iS20M5R5S1T

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 ± 0.5V gate threshold

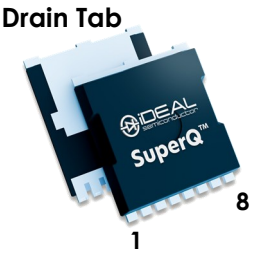
APPLICATIONS

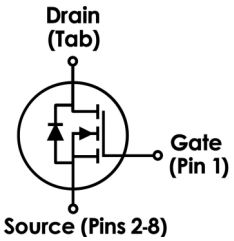
- Motor control
- Boost converters and SMPS control FETs
- Secondary side synchronous rectifier

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

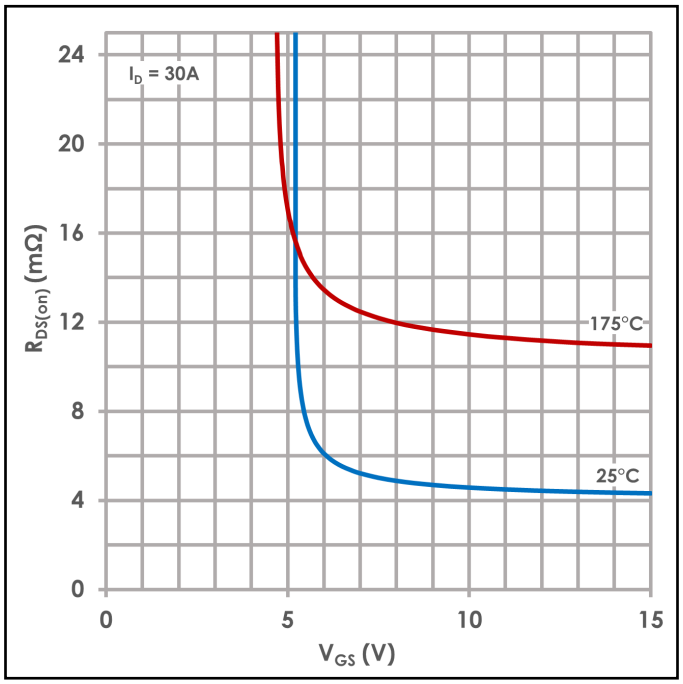
Parameter T_A = 25°C	Value	Unit
V_{DS}	200	V
$R_{DS(on),max}$	5.5	mΩ
I_D	151	A
Q_G	112	nC
Q_{SW}	8.3	nC
E_{OSS}	4.0	µJ

Pb

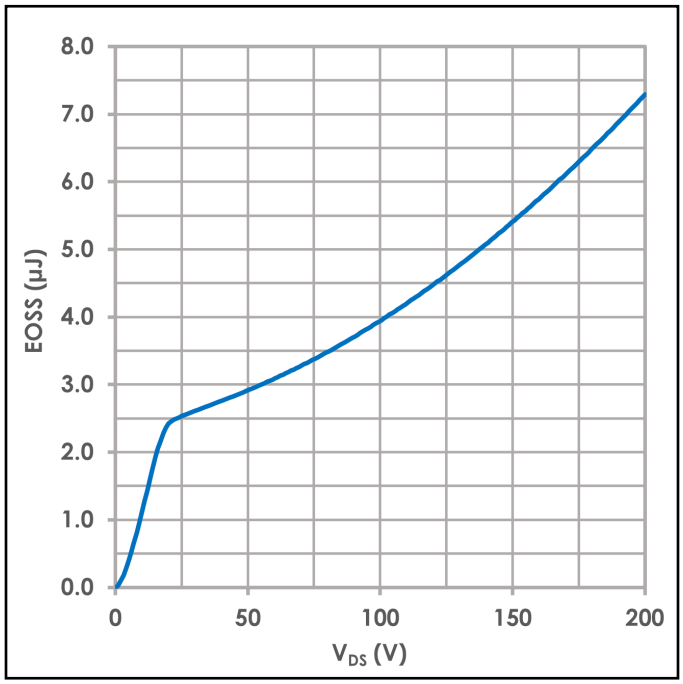
HAL

RoHS

ORDERING INFORMATION			
Part Number	**Package**	**Marking**	**Packaging**
iS20M5R5S1T	TOLL	iS20M5R5S1	13" 2,000pcs T&R



