GSX150N15TH

MOSFET

Metal Oxide Semiconductor Field Effect Transistor

Shield Gate Trench MOSFET

150V Power Transistor

GSX150N15TH

Data Sheet

Ver 0

2022-2-28

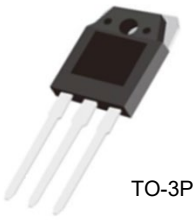
150V 186A Power MOSFET

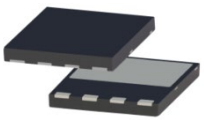
■Description

Group Semiconductor(GS) has series Shield Gate Trench power MOSFET platforms for voltage up 40V to 300 volts, both with design service and manufacturing capability, including cell, termination design and simulation.

The GS 150V 186A power MOSFET is a Low voltage N channel Shield Gate Trench power MOSFET sample with advanced technology to have better characteristics, such as fast switching time, low Ciss and Crss, low on resistance and excellent avalanche characteristics, making it especially suitable for applications which require superior power density and outstanding efficiency.


TO-247


TO-3P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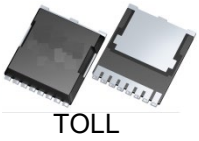

TOLL

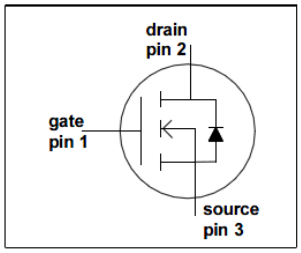

TO-263

■ Features

RDS(ON)=4mΩ @VGS = 10V
VDS = 150V
ID (@ VGS=10V) = 186A

■ PKG

GSW150N15TH	GSJ150N15TH	GSL150N15TH	GSM150N15TH	GSB150N15TH
TO-247	TO-3P	Toll	DFN8*8	TO-263



■Absolute Maximum Ratings (TC = 25° C, unless otherwise specified)

Symbol	Parameter	GSW150N15TH	GSJ150N15TH	Unit
V_{DSS}	Drain-Source Voltage	150		V
I_D	Drain Current -Continuous (TC = 25℃) -Continuous (TC = 100℃)	186* 156*		A
I_{DM}	Drain Current - Pulsed (Note 1)	507		A
V_{GSS}	Gate-Source voltage	±20		V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	420		mJ
P_D	Power Dissipation (TC = 25℃)	341	341	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150		℃
T_L	Max. Lead Temperature for Soldering Purpose, 1/8” from Case for 5 Seconds	300		℃

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■ Electrical Characteristics (TJ=25° C unless otherwise specified)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250μA, T_J = 25℃	150	--	--	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25℃	--	60	--	mV/℃
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 120V, V_{GS} = 0V -Tj=25 ℃ -T_J = 150℃	--	--	 1 100	 μA μA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 20V, V_{DS} = 0V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -20V, V_{DS} = 0V	--	--	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	3	--	5	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10V, I_D = 100A	--	3.6	4.5	mΩ
g_{FS}	Forward Transconductance	|VDS|>2|ID|*RDS(on)max, ID=100 A	--	150	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 75V, V_{GS} = 0V, f = 1.0MHz	--	6000	-	pF
C_{oss}	Output Capacitance		--	1500	-	pF
C_{rss}	Reverse Transfer Capacitance		--	34	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	VDD=75 V, VGS=10 V, ID=100 A, RG,ext=2.7 Ω	--	23	--	ns
t_r	Turn-On Rise Time		--	90	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	29	--	ns
t_f	Turn-Off Fall Time		--	62	--	ns
Q_g	Total Gate Charge	VDD=75 V, ID=100 A, VGS=0 to 10 V	--	80	100	nC
Q_{gs}	Gate-Source Charge		--	35	--	nC
Q_{gd}	Gate-Drain Charge		--	16	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	186	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	507	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0V, I_S = 12A	--	0.9	1.5	V
t_{rr}	Reverse Recovery Time	VR=128 V, IF=100 A, diF/dt=100 A/μs	--	57	--	ns
Q_{rr}	Reverse Recovery Charge		--	76	--	μC

