

General Description

The WSD6056DN56 is the highest performance trench Dual N-Channel MOSFET with extreme high cell density, which provide excellent $R_{DS(ON)}$ and gate charge for most of the synchronous buck converter applications.

The WSD6056DN56 meet the RoHS and Green Product requirement 100% E_{AS} guaranteed with full function reliability approved.

Features

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

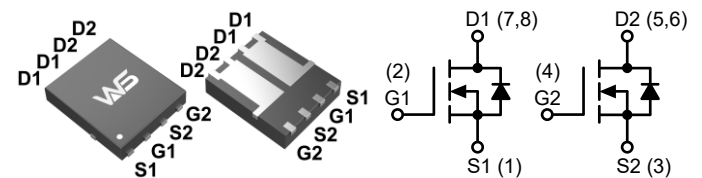
Product Summary

| BV_{DSS} | $R_{DS(ON)}$ | I_D |
|------------|--------------|-------|
| 60V | 16m Ω | 45A |

Applications

- High Frequency Point-of-Load Synchronous Buck Converter for MB/NB/UMPC/VGA
- Fast switching
- Load Switch

DFN5X6-8L Pin Configuration



Absolute Maximum Ratings

| Symbol | Parameter | | Rating | Units |
|-----------------|--|---------------------------|------------|---------------|
| V_{DS} | Drain-Source Voltage | | 60 | V |
| V_{GS} | Gate-Source Voltage | | ± 20 | |
| T_J | Maximum Junction Temperature | | 150 | $^{\circ}C$ |
| T_{STG} | Storage Temperature Range | | -55 to 150 | |
| I_S | Diode Continuous Forward Current | $T_C=25^{\circ}C$ | 45 | A |
| I_D | Continuous Drain Current | $T_C=25^{\circ}C$ | 45 | A |
| | | $T_C=70^{\circ}C$ | 28.5 | |
| I_{DM}^b | Pulse Drain Current Tested | $T_C=25^{\circ}C$ | 180 | A |
| P_D | Maximum Power Dissipation | $T_C=25^{\circ}C$ | 67 | W |
| | | $T_C=70^{\circ}C$ | 45 | |
| $R_{\theta JL}$ | Thermal Resistance-Junction to Lead | Steady State | 5 | $^{\circ}C/W$ |
| $R_{\theta JA}$ | Thermal Resistance-Junction to Ambient | $t \leq 10s$ | 45 | $^{\circ}C/W$ |
| | | Steady State ^b | 90 | |
| I_{AS}^d | Avalanche Current, Single pulse | $L=0.5mH$ | 20 | A |
| E_{AS}^d | Avalanche Energy, Single pulse | $L=0.5mH$ | 20 | mJ |

Electrical Characteristics (T_J=25°C, Unless Otherwise Noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|----------------------------------|--|------|------|------|-------|
| Static Characteristics | | | | | | |
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} =0V, I _D =250μA | 60 | --- | --- | V |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} =60V, V _{GS} =0V | --- | --- | 1.0 | μA |
| | | T _J =85°C | --- | --- | 30 | |
| I _{GSS} | Gate Leakage Current | V _{GS} =±25V, V _{DS} =0V | --- | --- | ±100 | nA |
| V _{GS(th)} | Gate Threshold Voltage | V _{GS} =V _{DS} , I _{DS} =250μA | 1.2 | 1.5 | 2.5 | V |
| R _{DS(ON)} ³ | Drain-Source On-state Resistance | V _{GS} =10V, I _D =20A | --- | 16 | 20 | mΩ |
| | | V _{GS} =4.5V, I _D =15A | --- | 20 | 25 | |
| Diode Characteristics | | | | | | |
| V _{SD} | Diode Forward Voltage | I _{SD} =1A, V _{GS} =0V | --- | 0.75 | 1.2 | V |
| t _{rr} | Reverse Recovery Time | I _{SD} =20A, di _{SD} /dt=100A/μs | --- | 26 | --- | ns |
| Q _{rr} | Reverse Recovery Charge | | --- | 30 | --- | nC |
| Dynamic Characteristics ^{3,4} | | | | | | |
| R _g | Gate resistance | V _{GS} =0V, V _{DS} =0V, f=1.0MHz | --- | 0.9 | --- | Ω |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =30V, f=1.0MHz | --- | 945 | --- | pF |
| C _{oss} | Output Capacitance | | | | | |
| C _{rss} | Reverse Transfer Capacitance | | | | | |
| T _{d(on)} | Turn-on Delay Time | V _{DD} =30V, I _{DS} =1A V _{GEN} =10V, R _G =3.3Ω | --- | 10 | --- | ns |
| T _r | Turn-on Rise Time | | | | | |
| T _{d(off)} | Turn-off Delay Time | | | | | |
| T _f | Turn-on Fall Time | | | | | |
| Gate Charge Characteristics ^{3,4} | | | | | | |
| Q _g | Total Gate Charge | V _{DS} =30V, V _{GS} =10V, I _{DS} =20A | --- | 28 | --- | nC |
| Q _g | Total Gate Charge | | | | | |
| Q _{gth} | Threshold Gate Charge | | | | | |
| Q _{gs} | Gate-Source Charge | | | | | |
| Q _{gd} | Gate-Drain Charge | | | | | |

