

SuperQ™ 200V N-Channel Power MOSFET

FEATURES

- Low $R_{DS(on)}$ in TO-220 package
- High short-circuit withstand capability (SCWC)
- 100% UIS tested in production
- Low switching losses, Q_{sw} and E_{oss}
- Easier parallelling with $\pm 0.5V$ gate threshold

APPLICATIONS

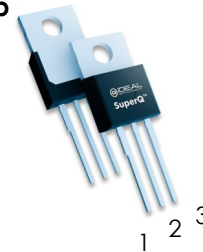
- Motor control
- Boost converters and SMPS control FETs
- Secondary side synchronous rectifier

DESCRIPTION

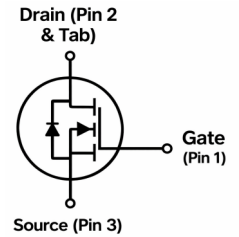
Engineered for high-efficiency SMPS and motor drives, this 200V SuperQ MOSFET delivers ultra-low conduction and switching losses in a robust TO-220 package. Featuring best-in-class $R_{DS(on)}$ and Q_{sw} , it minimizes heat dissipation at both full and partial loads.

PRODUCT SUMMARY

Drain Tab



TO-220



| Parameter | Value | Unit |
|--------------------------|-------|---------------|
| $T_A = 25^\circ\text{C}$ | | |
| V_{DS} | 200 | V |
| $R_{DS(on),max}$ | 8.3 | m Ω |
| I_D | 128 | A |
| Q_G | 73 | nC |
| Q_{sw} | 5.2 | nC |
| E_{oss} | 3.0 | μJ |



ORDERING INFORMATION

| Part Number | Package | Marking | Packaging |
|-------------|---------|------------|-----------|
| iS20M8R0S1P | TO-220 | iS20M8R0S1 | 50pc Tube |

