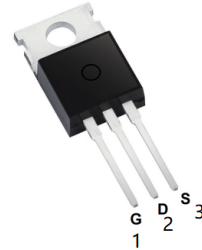


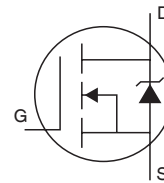
Applications

- DC Motor Drive
- High Efficiency Synchronous Rectification in SMPS
- Uninterruptible Power Supply
- High Speed Power Switching
- Hard Switched and High Frequency Circuits



Benefits

- Optimized for Logic Level Drive
- Very Low $R_{DS(ON)}$ at 4.5V V_{GS}
- Superior R^*Q at 4.5V V_{GS}
- Improved Gate, Avalanche and Dynamic dV/dt Ruggedness
- Fully Characterized Capacitance and Avalanche SOA
- Enhanced body diode dV/dt and dI/dt Capability
- Lead-Free
- $V_{DS(V)} = 40V$
- $I_D = 195A$ ($V_{GS} = 10V$)
- $R_{DS(ON)} < 1.7m\Omega$ ($V_{GS} = 10V$)
- $R_{DS(ON)} < 2.0m\Omega$ ($V_{GS} = 4.5V$)



Absolute Maximum Ratings

| Symbol | Parameter | Max. | Units |
|------------------------------|--|----------------------------|-------|
| $I_D @ T_C = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ (Silicon Limited) | 343 ① | A |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ (Silicon Limited) | 243 ① | |
| $I_D @ T_C = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ (Package Limited) | 195 | |
| I_{DM} | Pulsed Drain Current ② | 1372 | |
| $P_D @ T_C = 25^\circ C$ | Maximum Power Dissipation | 375 | W |
| | Linear Derating Factor | 2.5 | W/°C |
| V_{GS} | Gate-to-Source Voltage | ± 20 | V |
| dv/dt | Peak Diode Recovery ③ | 4.6 | V/ns |
| T_J | Operating Junction and | -55 to + 175 | °C |
| T_{STG} | Storage Temperature Range | | |
| | Soldering Temperature, for 10 seconds (1.6mm from case) | 300 | |
| | Mounting torque, 6-32 or M3 screw | 10lbf·in (1.1N·m) | |
| E_{AS} (Thermally limited) | Single Pulse Avalanche Energy ③ | 255 | mJ |
| I_{AR} | Avalanche Current ② | See Fig. 14, 15, 22a, 22b, | A |
| E_{AR} | Repetitive Avalanche Energy ② | | mJ |

Thermal Resistance

| Symbol | Parameter | Typ. | Max. | Units |
|-----------------|-------------------------------------|------|------|-------|
| $R_{\theta JC}$ | Junction-to-Case ④ | | 0.4 | °C/W |
| $R_{\theta CS}$ | Case-to-Sink, Flat, Greased Surface | 0.5 | | |
| $R_{\theta JA}$ | Junction-to-Ambient | | 62 | |

Static @ T_J = 25°C (unless otherwise specified)

| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|--|---|--|-------|------------------|--|---|
| V _{(BR)DSS} | Drain-to-Source Breakdown Voltage | 40 | | | V | V _{GS} = 0V, I _D = 250μA |
| ΔV _{(BR)DSS} /ΔT _J | Breakdown Voltage Temp. Coefficient | | 0.04 | | V/°C | Reference to 25°C, I _D = 5mA ^② |
| R _{DS(on)} | Static Drain-to-Source On-Resistance | | 1.4 | 1.7 | mΩ | V _{GS} = 10V, I _D = 195A ^⑤ |
| | | 1.6 | | 2.0 | | V _{GS} = 4.5V, I _D = 172A ^⑤ |
| V _{GS(th)} | Gate Threshold Voltage | 1.0 | | 2.5 | V | V _{DS} = V _{GS} , I _D = 250μA |
| I _{DSS} | Drain-to-Source Leakage Current | | | 20 | μA | V _{DS} = 40V, V _{GS} = 0V |
| | | | | 250 | | V _{DS} = 40V, V _{GS} = 0V, T _J = 125°C |
| I _{GSS} | Gate-to-Source Forward Leakage | | | 100 | nA | V _{GS} = 20V |
| | Gate-to-Source Reverse Leakage | | | -100 | | V _{GS} = -20V |
| R _{G(int)} | Internal Gate Resistance | | 2.1 | | Ω | |
| g _{fs} | Forward Transconductance | 286 | | | S | V _{DS} = 10V, I _D = 195A |
| Q _g | Total Gate Charge | | 108 | 162 | nC | I _D = 185A |
| Q _{gs} | Gate-to-Source Charge | | 29 | | | V _{DS} = 20V |
| Q _{gd} | Gate-to-Drain ("Miller") Charge | | 54 | | | V _{GS} = 4.5V ^⑤ |
| Q _{sync} | Total Gate Charge Sync. (Q _g - Q _{gd}) | | 54 | | | I _D = 185A, V _{DS} = 0V, V _{GS} = 4.5V |
| t _{d(on)} | Turn-On Delay Time | | 65 | | ns | V _{DD} = 26V |
| t _r | Rise Time | | 827 | | | I _D = 195A |
| t _{d(off)} | Turn-Off Delay Time | | 97 | | | R _G = 2.1Ω |
| t _f | Fall Time | | 355 | | | V _{GS} = 4.5V ^⑤ |
| C _{iss} | Input Capacitance | | 10315 | | pF | V _{GS} = 0V |
| C _{oss} | Output Capacitance | | 1980 | | | V _{DS} = 25V |
| C _{rss} | Reverse Transfer Capacitance | | 935 | | | f = 1.0MHz |
| C _{oss} eff. (ER) | Effective Output Capacitance (Energy Related) ^⑦ | | 2378 | | | V _{GS} = 0V, V _{DS} = 0V to 32V ^⑦ |
| C _{oss} eff. (TR) | Effective Output Capacitance (Time Related) ^⑧ | | 2986 | | V _{GS} = 0V, V _{DS} = 0V to 32V ^⑧ | |
| I _S | Continuous Source Current (Body Diode) | | | 343 ^① | A | MOSFET symbol showing the integral reverse p-n junction diode. |
| I _{SM} | Pulsed Source Current (Body Diode) ^② | | | 1372 | | |
| V _{SD} | Diode Forward Voltage | | | 1.3 | V | T _J = 25°C, I _S = 195A, V _{GS} = 0V ^⑤ |
| t _{rr} | Reverse Recovery Time | | 39 | | ns | T _J = 25°C V _R = 34V, |
| | | | 41 | | | T _J = 125°C I _F = 195A |
| Q _{rr} | Reverse Recovery Charge | | 39 | | nC | di/dt = 100A/μs ^⑤ |
| | | | 46 | | | T _J = 125°C |
| I _{RRM} | Reverse Recovery Current | | 1.7 | | A | T _J = 25°C |
| t _{on} | Forward Turn-On Time | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) | | | | |

Notes:

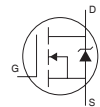
- ① Calculated continuous current based on maximum allowable junction temperature Bond wire current limit is 195A. Note that current limitation arising from heating of the device leads may occur with some lead mounting arrangements.
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ Limited by T_{Jmax}, starting T_J = 25°C, L = 0.013mH
R_G = 25Ω, I_{AS} = 195A, V_{GS} = 10V. Part not recommended for use above this value.
- ④ I_{SD} ≤ 195A, di/dt ≤ 841A/μs, V_{DD} ≤ V_{(BR)DSS}, T_J ≤ 175°C.

⑤ Pulse width ≤ 400μs; duty cycle ≤ 2%.

