iS15M2R5S1TC

SuperQ™ 150-V N-Channel Power MOSFET

FEATURES

- Low on-resistance, $R_{DS(on)}$
- Robustness under fault conditions including high short circuit withstand current
- Optimized Q_{SW} and E_{OSS} for hard switching
- 175°C temperature rating

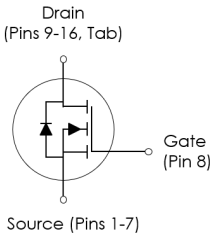
APPLICATIONS

- Motor control
- Battery disconnect switch
- Switch mode power on primary & secondary

DESCRIPTION

Engineered for high-efficiency motor drives and battery disconnect switches, this 150V SuperQ MOSFET delivers ultra-low conduction and switching losses in a robust TOLT package. Featuring best-in-class $R_{DS(on)}$, Q_{SW} and short-circuit handling, it minimizes heat dissipation at both full and partial loads.

PRODUCT SUMMARY



TOLT

Parameter T_A = 25°C	Value	Unit
V_{DS}	150	V
$R_{DS(on),max}$	2.5	mΩ
I_D	235	A
Q_G	135	nC
Q_{SW}	8.7	nC
E_{OSS}	2.7	µJ

ORDERING INFORMATION			
Part Number	**Package**	**Marking**	**Packaging**
iS15M2R5S1TC	TOLT	iS15M2R5S1	13' 2,000pcs T&R