Typical Drain-Source On Resistance



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	151	A
	Continuous drain current (silicon limited), T_C = 100°C	107	
I_{DM}	Pulsed drain current	538	A
P_D	Power dissipation, T_C = 25°C	314	W
T_J, T_{stg}	Operating junction, storage temperature	-55 to 175	°C
E_{AS}	Avalanche energy, single pulse I_D = 18.2A, R_{GS} = 25Ω	1662	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 - TOLL	-	-	0.5	°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	100	nA
$V_{GS(th)}$	Gate-to-source threshold voltage	V_{DS} = V_{GS}, I_D = 300µA	3.1	3.5	4.1	V
$R_{DS(on)}$	Drain-to-source on-resistance	V_{GS} = 10V, I_D = 30A	-	4.6	5.5	mΩ
g_{fs}	Transconductance	V_{DS} = 10V, I_D = 30A	16.5	33	-	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input capacitance (2)	V_{GS} = 0V, V_{DS} = 100V, f = 100kHz	-	8,366	10,876	pF
C_{rss}	Reverse transfer capacitance (2)		-	37	48	
C_{oss}	Output capacitance (2)		-	249	324	
$C_{o(er)}$	Effective output capacitance	V_{DS} = 0 to 100V, V_{GS} = 0V	-	396	-	
R_G	Series gate resistance	f = 1MHz	-	0.6	0.9	Ω
$t_{d(on)}$	Turn-on delay time	V_{DS} = 100V, V_{GS} = 10V, I_{DS} = 30A, $R_{G,EXT}$ = 0 Ω	-	25.7	-	ns
t_r	Rise time		-	4.1	-	
$t_{d(off)}$	Turn-off delay time		-	67.3	-	
t_f	Fall time		-	16.3	-	
GATE CHARGE CHARACTERISTICS						
Q_g	Gate charge total (2)	V_{DS} = 100V, I_D = 30A, V_{GS} = 0 to 10V	-	112	146	nC
Q_{sw}	Switching charge (3)		-	8.3	-	
Q_{gd}	Gate to drain charge (2) (3)		-	4.0	5.2	
$Q_{g(th)}$	Gate charge at threshold (3)		-	25.5	-	
Q_{gs2}	Gate to source charge (3)		-	4	-	
$V_{plateau}$	Gate plateau voltage		-	5.5	-	V
Q_{oss}	Output charge (2)	V_{DS} = 0 to 100V, V_{GS} = 0V	-	398	458	nC
E_{oss}	Capacitive stored energy		-	4.0	-	µJ
DIODE CHARACTERISTICS						
V_{SD}	Diode forward voltage	I_{SD} = 30A, V_{GS} = 0V	-	0.9	1.2	V
Q_{rr}	Reverse recovery charge	V_{DS} = 100V, I_F = 30A, di/dt = 100A/µs	-	0.7	-	µC
t_{rr}	Reverse recovery time		-	151	-	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 Qsw application note on www.idealsemi.com

Ratings and Characteristics Curves

(T_A = 25°C unless otherwise specified)