⑥ C_{oss} eff. (TR) is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

⑦ C_{oss} eff. (ER) is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

⑧ R_θ is measured at T_J approximately 90°C



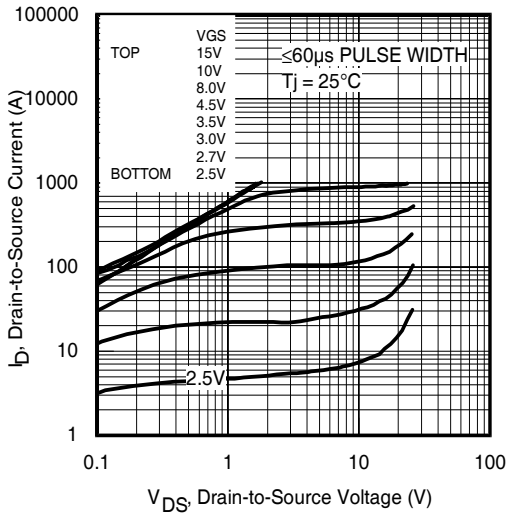


Fig 1. Typical Output Characteristics

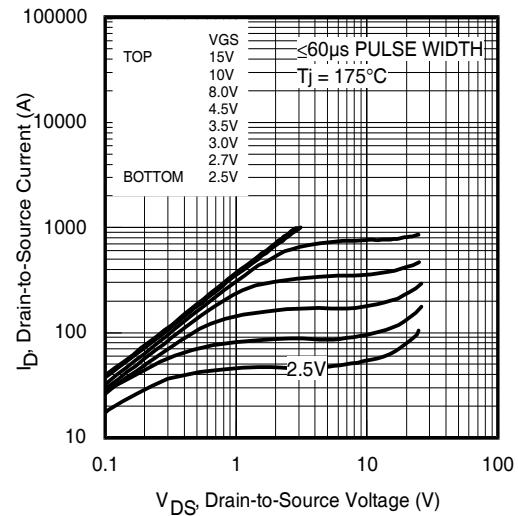


Fig 2. Typical Output Characteristics

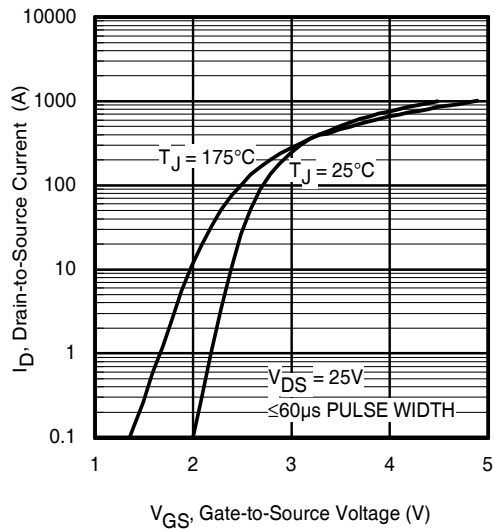


Fig 3. Typical Transfer Characteristics

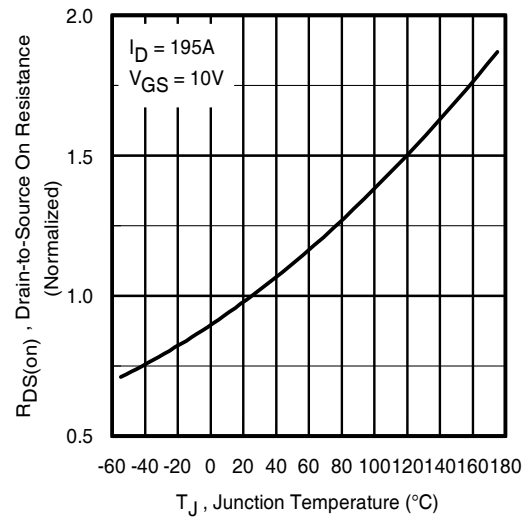


Fig 4. Normalized On-Resistance vs. Temperature

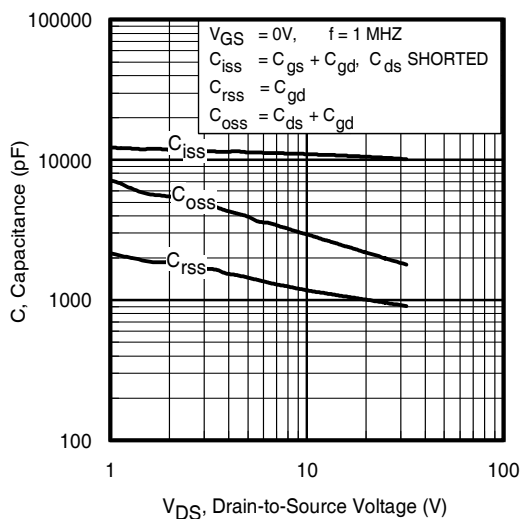