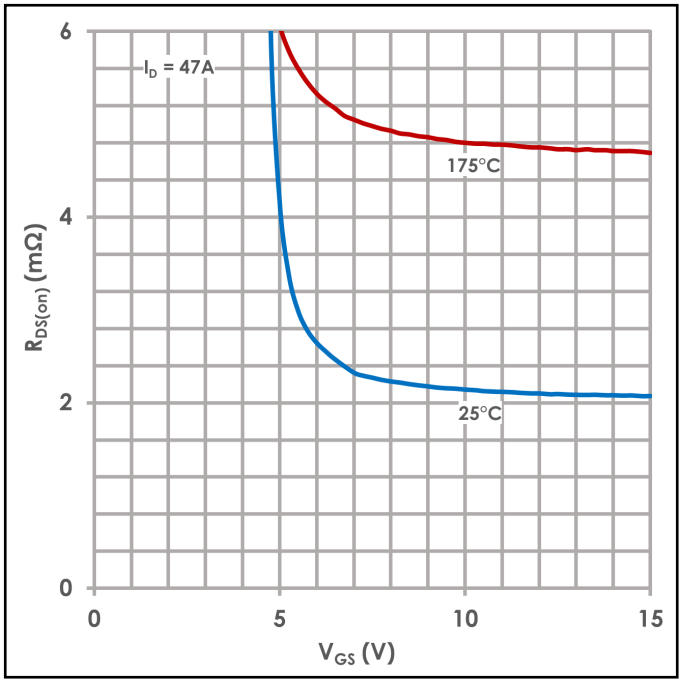


Figure 1: Typical Drain-Source On Resistance

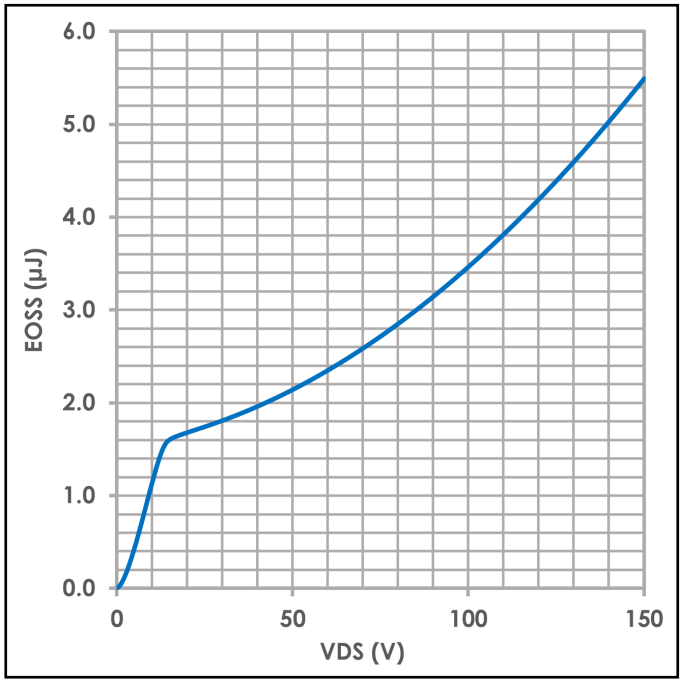


Figure 2: Typical COSS Stored Energy

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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	240	A
	Continuous drain current (silicon limited), T_C = 100°C	170	
I_{DM}	Pulsed drain current	854	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 = 46.6A, R_{GS} = 25Ω	1,087	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	-	-	0.48	°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.

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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	150	-	-	V
I_{DSS}	Drain-to-source leakage current	V_{GS} = 0V, V_{DS} = 120V, T_J = 25°C	-	0.2	1	µA
		V_{GS} = 0V, V_{DS} = 120V, 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 = 321µA	2.4	3.2	4.0	V
$R_{DS(on)}$	Drain-to-source on-resistance	V_{GS} = 10V, I_D = 47A	-	2.2	2.5	mΩ
g_{fs}	Transconductance	V_{DS} = 10V, I_D = 47A	43	85	-	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input capacitance (2)	V_{GS} = 0V, V_{DS} = 75V, f = 100kHz	-	7,918	-	pF
C_{rss}	Reverse transfer capacitance (2)		-	82	-	
C_{oss}	Output capacitance (2)		-	352	-	
$C_{o(er)}$	Effective output capacitance	V_{DS} = 0 to 75V, V_{GS} = 0V	-	960	-	
R_G	Series gate resistance	f = 1MHz	-	1.1	-	Ω
$t_{d(on)}$	Turn-on delay time	V_{DS} = 75V, V_{GS} = 10V, I_{DS} = 47A, $R_{G,EXT}$ = 0 Ω	-	18	-	ns
t_r	Rise time		-	3	-	
$t_{d(off)}$	Turn-off delay time		-	59	-	
t_f	Fall time		-	14	-	
GATE CHARGE CHARACTERISTICS						
Q_g	Gate charge total (2)	V_{DS} = 75V, I_D = 47A, V_{GS} = 0 to 10V	-	135	-	nC
Q_{sw}	Switching charge (3)		-	8.7	-	
Q_{gd}	Gate to drain charge (2)		-	5.3	-	
$V_{plateau}$	Gate plateau voltage		-	4.5	-	V
Q_{oss}	Output charge (2)	V_{DS} = 0 to 75V, V_{GS} = 0V	-	346	-	nC
E_{oss}	Capacitive stored energy		-	2.7	-	µJ
DIODE CHARACTERISTICS						
V_{SD}	Diode forward voltage	I_{SD} = 47A, V_{GS} = 0V	-	0.8	-	V
Q_{rr}	Reverse recovery charge	V_{DS} = 75V, I_F = 47A, di/dt = 100A/µs	-	146	-	nC
t_{rr}	Reverse recovery time		-	117	-	ns

(2) Defined by design. Not subject to production test.
(3) Q_{SW} should be used for switching loss calculations. Refer to Qsw application note on www.idealsemi.com and Figure 16

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Ratings and Characteristics Curves

(T_A = 25°C unless otherwise specified)

