

Features

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

Description

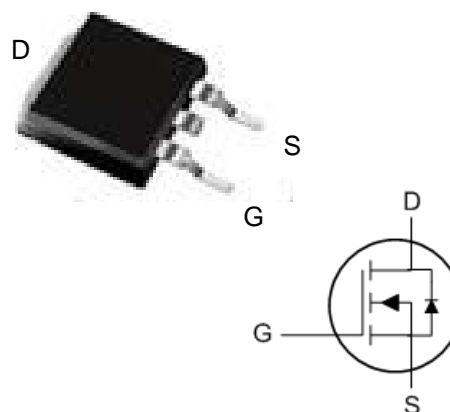
The D60N04M is the high cell density trenched N-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The D60N04M meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

Product Summary

| BVDSS | RDSON | ID |
|-------|-------|-----|
| 40V | 7.5mΩ | 60A |

TO252 Pin Configuration



Absolute Maximum Ratings

| Symbol | Parameter | Rating | Units |
|-----------------------|--|------------|------------|
| V_{DS} | Drain-Source Voltage | 40 | V |
| V_{GS} | Gate-Source Voltage | ± 20 | V |
| $I_D@T_C=25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V^1$ | 60 | A |
| $I_D@T_C=100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V^1$ | 45 | A |
| I_{DM} | Pulsed Drain Current ² | 120 | A |
| EAS | Single Pulse Avalanche Energy ³ | 76.1 | mJ |
| I_{AS} | Avalanche Current | 39 | A |
| $P_D@T_C=25^\circ C$ | Total Power Dissipation ⁴ | 44.6 | W |
| T_{STG} | Storage Temperature Range | -55 to 150 | $^\circ C$ |
| T_J | Operating Junction Temperature Range | -55 to 150 | $^\circ C$ |

Thermal Data

| Symbol | Parameter | Typ. | Max. | Unit |
|-----------------|---|------|------|--------------|
| $R_{\theta JA}$ | Thermal Resistance Junction-ambient (Steady State) ¹ | --- | 62 | $^\circ C/W$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case ¹ | --- | 2.8 | $^\circ C/W$ |

D60N04M

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 =12A | --- | --- | 7.5 | mΩ |
| | | V _{GS} =4.5V, I _D =10A | --- | --- | 10 | |
| V _{GS(th)} | Gate Threshold Voltage | V _{GS} =V _{DS} , I _D =250uA | 1.0 | --- | 2.5 | V |
| ΔV _{GS(th)} | V _{GS(th)} Temperature Coefficient | | --- | -4.96 | --- | 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 =12A | --- | 39 | --- | S |
| R _g | Gate Resistance | V _{DS} =0V, V _{GS} =0V, f=1MHz | --- | 1.6 | --- | Ω |
| Q _g | Total Gate Charge (4.5V) | V _{DS} =20V, V _{GS} =4.5V, I _D =12A | --- | 18.8 | --- | nC |
| Q _{gs} | Gate-Source Charge | | --- | 4.7 | --- | |
| Q _{gd} | Gate-Drain Charge | | --- | 8.2 | --- | |
| T _{d(on)} | Turn-On Delay Time | V _{DD} =15V, V _{GS} =10V, R _G =3.3Ω I _D =1A | --- | 14.3 | --- | ns |
| T _r | Rise Time | | --- | 2.6 | --- | |
| T _{d(off)} | Turn-Off Delay Time | | --- | 77 | --- | |
| T _f | Fall Time | | --- | 4.8 | --- | |
| C _{iss} | Input Capacitance | V _{DS} =15V, V _{GS} =0V, f=1MHz | --- | 2332 | --- | pF |
| C _{oss} | Output Capacitance | | --- | 193 | --- | |
| C _{rss} | Reverse Transfer Capacitance | | --- | 138 | --- | |
| Diode Characteristics | | | | | | |
| I _S | Continuous Source Current ^{1,5} | V _G =V _D =0V, Force Current | --- | --- | 60 | A |
| I _{SM} | Pulsed Source Current ^{2,5} | | --- | --- | 120 | A |
| V _{SD} | Diode Forward Voltage ² | V _{GS} =0V, I _S =1A, T _J =25°C | --- | --- | 1 | V |

Note :

- 1.The data tested by surface mounted on a 1 inch² FR-4 board with 20Z 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}=39A
- 4.The power dissipation is limited by 150°C junction temperature
- 5.The data is theoretically the same as I_D and I_S , in real applications , should be limited by total power dissipation.

