

Features

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

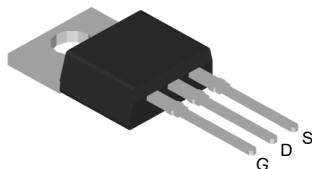
Product Summary



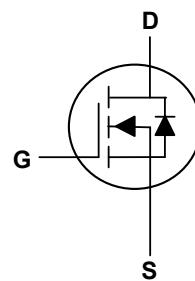
| | | |
|---------------------------------|-----|----|
| V_{DS} | 60 | V |
| I_D | 70 | A |
| $R_{DS(ON)}$ (at $V_{GS}=10V$) | 8.5 | mΩ |

Applications

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



TO-220 Top View



Absolute Maximum Ratings($T_c=25^\circ\text{C}$, unless otherwise noted)

| Parameter | Symbol | Rating | Units |
|--|-------------------------------|------------|-------|
| Drain-Source Voltage | V_{DS} | 60 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Continuous Drain Current ¹ | $I_D @ T_c=25^\circ\text{C}$ | 70 | A |
| Continuous Drain Current ¹ | $I_D @ T_c=100^\circ\text{C}$ | 55 | A |
| Pulsed Drain Current ² | I_{DM} | 280 | A |
| Single Pulse Avalanche Energy ³ | EAS | 80 | mJ |
| Avalanche Current | I_{AS} | 40 | A |
| Total Power Dissipation ⁴ | $P_D @ T_c=25^\circ\text{C}$ | 89 | W |
| Storage Temperature Range | T_{STG} | -55 to 150 | °C |
| Operating Junction Temperature Range | T_J | -55 to 150 | °C |

Thermal Characteristics

| Parameter | Symbol | Typ | Max | Unit |
|--|-----------------|-----|-----|------|
| Thermal Resistance Junction-Ambient ¹ | $R_{\theta JA}$ | --- | 60 | °C/W |
| Thermal Resistance Junction-Case ¹ | $R_{\theta JC}$ | --- | 1.4 | °C/W |

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

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|--|----------------------------|---|-----|------|-----------|------------------|
| Drain-Source Breakdown Voltage | BV_{DSS} | $V_{\text{GS}}=0\text{V}$, $I_D=250\mu\text{A}$ | 60 | --- | --- | V |
| Static Drain-Source On-Resistance ² | $R_{\text{DS}(\text{ON})}$ | $V_{\text{GS}}=10\text{V}$, $I_D=20\text{A}$ | --- | 6.5 | 8.5 | $\text{m}\Omega$ |
| Gate Threshold Voltage | $V_{\text{GS}(\text{th})}$ | $V_{\text{GS}}=V_{\text{DS}}$, $I_D=250\mu\text{A}$ | 1 | --- | 2.5 | V |
| Drain-Source Leakage Current | I_{DSS} | $V_{\text{DS}}=48\text{V}$, $V_{\text{GS}}=0\text{V}$, $T_J=25^\circ\text{C}$ | --- | --- | 1 | uA |
| | | $V_{\text{DS}}=48\text{V}$, $V_{\text{GS}}=0\text{V}$, $T_J=55^\circ\text{C}$ | --- | --- | 5 | |
| Gate-Source Leakage Current | I_{GSS} | $V_{\text{GS}}=\pm 20\text{V}$, $V_{\text{DS}}=0\text{V}$ | --- | --- | ± 100 | nA |
| Gate Resistance | R_g | $V_{\text{DS}}=0\text{V}$, $V_{\text{GS}}=0\text{V}$, $f=1\text{MHz}$ | --- | 1.2 | --- | Ω |
| Total Gate Charge | Q_g | $V_{\text{DS}}=30\text{V}$, $V_{\text{GS}}=10\text{V}$, $I_D=18\text{A}$ | --- | 57 | --- | nC |
| Gate-Source Charge | Q_{gs} | | --- | 8.7 | --- | |
| Gate-Drain Charge | Q_{gd} | | --- | 14 | --- | |
| Turn-On Delay Time | $T_{\text{d(on)}}$ | $V_{\text{DD}}=30\text{V}$, $V_{\text{GS}}=10\text{V}$, $R_G=3.3\Omega$, $I_D=20\text{A}$ | --- | 16.2 | --- | ns |
| Rise Time | T_r | | --- | 41.2 | --- | |
| Turn-Off Delay Time | $T_{\text{d(off)}}$ | | --- | 56.4 | --- | |
| Fall Time | T_f | | --- | 16.2 | --- | |
| Input Capacitance | C_{iss} | $V_{\text{DS}}=30\text{V}$, $V_{\text{GS}}=0\text{V}$, $f=1\text{MHz}$ | --- | 3307 | --- | pF |
| Output Capacitance | C_{oss} | | --- | 201 | --- | |
| Reverse Transfer Capacitance | C_{rss} | | --- | 151 | --- | |