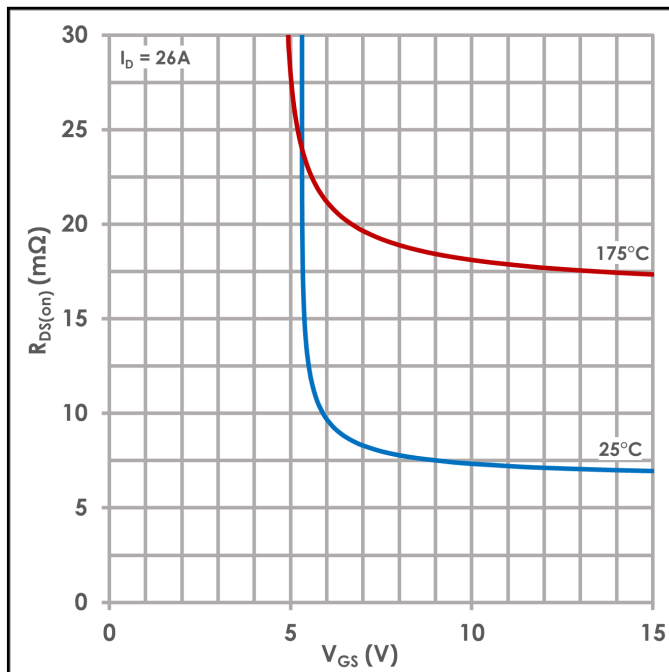


Figure 1: Typical Drain-Source On Resistance

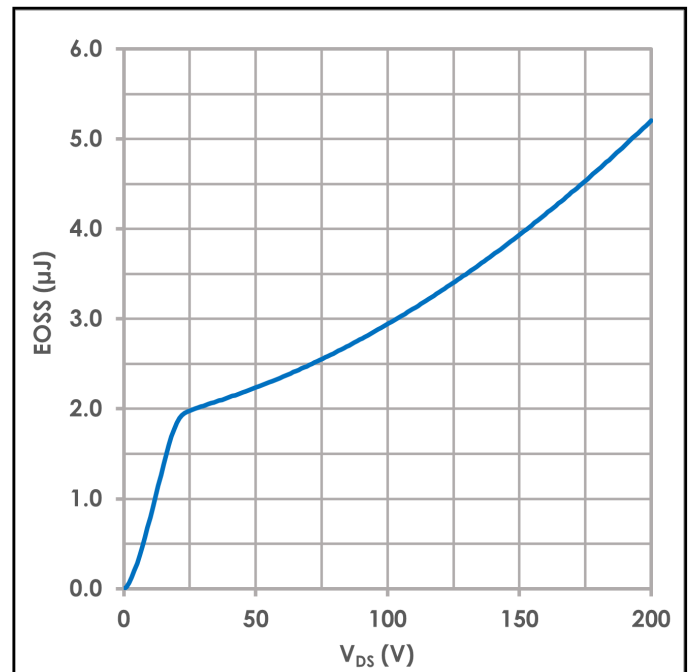


Figure 2: Typical C_{oss} Stored Energy

| ABSOLUTE MAXIMUM RATINGS | | | |
|-----------------------------------|--|------------|------|
| SYMBOL | PARAMETER (T _A = 25°C unless otherwise specified) | VALUE | UNIT |
| V _{GS} | Gate-to-source voltage | ± 20 | V |
| I _D | Continuous drain current (silicon limited), T _C = 25°C | 128 | A |
| | Continuous drain current (silicon limited), T _C = 100°C | 90 | |
| I _{DM} | Pulsed drain current | 476 | A |
| P _D | Power dissipation, T _C = 25°C | 333 | W |
| T _J , T _{stg} | Operating junction, storage temperature | -55 to 175 | °C |
| E _{AS} | Avalanche energy, single pulse I _D = 56A, R _{GS} = 25Ω | 434 | mJ |

| THERMAL CHARACTERISTICS | | | | | |
|-------------------------|--|-------|-----|------|------|
| SYMBOL | PARAMETER (T _A = 25°C unless otherwise specified) | VALUE | | | UNIT |
| | | MIN | TYP | MAX | |
| R _{θJC} | Junction-to-case thermal resistance - TO-220 | - | - | 0.45 | °C/W |
| R _{θJA} | Junction-to-ambient thermal resistance ⁽¹⁾ | - | - | 40 | °C/W |
| R _{θJA} | Junction-to-ambient thermal resistance, minimal footprint | - | - | 62 | °C/W |

(1) 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm² (one layer, 70 μm thick) copper area for drain connection. PCB is vertical in still air.

| ELECTRICAL CHARACTERISTICS (T _A = 25°C unless otherwise specified) | | | | | | |
|---|---|---|-------|-------|-------|------|
| SYMBOL | PARAMETER | TEST CONDITIONS | VALUE | | | UNIT |
| | | | MIN | TYP | MAX | |
| STATIC CHARACTERISTICS | | | | | | |
| BV _{DSS} | Drain-to-source voltage | V _{GS} = 0V, I _D = 1mA | 200 | - | - | V |
| I _{DSS} | Drain-to-source leakage current | V _{GS} = 0V, V _{DS} = 160V, T _J = 25°C | - | 0.1 | 1 | μA |
| | | V _{GS} = 0V, V _{DS} = 160V, T _J = 125°C ⁽²⁾ | - | - | 100 | |
