

SuperQ™ 200V N-Channel Power MOSFET

FEATURES

- Industry leading $R_{DS(on)}$ in TOLL 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

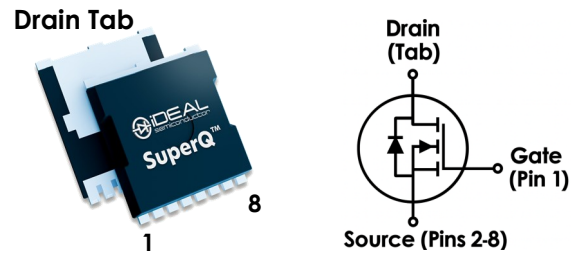
APPLICATIONS

- 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 TOLL package. Featuring best-in-class $R_{DS(on)}$ and Q_{sw} , it minimizes heat dissipation at both full and partial loads.

PRODUCT SUMMARY



TOLL

Parameter	Value	Unit
$T_A = 25^\circ C$		
V_{DS}	200	V
$R_{DS(on),max}$	8.0	m Ω
I_D	109	A
Q_G	76	nC
Q_{sw}	5.2	nC
E_{oss}	2.9	μJ



ORDERING INFORMATION

Part Number	Package	Marking	Packaging
iS20M8R0S1T	TOLL	iS20M8R0S1	13" 2,000pcs T&R

