SuperQ™ 200V N-Channel Power MOSFET

FEATURES

- Industry leading $R_{DS(on)}$ in TOLT package
- High short-circuit withstand capability (SCWC)
- 100% UIS tested in production
- Low switching losses, Q_{SW} and E_{OSS}
- Easier parallelling with ± 0.5V gate threshold

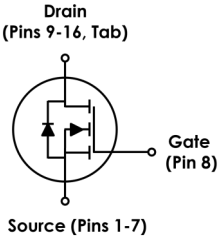
APPLICATIONS

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

PRODUCT SUMMARY



TOLT

Parameter T_A = 25°C	Value	Unit
V_{DS}	200	V
$R_{DS(on),max}$	8.0	mΩ
I_D	109	A
Q_G	76	nC
Q_{SW}	5.2	nC
E_{OSS}	2.9	µJ

Pb

HAL

RoHS

ORDERING INFORMATION			
Part Number	**Package**	**Marking**	**Packaging**
iS20M8R0S1TC	TOLT	iS20M8R0S1	13" 1,300pcs T&R

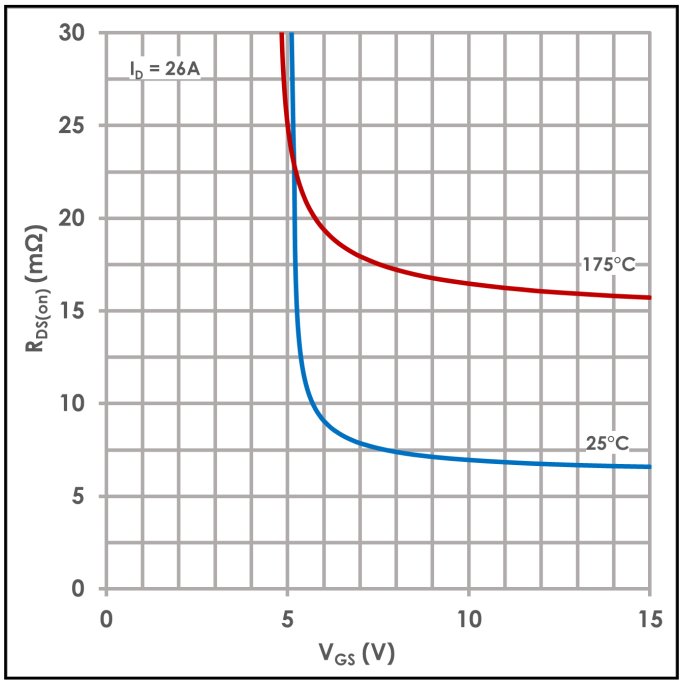


Figure 1: Typical Drain-Source On Resistance

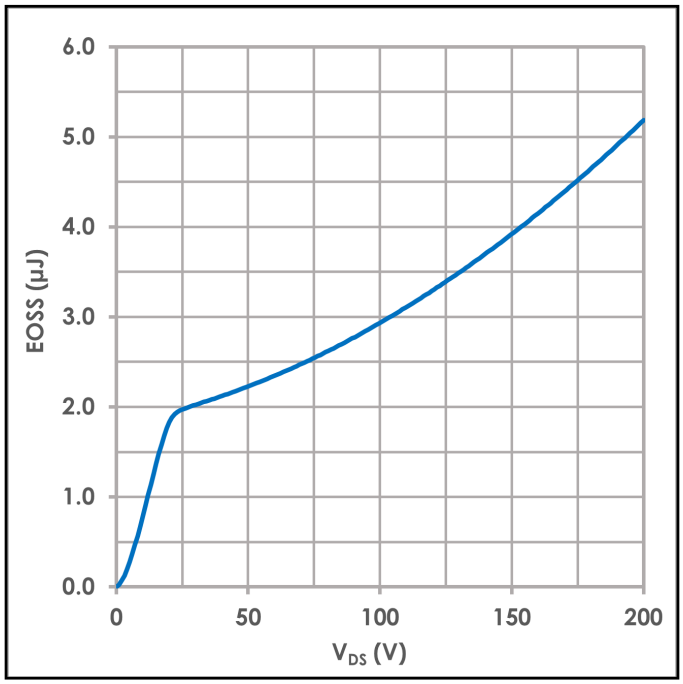


Figure 2: Typical C_{OSS} Stored Energy

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**	
$R_{\theta JC}$	Junction-to-case thermal resistance - TOLT	-	-	0.62	°C/W
$R_{\theta JA}$	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						
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	-	1.8	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, di/dt = 100A/µs	-	0.6	-	µC
t_{rr}	Reverse recovery time		-	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

