

General Description

The WSF4060 is the highest performance trench N-Ch MOSFET with extreme high cell density, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications. The WSF4060 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

Features

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

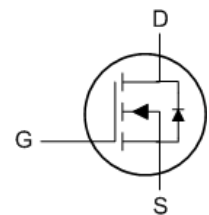
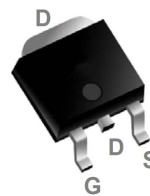
Product Summary

| BVDSS | RDSON | ID |
|-------|-------|-----|
| 40V | 7.2mΩ | 60A |

Applications

- High Frequency Point-of-Load Synchronous Buck Converter
- Networking DC-DC Power System
- Power Tool Application

TO-252 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, $V_{GS} @ 10V$ | 60 | A |
| $I_D@T_C=100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 48 | A |
| I_{DM} | Pulsed Drain Current ^a | 160 | A |
| EAS | Single Pulse Avalanche Energy ^b | 100 | mJ |
| I_{AS} | Avalanche Current | 60 | A |
| $P_D@T_a=25^\circ C$ | Total Power Dissipation | 3.0 | 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 ¹ | --- | 50 | $^\circ C/W$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case ¹ | --- | 2.5 | $^\circ C/W$ |

Notes :

* Avalanche single pulse test and avalanche period time $t_{av} \leq 100 \mu s$, duty < 1% .

** Avalanche test condition: $T_J=25^\circ C$, $L=0.5mH$, $I_{AS}=20A$, $V_{DD}=30V$, and $V_{GS}=10V$.

*** Current limited by bond wire.

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 | BV _{DSS} Temperature Coefficient | Reference to 25°C, I _D =1mA | --- | 0.043 | --- | V/°C |
| R _{DS(ON)} | Static Drain-Source On-Resistance ² | V _{GS} =10V, I _D =20A | --- | 7.2 | 9.0 | mΩ |
| R _{DS(ON)} | Static Drain-Source On-Resistance ² | V _{GS} =4.5V, I _D =10A | --- | 9.2 | 13 | mΩ |
| V _{GS(th)} | Gate Threshold Voltage | V _{GS} =V _{DS} , I _D =250uA | 1.2 | 1.6 | 2.5 | V |
| ΔV _{GS(th)} | V _{GS(th)} Temperature Coefficient | | --- | -6.94 | --- | mV/°C |
| I _{DSS} | Drain-Source Leakage Current | V _{DS} =32V, V _{GS} =0V, T _J =25°C | --- | --- | 2 | uA |
| | | V _{DS} =32V, V _{GS} =0V, T _J =55°C | --- | --- | 10 | |
| I _{GSS} | Gate-Source Leakage Current | V _{GS} =±20V, V _{DS} =0V | --- | --- | ±100 | nA |
| g _{fs} | Forward Transconductance | V _{DS} =5V, I _D =20A | --- | 33 | --- | S |
| R _g | Gate Resistance | V _{DS} =0V, V _{GS} =0V, f=1MHz | --- | 1.4 | 2 | Ω |
| Q _g | Total Gate Charge (10V) | V _{DS} =20V, V _{GS} =10V, I _D =40A | --- | 32 | 44 | nC |
| Q _{gs} | Gate-Source Charge | | --- | 3.8 | --- | |
| Q _{gd} | Gate-Drain Charge | | --- | 9.0 | --- | |
| T _{d(on)} | Turn-On Delay Time | V _{DD} =30V, V _{GEN} =10V, R _G =1Ω, I _D =1A, RL=15Ω. | --- | 11 | 21 | ns |
| T _r | Rise Time | | --- | 13 | 24 | |
| T _{d(off)} | Turn-Off Delay Time | | --- | 37 | 67 | |
| T _f | Fall Time | | --- | 11 | 21 | |
| C _{iss} | Input Capacitance | V _{DS} =20V, V _{GS} =0V, f=1MHz | --- | 1460 | --- | pF |
| C _{oss} | Output Capacitance | | --- | 180 | --- | |
| C _{rss} | Reverse Transfer Capacitance | | --- | 146 | --- | |