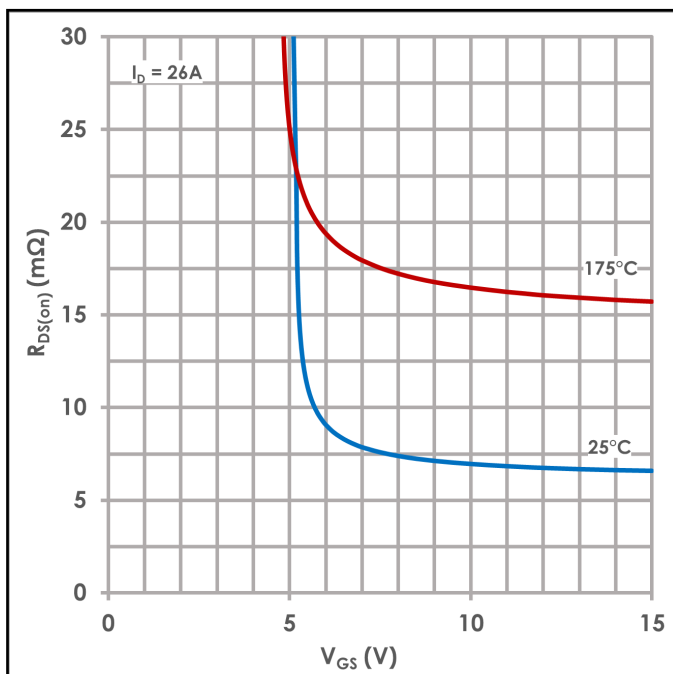


Figure 1: Typical Drain-Source On Resistance

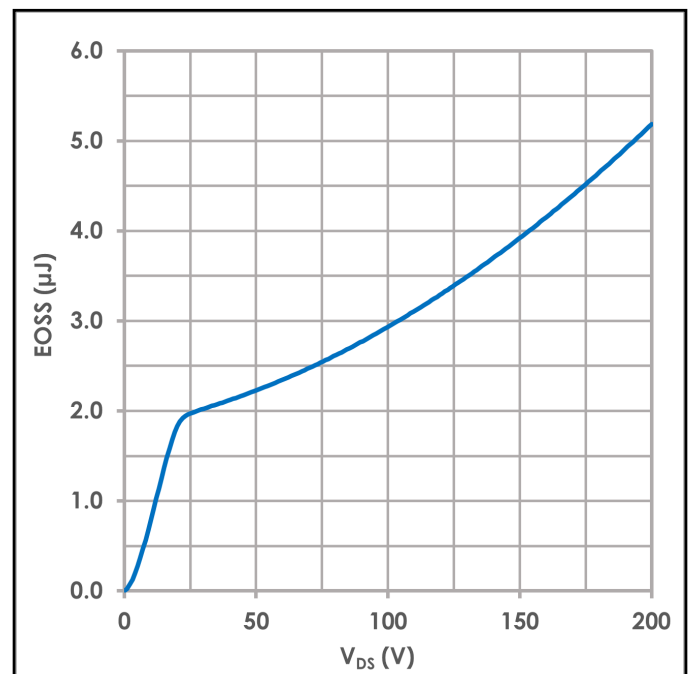


Figure 2: Typical C_{oss} Stored Energy

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	109	A
	Continuous drain current (silicon limited), T _C = 100°C	77	
I _{DM}	Pulsed drain current	389	A
P _D	Power dissipation, T _C = 25°C	242	W
T _J , T _{stg}	Operating junction, storage temperature	-55 to 175	°C
E _{AS}	Avalanche energy, single pulse I _D = 37A, R _{GS} = 25Ω	678	mJ

THERMAL CHARACTERISTICS					
SYMBOL	PARAMETER (T _A = 25°C unless otherwise specified)	VALUE			UNIT
		MIN	TYP	MAX	
R _{θJC}	Junction-to-case thermal resistance - TOLL	-	-	0.62	°C/W
R _{θJA}	Junction-to-ambient thermal resistance ⁽¹⁾	-	-	50	°C/W

(1) 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm (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						
B _V 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	-	1.8	100	nA
V _{GS(th)}	Gate-to-source threshold voltage	V _{DS} = V _{GS} , I _D = 300μA	3	3.5	4	V
R _{DS(on)}	Drain-to-source on-resistance	V _{GS} = 10V, I _D = 26A	-	6.7	8.0	mΩ
g _{fs}	Transconductance	V _{DS} = 10V, I _D = 26A	38	76	-	S
DYNAMIC CHARACTERISTICS						
C _{iss}	Input capacitance ⁽²⁾	V _{GS} = 0V, V _{DS} = 100V, f = 100kHz	-	5,768	7,498	pF
C _{rss}	Reverse transfer capacitance ⁽²⁾		-	13	17	
C _{oss}	Output capacitance ⁽²⁾		-	169	220	
C _{o(er)}	Effective output capacitance		V _{DS} = 0 to 100V, V _{GS} = 0V	-	294	
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	-	17.2	-	ns
t _r	Rise time		-	6.9	-	
t _{d(off)}	Turn-off delay time		-	39.5	-	
t _f	Fall time		-	5	-	
GATE CHARGE CHARACTERISTICS						
Q _G	Gate charge total ⁽²⁾	V _{DS} = 100V, I _D = 26A, V _{GS} = 0 to 10V	-	76	99	nC
Q _{sw}	Switching charge ⁽³⁾		-	5.2	-	
Q _{gd}	Gate to drain charge ^{(2) (3)}		-	2	2.6	
Q _{G(th)}	Gate charge at threshold ⁽³⁾		-	17	-	
Q _{gs2}	Gate to source charge ⁽³⁾		-	3.1	-	
V _{plateau}	Gate plateau voltage		-	5.6	-	V
Q _{oss}	Output charge ⁽²⁾	V _{DS} = 0 to 100V, V _{GS} = 0V	-	284	327	nC
E _{oss}	Capacitive stored energy		-	2.9	-	μJ
DIODE CHARACTERISTICS						
V _{SD}	Diode forward voltage	I _{SD} = 26A, V _{GS} = 0V	-	0.9	1.2	V
Q _{rr}	Reverse recovery charge	V _{DS} = 100V, I _F = 26A,	-	0.6	-	μC
t _{rr}	Reverse recovery time	di/dt = 100A/μs	-	132	-	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