Ratings and Characteristics Curves

(T_A = 25°C unless otherwise specified)

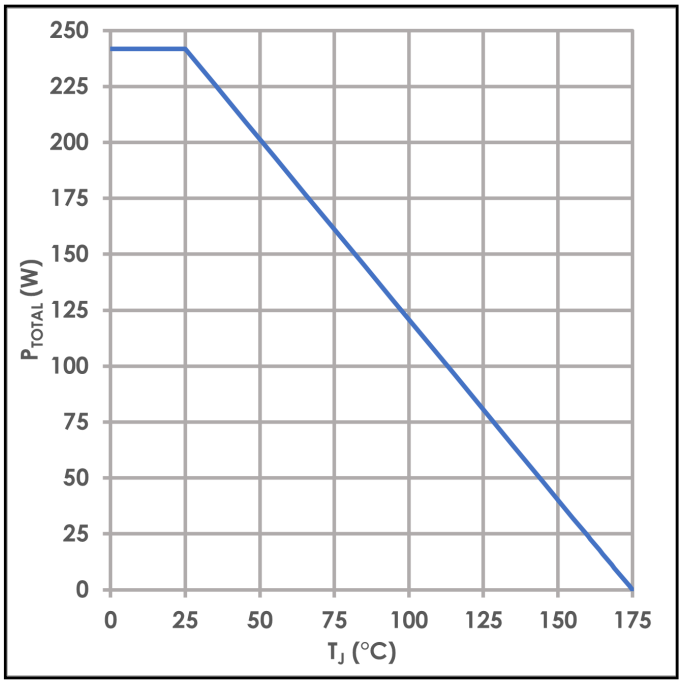


Figure 3: Power Dissipation

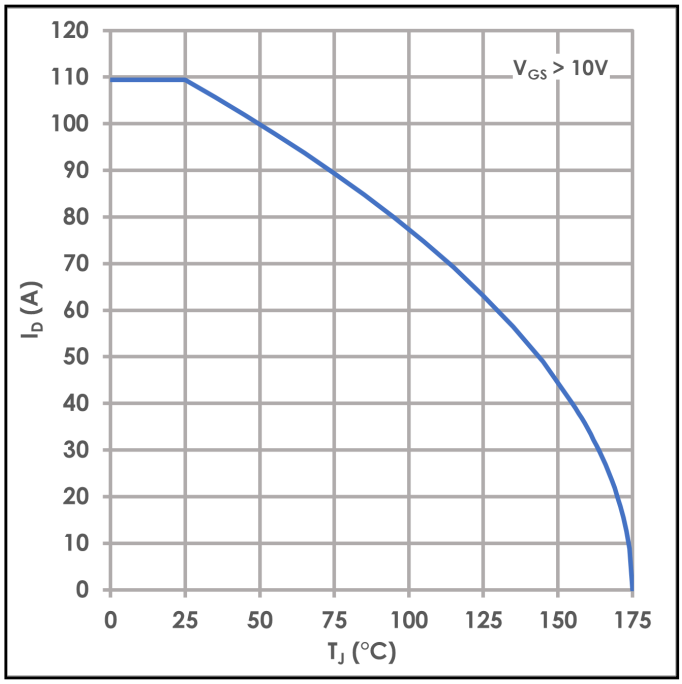


Figure 4: Drain Current