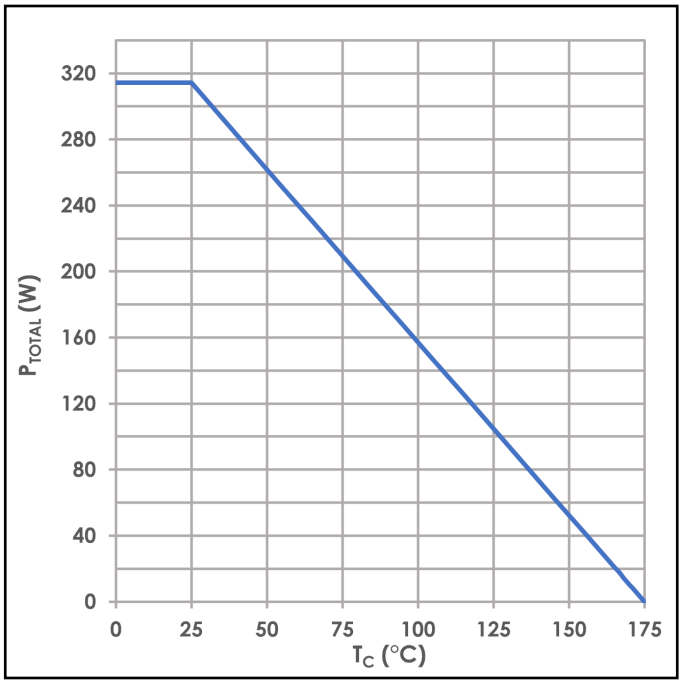


Figure 1: Power Dissipation

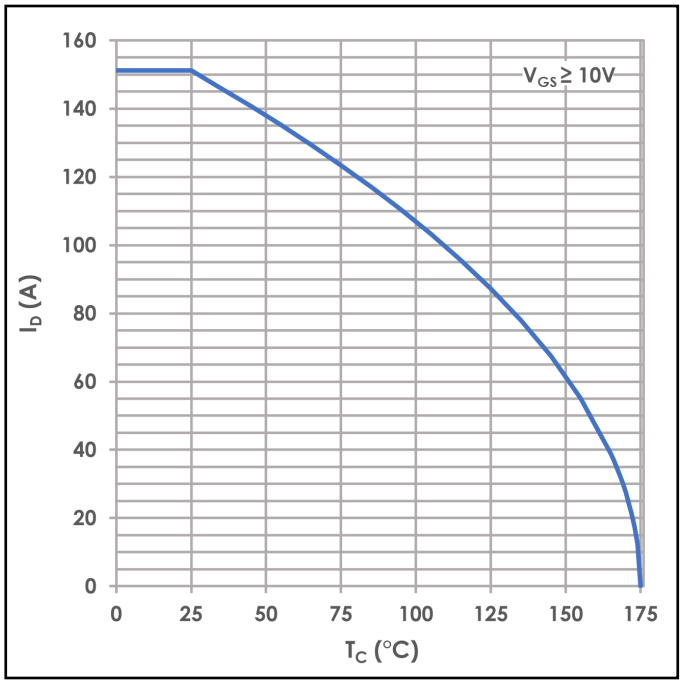


Figure 2: Drain Current

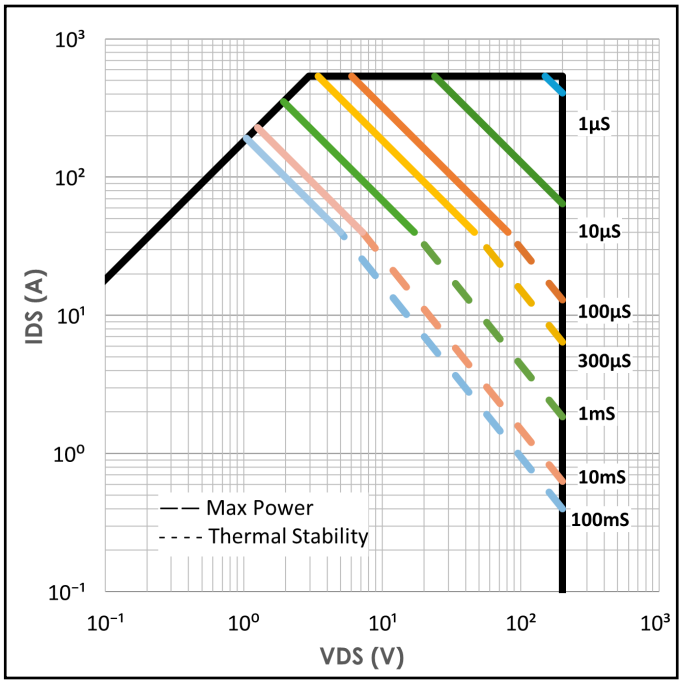


Figure 3: Safe Operating Area

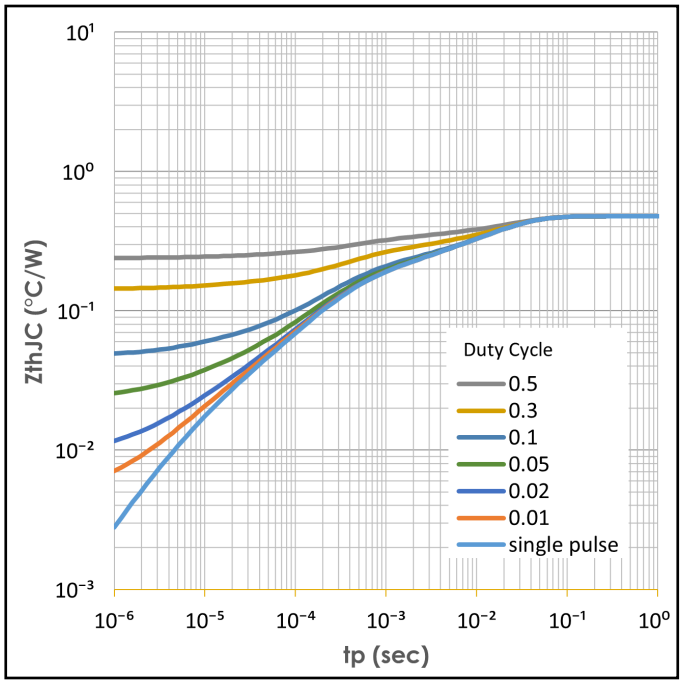


Figure 4: Max Transient Thermal Impedance

Ratings and Characteristics Curves

(T_A = 25°C unless otherwise specified)