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L=0.08mH, I_{AS}=100A, VDD=150V, Starting TJ=25 ℃
3. Pulse Test: Pulse width ≤ 300us, Duty Cycle ≤ 2%
4. Essentially Independent of Operating Temperature Typical Characteristics

■Thermal Characteristics

Symbol	Parameter	GSW150N15TH	GSJ150N15TH	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.44	0.44	℃/W
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink Typ.	0.24	0.24	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	40	40	℃/W

Symbol	Parameter	Value (TO247)	Unit
$R_{\theta JA}$ (6)	Maximum Junction-to-Ambient	82	℃/W
$R_{\theta CS}$ (6)	Maximum Case-to-sink	0.6	℃/W
$R_{\theta JC}$ (7),(8)	Maximum Junction-to-Case θ	4.1	℃/W

1. The power dissipation PD is based on TJ(MAX)=150° C in a TO251 package, using junction-to-case thermal resistance.
2. Repetitive rating, pulse width limited by junction temperature TJ(MAX)=150° C.
3. L=1mH, Starting TJ=25° C.
4. L = 10mH, starting TJ = 25° C.
5. L=60mH, starting TJ = 25° C.
6. The tests are performed with the device with T A =25° C.
7. The R □ JA is the sum of the thermal impedance from junction to case R □ JC and case to ambient.
8. These curves are based on the junction-to-case thermal impedance, assuming a maximum junction temperature of TJ(MAX)=150° C.

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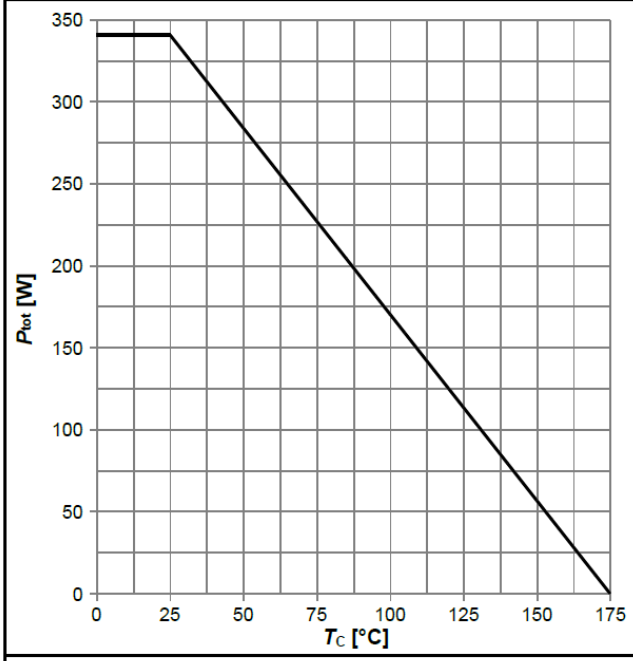
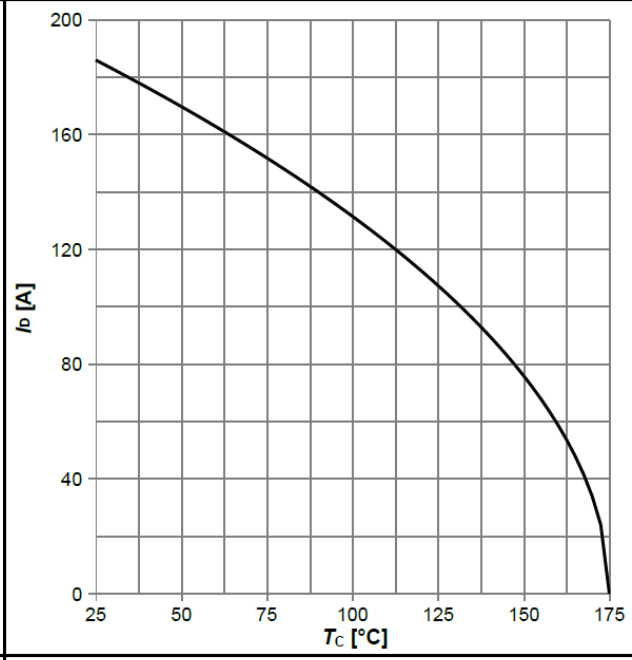
Typical Performance Characteristics

