

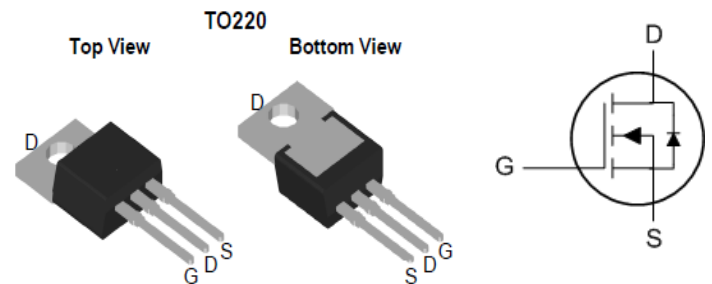
- ★ 100% EAS Guaranteed
- ★ Green Device Available
- ★ Super Low Gate Charge
- ★ Excellent CdV/dt effect decline
- ★ Advanced high cell density Trench technology

Product Summary

| BVDSS | RDSON | ID |
|-------|-------|-----|
| 40V | 6.5mΩ | 90A |

Description

The IRF1404 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 IRF1404 meet the RoHS and Green Product requirement 100% EAS guaranteed with full function reliability approved.



Absolute Maximum Ratings

| Symbol | Parameter | Rating | Units |
|---------------------------------------|--|------------|-------|
| V _{DS} | Drain-Source Voltage | 40 | V |
| V _{GS} | Gate-Source Voltage | ±20 | V |
| I _D @T _C =25°C | Continuous Drain Current, V _{GS} @ 10V ¹ | 90 | A |
| I _D @T _C =100°C | Continuous Drain Current, V _{GS} @ 10V ¹ | 57 | A |
| I _D @T _A =25°C | Continuous Drain Current, V _{GS} @ 10V ¹ | 13.6 | A |
| I _D @T _A =70°C | Continuous Drain Current, V _{GS} @ 10V ¹ | 11 | A |
| I _{DM} | Pulsed Drain Current ² | 270 | A |
| EAS | Single Pulse Avalanche Energy ³ | 110 | mJ |
| I _{AS} | Avalanche Current | 47 | A |
| P _D @T _C =25°C | Total Power Dissipation ⁴ | 87 | 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 _{θJA} | Thermal Resistance Junction-Ambient ¹ | --- | 62 | °C/W |
| R _{θJC} | Thermal Resistance Junction-Case ¹ | --- | 1.44 | °C/W |

Electrical Characteristics (T_J=25 °C, unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------------|--|---|------|-------|------|-------|
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} =0V, I _D =250uA | 40 | --- | --- | V |
| ΔBV _{DSS} /ΔT _J | BVDSS Temperature Coefficient | Reference to 25°C, I _D =1mA | --- | 0.034 | --- | V/°C |
| R _{DS(ON)} | Static Drain-Source On-Resistance ² | V _{GS} =10V, I _D =30A | --- | --- | 6.5 | mΩ |
| | | V _{GS} =4.5V, I _D =20A | --- | --- | 8.5 | |
| V _{GS(th)} | Gate Threshold Voltage | V _{GS} =V _{DS} , I _D =250uA | 1.2 | --- | 2.5 | V |
| ΔV _{GS(th)} | V _{GS(th)} Temperature Coefficient | | --- | -5.84 | --- | mV/°C |
| I _{DSS} | Drain-Source Leakage Current | V _{DS} =32V, V _{GS} =0V, T _J =25°C | --- | --- | 1 | uA |
| | | V _{DS} =32V, V _{GS} =0V, T _J =55°C | --- | --- | 5 | |
| I _{GSS} | Gate-Source Leakage Current | V _{GS} =±20V, V _{DS} =0V | --- | --- | ±100 | nA |
| g _{fs} | Forward Transconductance | V _{DS} =5V, I _D =30A | --- | 50 | --- | S |
| R _g | Gate Resistance | V _{DS} =0V, V _{GS} =0V, f=1MHz | --- | 1.4 | --- | Ω |
| Q _g | Total Gate Charge (4.5V) | V _{DS} =32V, V _{GS} =4.5V, I _D =20A | --- | 30 | --- | nC |
| Q _{gs} | Gate-Source Charge | | --- | 7.2 | --- | |
| Q _{gd} | Gate-Drain Charge | | --- | 13 | --- | |
| T _{d(on)} | Turn-On Delay Time | V _{DD} =20V, V _{GS} =10V, R _G =3.3Ω I _D =20A | --- | 10 | --- | ns |
| T _r | Rise Time | | --- | 34 | --- | |
| T _{d(off)} | Turn-Off Delay Time | | --- | 56 | --- | |
| T _f | Fall Time | | --- | 14.5 | --- | |
| C _{iss} | Input Capacitance | V _{DS} =15V, V _{GS} =0V, f=1MHz | --- | 3415 | --- | pF |
| C _{oss} | Output Capacitance | | --- | 282 | --- | |
| C _{rss} | Reverse Transfer Capacitance | | --- | 210 | --- | |

Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------------|--|---|------|------|------|------|
| I _S | Continuous Source Current ^{1,5} | V _G =V _D =0V, Force Current | --- | --- | 90 | A |
| I _{SM} | Pulsed Source Current ^{2,5} | | --- | --- | 270 | A |
| V _{SD} | Diode Forward Voltage ² | V _{GS} =0V, I _S =1A, T _J =25°C | --- | --- | 1 | V |
| t _{rr} | Reverse Recovery Time | I _F =30A, di/dt=100A/μs, T _J =25°C | --- | 4.5 | --- | nS |
| Q _{rr} | Reverse Recovery Charge | | --- | 0.5 | --- | nC |

Note :

- 1.The data tested by surface mounted on a 1 inch² 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}=47A
- 4.The power dissipation is limited by 150°C 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

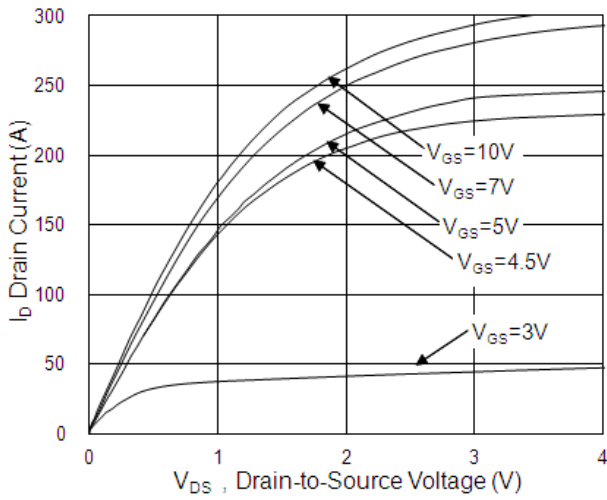


Fig.1 Typical Output Characteristics

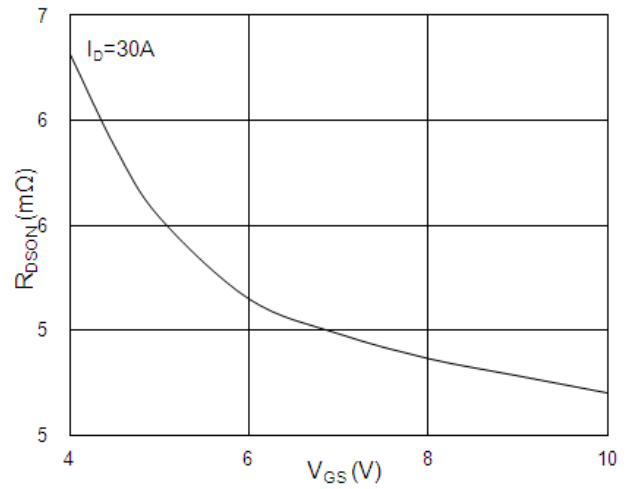


Fig.2 On-Resistance vs. G-S Voltage

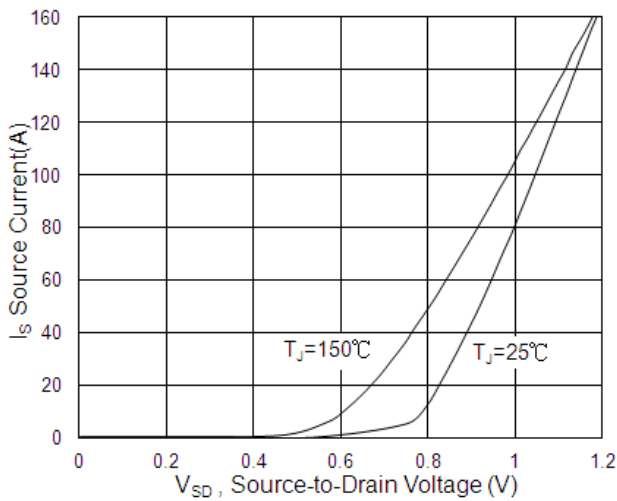


Fig.3 Forward Characteristics Of Reverse

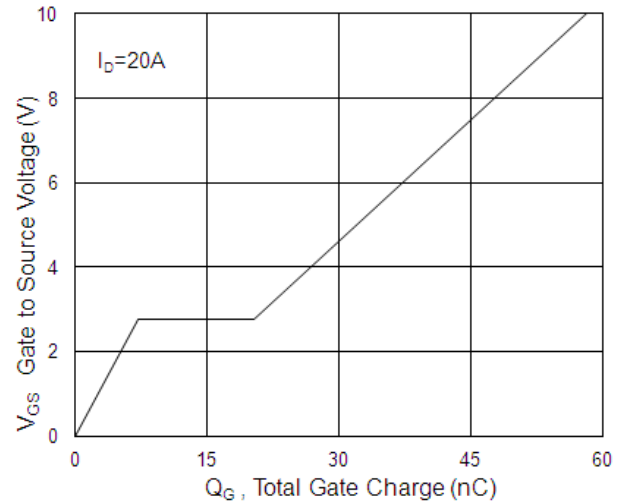


Fig.4 Gate-Charge Characteristics

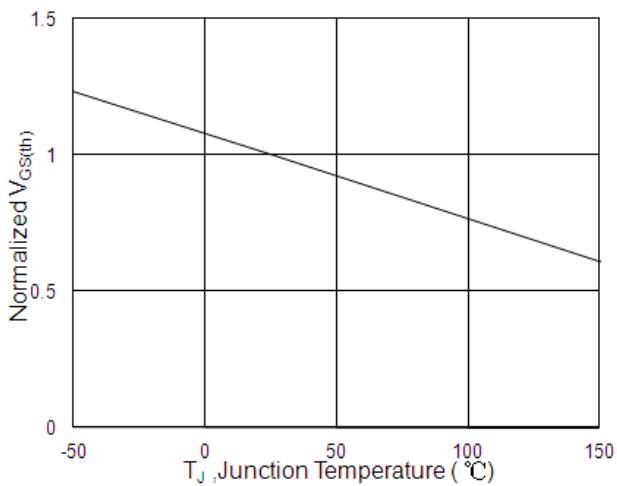