Typical Characteristics

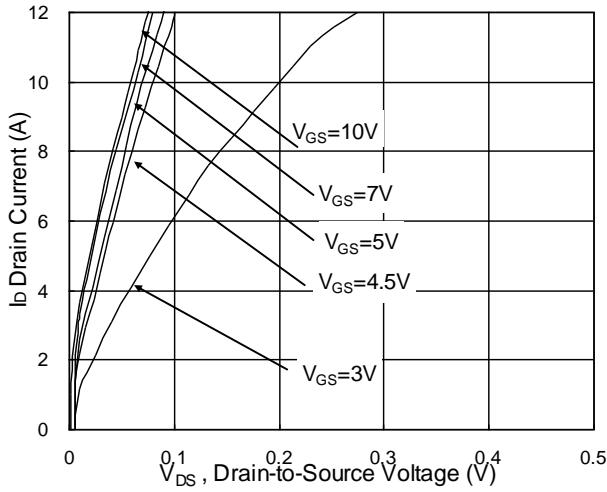


Fig.1 Typical Output Characteristics

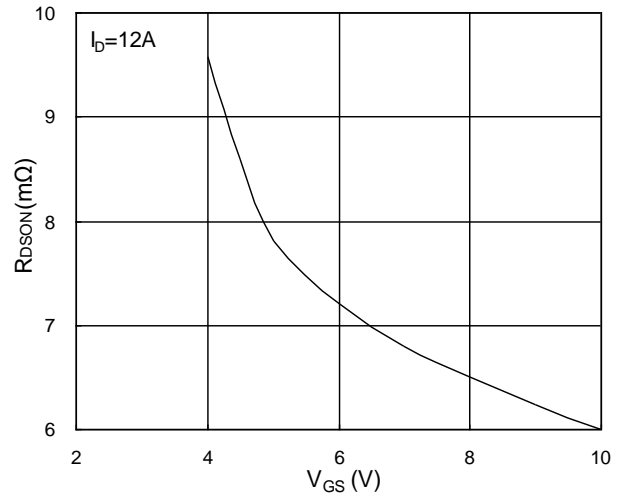


Fig.2 On-Resistance vs. G-S Voltage

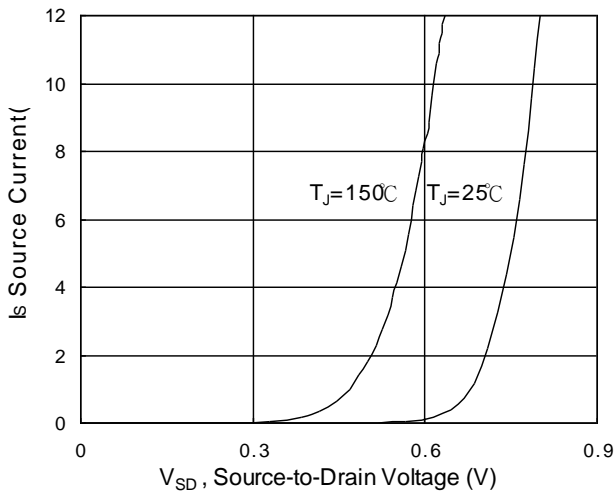


Fig.3 Forward Characteristics of Reverse

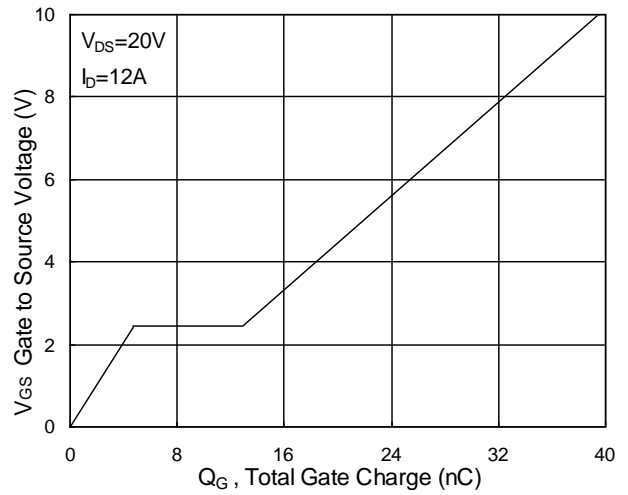