Drain-Source Diode Characteristics

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|--|-----------------|--|-----|-----|-----|------|
| Continuous Source Current ¹ | I_s | $V_G=V_D=0\text{V}$, Force Current | --- | --- | 70 | A |
| Diode Forward Voltage ² | V_{SD} | $V_{\text{GS}}=0\text{V}$, $I_s=1\text{A}$, $T_J=25^\circ\text{C}$ | --- | --- | 1.2 | V |
| Reverse Recovery Time | t_{rr} | $I_F=20\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$, $T_J=25^\circ\text{C}$ | --- | 22 | --- | nS |
| Reverse Recovery Charge | Q_{rr} | | --- | 72 | --- | 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 $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$
- 3.The EAS data shows Max. rating . The test condition is $V_{\text{DD}}=50\text{V}$, $V_{\text{GS}}=10\text{V}$, $L=0.1\text{mH}$
- 4.The power dissipation is limited by 150°C junction temperature

Typical Characteristics

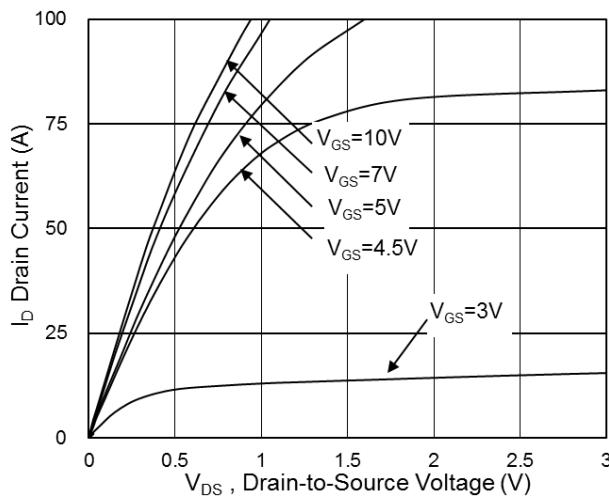


Fig.1 Typical Output Characteristics

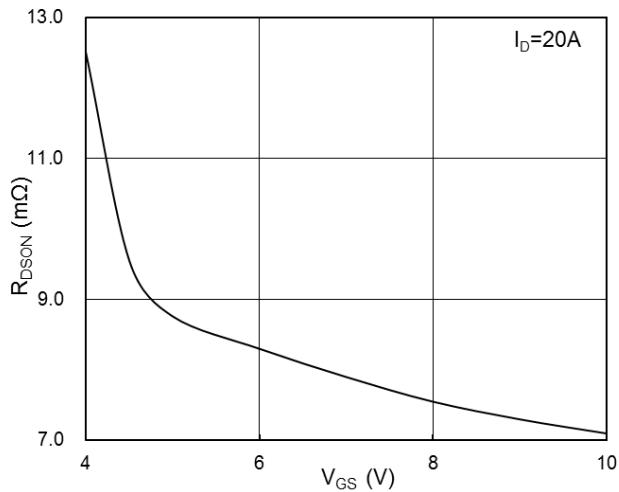


Fig.2 On-Resistance vs G-S Voltage