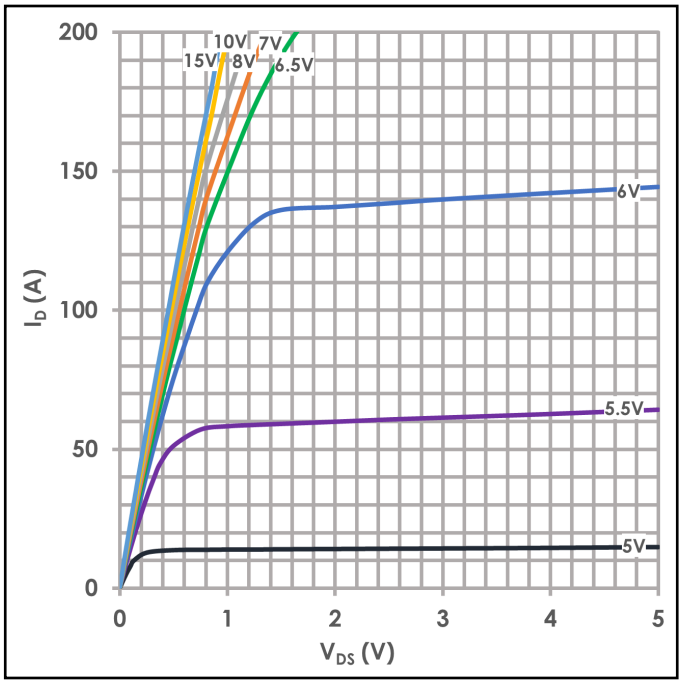


Figure 5: Typical Output Characteristics

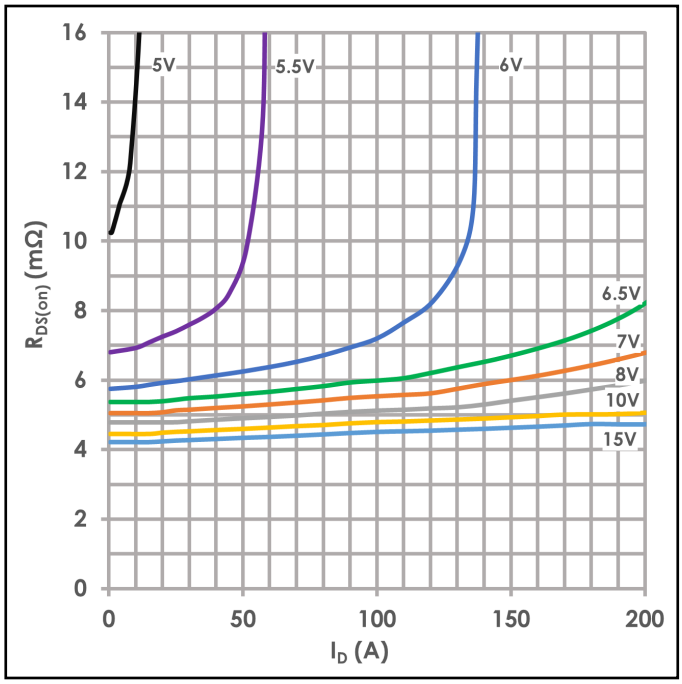


Figure 6: Typical Drain-Source On-Resistance

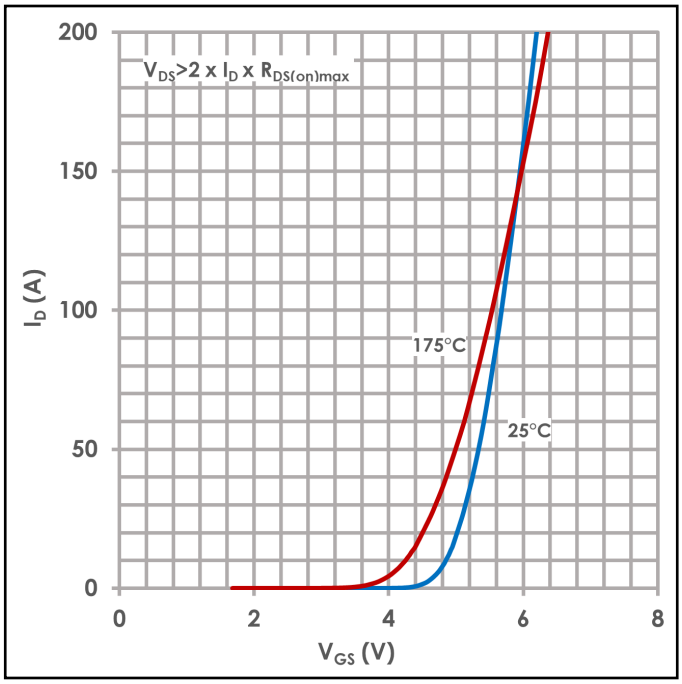


Figure 7: Typical Transfer Characteristics

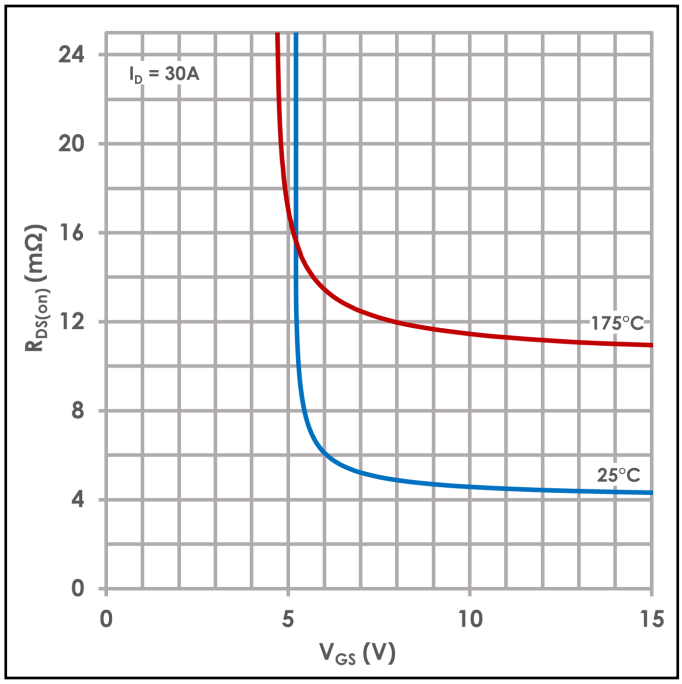


Figure 8: Typical Drain-Source On Resistance

Ratings and Characteristics Curves

(T_A = 25°C unless otherwise specified)