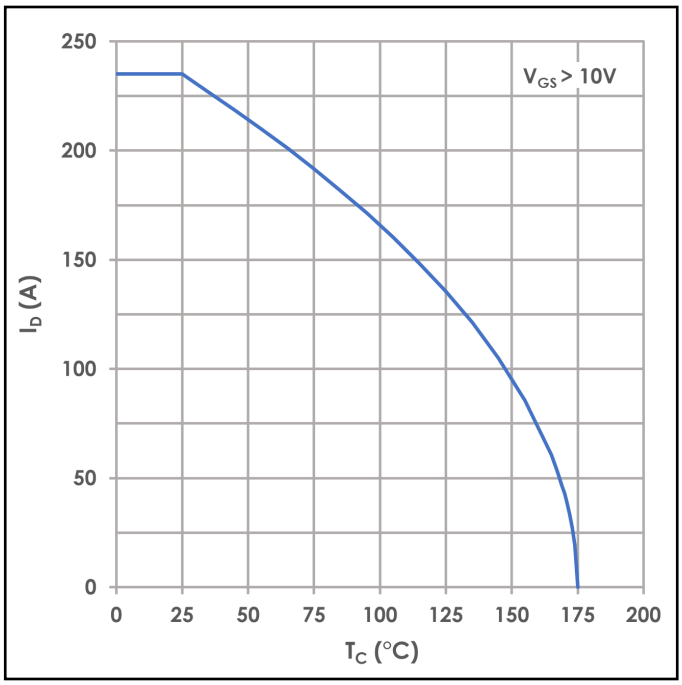

Figure 3: Drain Current

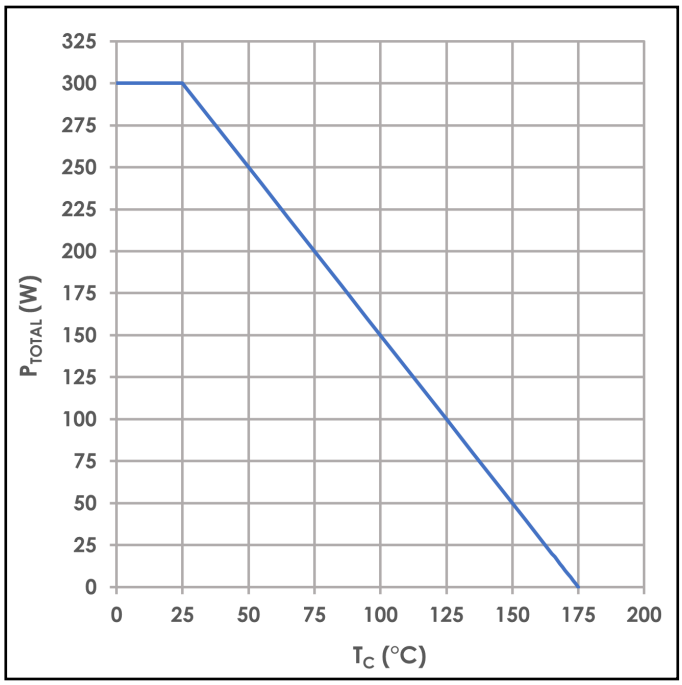

Figure 4: Power Dissipation

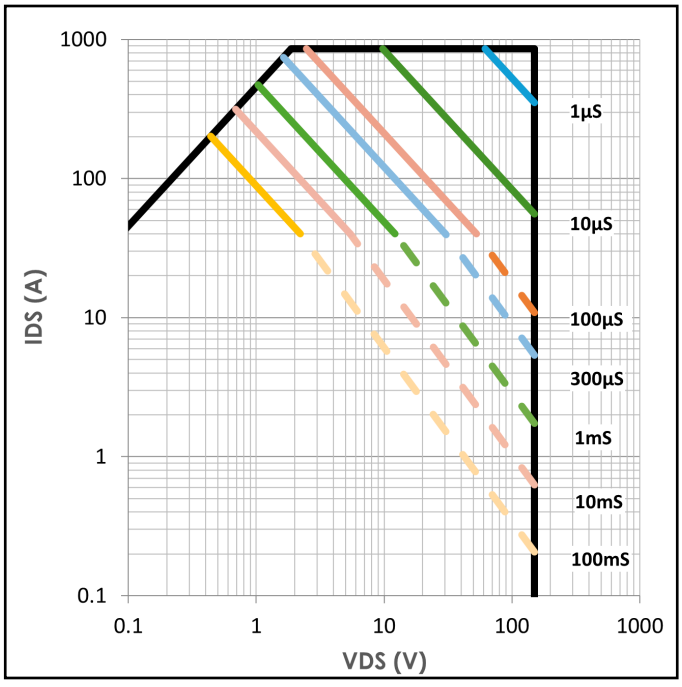

Figure 5: Safe Operating Area