Diagram 1: Power dissipation



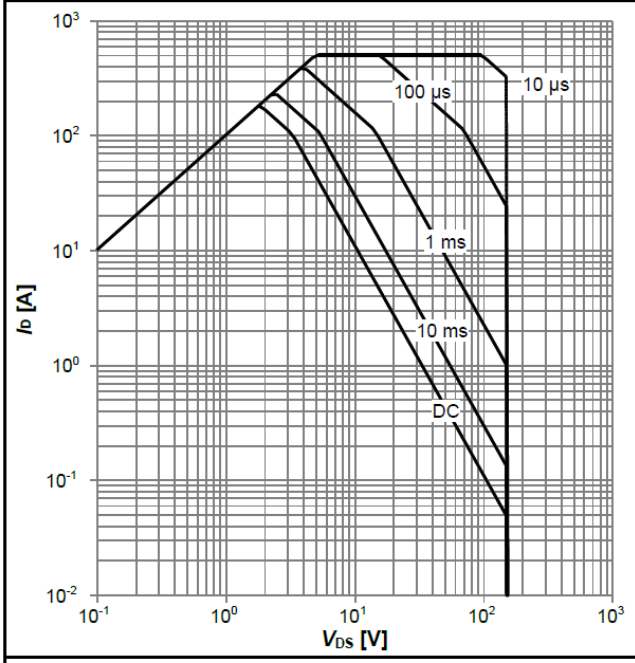
P_{tot}=f(T_C)