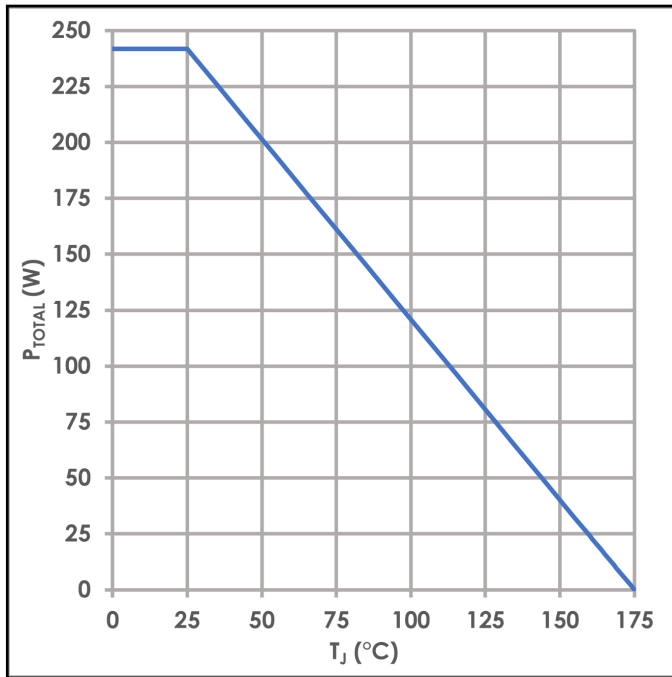


Figure 3: Power Dissipation

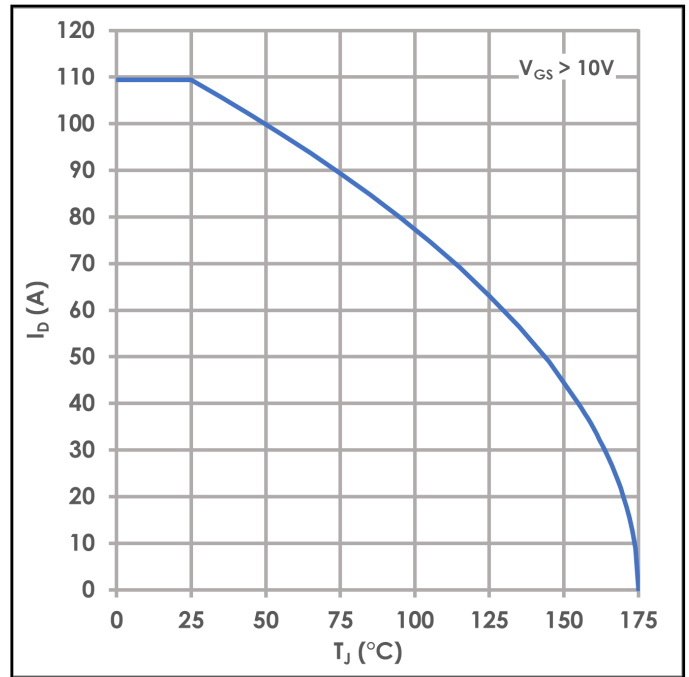


Figure 4: Drain Current

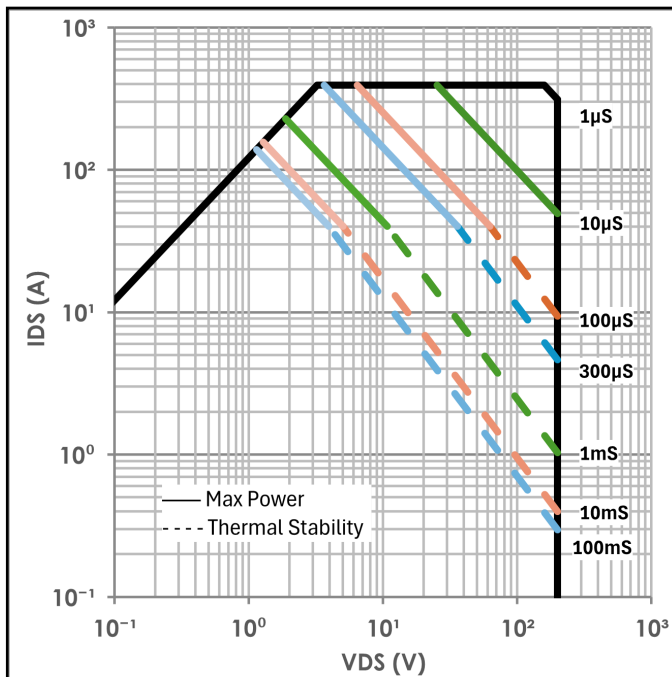


Figure 5: Safe Operating Area

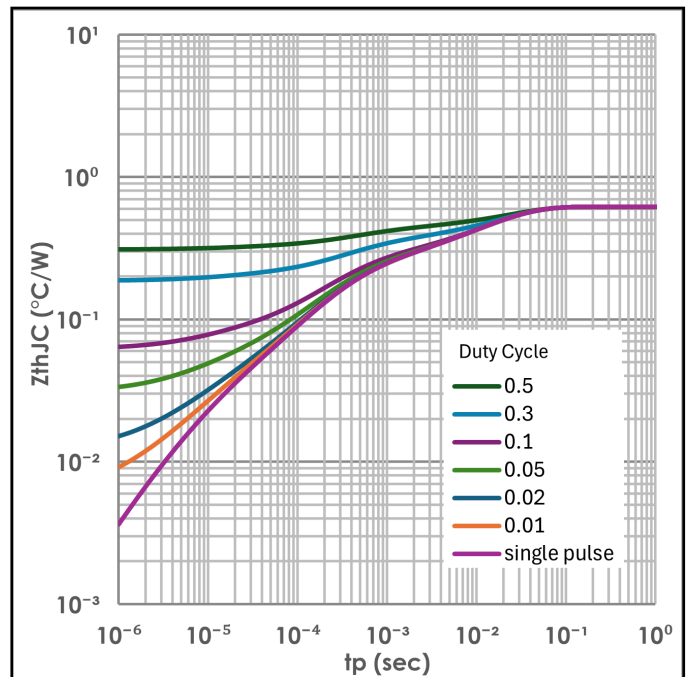


Figure 6: Max Transient Thermal Impedance