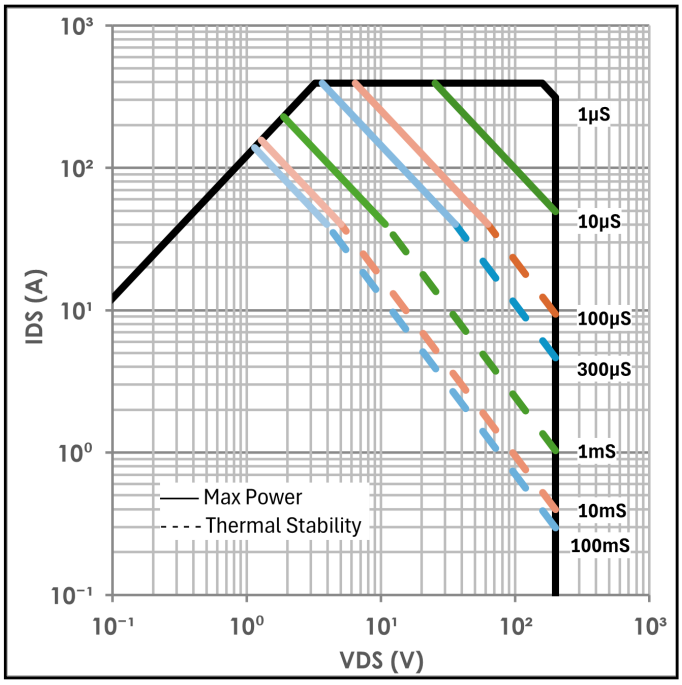


Figure 5: Safe Operating Area

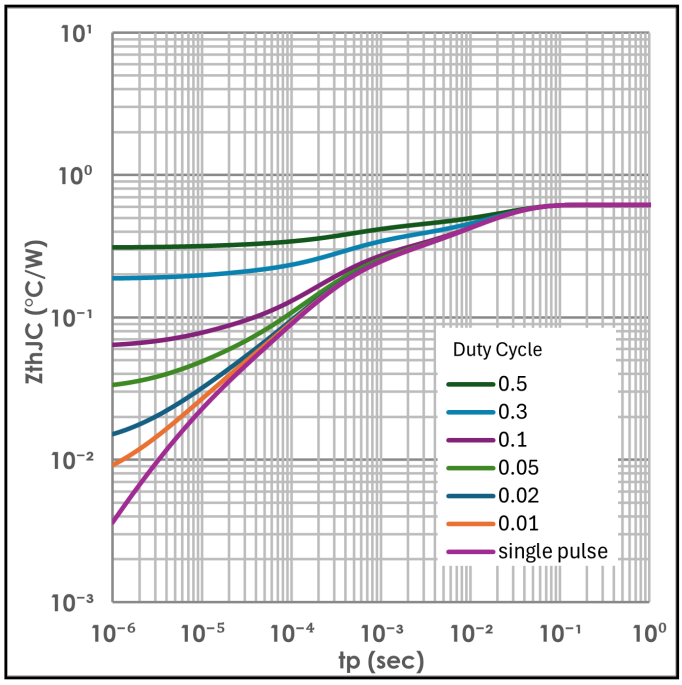


Figure 6: Max Transient Thermal Impedance

Ratings and Characteristics Curves

(T_A = 25°C unless otherwise specified)

