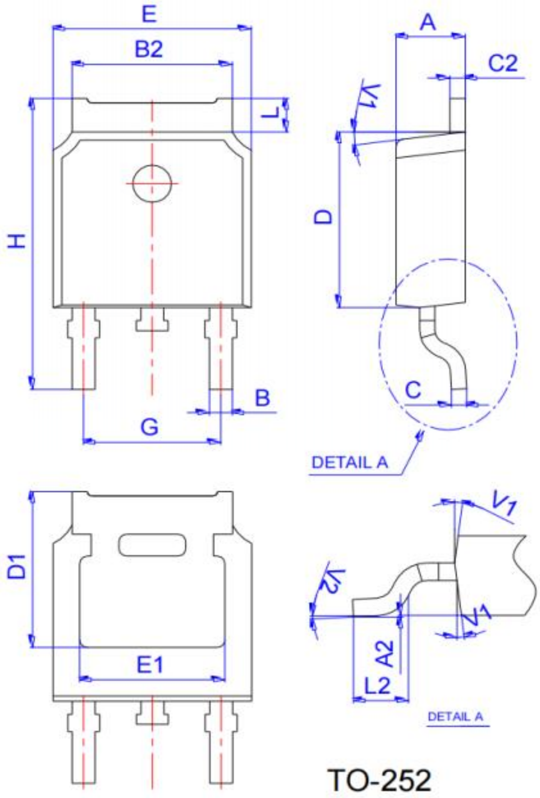


Fig.11 Unclamped Inductive Waveform

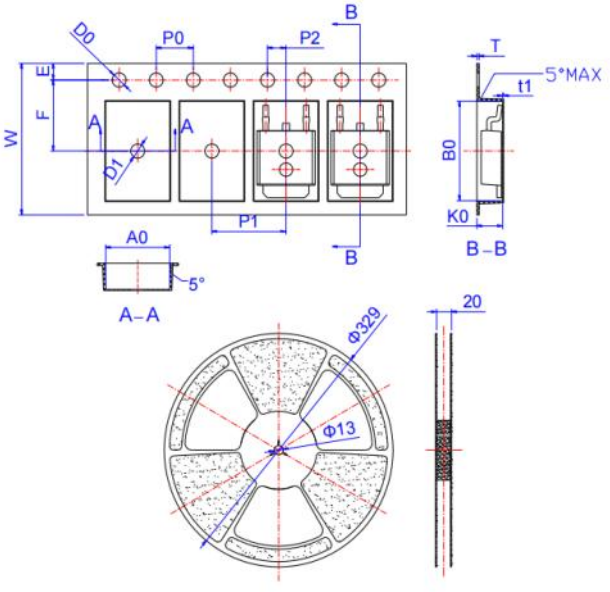
## Package Mechanical Data  TO-252-2L



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 Specification-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 |

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