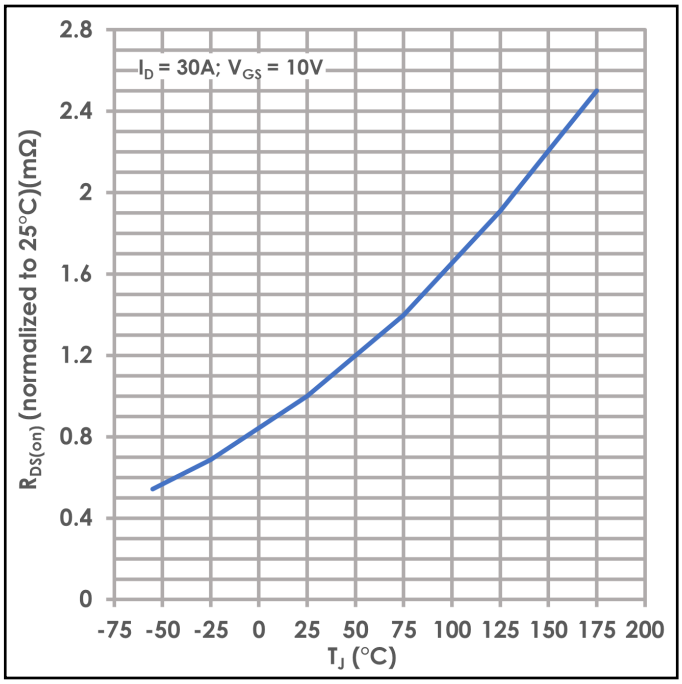


Figure 9: Normalized On-State Resistance vs. Temperature

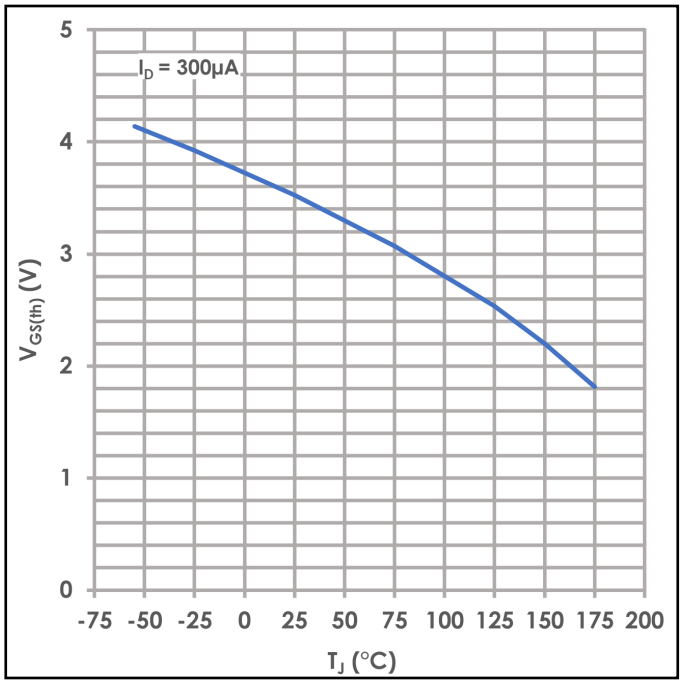


Figure 10: Typical Threshold Voltage

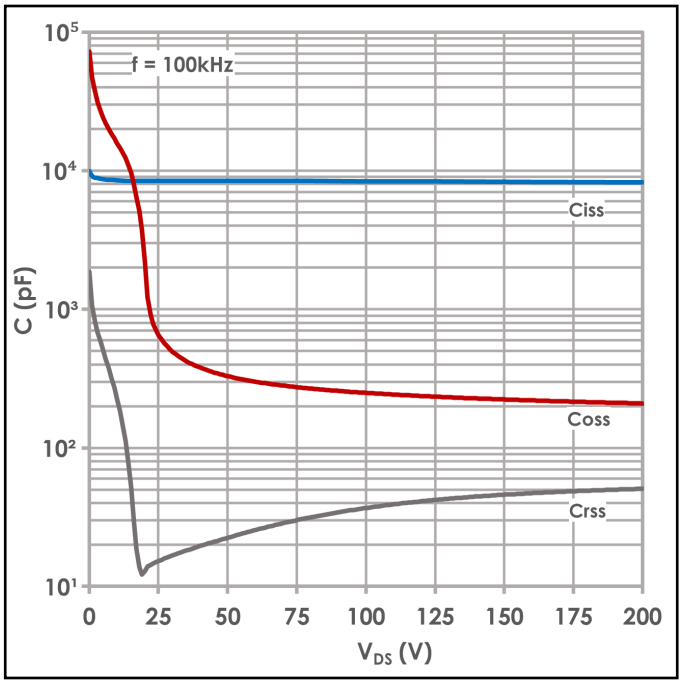