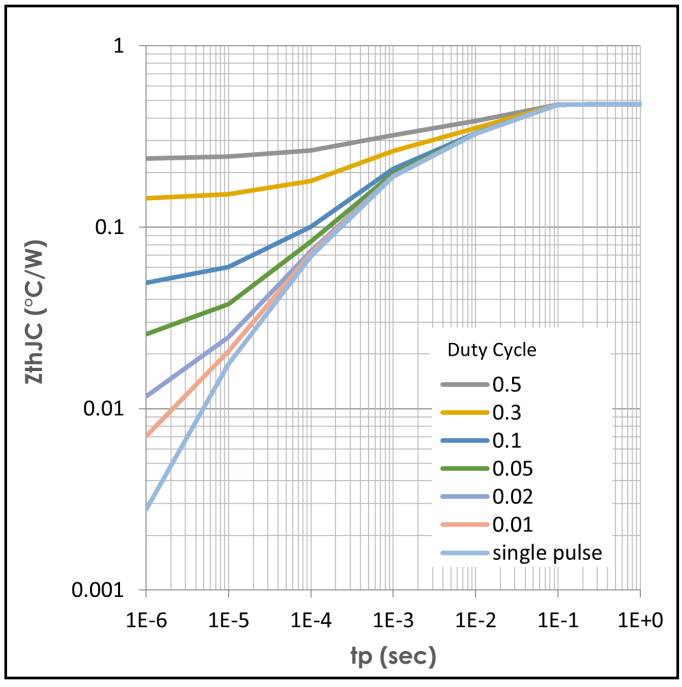

Figure 6: Max Transient Thermal Impedance

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Ratings and Characteristics Curves

(T_A = 25°C unless otherwise specified)