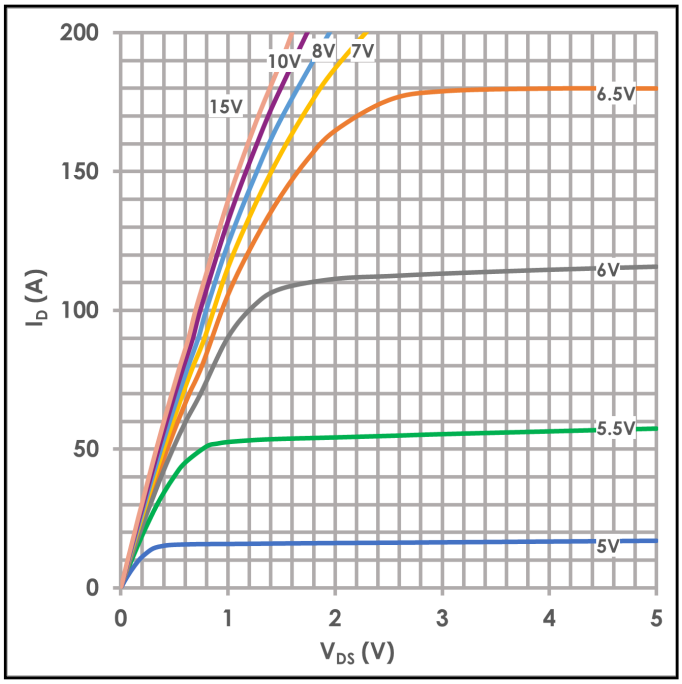


Figure 7: Typical Output Characteristics

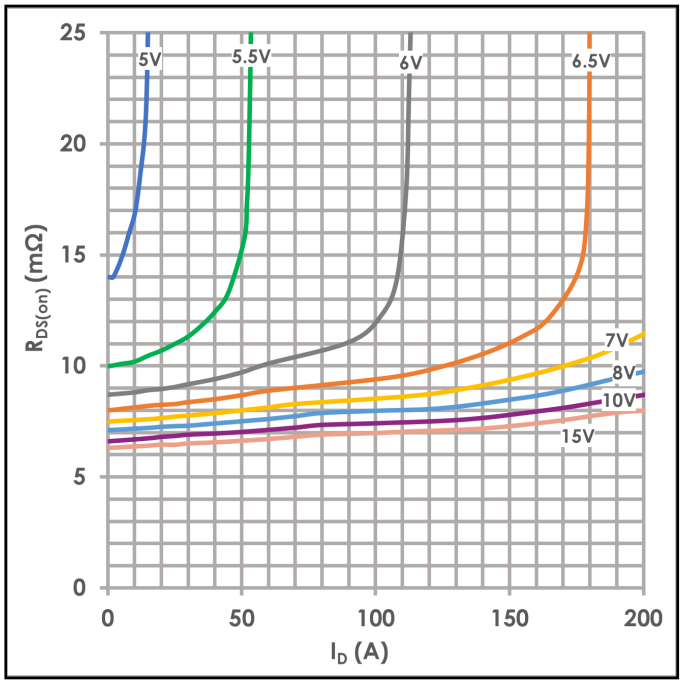


Figure 8: Typical Drain-Source On-Resistance

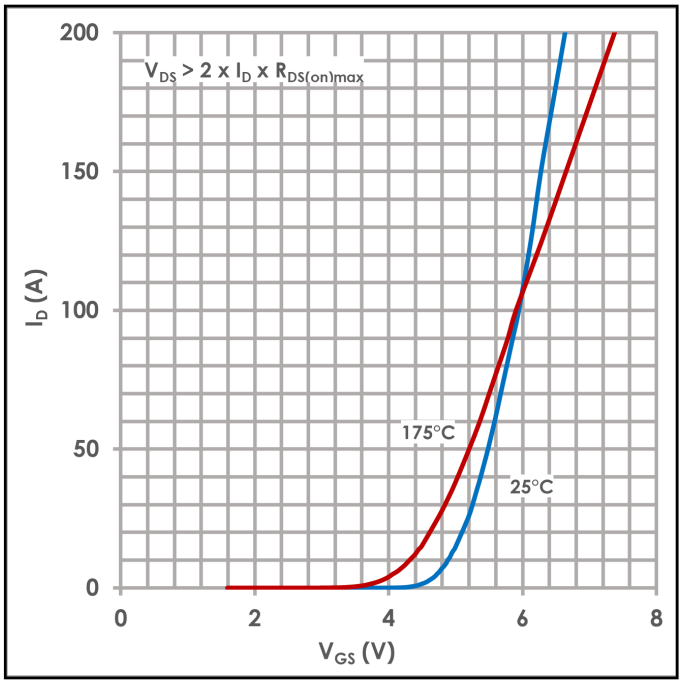