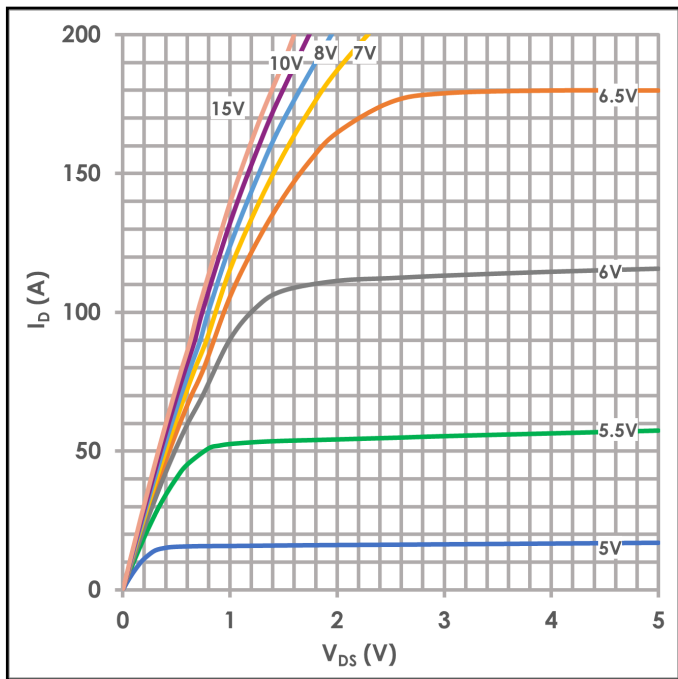


Figure 7: Typical Output Characteristics

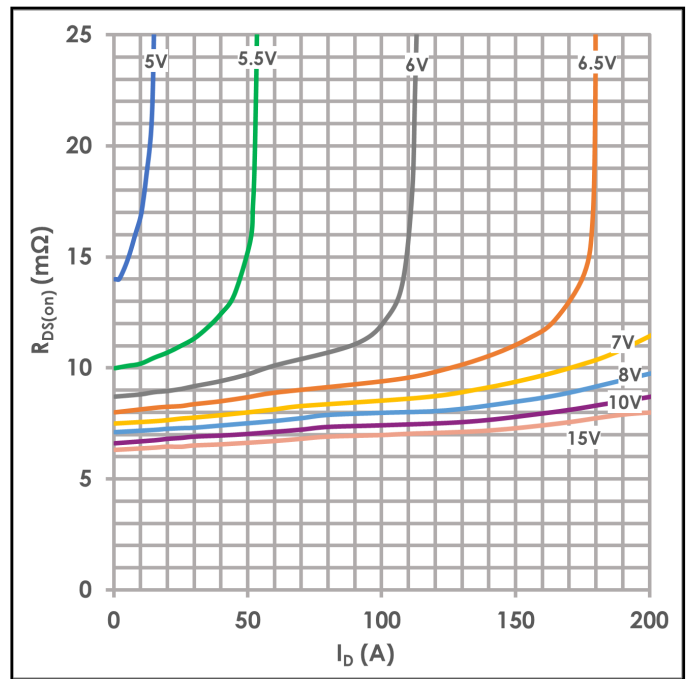


Figure 8: Typical Drain-Source On-Resistance

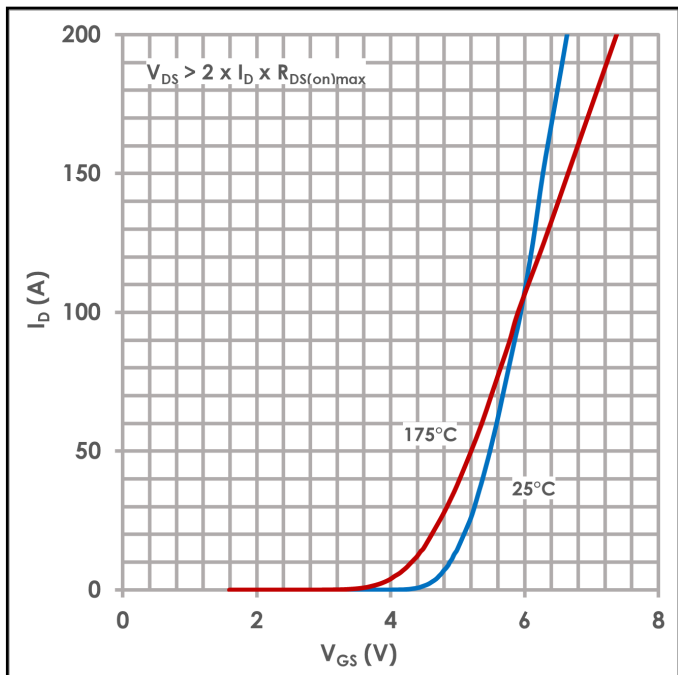


Figure 9: Typical Transfer Characteristics

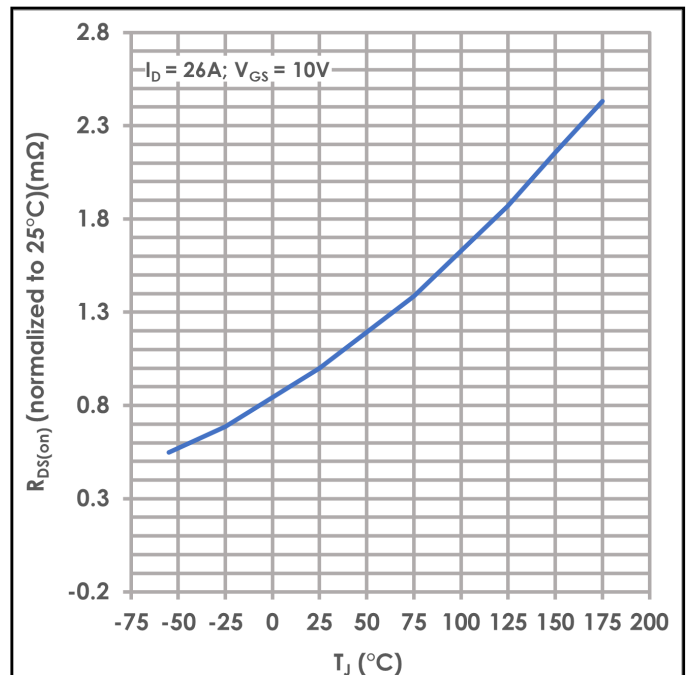