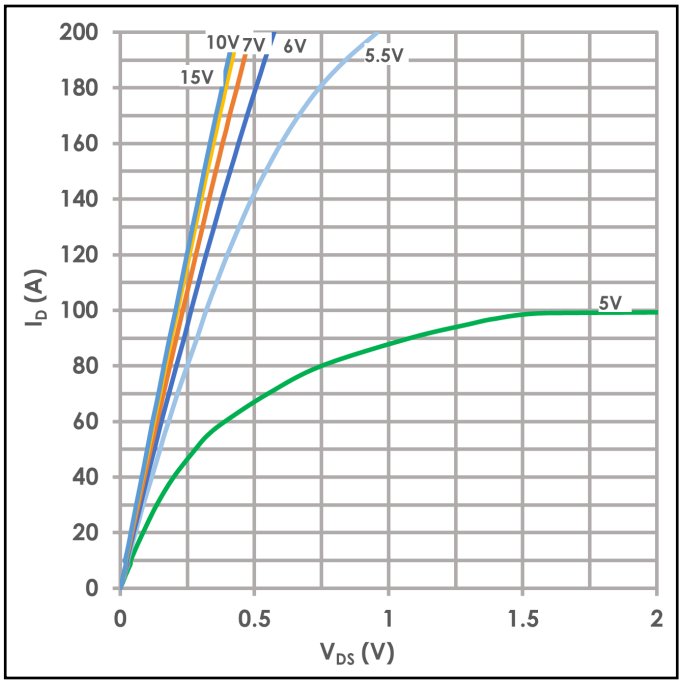

Figure 7: Typical Output Characteristics

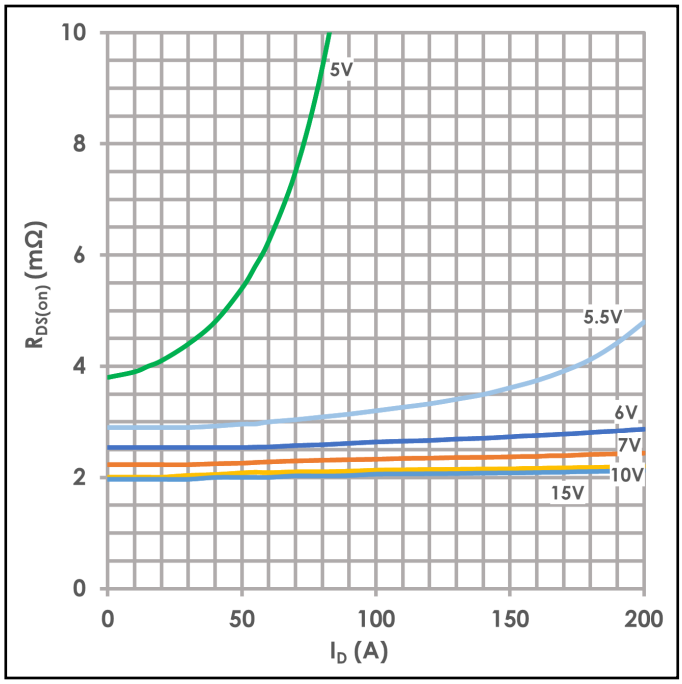

Figure 8: Typical Drain-Source On-Resistance

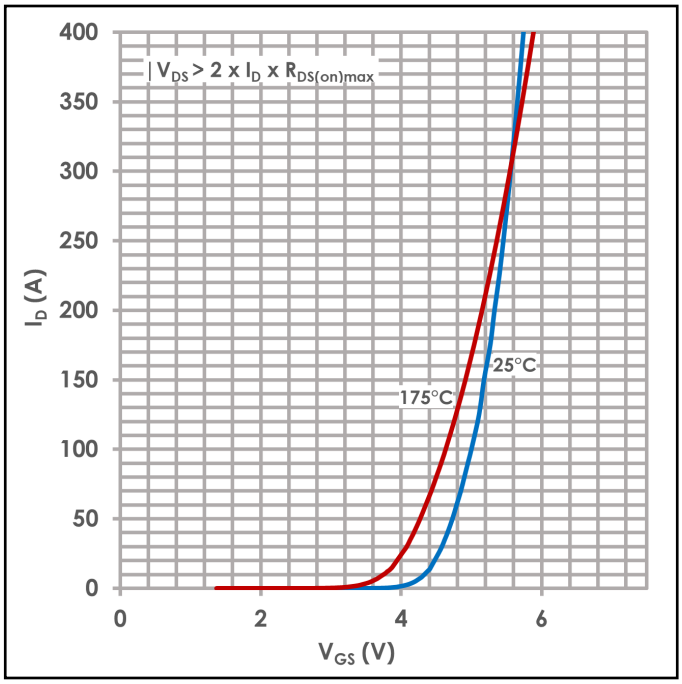

Figure 9: Typical Transfer Characteristics

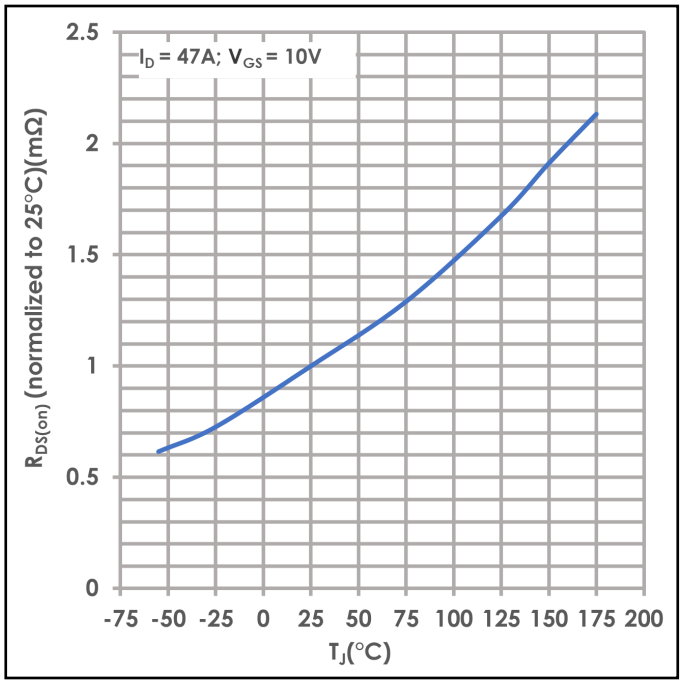

Figure 10: Normalized On-State Resistance

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Ratings and Characteristics Curves