Figure 9: Typical Transfer Characteristics

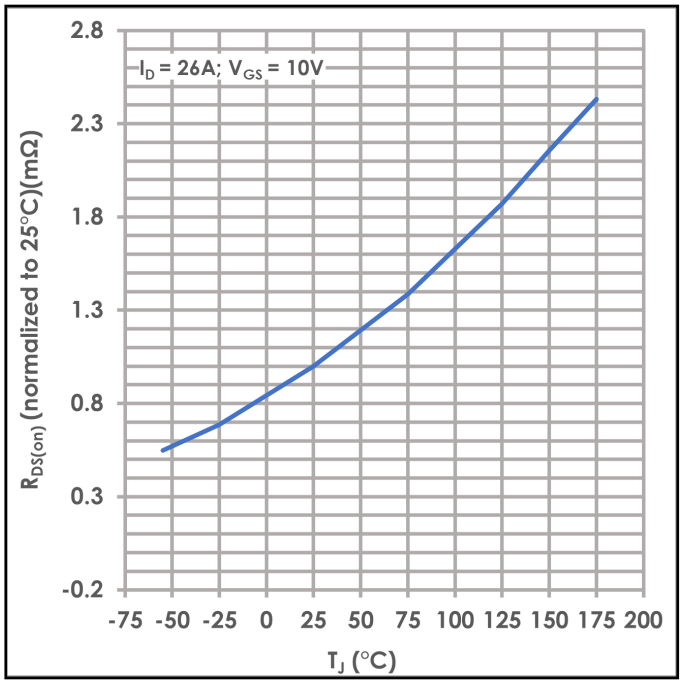


Figure 10: Normalized On-State Resistance vs. Temperature

Ratings and Characteristics Curves

(T_A = 25°C unless otherwise specified)

