

N-Ch 40V Fast Switching MOSFETs

Features

- Split Gate Trench MOSFET technology
- Excellent package for heat dissipation
- High density cell design for low $R_{DS(ON)}$

Applications

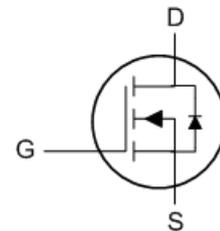
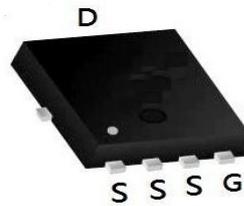
- DC-DC Converters
- Power management functions
- Synchronous-rectification applications

Product Summary



| BVDSS | RDSON | ID |
|-------|-------|-----|
| 40V | 6.9mΩ | 60A |

PDFN5060-8L 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 ¹ | 60 | A |
| $I_D@T_C=100^\circ C$ | Continuous Drain Current ¹ | 35 | A |
| I_{DM} | Pulsed Drain Current ² | 130 | A |
| EAS | Single Pulse Avalanche Energy ³ | 48 | mJ |
| I_{AS} | Avalanche Current | 35 | A |
| $P_D@T_C=25^\circ C$ | Total Power Dissipation ⁴ | 39 | 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 | --- | 60 | $^\circ C/W$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case ¹ | --- | 3.2 | $^\circ C/W$ |

Electrical Characteristics ($T_J=25\text{ }^\circ\text{C}$, unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|--------------|------------------------------------------------|-------------------------------------------------|------|------|-----------|------------|
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS}=0V, I_D=250\mu A$ | 40 | --- | --- | V |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance ² | $V_{GS}=10V, I_D=12A$ | --- | 6.9 | 8.5 | m Ω |
| | | $V_{GS}=4.5V, I_D=10A$ | --- | 10.0 | 15 | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}=V_{DS}, I_D=250\mu A$ | 1.35 | --- | 3 | V |
| I_{DSS} | Drain-Source Leakage Current | $V_{DS}=32V, V_{GS}=0V, T_J=25^\circ\text{C}$ | --- | --- | 1 | μA |
| | | $V_{DS}=32V, V_{GS}=0V, T_J=55^\circ\text{C}$ | --- | --- | 5 | |
| I_{GSS} | Gate-Source Leakage Current | $V_{GS}=\pm 20V, V_{DS}=0V$ | --- | --- | ± 100 | nA |
| R_g | Gate Resistance | $V_{DS}=0V, V_{GS}=0V, f=1\text{MHz}$ | --- | 1.7 | --- | Ω |
| Q_g | Total Gate Charge (4.5V) | $V_{DS}=20V, V_{GS}=4.5V, I_D=12A$ | --- | 5.8 | --- | nC |
| Q_{gs} | Gate-Source Charge | | --- | 3 | --- | |
| Q_{gd} | Gate-Drain Charge | | --- | 1.2 | --- | |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DD}=15V, V_{GS}=10V, R_G=3.3\Omega, I_D=1A$ | --- | 14.3 | --- | ns |
| T_r | Rise Time | | --- | 5.6 | --- | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 20 | --- | |
| T_f | Fall Time | | --- | 11 | --- | |
| C_{iss} | Input Capacitance | $V_{DS}=15V, V_{GS}=0V, f=1\text{MHz}$ | --- | 690 | --- | pF |
| C_{oss} | Output Capacitance | | --- | 193 | --- | |
| C_{riss} | Reverse Transfer Capacitance | | --- | 38 | --- | |

Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|----------|------------------------------------------|-------------------------------------------|------|------|------|------|
| I_S | Continuous Source Current ^{1,5} | $V_G=V_D=0V, \text{Force Current}$ | --- | --- | 60 | A |
| V_{SD} | Diode Forward Voltage ² | $V_{GS}=0V, I_S=1A, T_J=25^\circ\text{C}$ | --- | --- | 1 | V |

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 $\leq 300\mu s$, duty cycle $\leq 2\%$
- 3.The EAS data shows Max. rating . The test condition is $V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=31A$
- 4.The power dissipation is limited by 150 $^\circ\text{C}$ 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