Note:

- a: Max. continuous current is limited by bonding wire.
- b: Pulse width limited by max. junction temperature.
- c: Surface mounted on 1in² pad area, steady state t = 999s.
- d: UIS tested and pulse width limited by maximum junction temperature 150°C (initial temperature T_J=25°C).

- 1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
- 2. V_{DD}=48V, V_{GS}=10V, L=0.1mH, I_{AS}=20A., R_G=25Ω Starting T_J=25°C
- 3. The data tested by pulsed, pulse width ≤ 300μs, duty cycle ≤ 2%.
- 4. Essentially independent of operating temperature.

Typical Characteristics

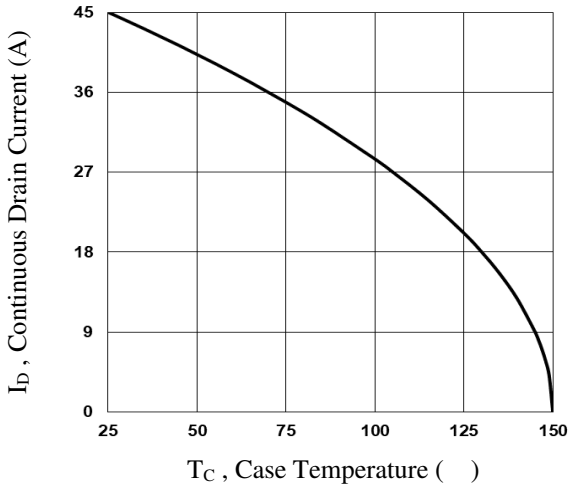


Fig.1 Continuous Drain Current vs. T_C

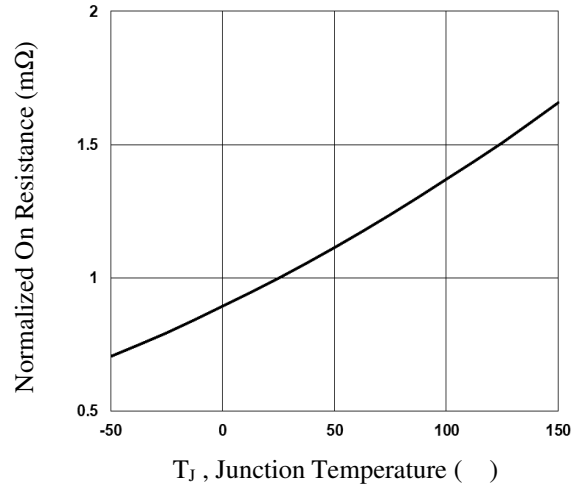


Fig.2 Normalized $R_{DS(on)}$ vs. T_J

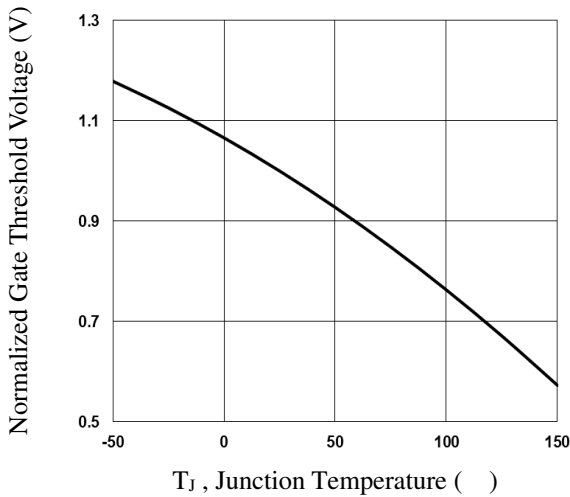


Fig.3 Normalized V_{th} vs. T_J

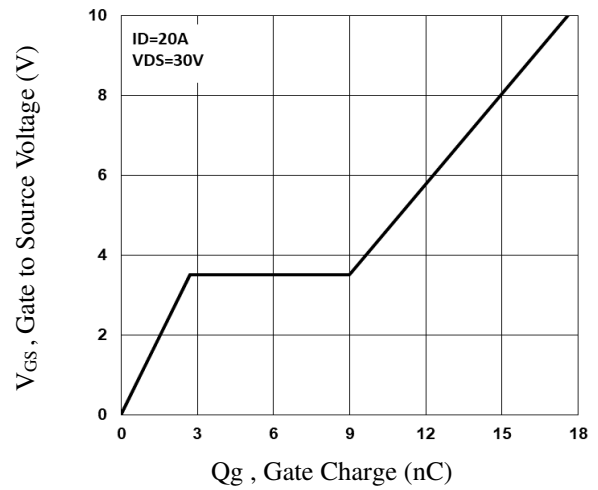


Fig.4 Gate Charge Waveform

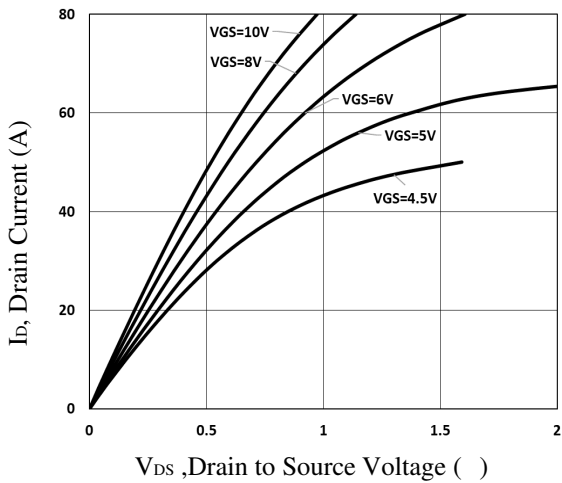


Fig.5 Typical Output Characteristics

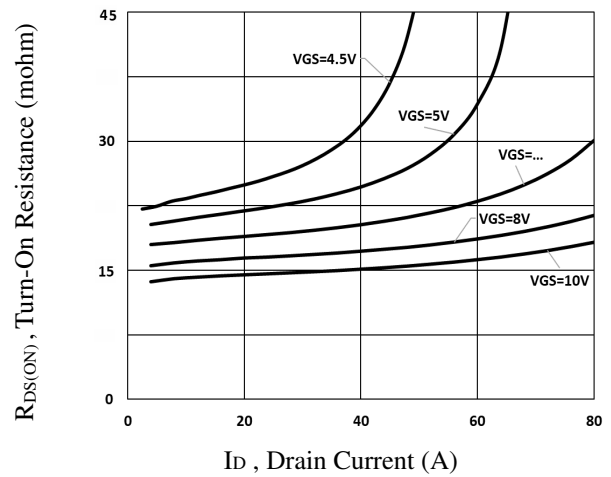


Fig.6 Turn-On Resistance vs. I_D

Typical Characteristics (Cont.)