| I _{GSS} | Gate-to-source leakage current | V _{DS} = 0V, V _{GS} = 20V | - | 1 | 100 | nA |
| V _{GS(th)} | Gate-to-source threshold voltage | V _{DS} = V _{GS} , I _D = 213μA | 3.1 | 3.5 | 4.1 | V |
| R _{DS(on)} | Drain-to-source on-resistance | V _{GS} = 10V, I _D = 26A | - | 7.3 | 8.3 | mΩ |
| g _{fs} | Transconductance | V _{DS} = 10V, I _D = 26A | 37 | 74 | - | S |
| DYNAMIC CHARACTERISTICS | | | | | | |
| C _{iss} | Input capacitance ⁽²⁾ | V _{GS} = 0V, V _{DS} = 100V, f = 100kHz | - | 5,694 | 7,402 | pF |
| C _{rss} | Reverse transfer capacitance ⁽²⁾ | | - | 13 | 16 | |
| C _{oss} | Output capacitance ⁽²⁾ | | - | 170 | 221 | |
| C _{o(er)} | Effective output capacitance | V _{DS} = 0 to 100V, V _{GS} = 0V | - | 295 | - | |
| R _G | Series gate resistance | f = 1MHz | - | 0.9 | 1.3 | Ω |
| t _{d(on)} | Turn-on delay time | V _{DS} = 100V, V _{GS} = 10V, I _{DS} = 26A, R _{G,EXT} = 0 Ω | - | 18.7 | - | ns |
| t _r | Rise time | | - | 5.9 | - | |
| t _{d(off)} | Turn-off delay time | | - | 41.8 | - | |
| t _f | Fall time | | - | 5.5 | - | |
| GATE CHARGE CHARACTERISTICS | | | | | | |
| Q _G | Gate charge total ⁽²⁾ | V _{DS} = 100V, I _D = 26A, V _{GS} = 0 to 10V | - | 73 | 95 | nC |
| Q _{sw} | Switching charge ⁽³⁾ | | - | 5.2 | - | |
| Q _{gd} | Gate to drain charge ⁽²⁾⁽³⁾ | | - | 2.1 | 2.7 | |
| Q _{g(th)} | Gate charge at threshold ⁽³⁾ | | - | 17.3 | - | |
| Q _{gs2} | Gate to source charge ⁽³⁾ | | - | 3.1 | - | |
| V _{plateau} | Gate plateau voltage | | - | 5.9 | - | V |
| Q _{oss} | Output charge ⁽²⁾ | V _{DS} = 0 to 100V, V _{GS} = 0V | - | 290 | 334 | nC |
| E _{oss} | Capacitive stored energy | | - | 3.0 | - | μJ |
| DIODE CHARACTERISTICS | | | | | | |
| V _{SD} | Diode forward voltage | I _{SD} = 26A, V _{GS} = 0V | - | 0.9 | 1.1 | V |
| Q _{rr} | Reverse recovery charge | V _{DS} = 100V, I _F = 26A, | - | 0.6 | - | μC |
| t _{rr} | Reverse recovery time | di/dt = 100A/μs | - | 136 | - | ns |