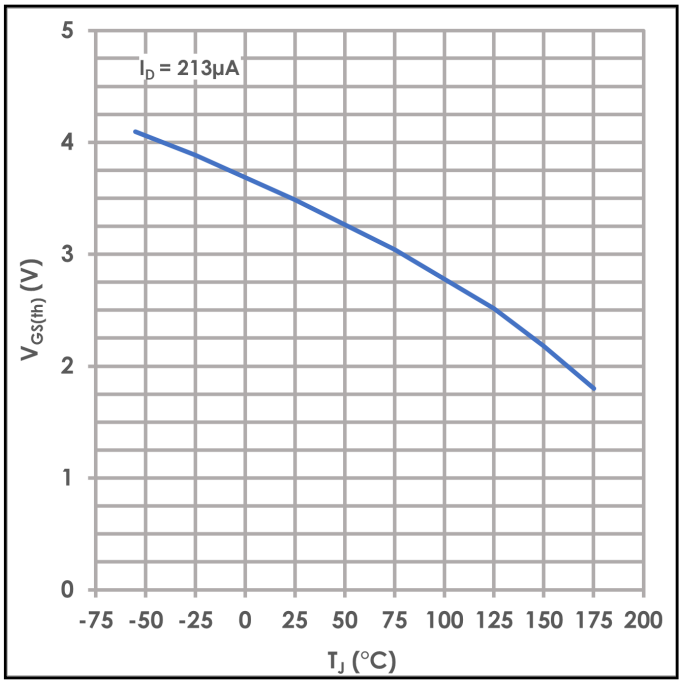


Figure 11: Typical Threshold Voltage

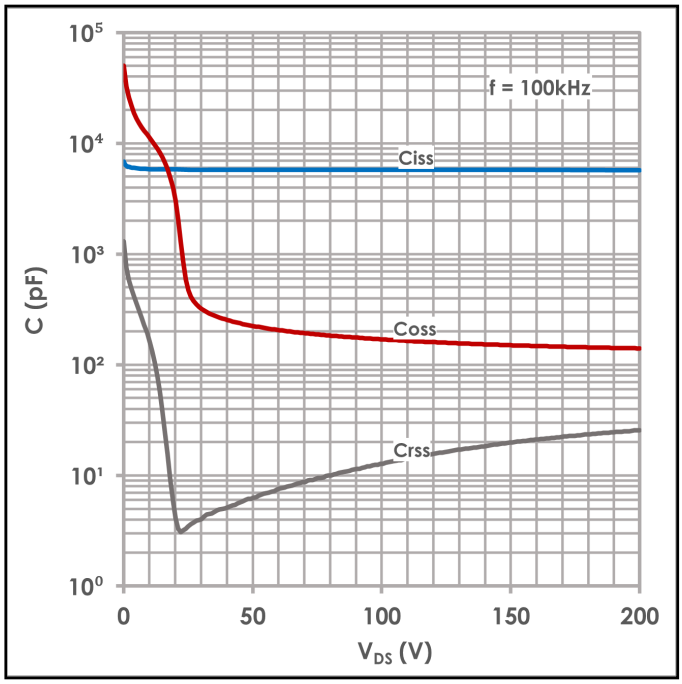


Figure 12: Typical Capacitances

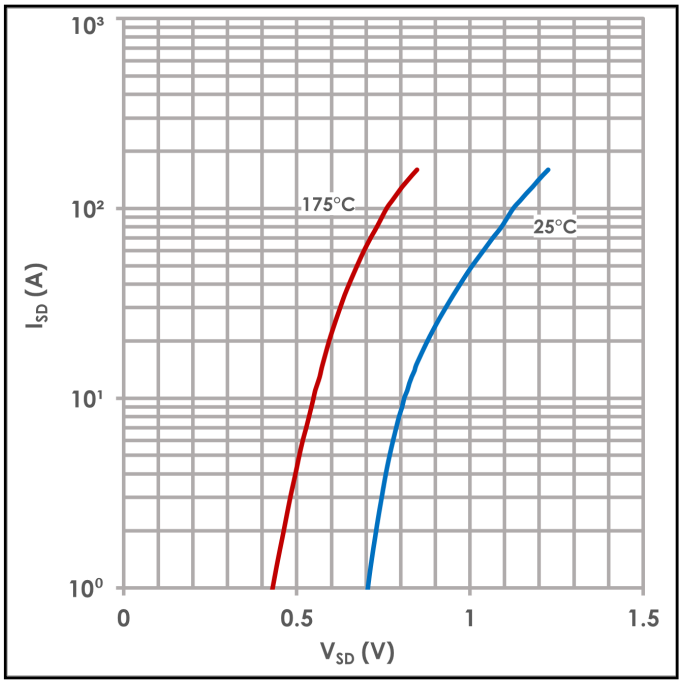


Figure 13: Typical Diode Forward Volltage

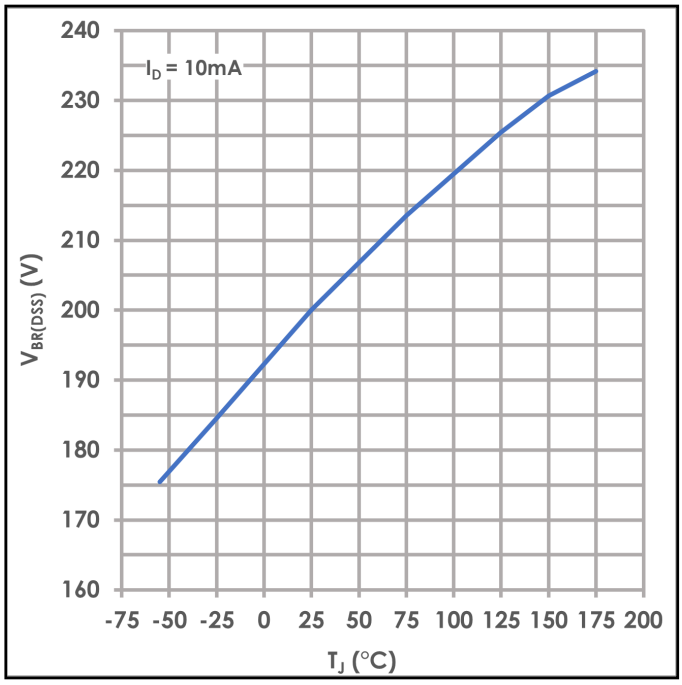


Figure 14: Min Drain-Source Breakdown Voltage

Ratings and Characteristics Curves

(T_A = 25°C unless otherwise specified)