Figure 11: Typical Capacitances

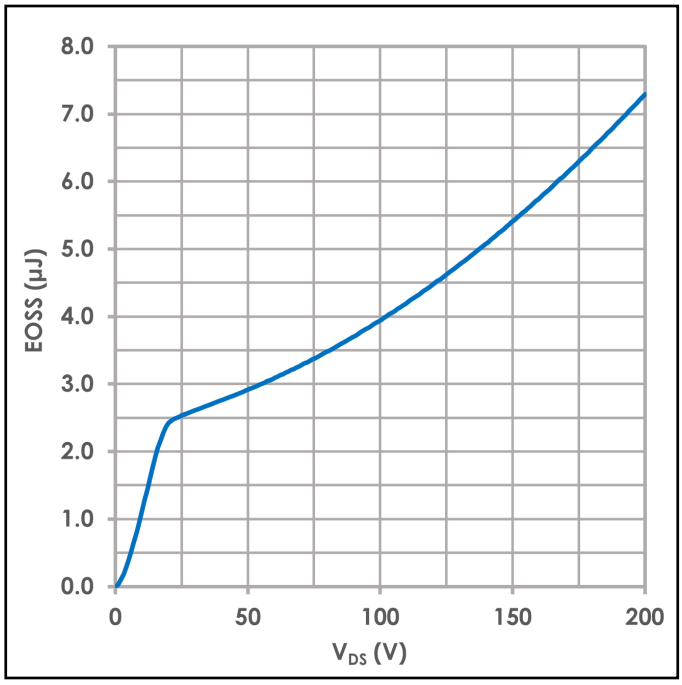


Figure 12: Typical C_{OSS} Stored Energy

Ratings and Characteristics Curves

(T_A = 25°C unless otherwise specified)