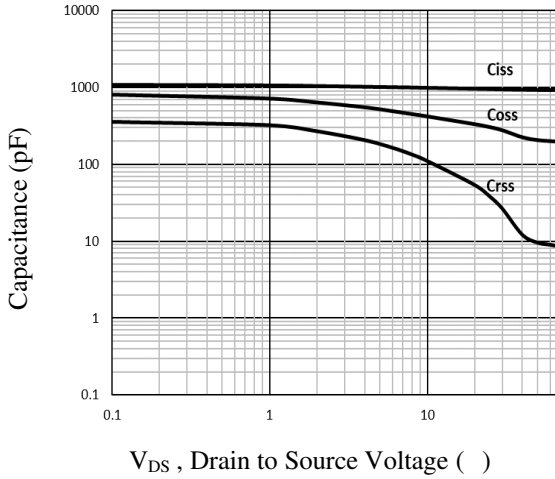


Fig.7 Capacitance Characteristics

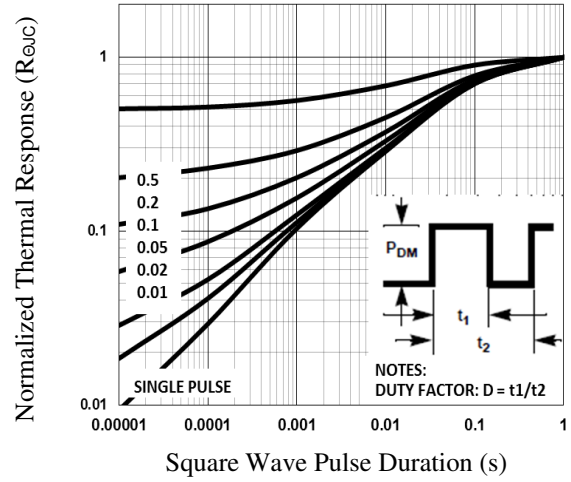


Fig.8 Normalized Transient Response

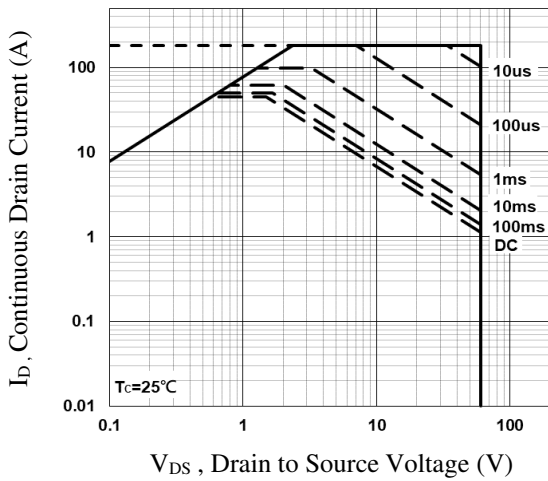


Fig.9 Maximum Safe Operation Area

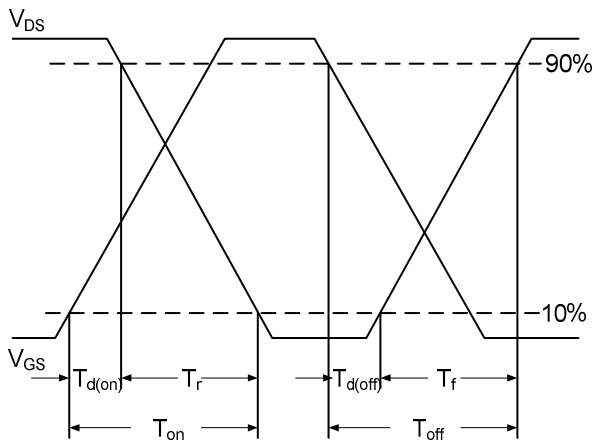


Fig.10 Switching Time Waveform

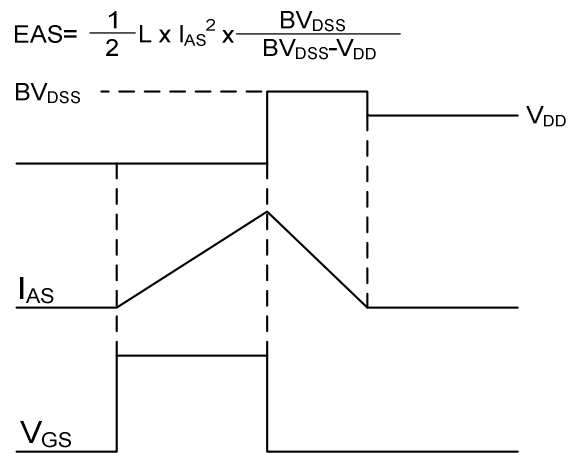
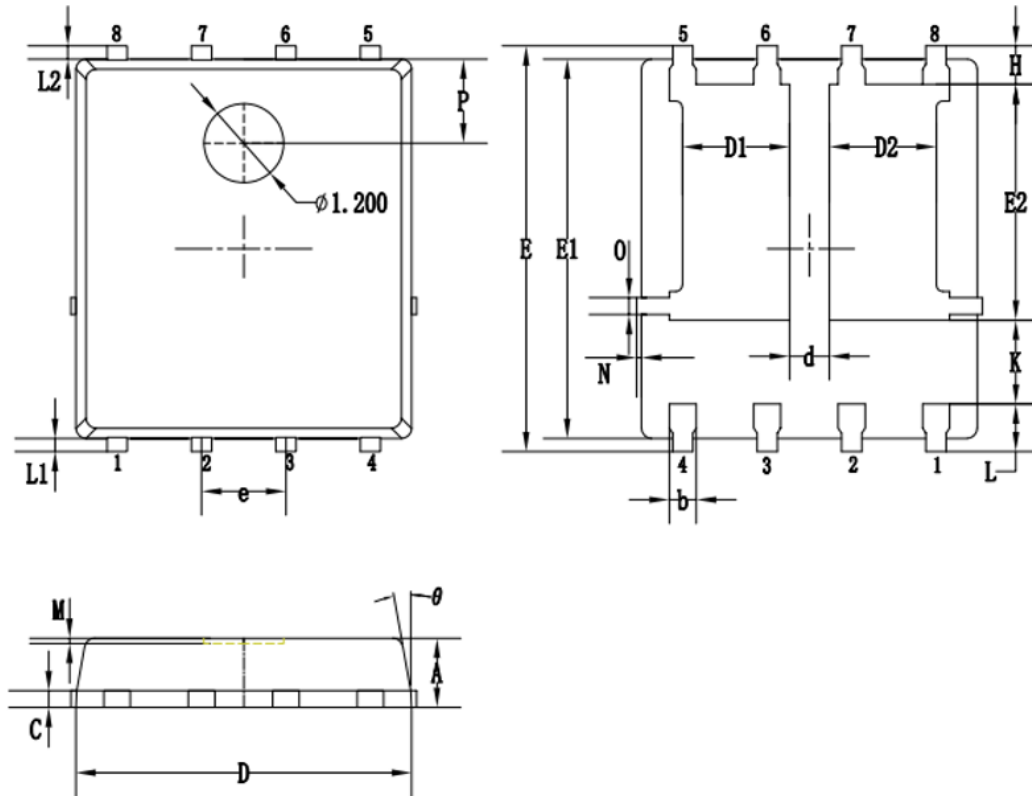


Fig.11 EAS Waveform

Packaging information


| SYMBOLS | MILLIMETERS | | |
|----------|-------------|------|------|
| | MIN. | NOM. | MAX. |
| A | 0.90 | 1.05 | 1.20 |
| b | 0.35 | 0.40 | 0.50 |
| C | 0.20 | 0.25 | 0.35 |
| D | 4.90 | 5.05 | 5.20 |
| D1/D2 | 1.51 | 1.61 | 1.71 |
| d | 0.50 | 0.60 | 0.70 |
| E | 6.00 | 6.15 | 6.30 |
| E1 | 5.60 | 5.75 | 5.90 |
| E2 | 3.47 | 3.57 | 3.67 |
| e | 1.27 BSC. | | |
| H | 0.48 | 0.58 | 0.68 |
| K | 1.17 | 1.27 | 1.37 |
| L | 0.64 | 0.74 | 0.84 |
| L1/L2 | 0.20 REF. | | |
| θ | 8° | 10° | 12° |
| M | 0.08 REF. | | |
| N | 0 | - | 0.15 |
| O | 0.25 REF. | | |
| P | 1.28 REF. | | |

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