(T_A = 25°C unless otherwise specified)

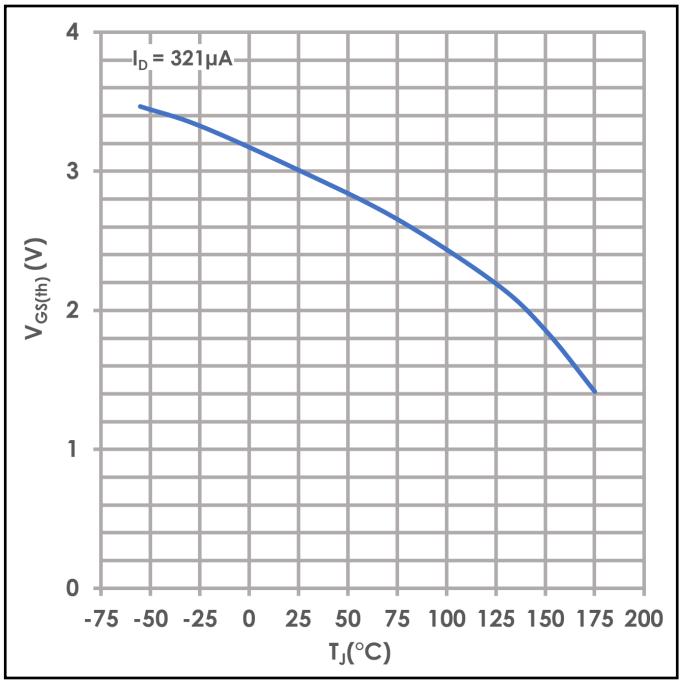

Figure 11: Typical Threshold Voltage

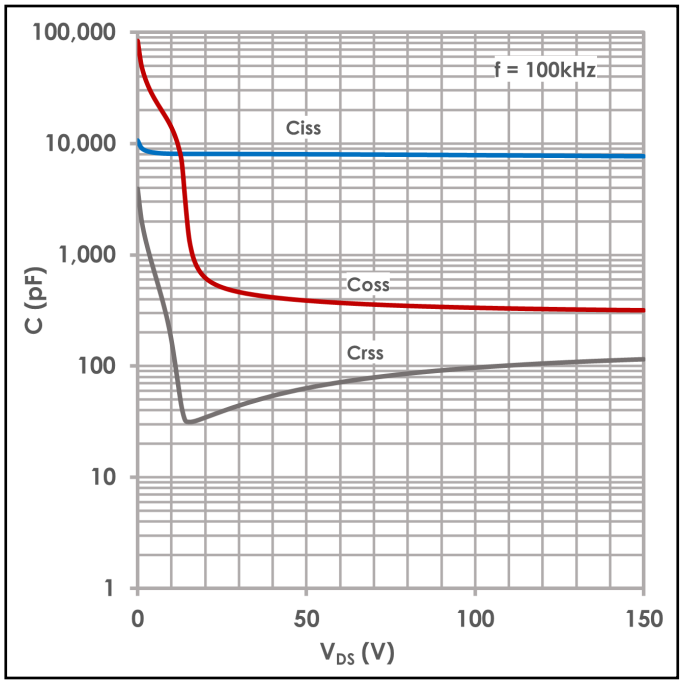

Figure 12: Typical Capacitances

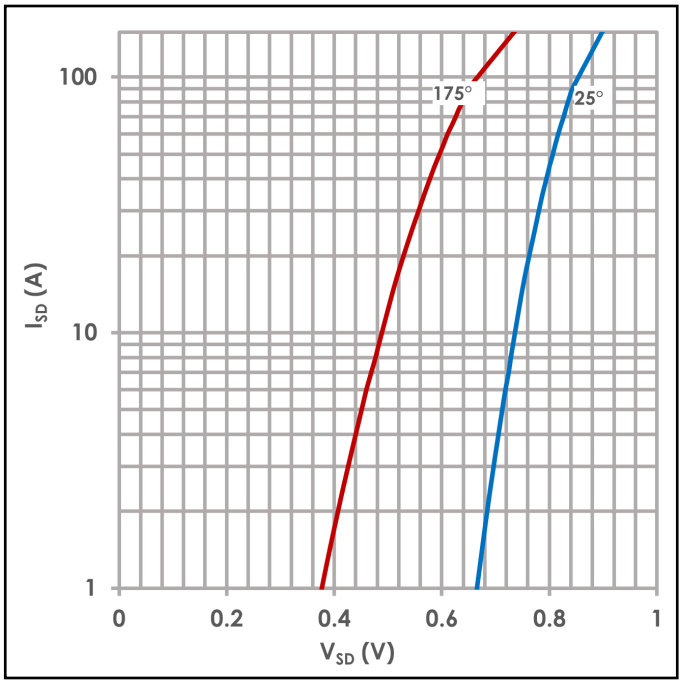