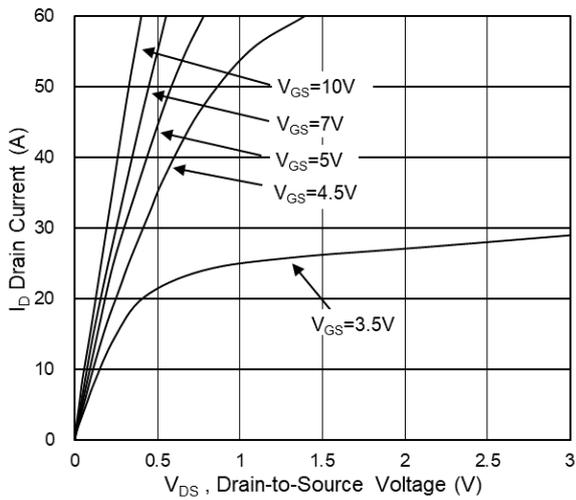


Fig.1 Typical Output Characteristics

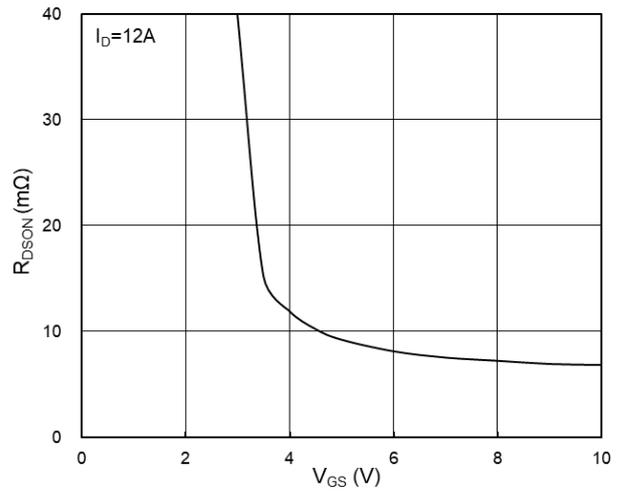


Fig.2 On-Resistance vs G-S Voltage

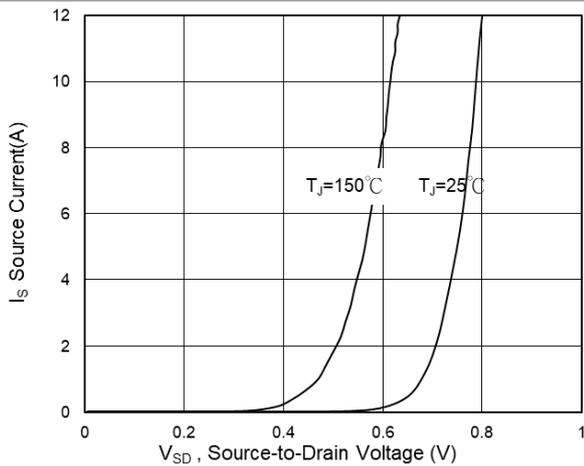


Fig.3 Source Drain Forward Characteristics

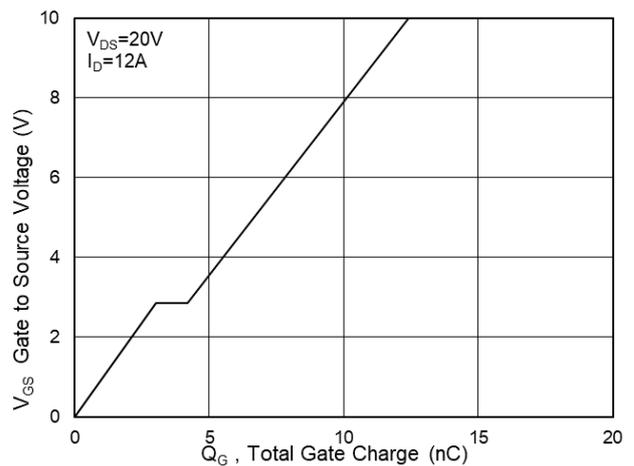