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

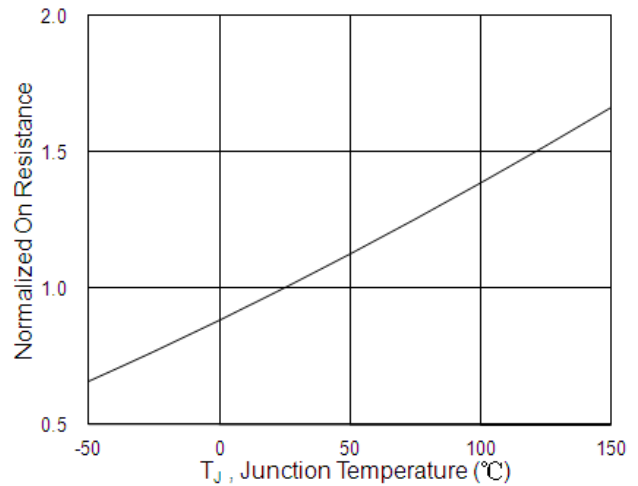


Fig.6 Normalized R_{DSON} vs. T_J

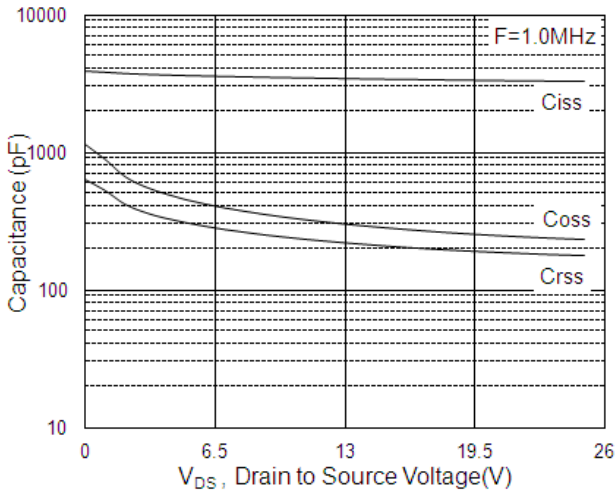


Fig.7 Capacitance

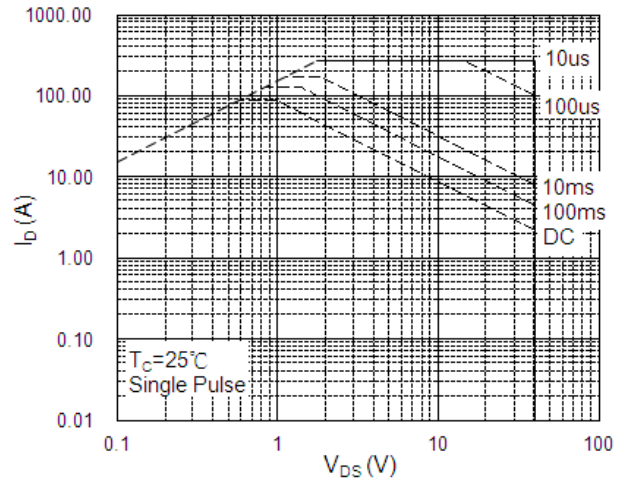


Fig.8 Safe Operating Area

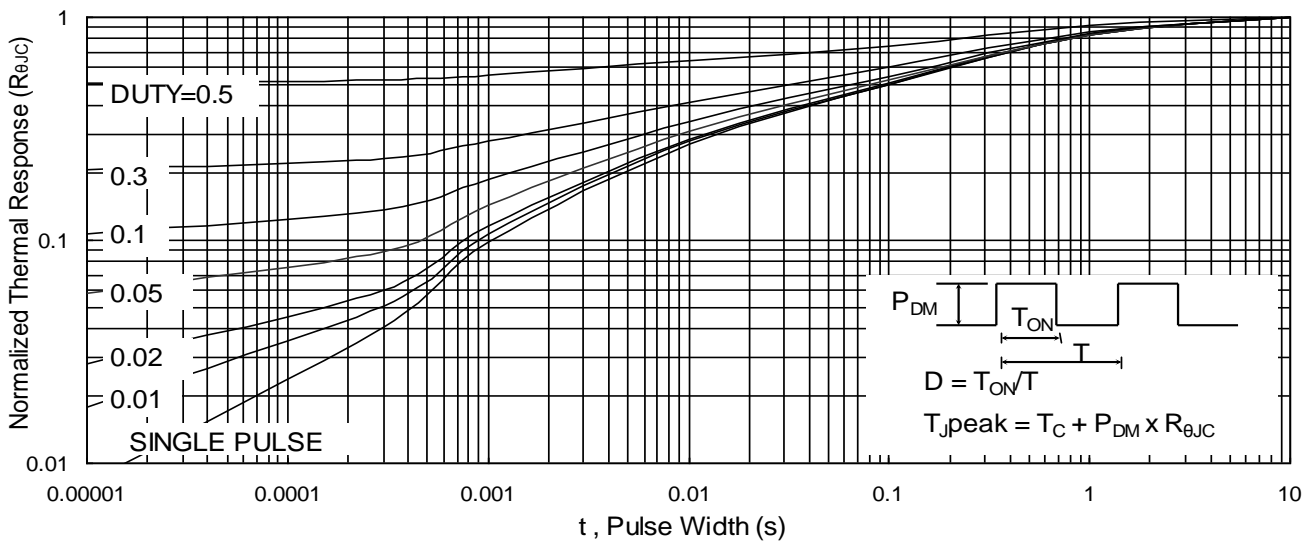


Fig.9 Normalized Maximum Transient Thermal Impedance

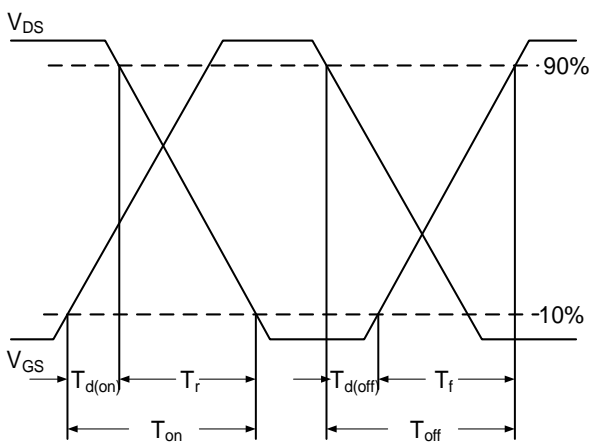


Fig.10 Switching Time Waveform

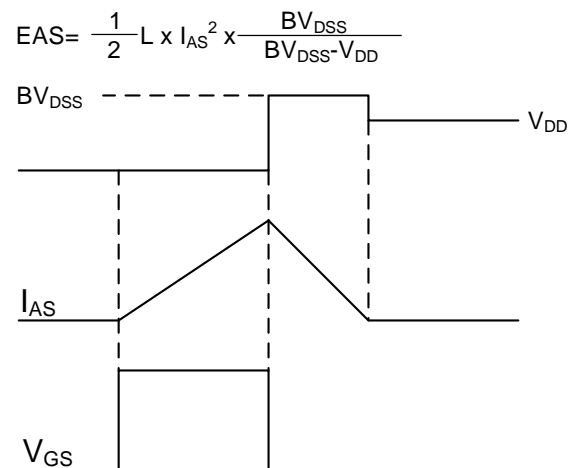


Fig.11 Unclamped Inductive Switching Waveform