(2) Defined by design. Not subject to production test.

(3) Q_{sw} should be used for switching loss calculations. See Figure 16 for gate charge definitions. For more information see Q_{sw} application note on www.idealsemi.com

Ratings and Characteristics Curves

($T_A = 25^\circ\text{C}$ unless otherwise specified)

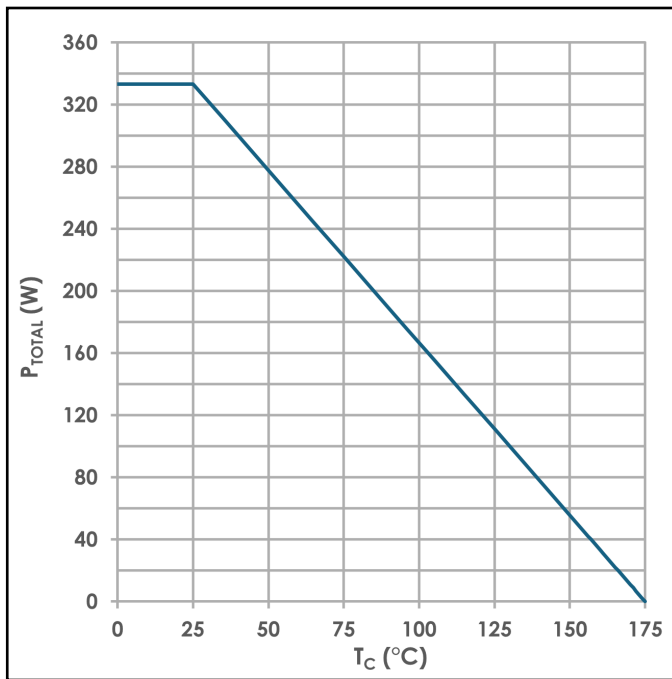


Figure 3: Power Dissipation

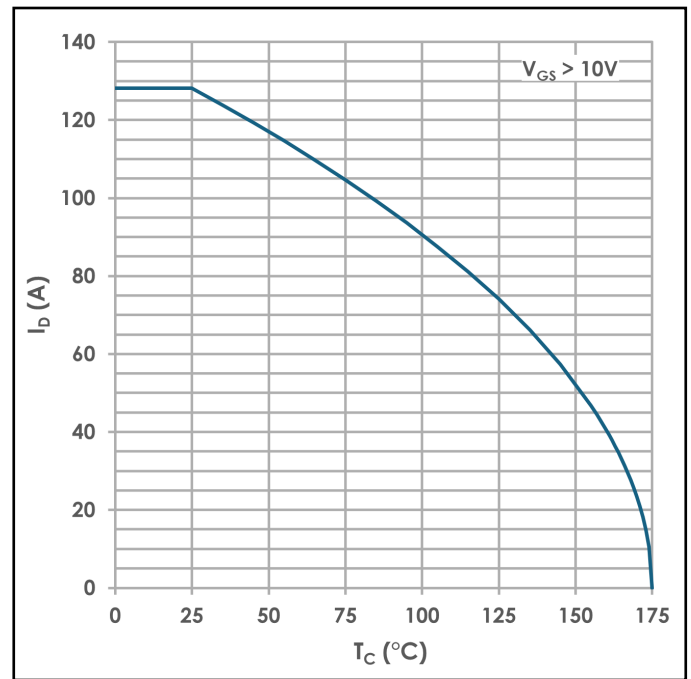


Figure 4: Drain Current

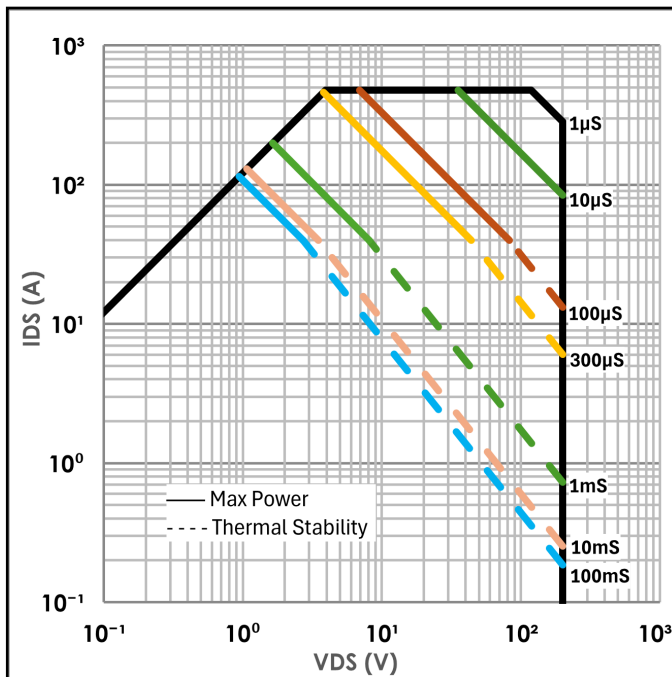