Diagram 2: Drain current



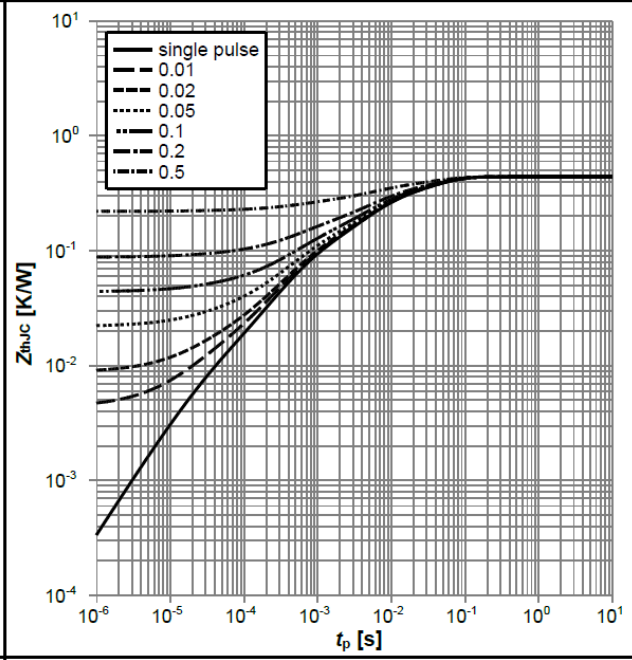
I_D=f(T_C); V_{GS}≥10 V

Diagram 3: Safe operating area



I_D=f(V_{DS}); T_C=25 °C; D=0; parameter: t_p

Diagram 4: Max. transient thermal impedance



Z_{thJC}=f(t_p); parameter: D=t_p/T

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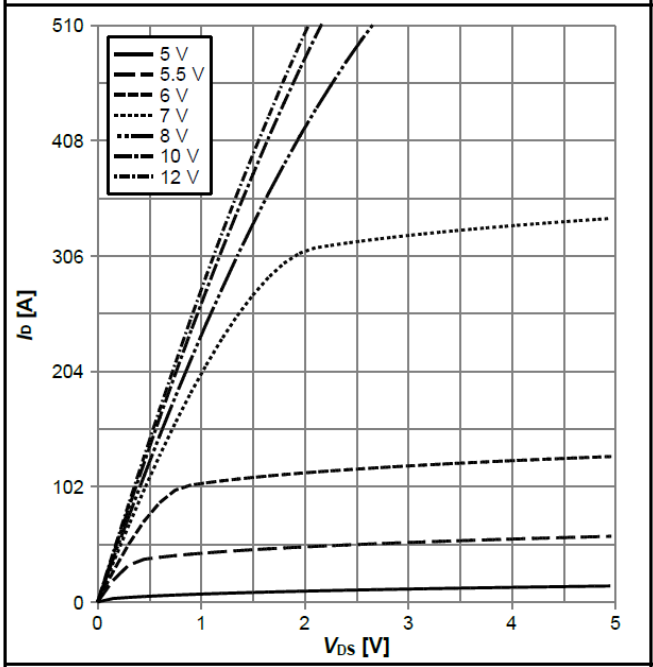
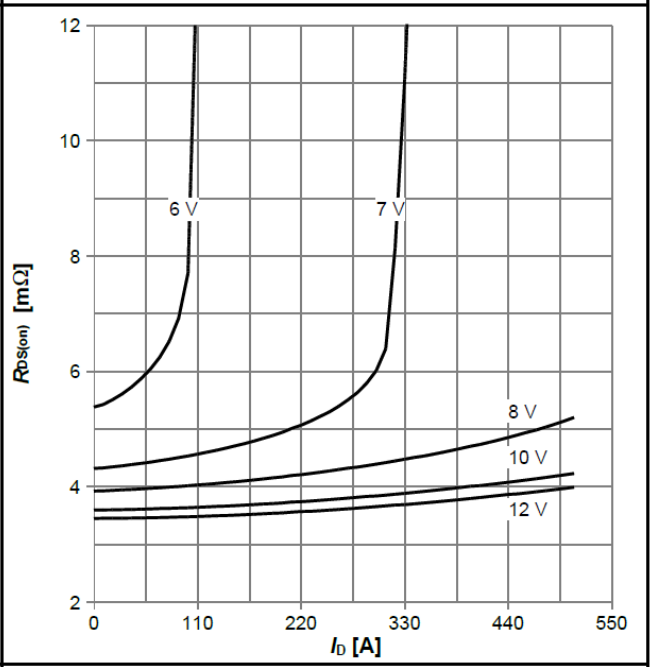
Typical Performance Characteristics

Diagram 5: Typ. output characteristics



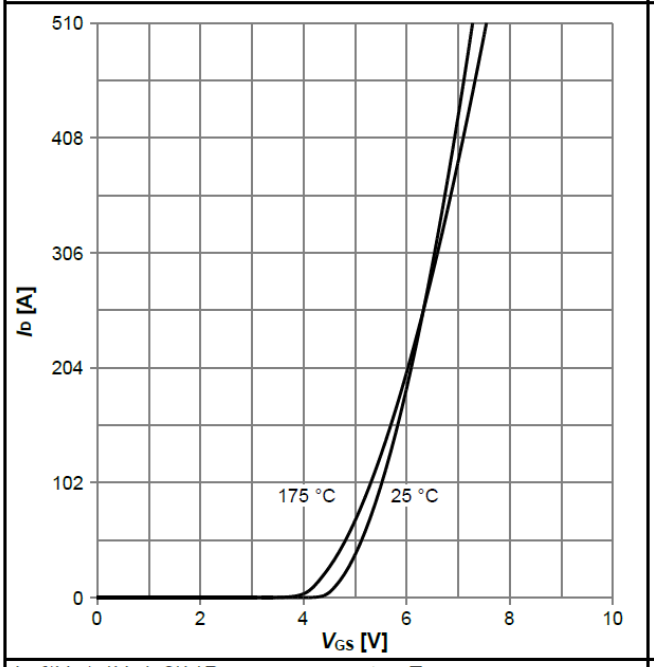
$I_D=f(V_{DS})$, $T_j=25$ °C; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