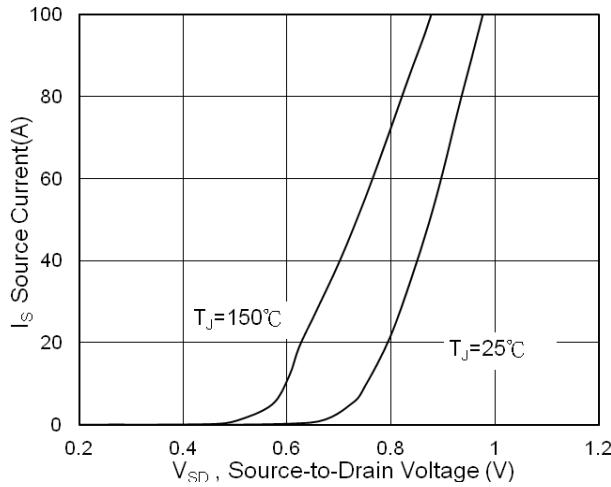


Fig.3 Source Drain Forward Characteristics

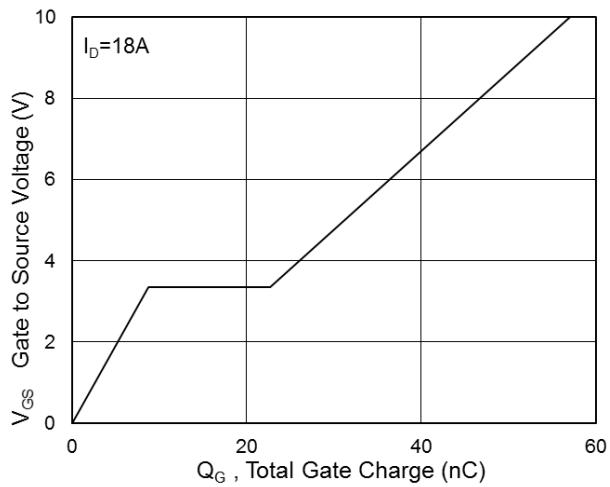


Fig.4 Gate-Charge Characteristics

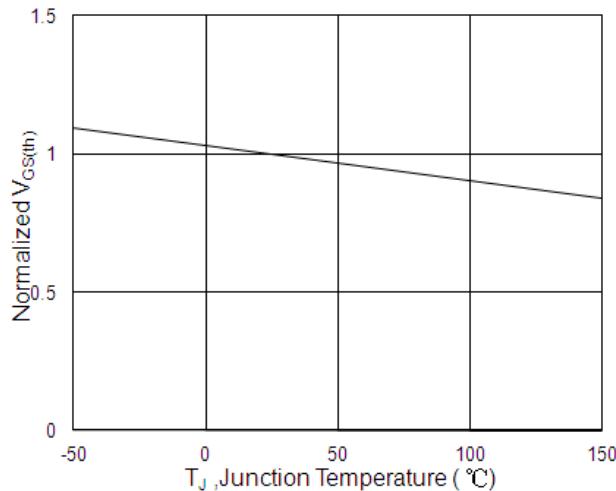


Fig.5 Normalized $V_{GS(th)}$ vs T_J

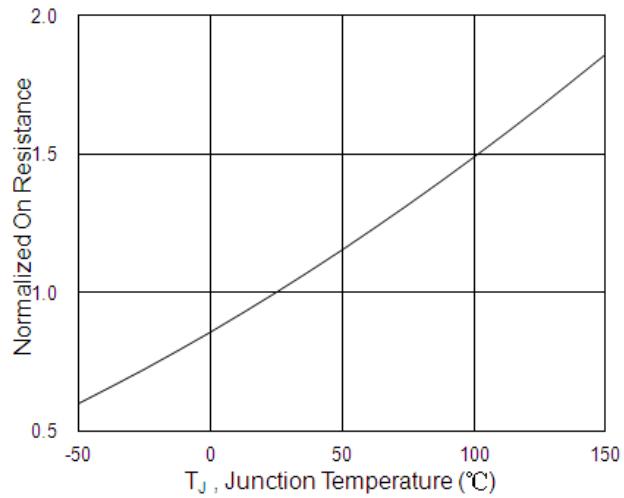
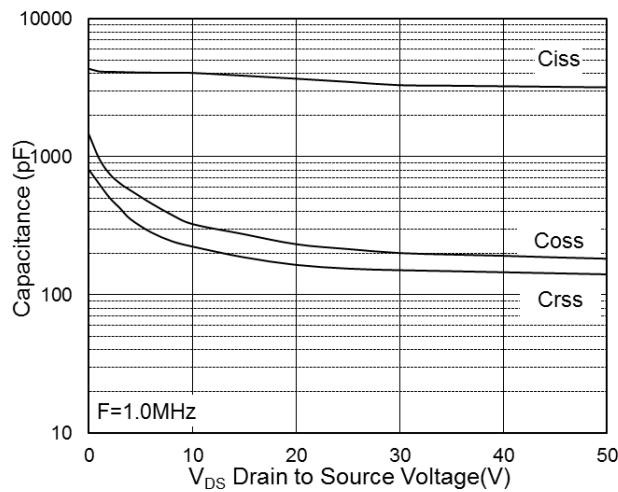
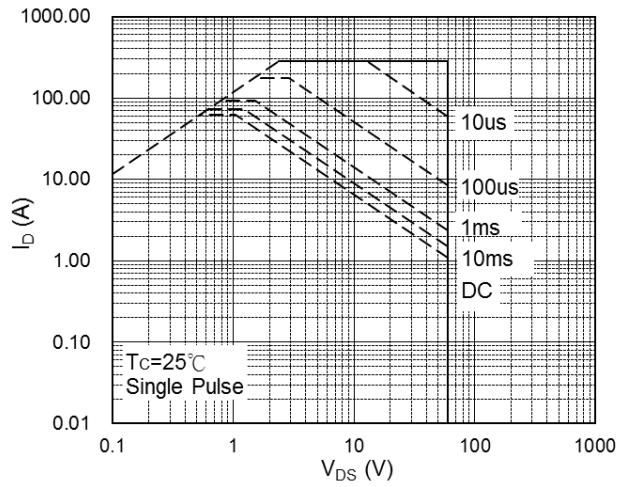
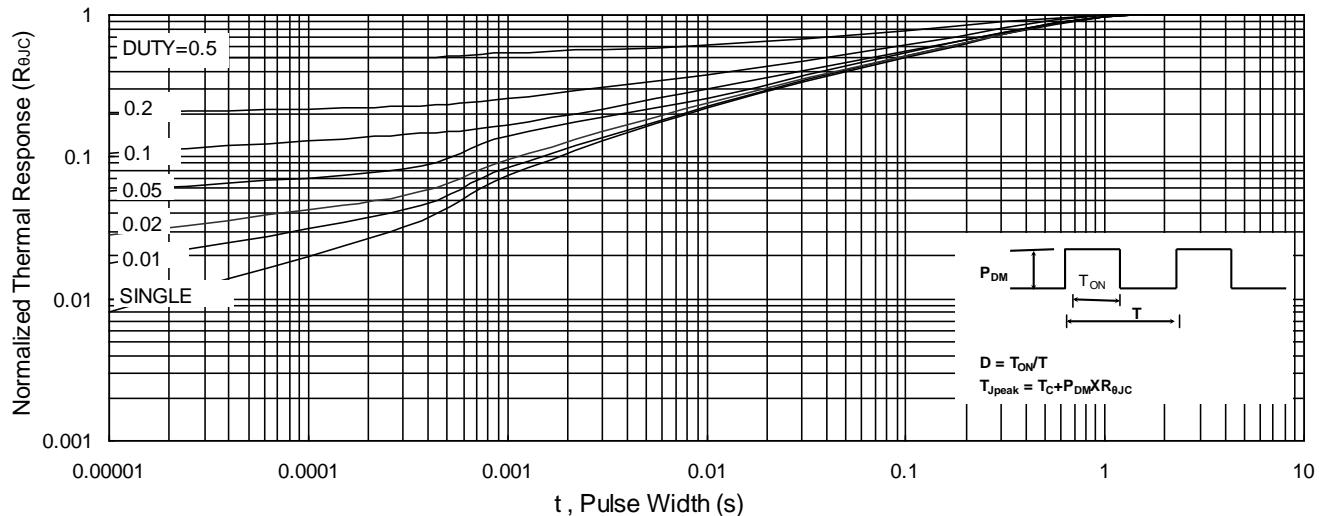
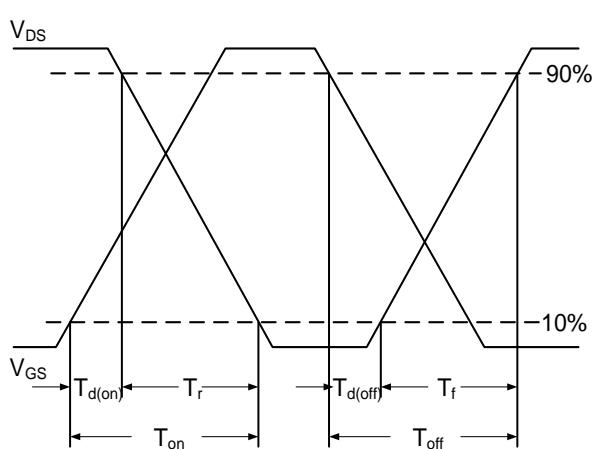
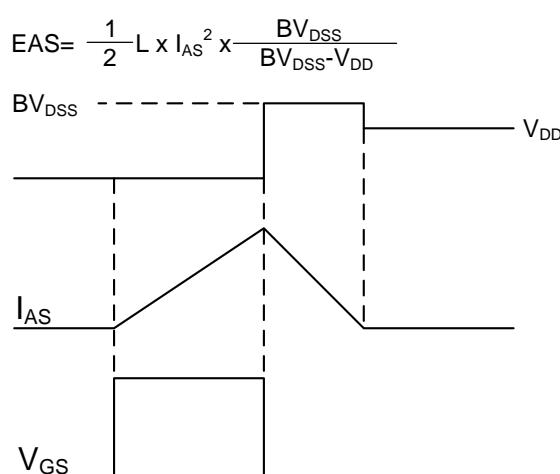
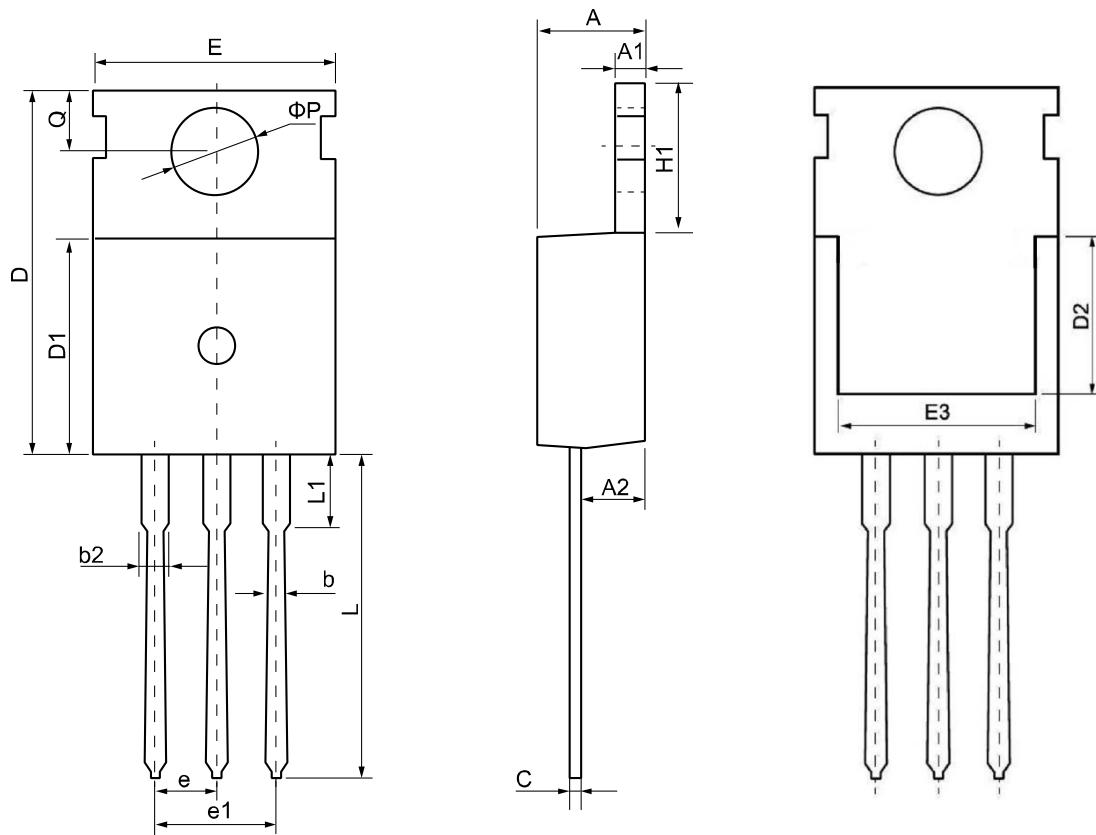