Figure 5: Safe Operating Area

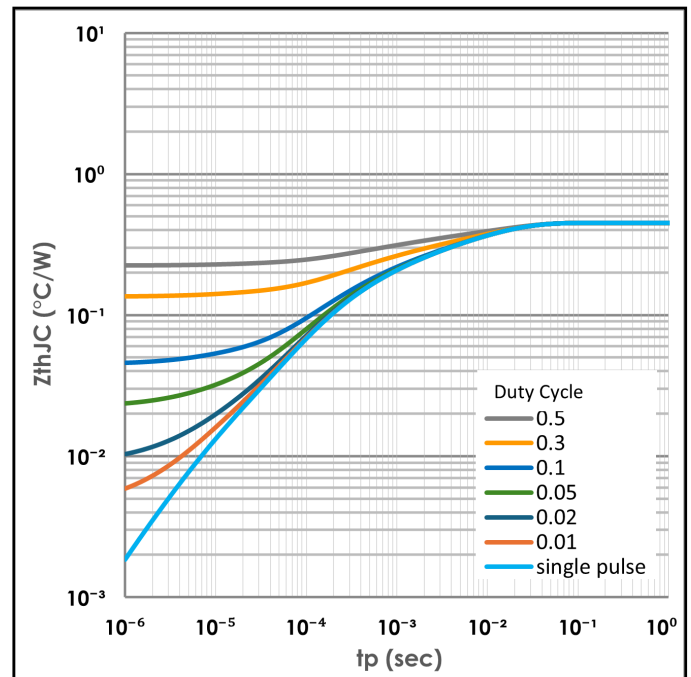


Figure 6: Max Transient Thermal Impedance

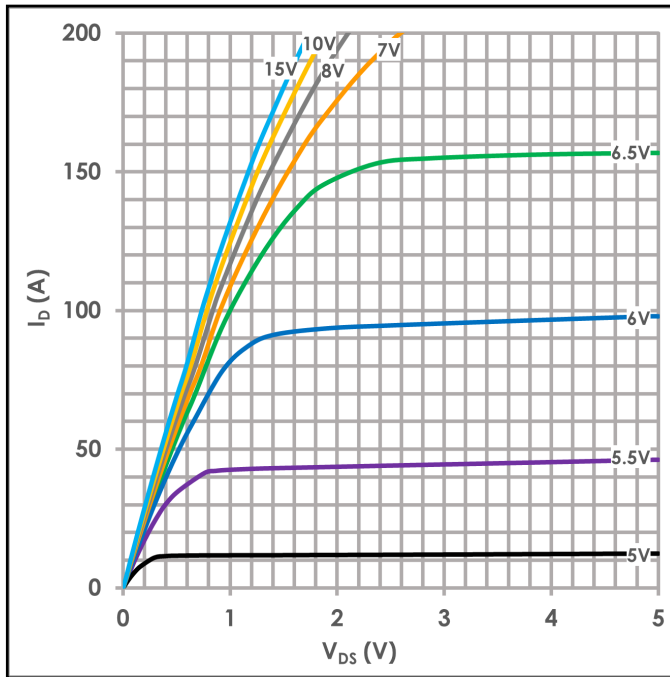


Figure 7: Typical Output Characteristics

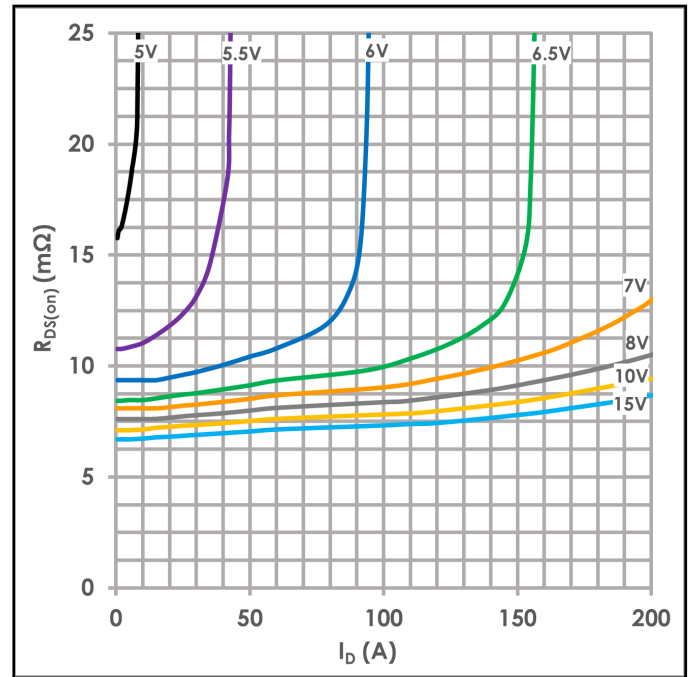


Figure 8: Typical Drain-Source On-Resistance

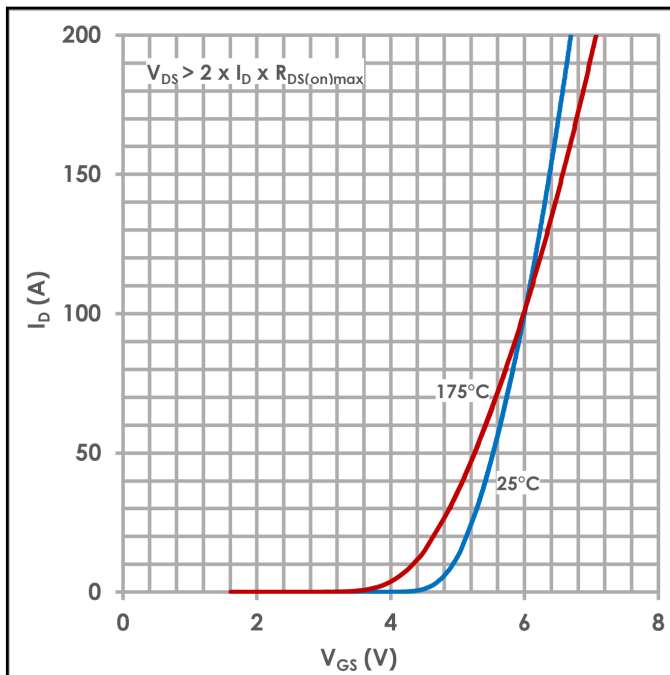


Figure 9: Typical Transfer Characteristics

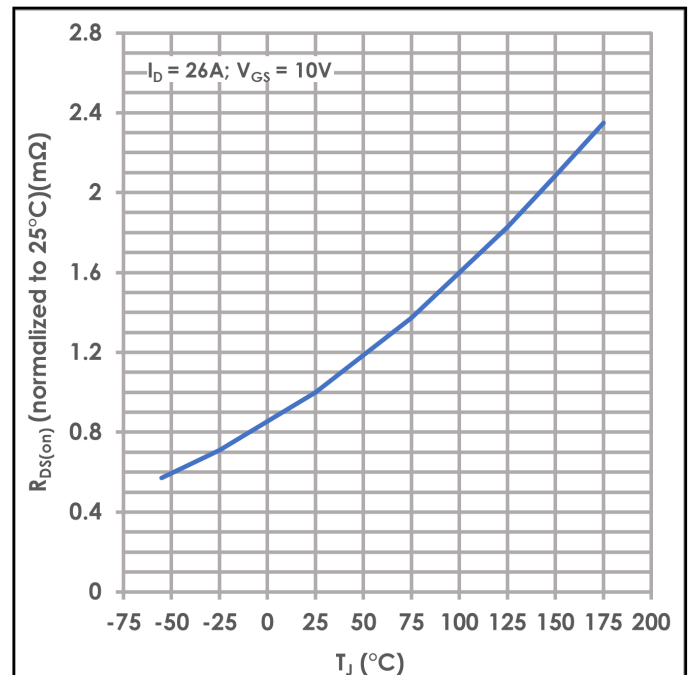


Figure 10: Normalized On-State Resistance vs. Temperature