Diode Characteristics

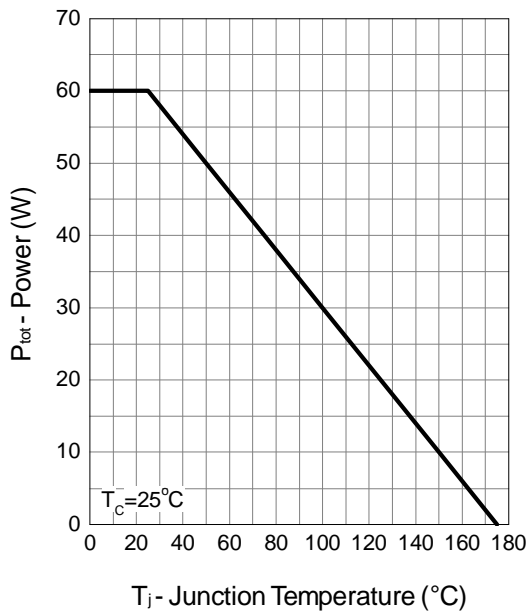
| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------------|--|--|------|------|------|------|
| I _S | Continuous Source Current ^{1,6} | V _G =V _D =0V, Force Current | --- | --- | 40 | A |
| I _{SM} | Pulsed Source Current ^{2,6} | | --- | --- | 100 | A |
| V _{SD} | Diode Forward Voltage ² | V _{GS} =0V, I _S =20A, T _J =25°C | --- | 0.8 | 1.3 | V |

Note :

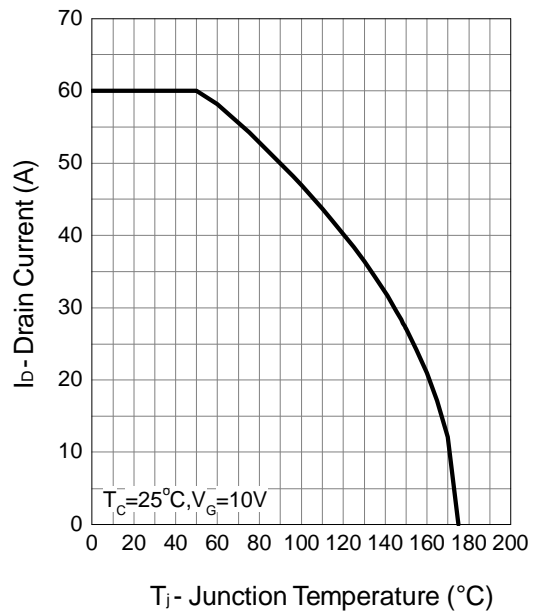
- 1.The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper, t<10sec .
- 2.The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3.The EAS data shows Max. rating . The test condition is V_{DD}=25V, V_{GS}=10V, L=0.5mH, I_{AS}=20A
- 4.The power dissipation is limited by 150°C junction temperature
- 5.The Min. value is 100% EAS tested guarantee.
- 6.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.
- 7.Package limitation current is 60A.