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

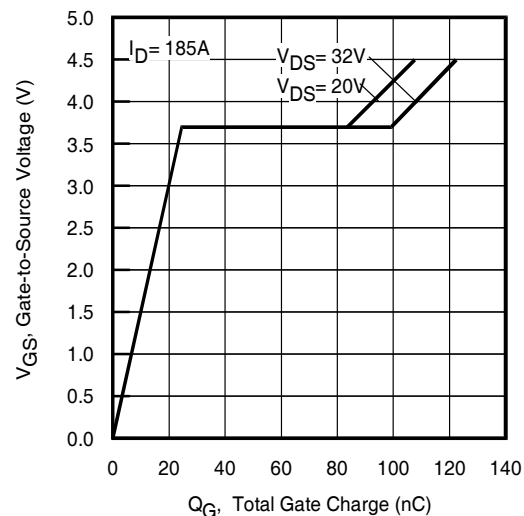


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

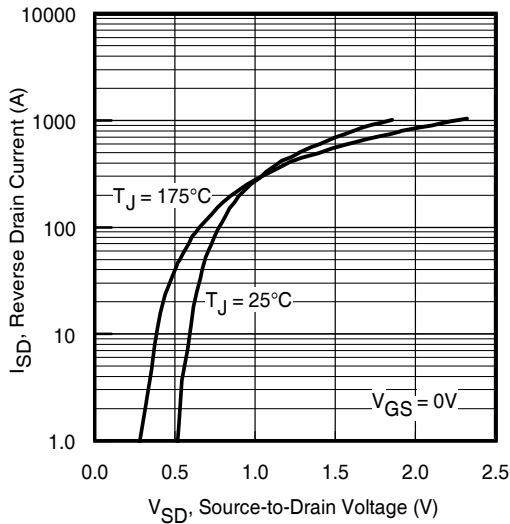


Fig 7. Typical Source-Drain Diode Forward Voltage

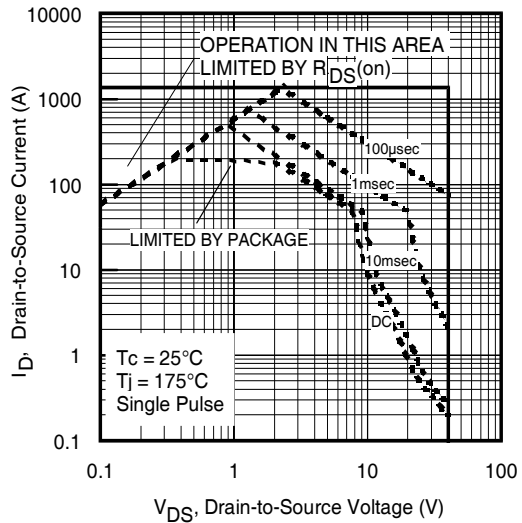


Fig 8. Maximum Safe Operating Area

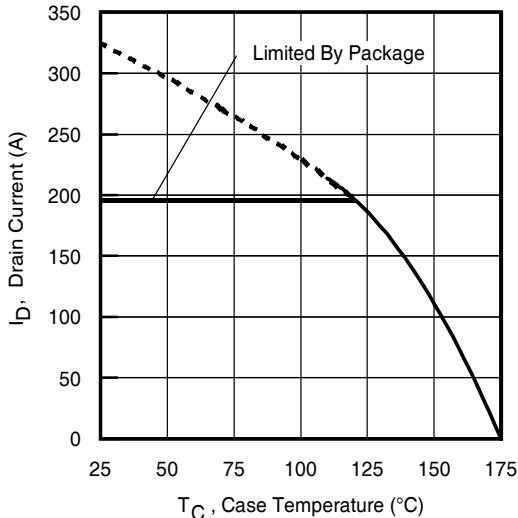


Fig 9. Maximum Drain Current vs. Case Temperature

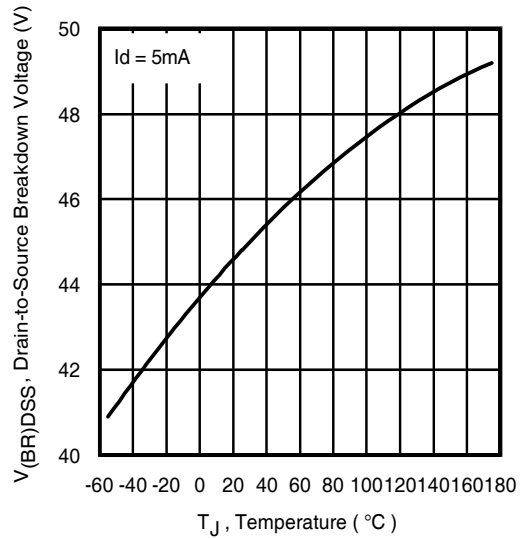


Fig 10. Drain-to-Source Breakdown Voltage

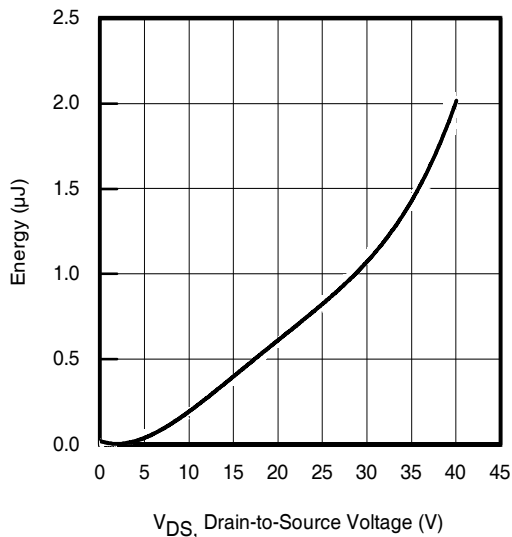


Fig 11. Typical C_{OSS} Stored Energy