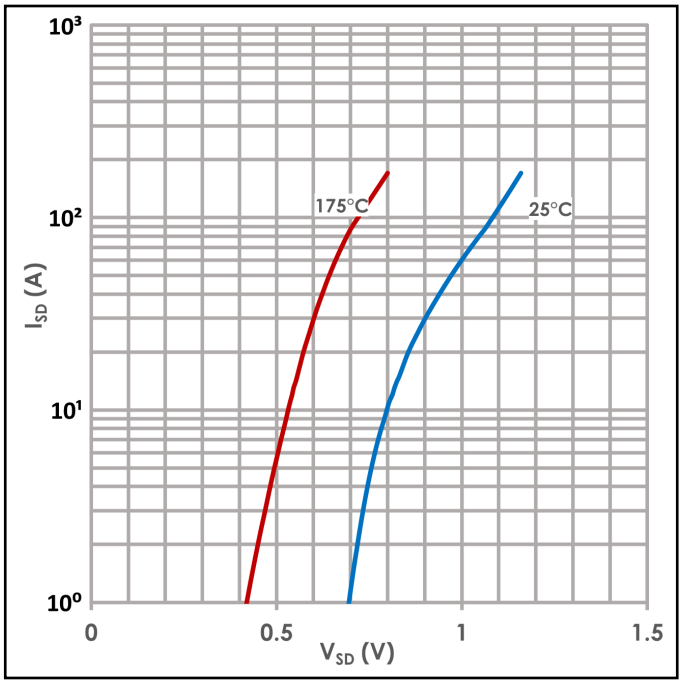


Figure 13: Typical Diode Forward Volltage

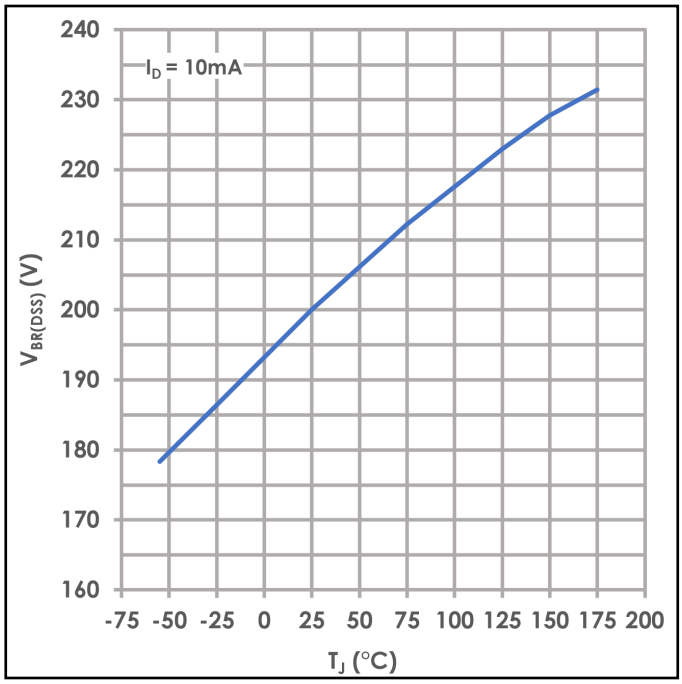


Figure 14: Min Drain-Source Breakdown Voltage

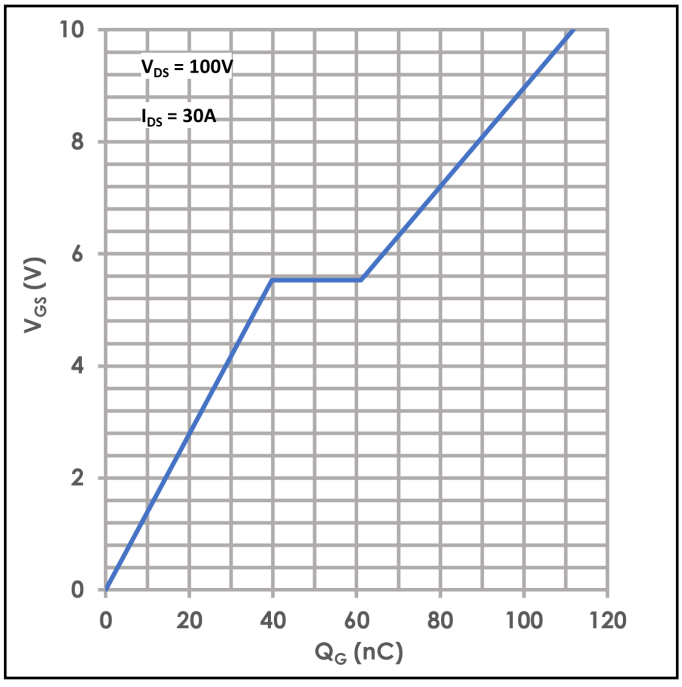


Figure 15: Typical Gate Charge

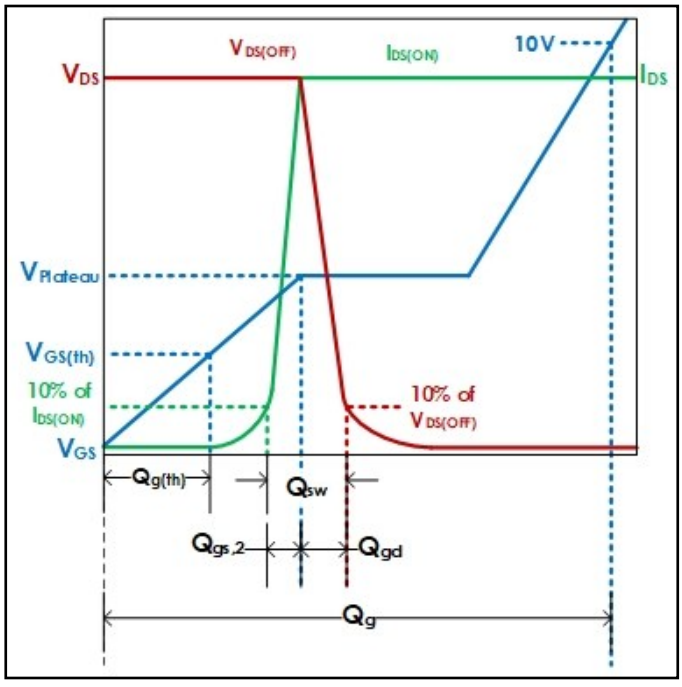
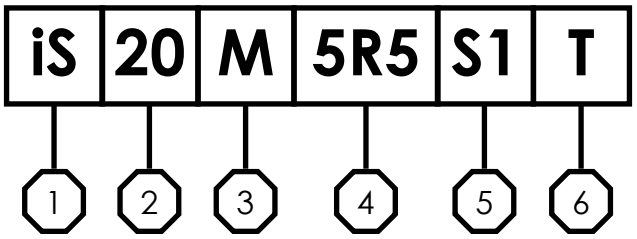


Figure 16: Gate Charge Definitions

DEVICE DECODER RING

Device Code



1 – iDEAL Semiconductor product