Figure 10: Normalized On-State Resistance vs. Temperature

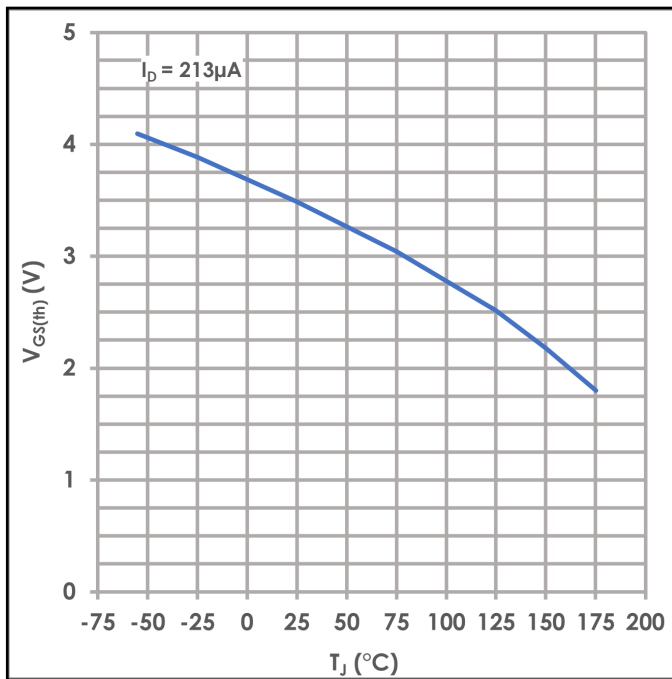


Figure 11: Typical Threshold Voltage

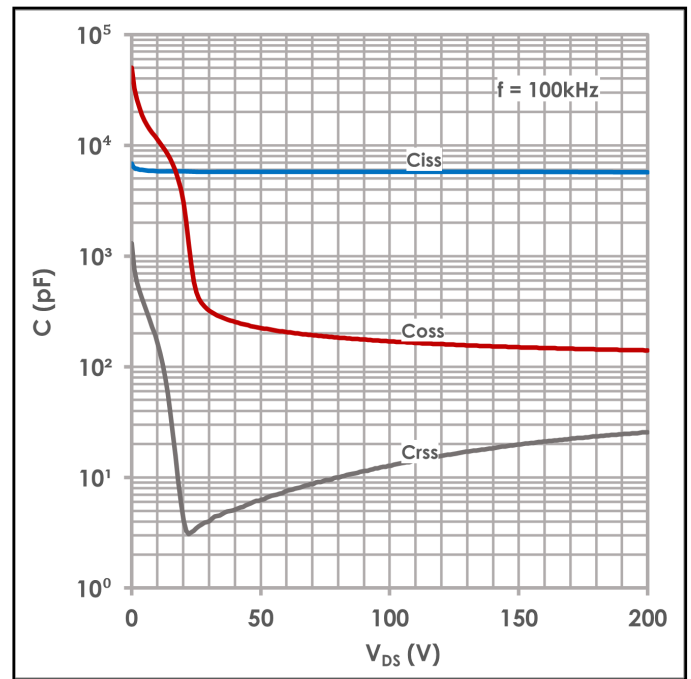


Figure 12: Typical Capacitances

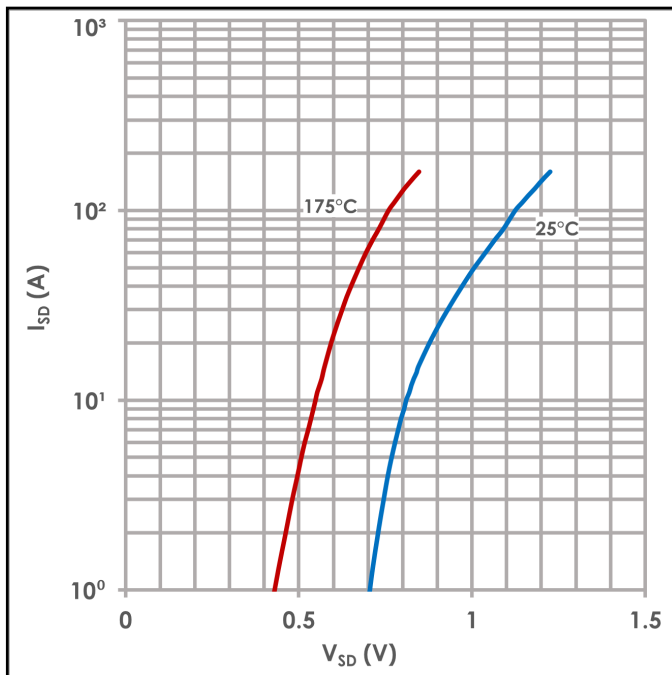


Figure 13: Typical Diode Forward Voltage

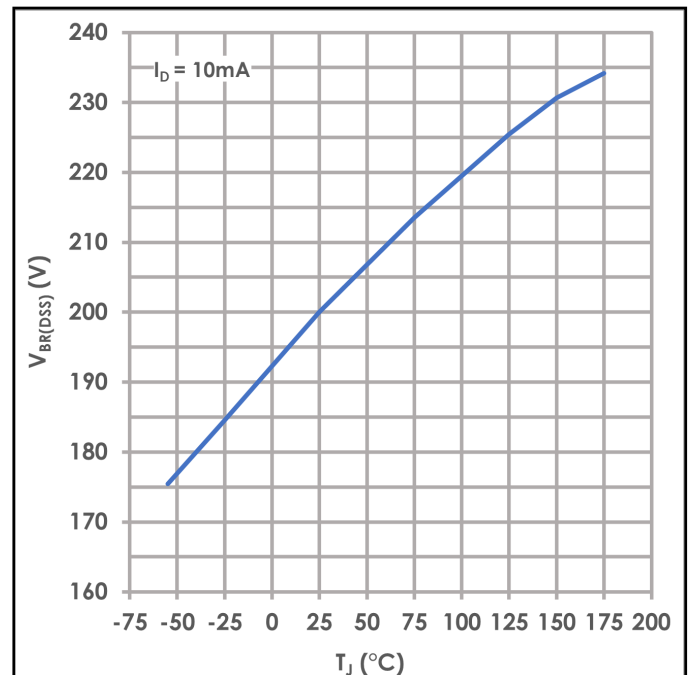