Fig.4 Gate-Charge Characteristics

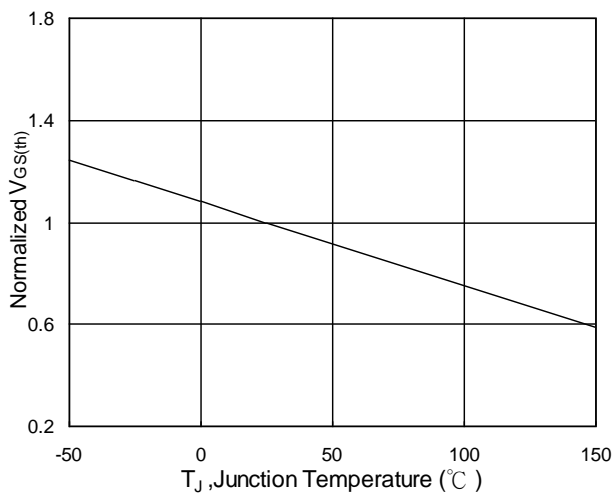


Fig.5 Normalized V_{GS(th)} vs. T_J

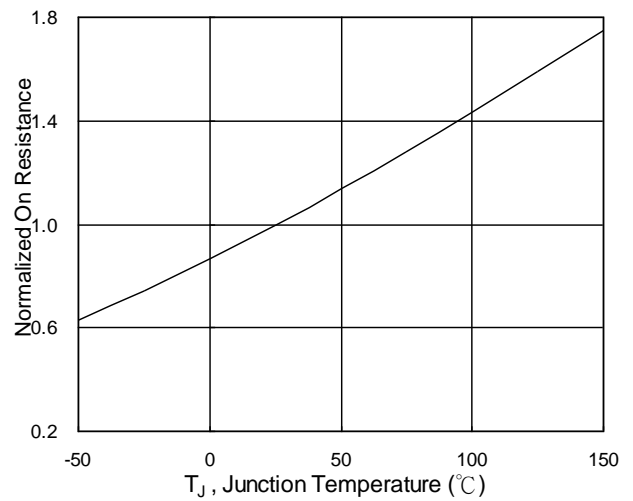


Fig.6 Normalized R_{DS(on)} vs. T_J

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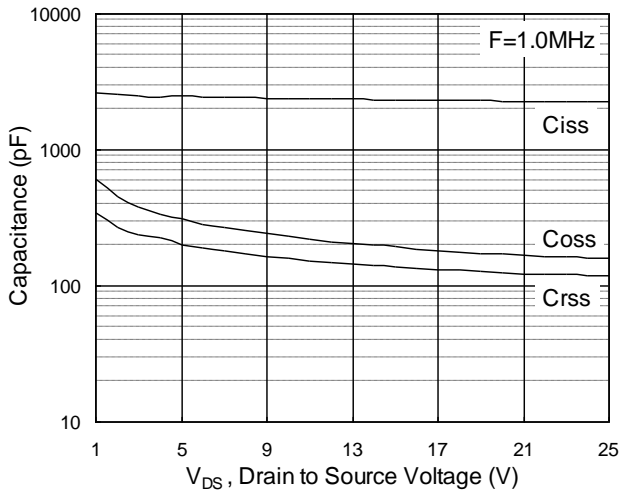