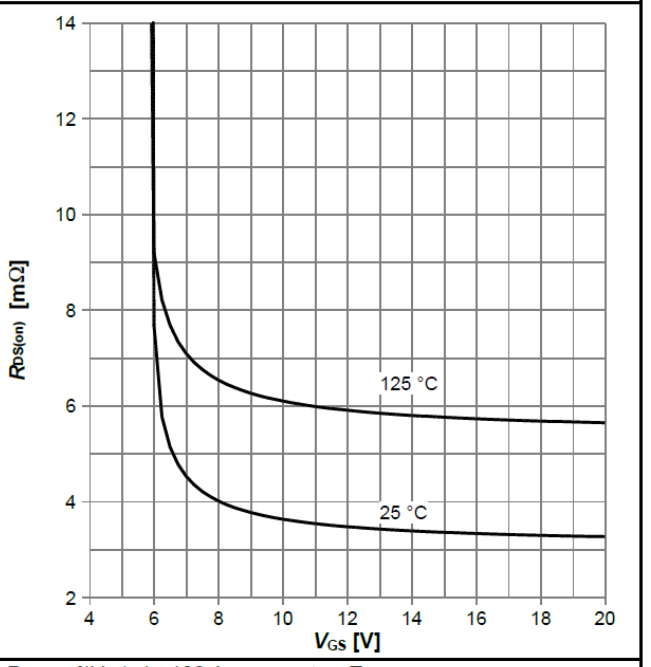
$R_{DS(on)}=f(I_D)$, $T_j=25$ °C; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



$I_D=f(V_{GS})$, $|V_{DS}|>2|I_D|R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. drain-source on resistance



$R_{DS(on)}=f(V_{GS})$, $I_D=100$ A; parameter: T_j

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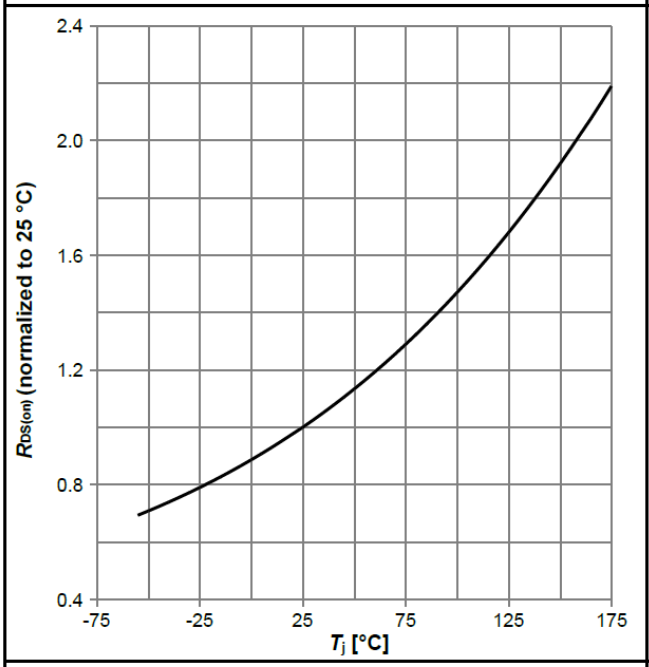
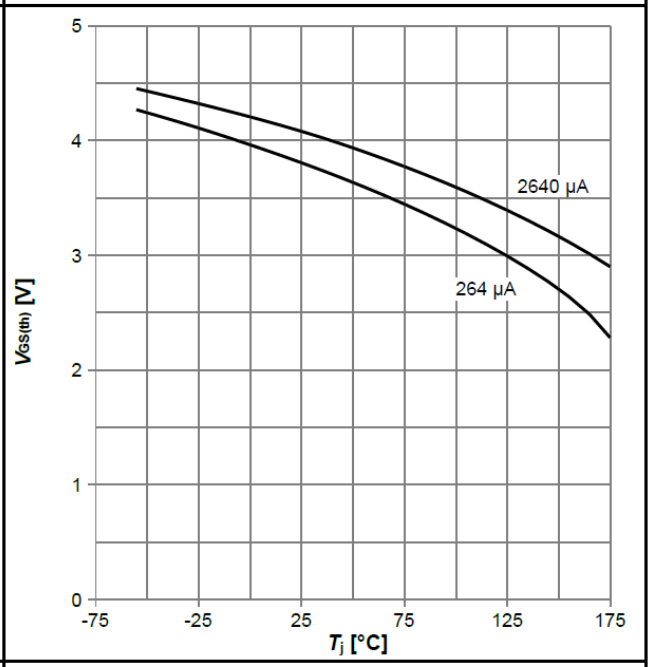
Typical Performance Characteristics