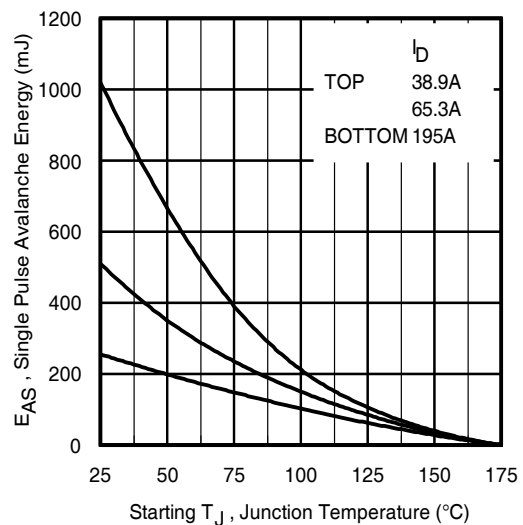


Fig 12. Maximum Avalanche Energy vs. Drain Current

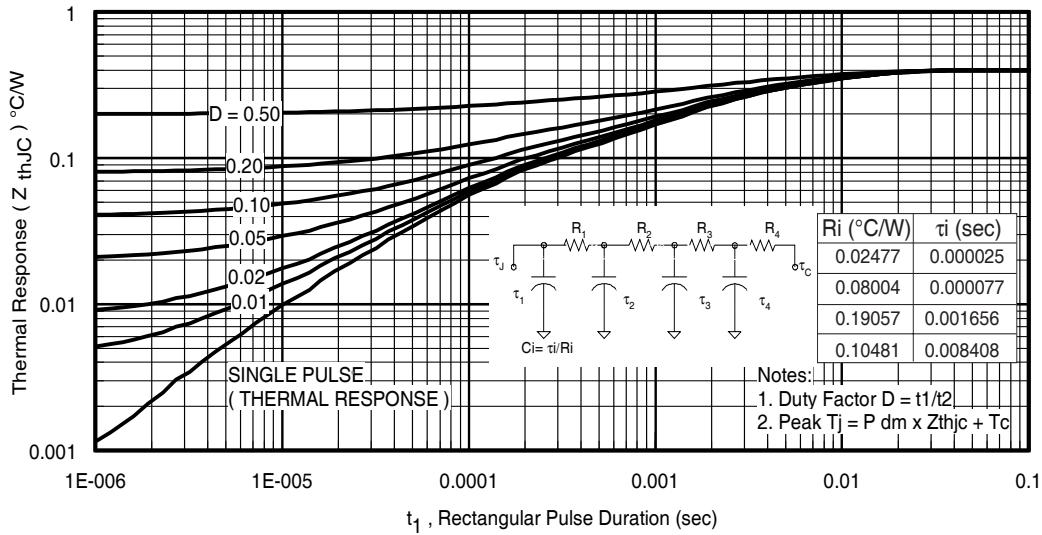


Fig 13. Maximum Effective Transient Thermal Impedance, Junction-to-Case

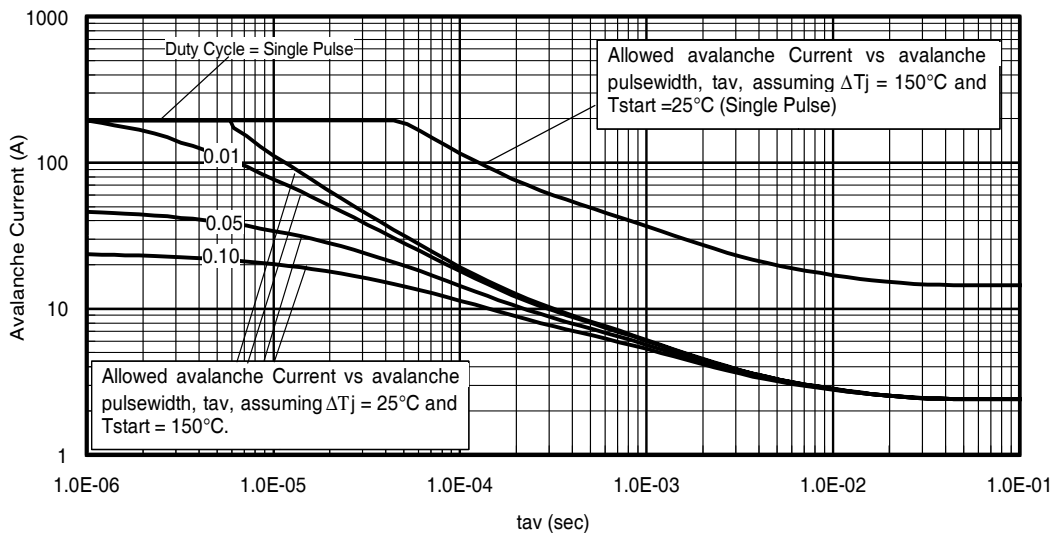


Fig 14. Typical Avalanche Current vs. Pulsewidth

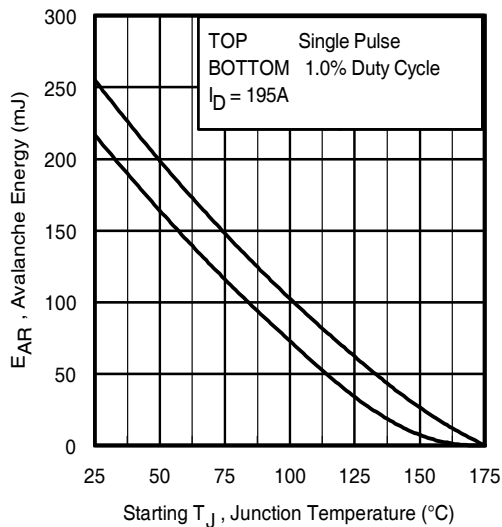


Fig 15. Maximum Avalanche Energy vs. Temperature

Notes on Repetitive Avalanche Curves, Figures 14, 15:

1. Avalanche failures assumption:
Purely a thermal phenomenon and failure occurs at a temperature far in excess of T_{jmax} . This is validated for every part type.
2. Safe operation in Avalanche is allowed as long as T_{jmax} is not exceeded.
3. Equation below based on circuit and waveforms shown in Figures 16a, 16b.
4. $P_{D(ave)}$ = Average power dissipation per single avalanche pulse.
5. BV = Rated breakdown voltage (1.3 factor accounts for voltage increase during avalanche).
6. I_{av} = Allowable avalanche current.
7. ΔT = Allowable rise in junction temperature, not to exceed T_{jmax} (assumed as 25°C)
 t_{av} = Average time in avalanche.
 D = Duty cycle in avalanche = $t_{av} \cdot f$
 $Z_{thJC}(D, t_{av})$ = Transient thermal resistance)