Fig.7 Capacitance

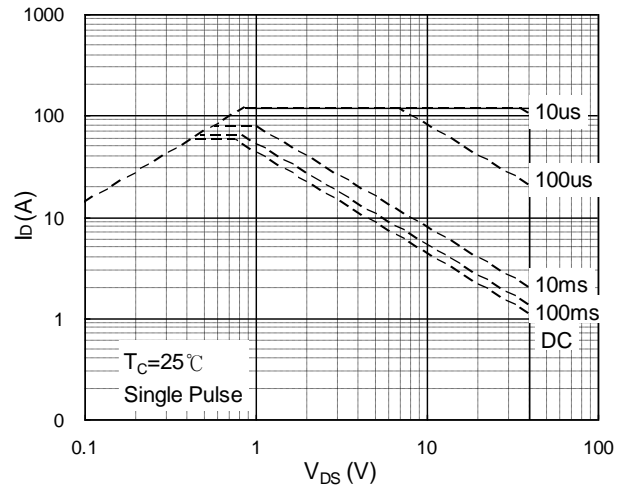


Fig.8 Safe Operating Area

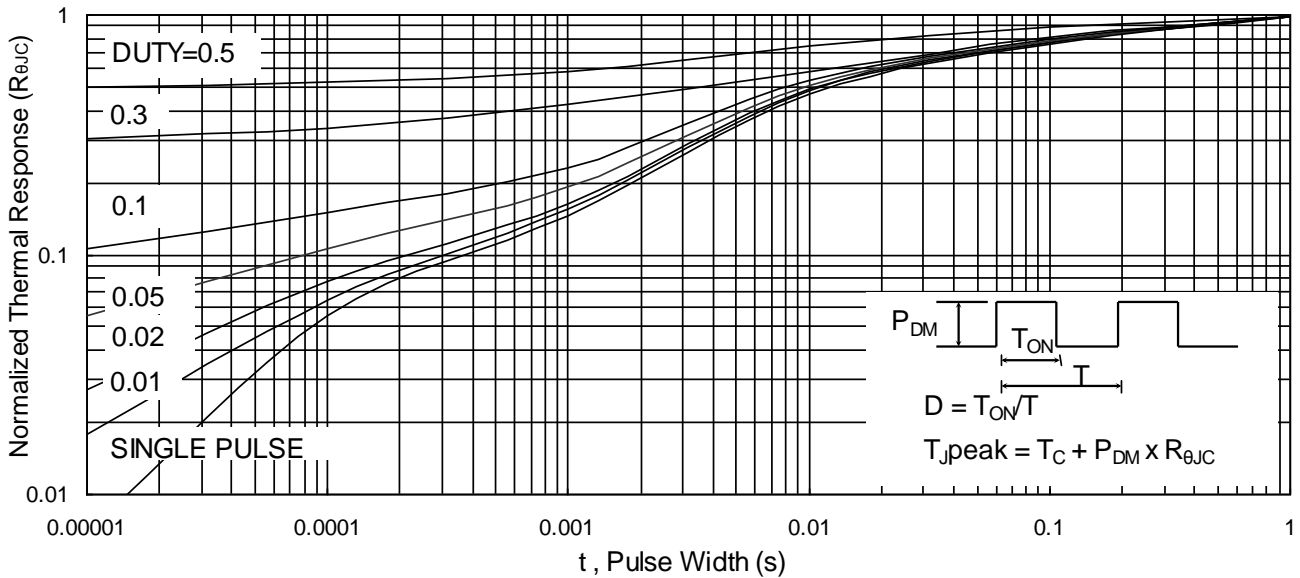


Fig.9 Normalized Maximum Transient Thermal Impedance

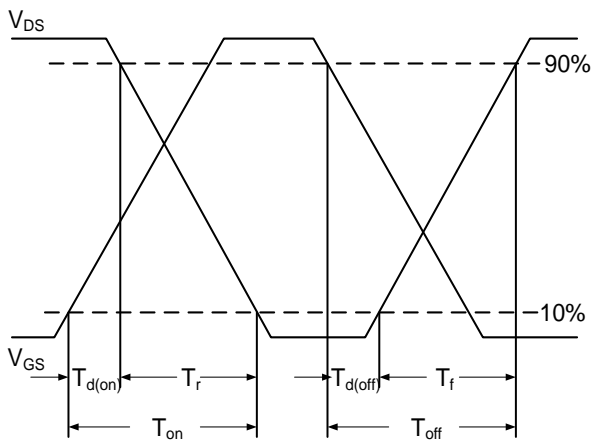


Fig.10 Switching Time Waveform

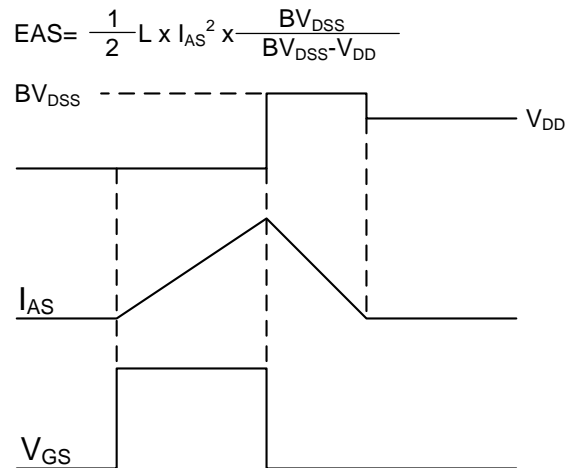
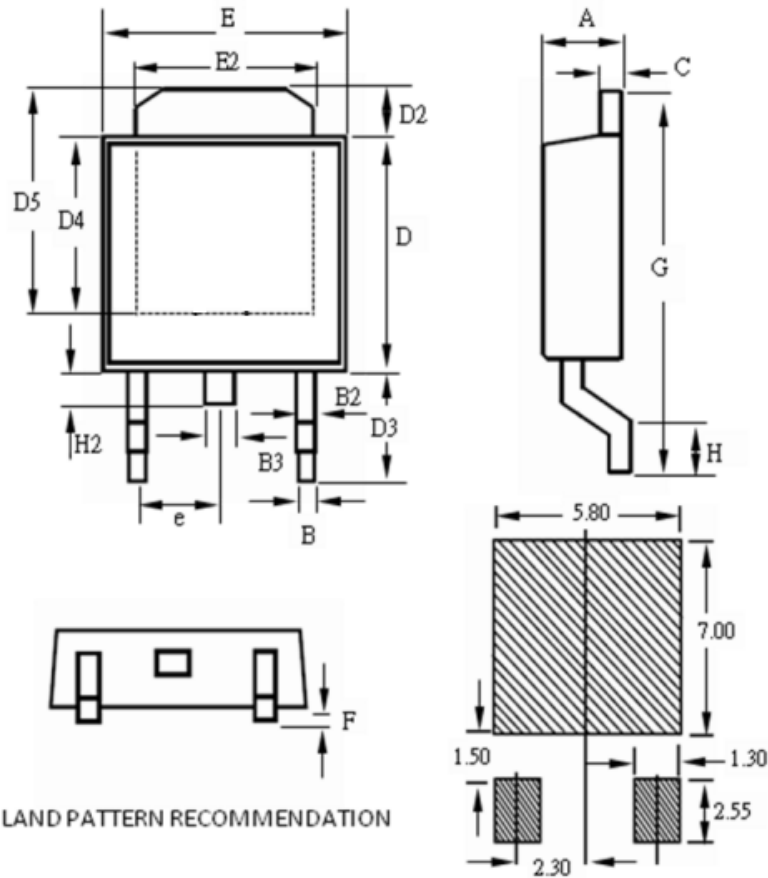


Fig.11 Unclamped Inductive Waveform

TO-252 Package Outline



| SYMBOLS | MILLIMETERS | | | INCHES | | |
|---------|-------------|------|-------|--------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 2.10 | -- | 2.50 | 0.083 | -- | 0.098 |
| B | 0.30 | -- | 0.89 | 0.012 | -- | 0.035 |
| B2 | 0.40 | -- | 1.14 | 0.016 | -- | 0.045 |
| B3 | 0.60 | -- | 1.00 | 0.024 | -- | 0.039 |
| C | 0.40 | -- | 0.89 | 0.016 | -- | 0.035 |
| D | 5.30 | -- | 6.25 | 0.209 | -- | 0.246 |
| D2 | 0.50 | -- | 1.70 | 0.020 | -- | 0.067 |
| D3 | 2.20 | -- | 3.40 | 0.087 | -- | 0.134 |
| D4 | 4.32 | -- | -- | 0.170 | -- | -- |
| D5 | 5.21 | -- | -- | 0.205 | -- | -- |
| E | 6.30 | -- | 6.73 | 0.248 | -- | 0.265 |
| E2 | 4.80 | -- | 5.46 | 0.189 | -- | 0.215 |
| F | 0.00 | -- | 0.30 | 0.000 | -- | 0.012 |
| G | 9.20 | -- | 10.41 | 0.362 | -- | 0.410 |
| H | 0.90 | -- | 1.95 | 0.035 | -- | 0.077 |
| H2 | 0.50 | -- | 1.10 | 0.020 | -- | 0.043 |
| e | -- | 2.30 | -- | -- | 0.091 | -- |

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