2 – Voltage rating divided by 10 (200V)

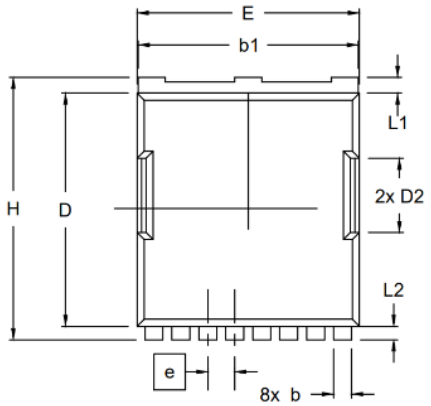
3 – M = N-Channel MOSFET, Standard Threshold

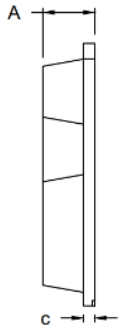
4 – Maximum drain-to-source resistance

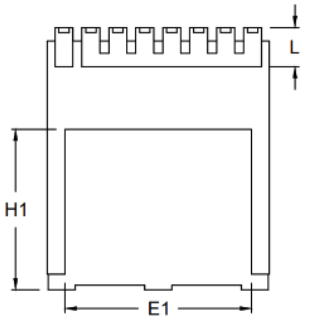
5 – SuperQ™ Generation

6 – 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

Revision History		
Version	**Date**	**Comments**
1.0	January 2026	Initial Release

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