Figure 13: Typical Diode Forward Voltage

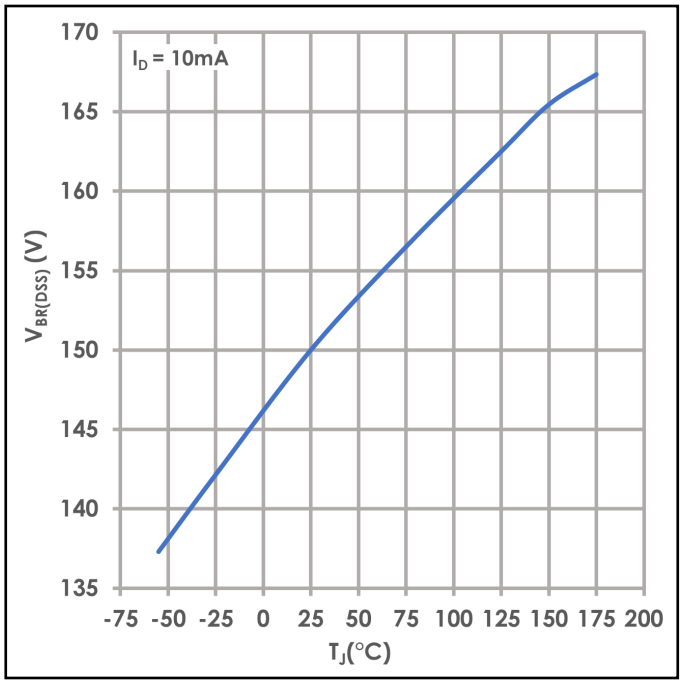

Figure 14: Min Drain-Source Breakdown Voltage

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Ratings and Characteristics Curves

(T_A = 25°C unless otherwise specified)