$$P_{D(ave)} = 1/2 (1.3 \cdot BV \cdot I_{av}) = \Delta T / Z_{thJC}$$

$$I_{av} = 2\Delta T / [1.3 \cdot BV \cdot Z_{th}]$$

$$E_{AS(AR)} = P_{D(ave)} \cdot t_{av}$$

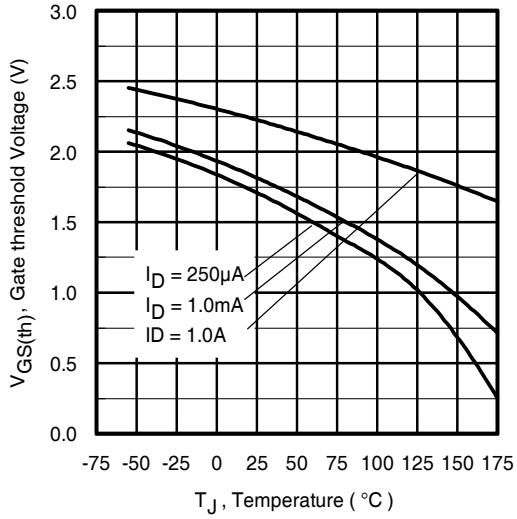


Fig 16. Threshold Voltage vs. Temperature

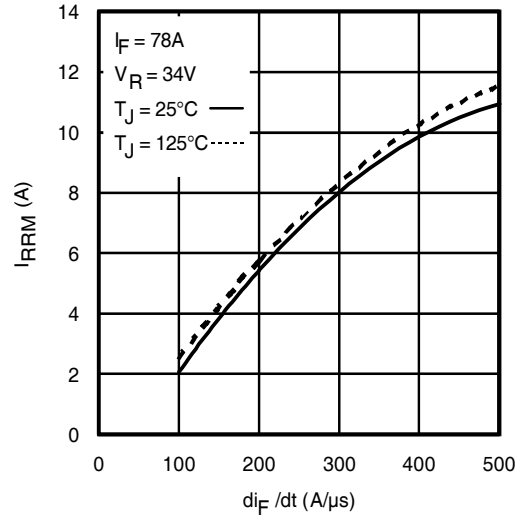


Fig 17. Typical Recovery Current vs. di_F/dt

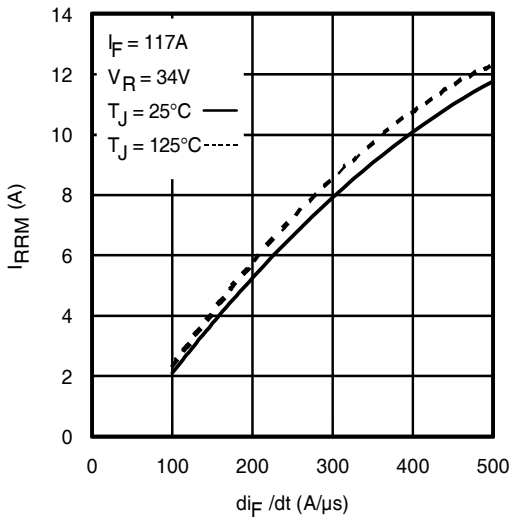


Fig 18. Typical Recovery Current vs. di_F/dt

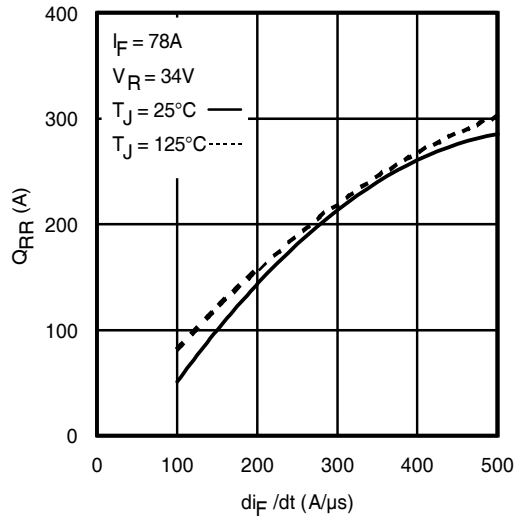


Fig 19. Typical Stored Charge vs. di_F/dt

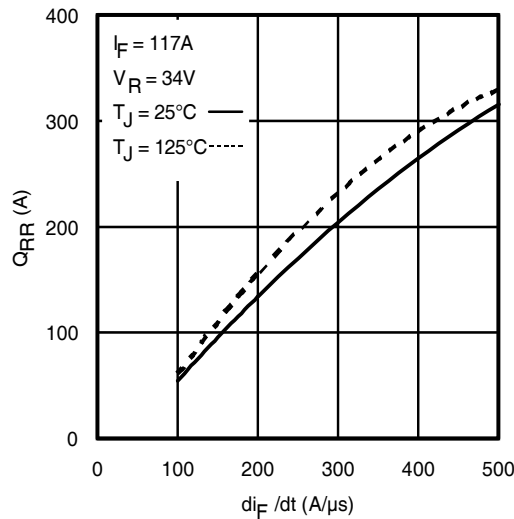
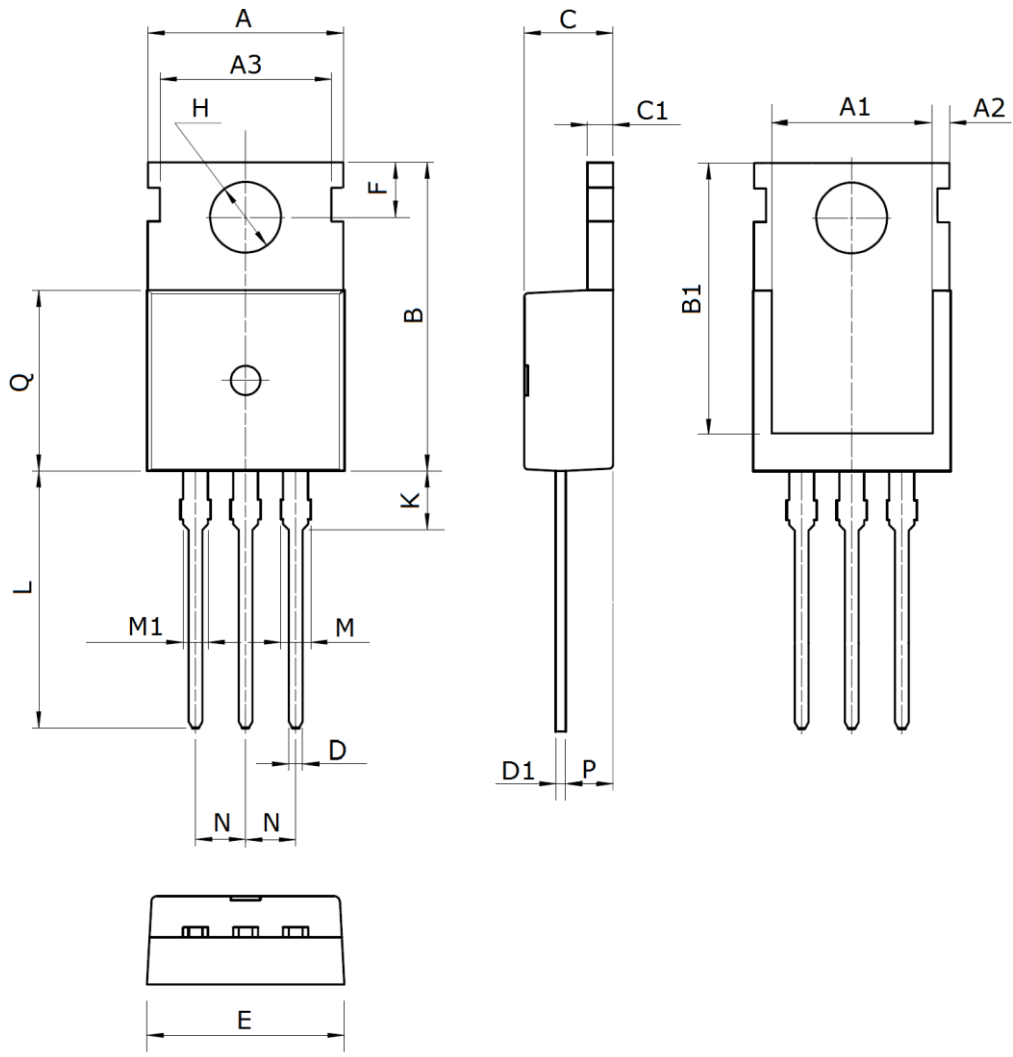


Fig 20. - Typical Stored Charge vs. di_F/dt

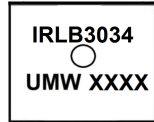
Package Dimensions

TO 220



| Symbol | Dimensions (mm) | Symbol | Dimensions (mm) | Symbol | Dimensions (mm) |
|--------|-----------------|--------|-----------------|--------|------------------|
| A | 10.0±0.3 | C1 | 1.3±0.2 | L | 13.2±0.4 |
| A1 | 8.0±0.2 | D | 0.8±0.2 | M | 1.38±0.1 |
| A2 | 0.94±0.1 | D1 | 0.5±0.1 | M1 | 1.28±0.1 |
| A3 | 8.7±0.1 | E | 10.0±0.3 | N | 2.54(typ) |
| B | 15.6±0.4 | F | 2.8±0.1 | P | 2.4±0.3 |
| B1 | 13.2±0.2 | H | 3.6±0.1 | Q | 9.15±0.25 |
| C | 4.5±0.2 | K | 3.1±0.2 | | |

Marking



Ordering information

| Order code | Package | Baseqty | Deliverymode |
|--------------|---------|---------|--------------|
| UMW IRLB3034 | TO-220 | 1000 | Tube and box |