Typical Characteristics

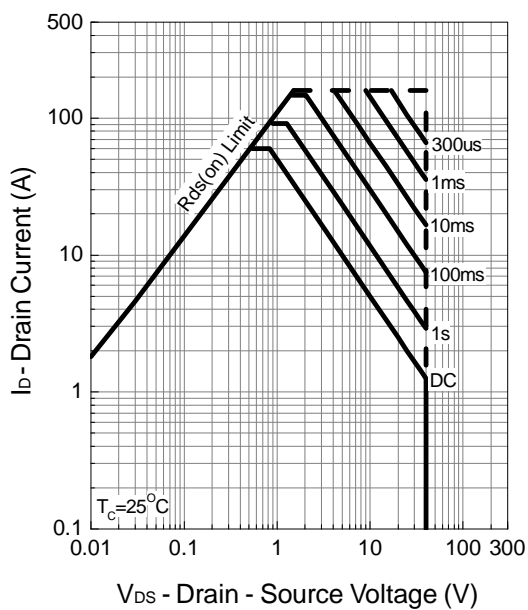
Power Dissipation



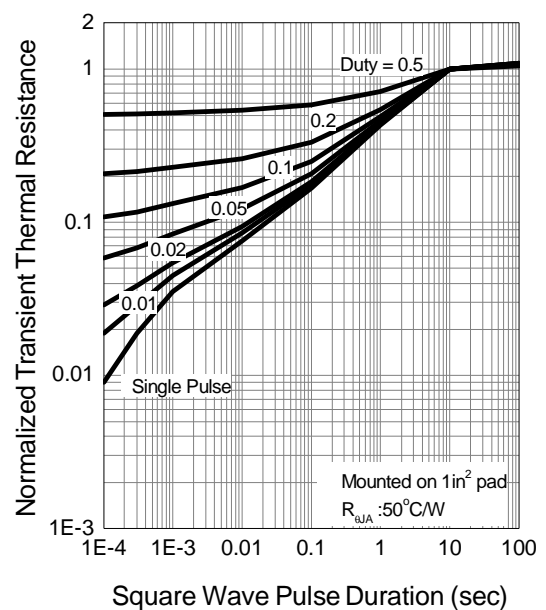
Drain Current



Safe Operation Area

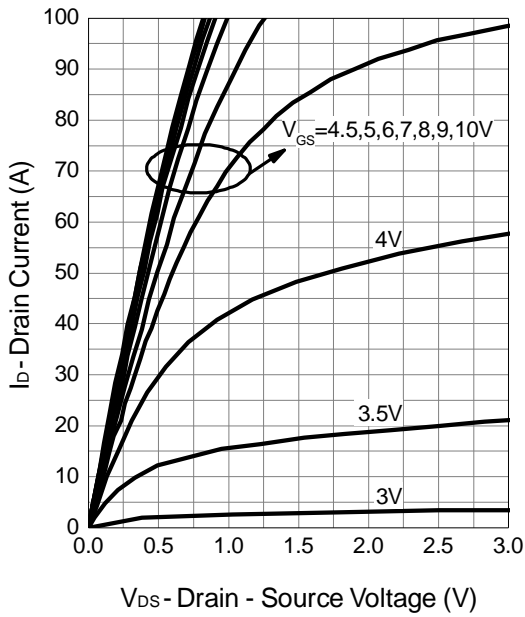


Thermal Transient Impedance

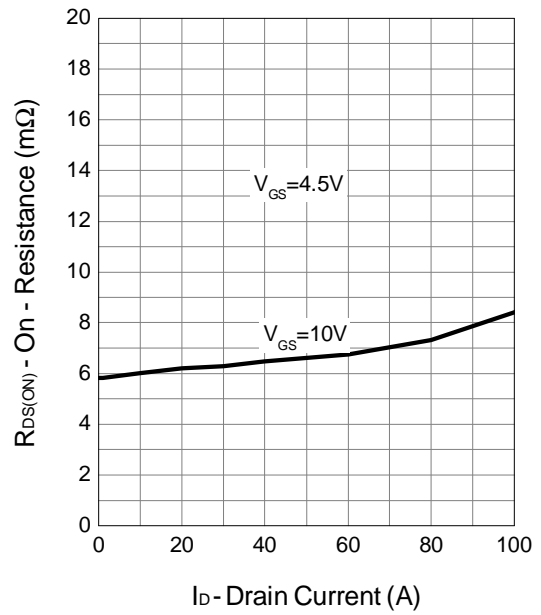


Typical Characteristics

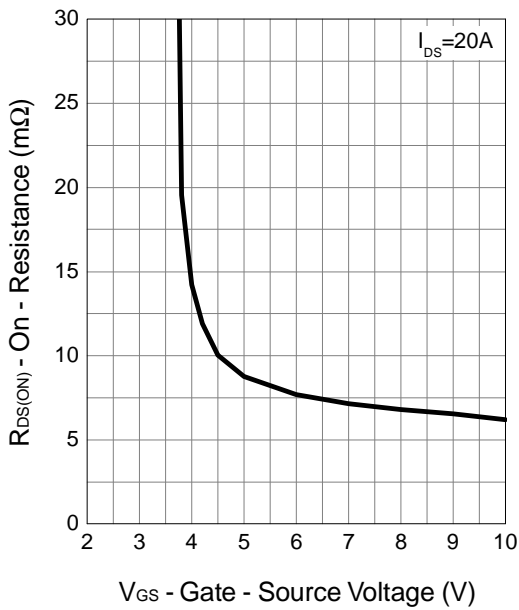
Output Characteristics



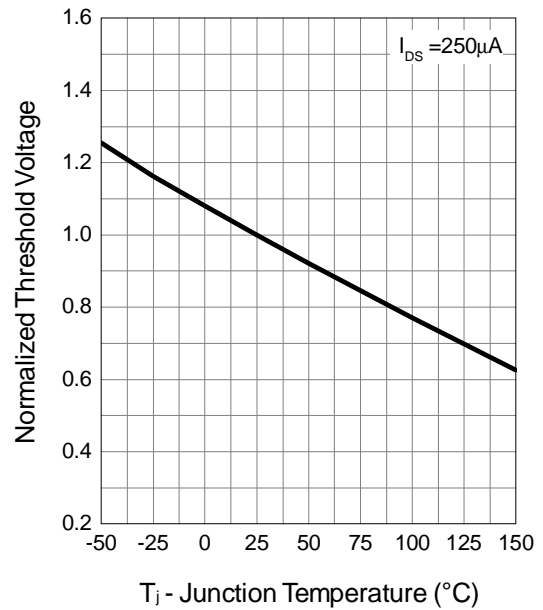
Drain-Source On Resistance



Gate-Source On Resistance

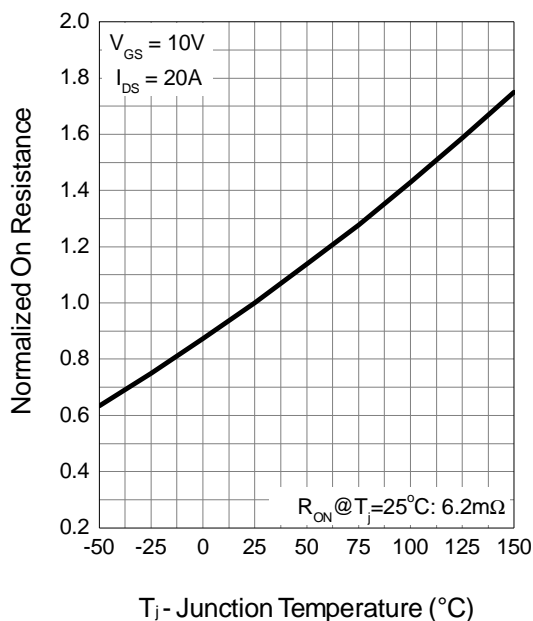


Gate Threshold Voltage

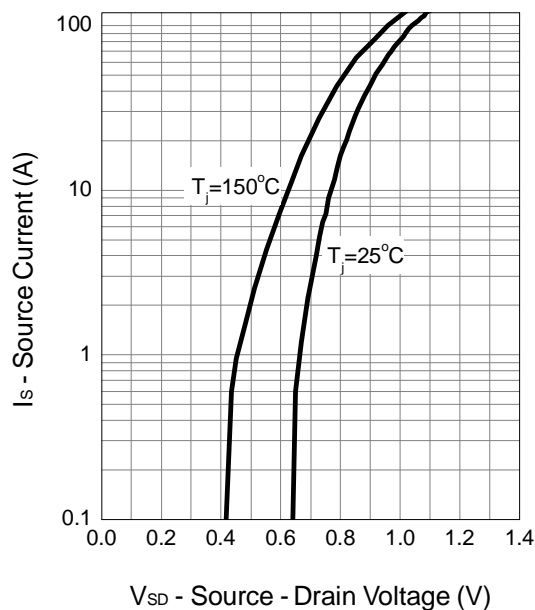