Fig.4 Gate-Charge Characteristics

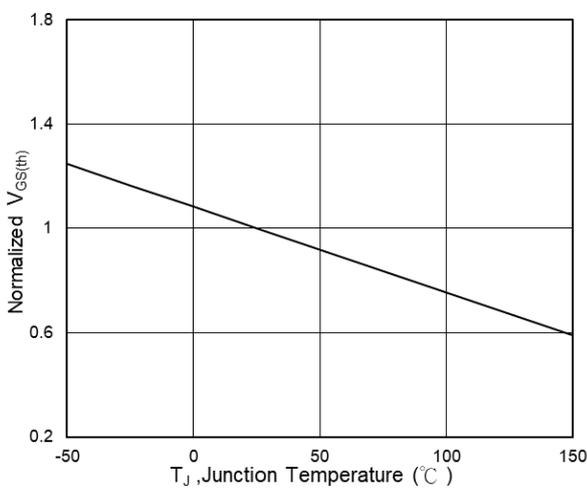


Fig.5 Normalized $V_{GS(th)}$ vs T_J

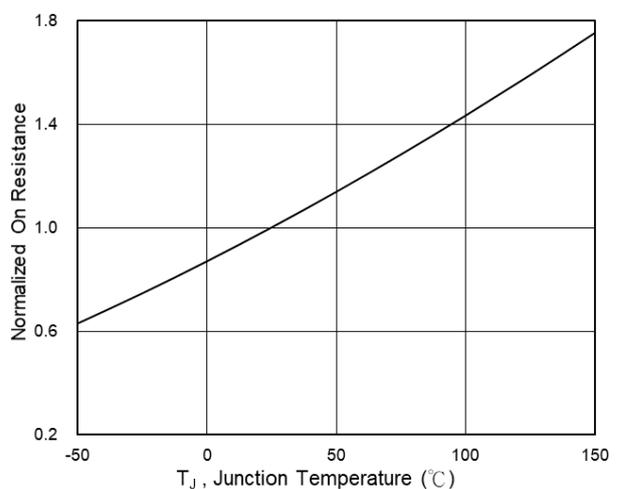


Fig.6 Normalized $R_{DS(on)}$ vs T_J

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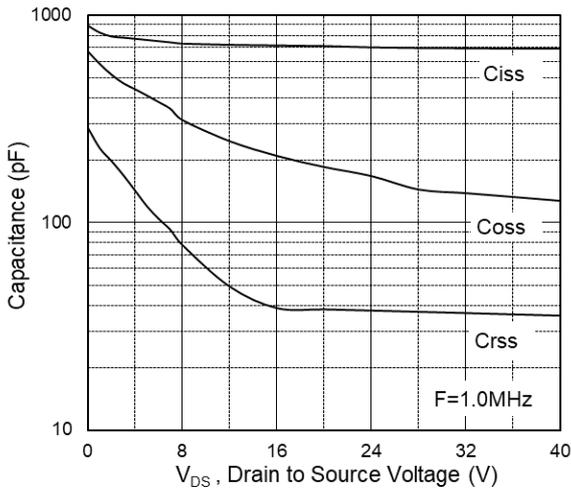