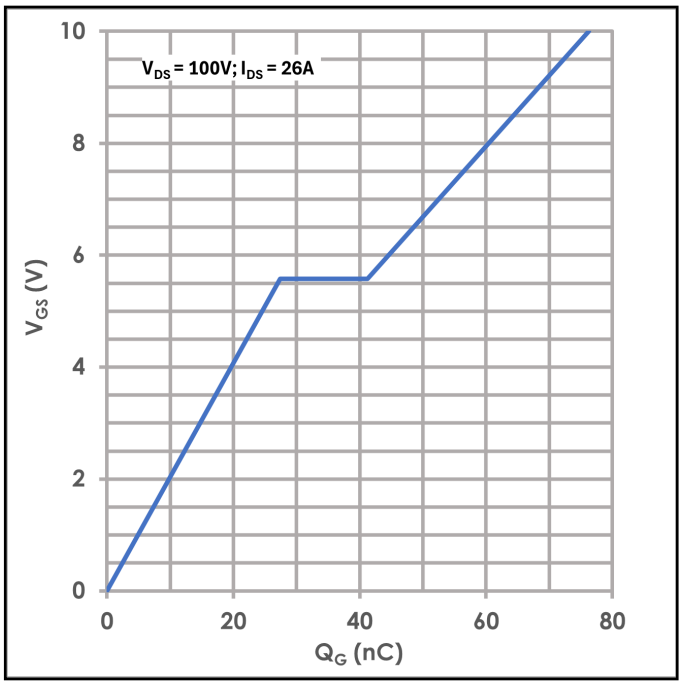


Figure 15: Typical Gate Charge

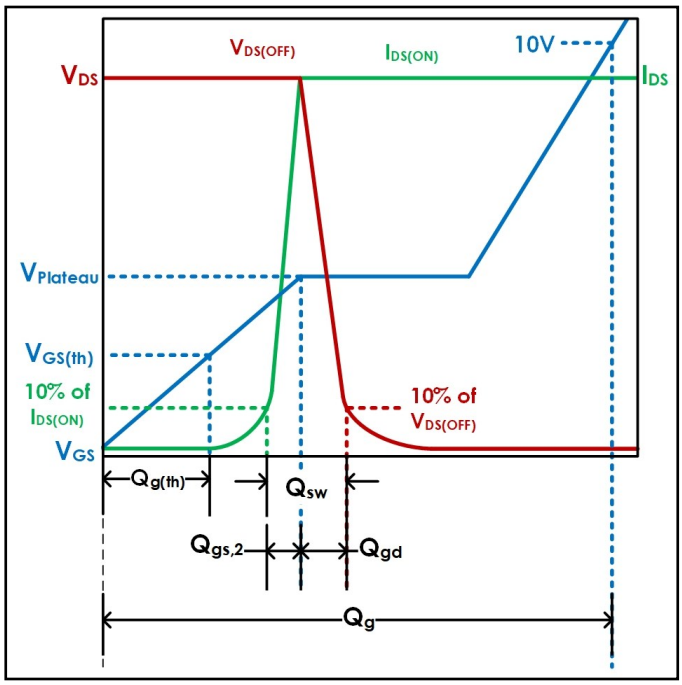
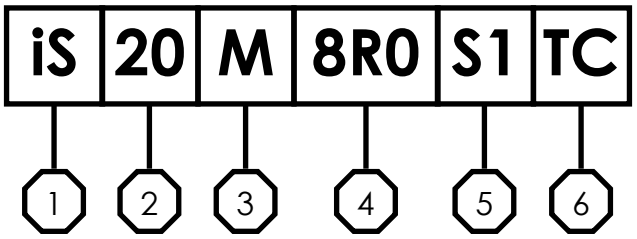


Figure 16: Gate Charge Definitions

DEVICE DECODER RING

Device Code



1 – iDEAL Semiconductor product

2 – Voltage rating divided by 10 (200V)

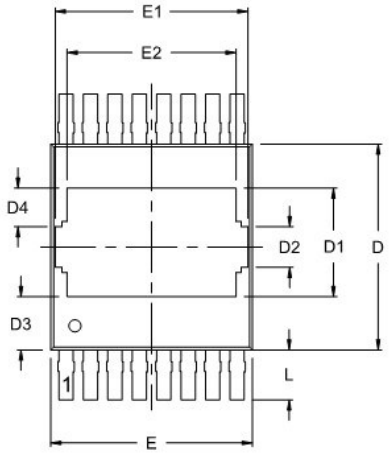
3 – M = N-Channel MOSFET, Standard Threshold

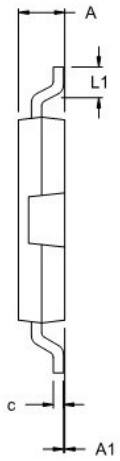
4 – Maximum drain-to-source resistance

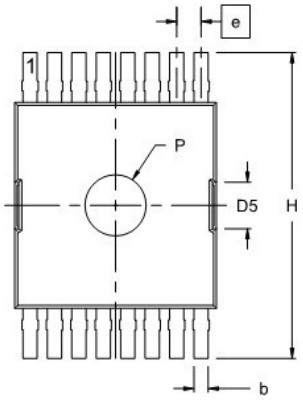
5 – SuperQ™ Generation

6 – TC = TOLT

TOLT Package Drawing







SYMBOL	MIN	MAX
A	2.20	2.35
A1	0.01	0.11
b	0.60	0.85
c	0.45	0.65
D	10.00	10.30
D1	4.76	5.87
D2	1.80	2.20
D3	2.42	2.82
D4	1.33	2.44
D5	2.08	2.48
E	9.70	10.10
E1	9.26	9.66
E2	8.10	8.50
e	1.20 BSC	
H	14.80	15.20
L	2.25	2.65
L1	1.30	1.70
P	2.90	3.10

Notes:
1. All linear dimensions in millimeters

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