Figure 14: Min Drain-Source Breakdown Voltage

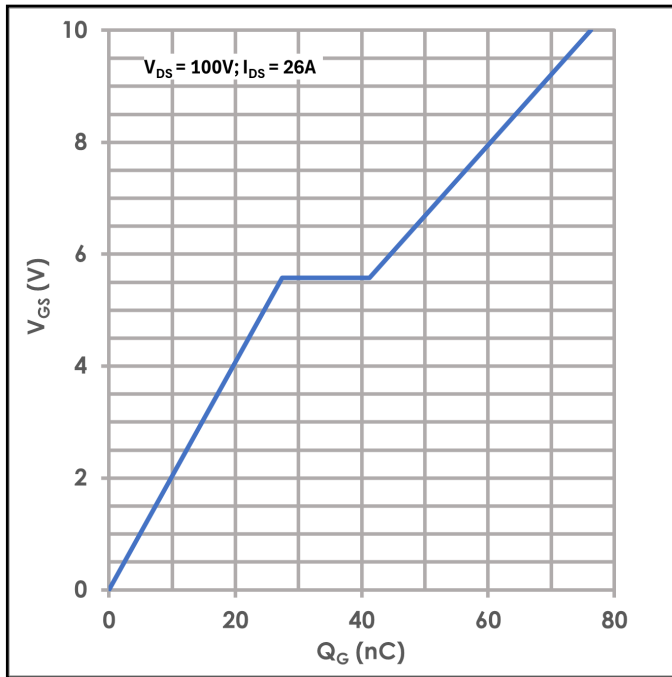


Figure 15: Typical Gate Charge

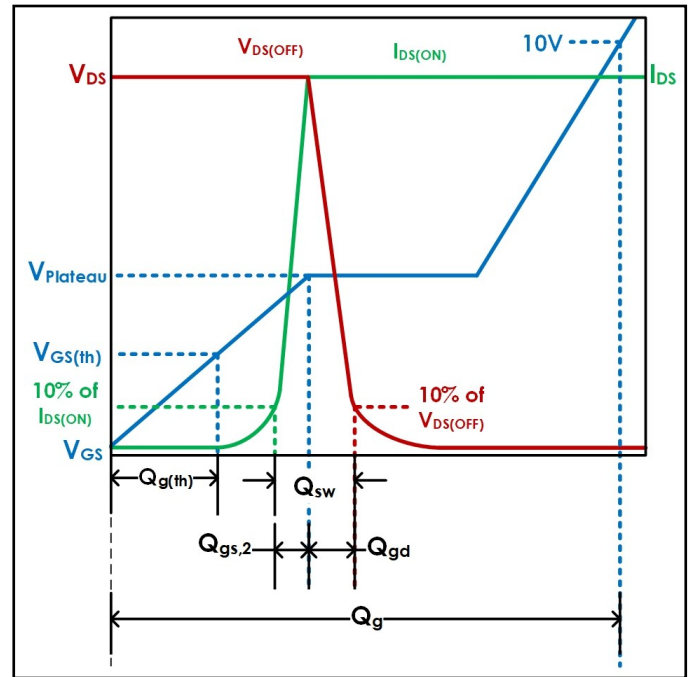
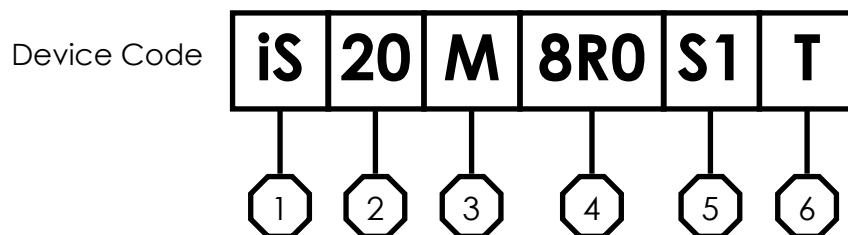


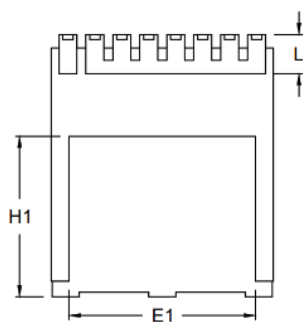
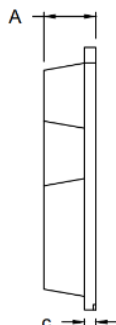