Fig.6 Normalized $R_{DS(on)}$ vs T_J


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

TO-220 Package Outline Dimensions



| Symbol | Dimensions (unit:mm) | | | Symbol | Dimensions (unit:mm) | | |
|---------------|-----------------------------|------------|------------|---------------|-----------------------------|------------|------------|
| | Min | Typ | Max | | Min | Typ | Max |
| A | 4.30 | 4.55 | 4.75 | E | 9.65 | 10.00 | 10.25 |
| A1 | 1.15 | 1.30 | 1.45 | E3 | 7.00 | -- | -- |
| A2 | 2.20 | 2.40 | 2.60 | e | 2.54 BSC | | |
| b | 0.70 | 0.80 | 0.95 | e1 | 5.08 BSC | | |
| b2 | 1.17 | 1.27 | 1.47 | H1 | 6.30 | 6.50 | 6.80 |
| c | 0.40 | 0.50 | 0.65 | L | 12.70 | 13.50 | 14.10 |
| D | 15.30 | 15.60 | 15.90 | L1 | -- | 3.20 | 3.95 |
| D1 | 8.90 | 9.10 | 9.35 | ΦP | 3.40 | 3.60 | 3.80 |
| D2 | 5.50 | -- | -- | Q | 2.60 | 2.80 | 3.00 |