Diagram 9: Normalized drain-source on resistance



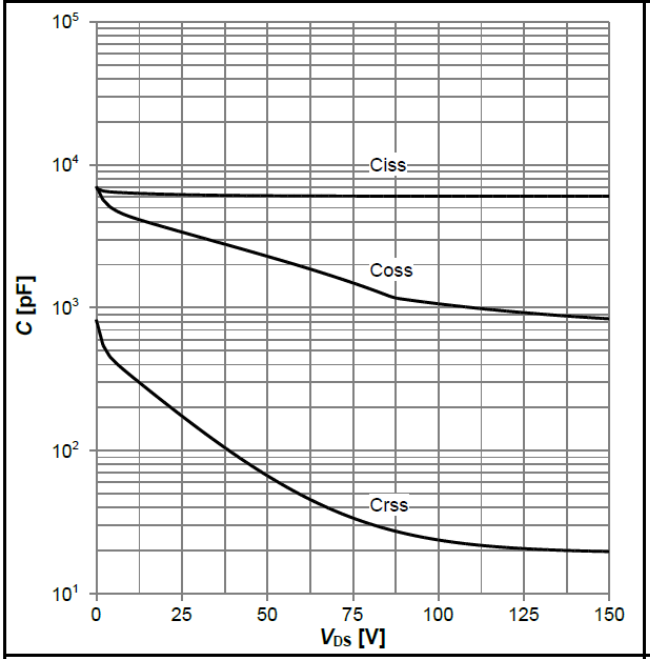
$R_{DS(on)}$=f(T_j), I_D=100 A, V_{GS}=10 V

Diagram 10: Typ. gate threshold voltage



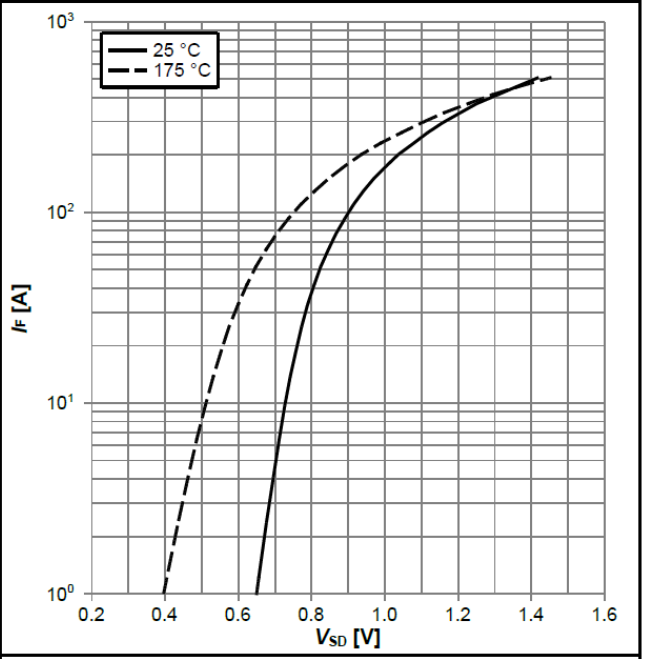
$V_{GS(th}$=f(T_j), V_{GS}=V_{DS}; parameter: I_D