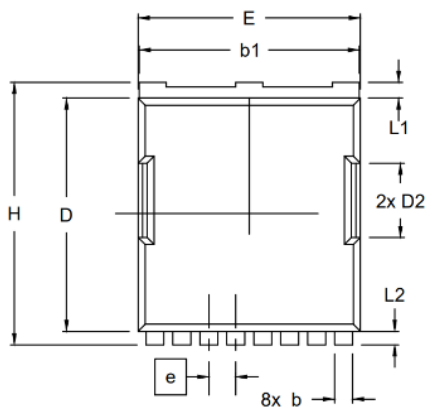
Figure 16: Gate Charge Definitions

DEVICE DECODER RING



- 1 - iDEAL Semiconductor product
- 2 - Voltage rating divided by 10 (200V)
- 3 - M = N-Channel MOSFET, Standard Threshold
- 4 - Maximum drain-to-source resistance
- 5 - SuperQ™ Generation
- 6 - T = TOLL

TOLL Package Drawing



SYMBOL	MIN	MAX
A	2.20	2.40
b	0.70	0.90
b1	9.70	9.90
c	0.40	0.6
D	10.28	10.58
D2	3.10	3.50
E	9.70	10.00
E1	7.90	8.60
e	1.20 BSC	
H	11.48	11.880
H1	6.75	7.43
L	1.40	2.10
L1	0.60	0.80
L2	0.500	0.700
θ	10° REF	

Notes:

1. All linear dimensions in millimeters

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