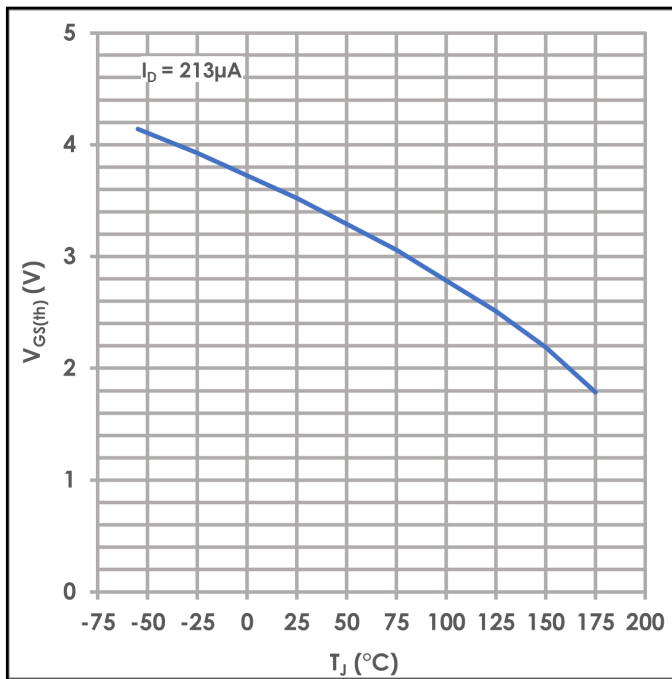


Figure 11: Typical Threshold Voltage

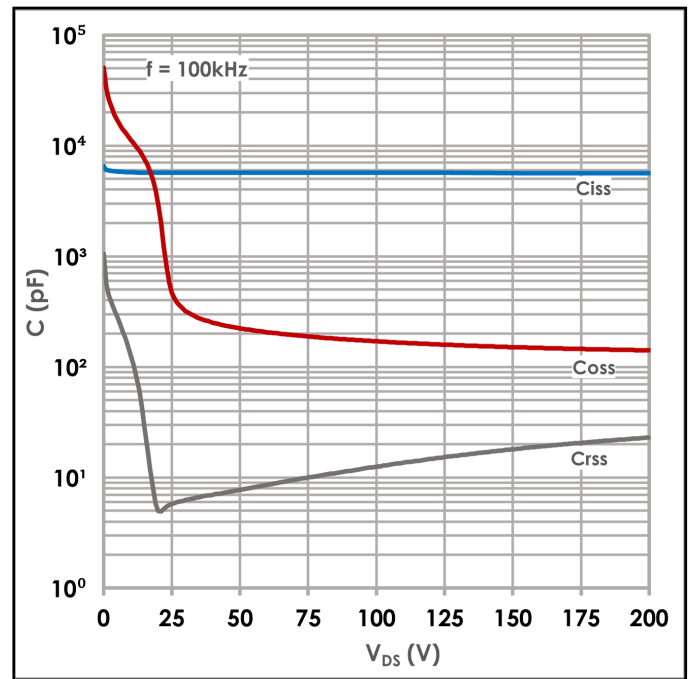


Figure 12: Typical Capacitances

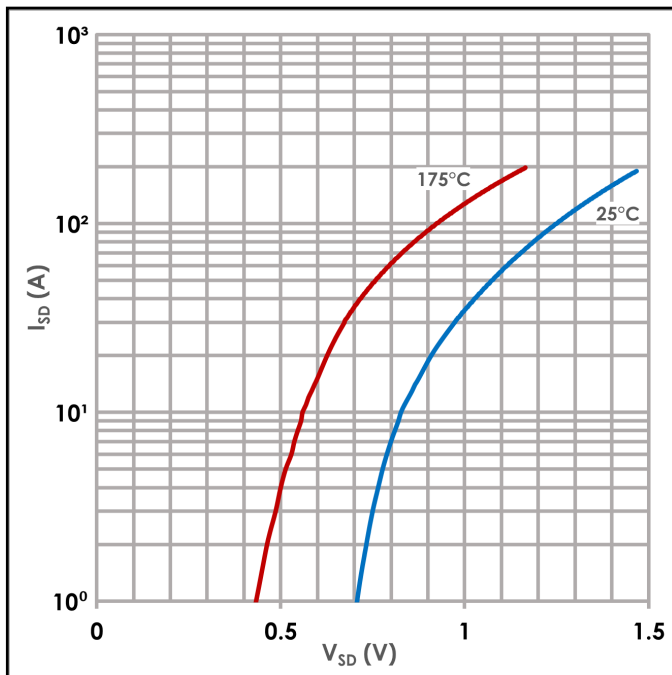


Figure 13: Typical Diode Forward Voltage

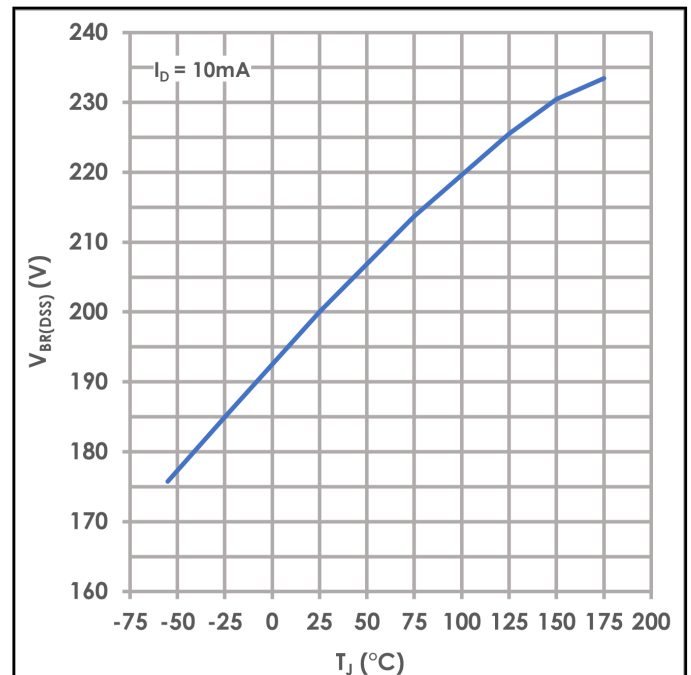


Figure 14: Min Drain-Source Breakdown Voltage

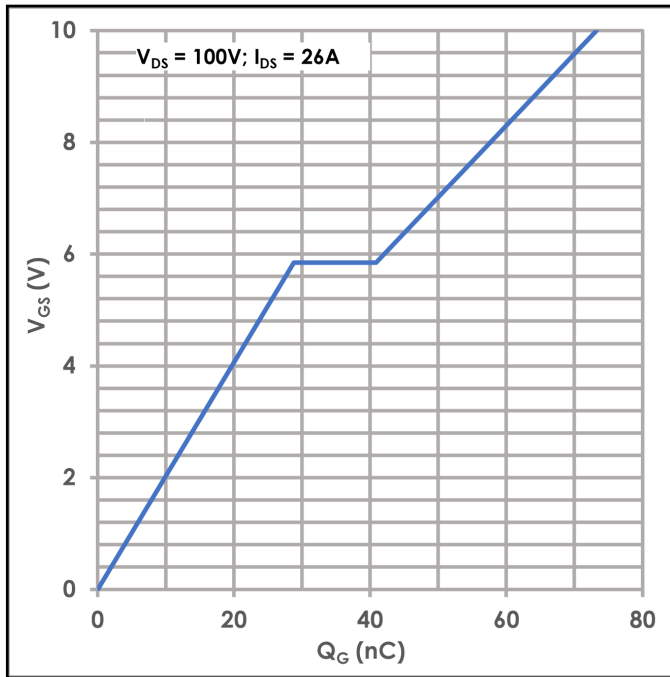


Figure 15: Typical Gate Charge

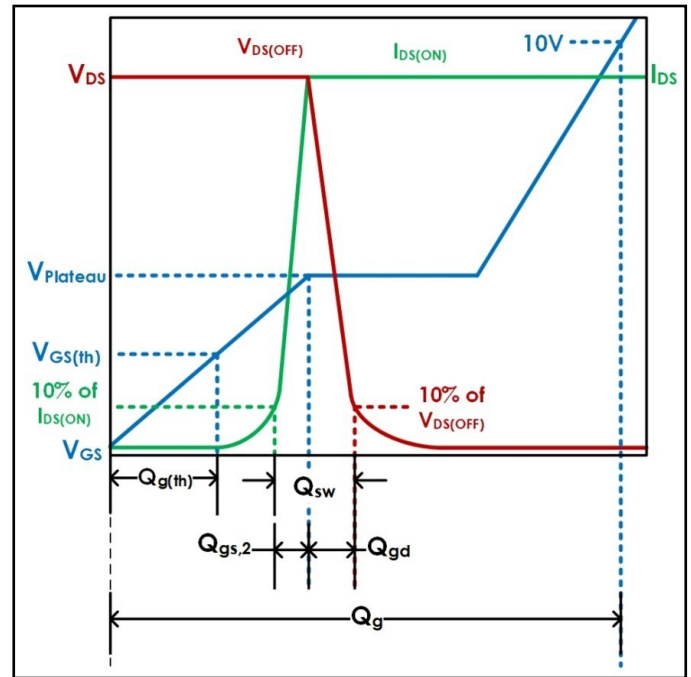
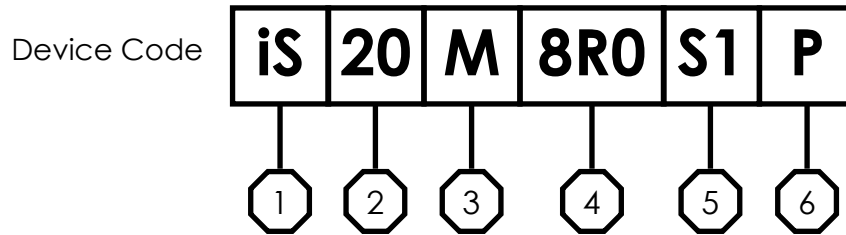