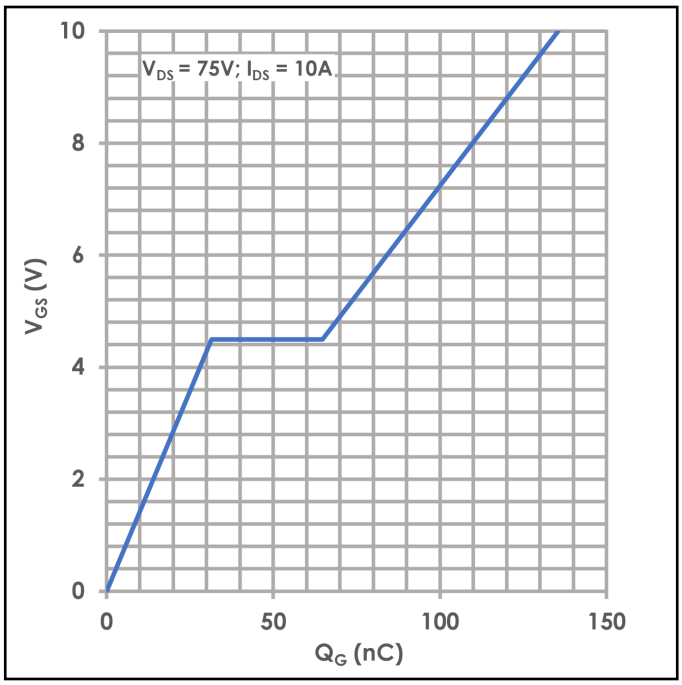

Figure 15: Typical Gate Charge

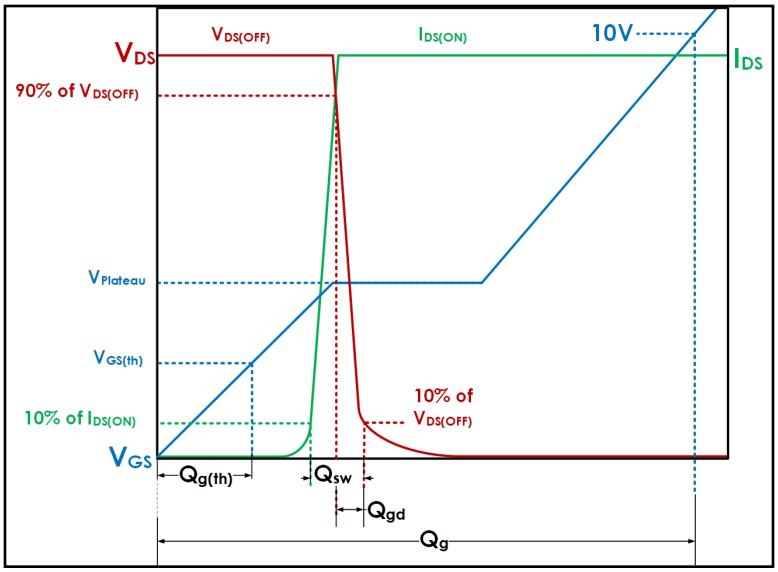

Figure 16: Gate Charge Definitions

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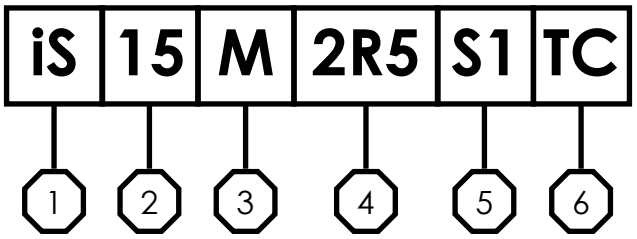
DEVICE DECODER RING

Device Code



1 – iDEAL Semiconductor product

2 – Voltage rating divided by 10 (150V)

3 – M = N-Channel MOSFET, Standard Threshold

4 – Maximum drain-to-source resistance

5 – SuperQ™ Generation

6 – TC = TOLT

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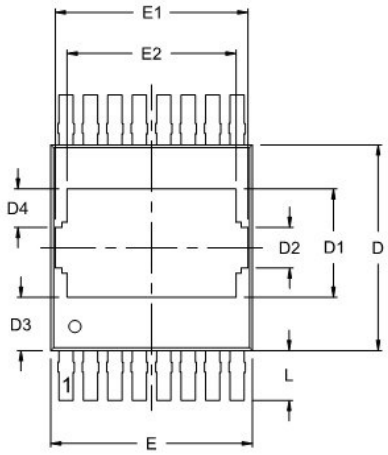
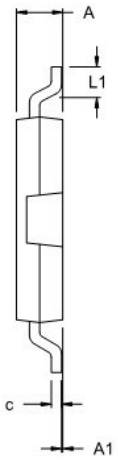
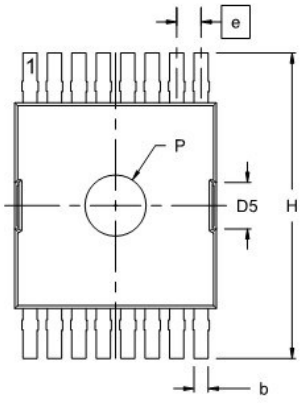
TOLT Package Drawing







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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Mailing Address:

iDEAL Semiconductor Devices, Inc.
116 Research Drive
Bethlehem, Pennsylvania, USA 18015
info@idealsemi.com

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