Typical Characteristics

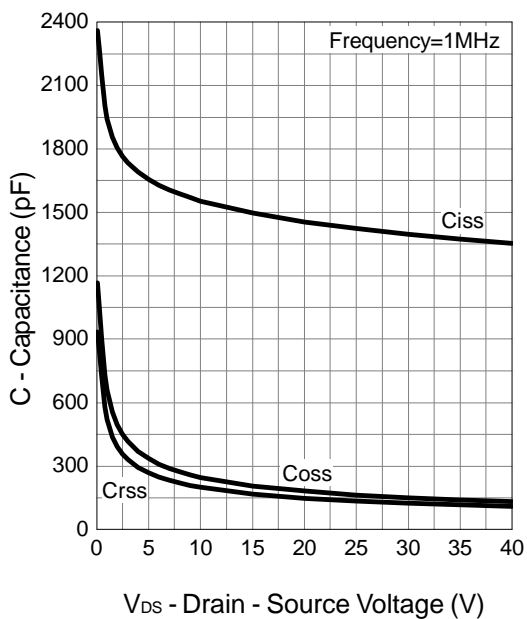
Drain-Source On Resistance



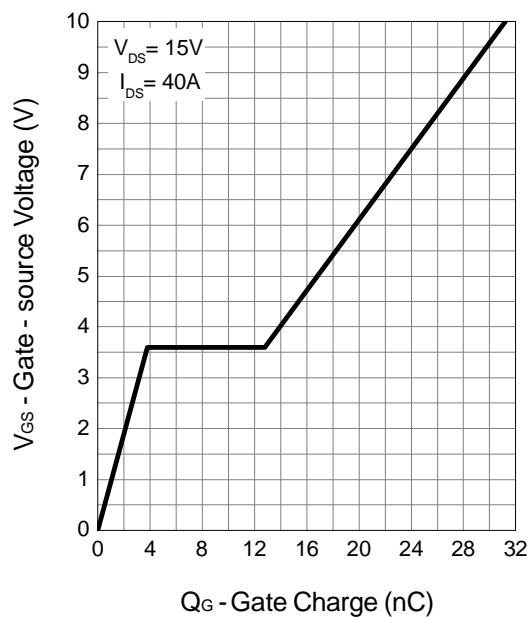
Source-Drain Diode Forward



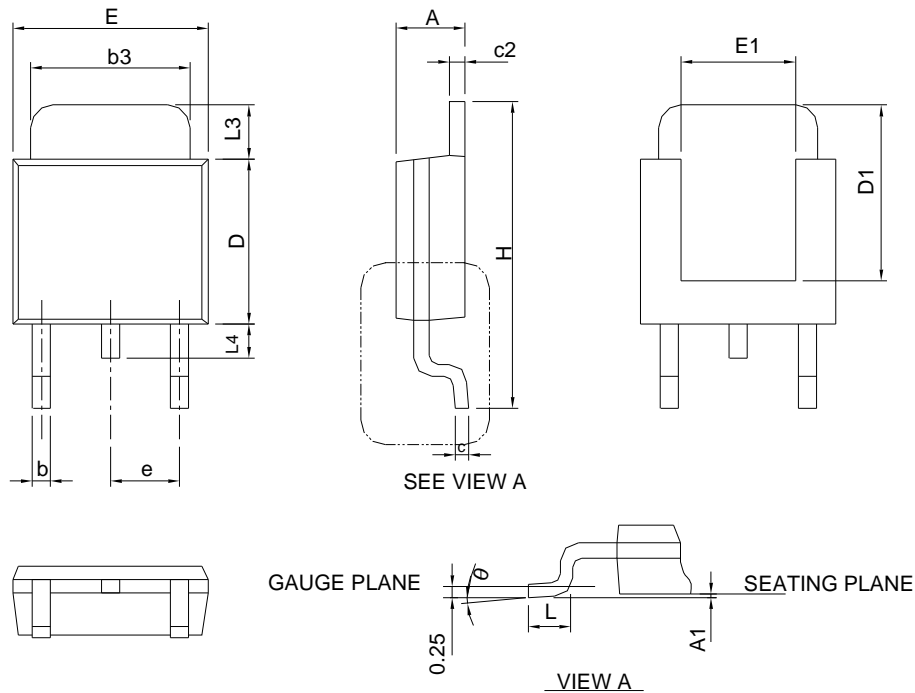
Capacitance



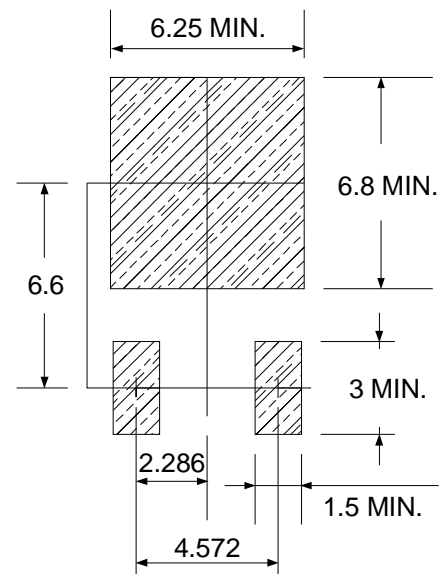
Gate Charge



Package Information

TO-252-3


| DIMENSIONS | TO-252-3 | | | |
|------------|-------------|-------|-----------|-------|
| | MILLIMETERS | | INCHES | |
| | MIN. | MAX. | MIN. | MAX. |
| A | 2.18 | 2.39 | 0.086 | 0.094 |
| A1 | - | 0.13 | - | 0.005 |
| b | 0.50 | 0.89 | 0.020 | 0.035 |
| b3 | 4.95 | 5.46 | 0.195 | 0.215 |
| c | 0.46 | 0.61 | 0.018 | 0.024 |
| c2 | 0.46 | 0.89 | 0.018 | 0.035 |
| D | 5.33 | 6.22 | 0.210 | 0.245 |
| D1 | 4.57 | 6.00 | 0.180 | 0.236 |
| E | 6.35 | 6.73 | 0.250 | 0.265 |
| E1 | 3.81 | 6.00 | 0.150 | 0.236 |
| e | 2.29 BSC | | 0.090 BSC | |
| H | 9.40 | 10.41 | 0.370 | 0.410 |
| L | 0.90 | 1.78 | 0.035 | 0.070 |
| L3 | 0.89 | 2.03 | 0.035 | 0.080 |
| L4 | - | 1.02 | - | 0.040 |
| θ | 0° | 8° | 0° | 8° |

RECOMMENDED LAND PATTERN


UNIT: mm

Note : Follow JEDEC TO-252 .

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