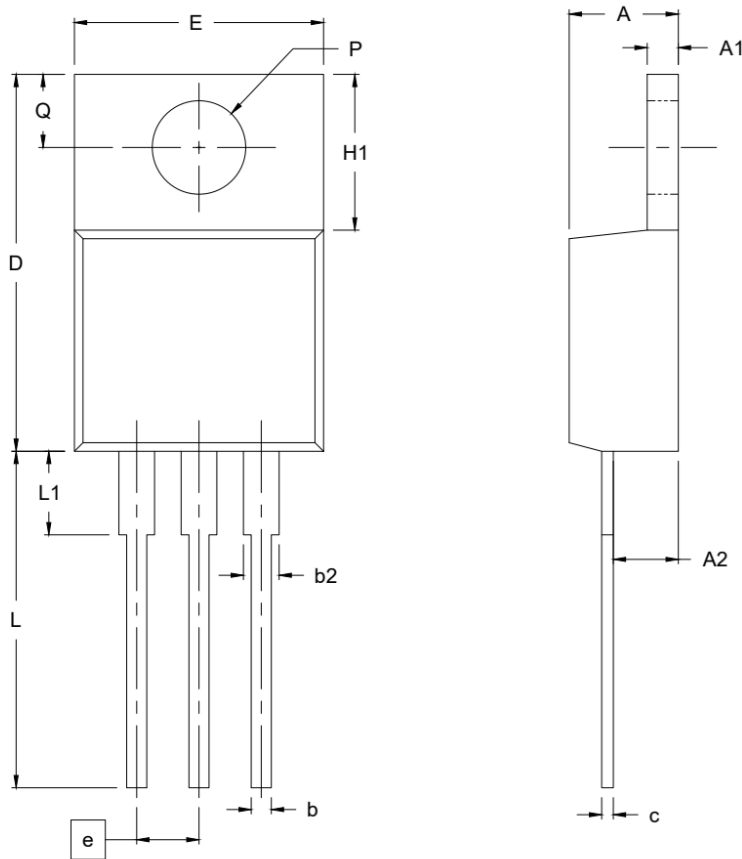
Figure 16: Gate Charge Definitions

DEVICE DECODER RING



-  — iDEAL Semiconductor product
-  — Voltage rating divided by 10 (200V)
-  — M = N-Channel MOSFET, Standard Threshold
-  — Maximum drain-to-source resistance
-  — SuperQ™ Generation
-  — P = TO-220

TO-220 Package Drawing



| SYMBOL | MIN | MAX |
|--------|----------|-------|
| A | 4.19 | 4.82 |
| A1 | 1.14 | 1.40 |
| A2 | 2.38 | 2.92 |
| b | 0.63 | 1.01 |
| b2 | 1.13 | 1.78 |
| c | 0.31 | 0.64 |
| D | 14.22 | 16.51 |
| E | 9.66 | 10.66 |
| e | 2.54 BSC | |
| H1 | 5.85 | 6.85 |
| L | 12.70 | 14.73 |
| L1 | 2.39 | 4.42 |
| P | 3.54 | 4.08 |
| Q | 2.54 | 3.42 |

Notes:

1. All linear dimensions in millimeters
2. Dimensions D and E do not include mold flash or protrusions

| Revision History | | |
|-------------------------|---------------|-----------------|
| Version | Date | Comments |
| 1.0 | February 2026 | Initial Release |

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