Diagram 11: Typ. capacitances



C=f(V_{DS}); V_{GS}=0 V; f=1 MHz

Diagram 12: Forward characteristics of reverse diode



I_F=f(V_{SD}); parameter: T_j

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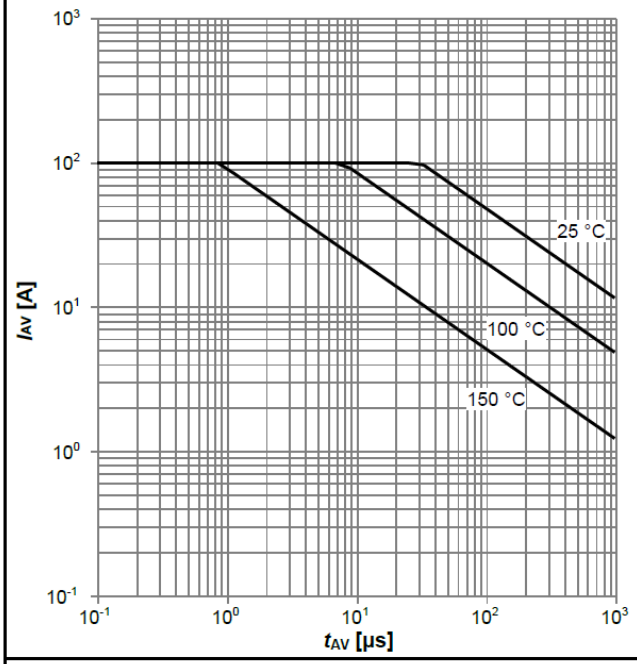
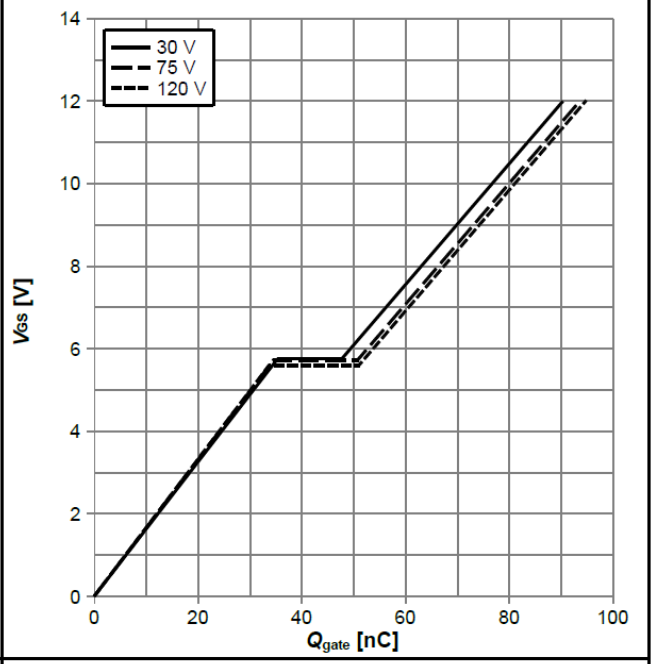
Diagram 13: Avalanche characteristics



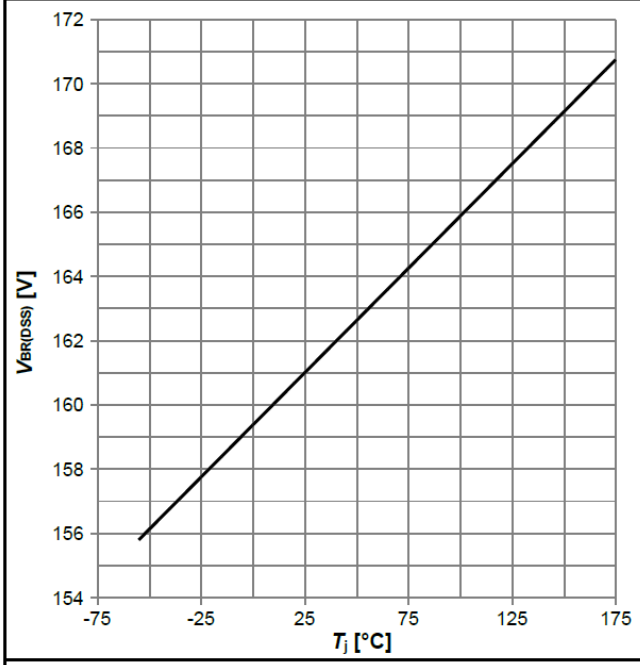
I_{AS}=f(t_{AV}); R_{GS}=25 Ω; parameter: $T_{j,start}$

Diagram 14: Typ. gate charge



V_{GS}=f(Q_{gate}), I_D=100 A pulsed, T_j=25 °C; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage



$V_{BR(DSS)}$=f(T_j); I_D=1 mA

Diagram Gate charge waveforms

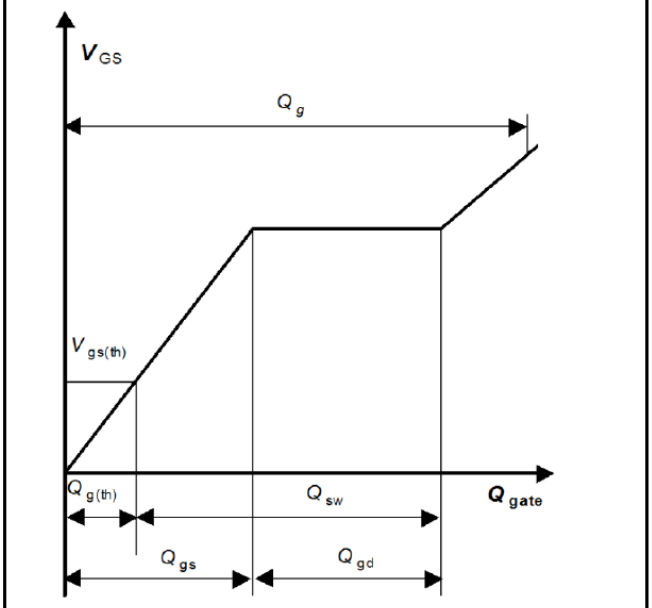


Table 20 Switching times test circuit and waveform for inductive load

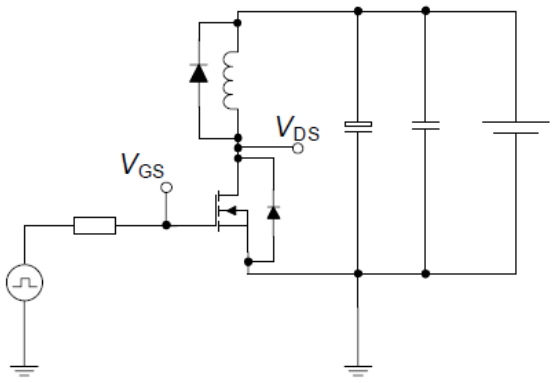
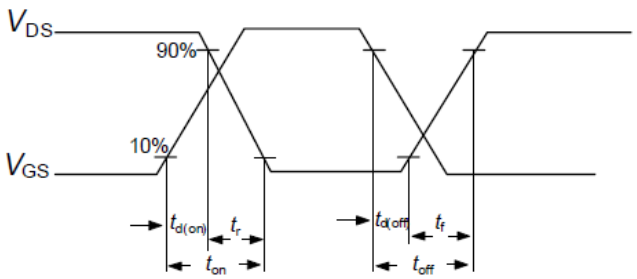
Switching times test circuit for inductive load	Switching time waveform
	

Table 21 Unclamped inductive load test circuit and waveform

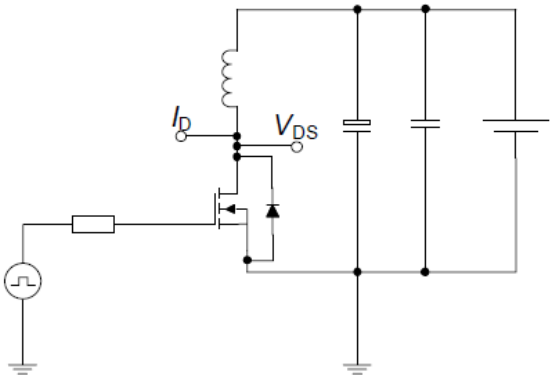
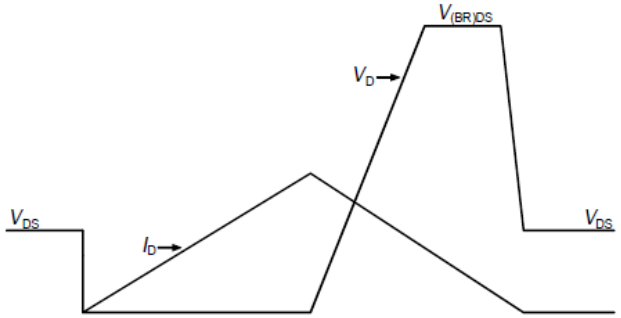
Unclamped inductive load test circuit	Unclamped inductive waveform
	

Table 22 Test circuit and waveform for diode characteristics

Test circuit for diode characteristics	Diode recovery waveform