Fig.7 Capacitance

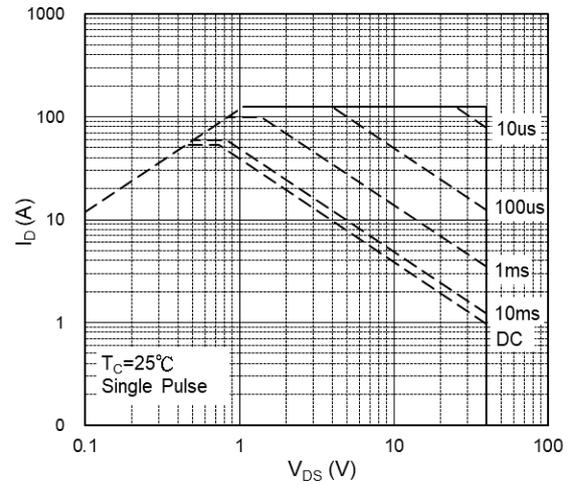


Fig.8 Safe Operating Area

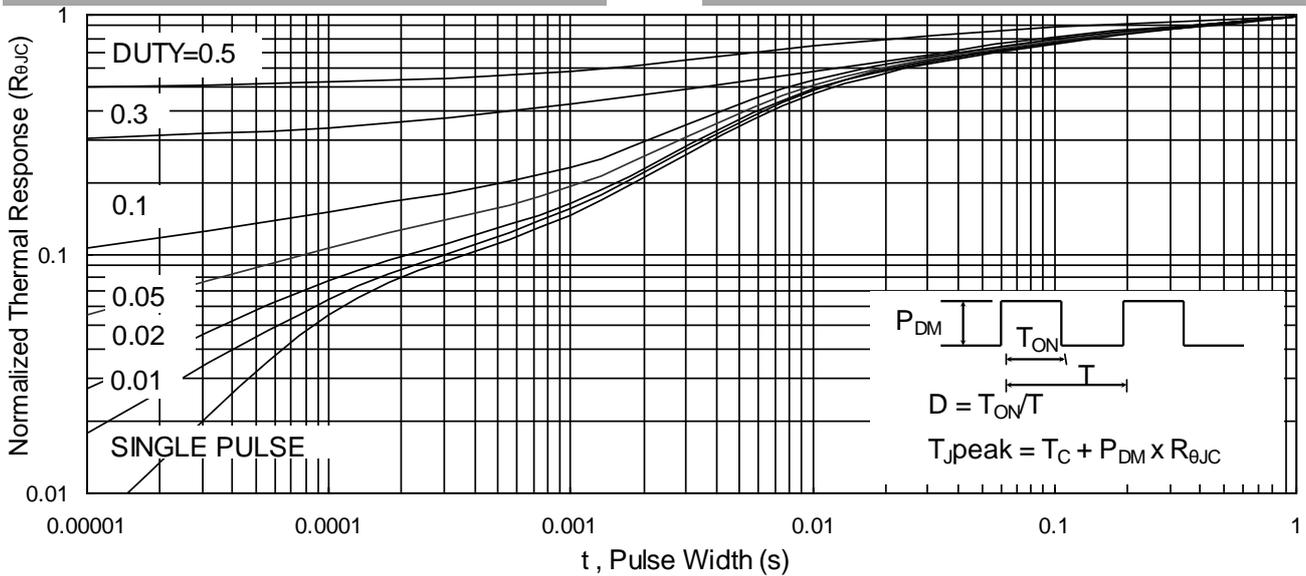


Fig.9 Normalized Maximum Transient Thermal Impedance

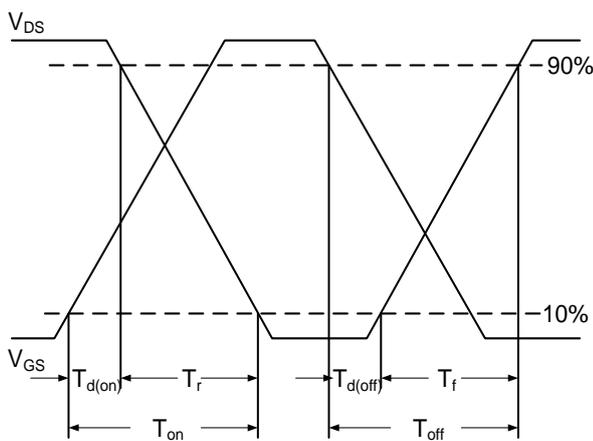


Fig.10 Switching Time Waveform

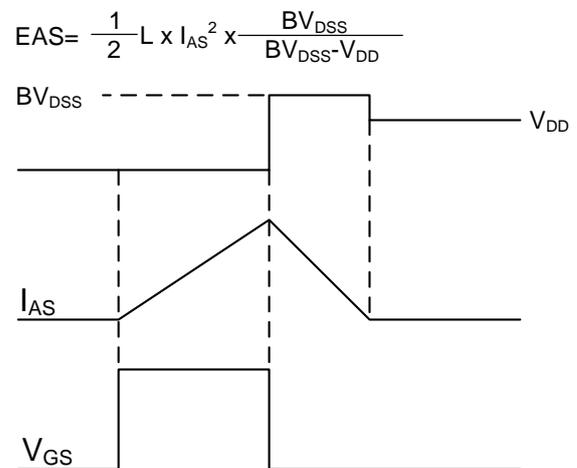
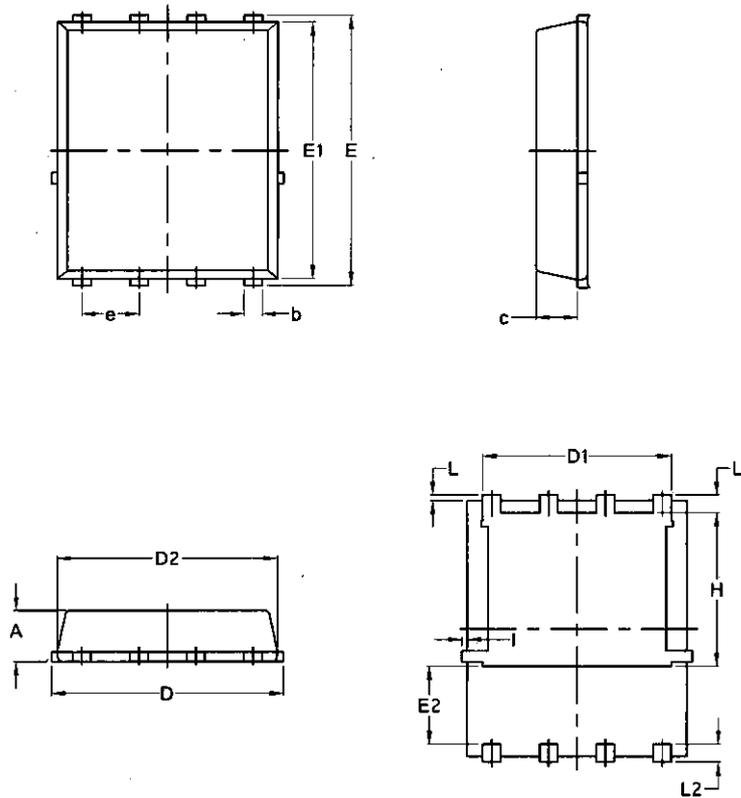


Fig.11 Unclamped Inductive Waveform

$$EAS = \frac{1}{2} L \times I_{AS}^2 \times \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$

Package Mechanical Data-PDFN5060-8L-JQ Single



| Symbol | Common | | | |
|--------|----------|--------|----------|--------|
| | mm | | Inch | |
| | Min | Max | Min | Max |
| A | 1.03 | 1.17 | 0.0406 | 0.0461 |
| b | 0.34 | 0.48 | 0.0134 | 0.0189 |
| c | 0.824 | 0.0970 | 0.0324 | 0.082 |
| D | 4.80 | 5.40 | 0.1890 | 0.2126 |
| D1 | 4.11 | 4.31 | 0.1618 | 0.1697 |
| D2 | 4.80 | 5.00 | 0.1890 | 0.1969 |
| E | 5.95 | 6.15 | 0.2343 | 0.2421 |
| E1 | 5.65 | 5.85 | 0.2224 | 0.2303 |
| E2 | 1.60 | / | 0.0630 | / |
| e | 1.27 BSC | | 0.05 BSC | |
| L | 0.05 | 0.25 | 0.0020 | 0.0098 |
| L1 | 0.38 | 0.50 | 0.0150 | 0.0197 |
| L2 | 0.38 | 0.50 | 0.0150 | 0.0197 |
| H | 3.30 | 3.50 | 0.1299 | 0.1378 |
| I | / | 0.18 | / | 0.0070 |