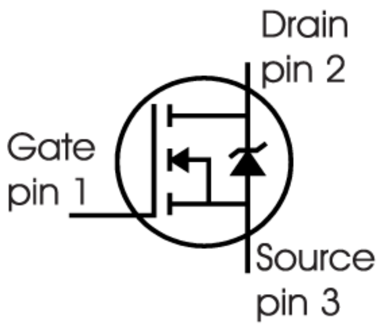
GROUP SEMICONDUCTOR

GSX90N60MF Super Junction MOSFETs

■**Description GroupSemiconductor(GS) has series Multi-EPI Super-Junction power MOSFET platforms for voltage up 500V to 1000 volts, both with design service and manufacturing capability, including cell, termination design and simulation.**
The GS 600V 90A power MOSFET is a Low voltage N channel Multi-EPI Super-Junction 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.



■ Features

- New revolutionary high voltage technology
- Better $R_{DS(on)}$ in TO-247
- Ultra Low gate charge
- Periodic avalanche rated
- Extreme dv/dt rated
- Ultra low effective capacitances
- Intrinsc fast-recovery body diode
- Pb-free lead planting
- $R_{DS(ON)}$=0.028Ω @VGS = 10V

VDS = 600V
ID (@ VGS=10V) = 45A

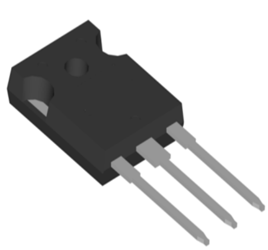
APPLICATIONS

- Consumer
- EV Charger
- PFC stages for server & telecom
- SMPS
- UPS
- Solar
- Lighting

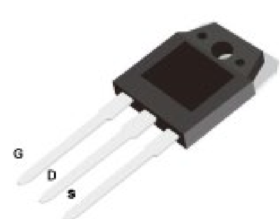
ORDERING INFORMATION

Industrial Range: -40° C to +125° C

Order Part No.	Package
GSW90N60MF	TO-247, Pb-Free
GSJ90N60MF	TO-3P, Pb-Free



TO-247



TO-3P

Maximum rating sat Tj = 25 ℃ , unlessotherwise specified.

Symbol	Parameter	GSX90N60MF	Unit
V_{DSS}	Drain-Source Voltage	600	V
I_D	Drain Current -Continuous (TC = 25℃) -Continuous (TC = 100℃)	90* 45*	A
I_{DM}	Drain Current - Pulsed (Note 1)	260	A
V_{GSS}	Gate-Source voltage	±30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	1950	mJ
I_{AR}	Repetitive Avalanche Current (Note 1)	13	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	2.5	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	15	V/ns
dVds/dt	Drain Source voltage slope (Vds=480V)	50	V/ns
P_D	Power Dissipation (TC = 25℃)	400	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	℃
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8” from Case for 5 Seconds	300	℃

1) Limited by Tj,max. Maximum duty cycle D=0.75
2) Pulse width tp limited by Tj,max
3) Identical low side and high side switch with identical RG; Vpeak<V(BR)DSS ; Tj<Tj.max

Thermal Characteristics

Symbol	Parameter	GSX90N60MF	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.32	℃/W
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink Typ.	0.5	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62	℃/W

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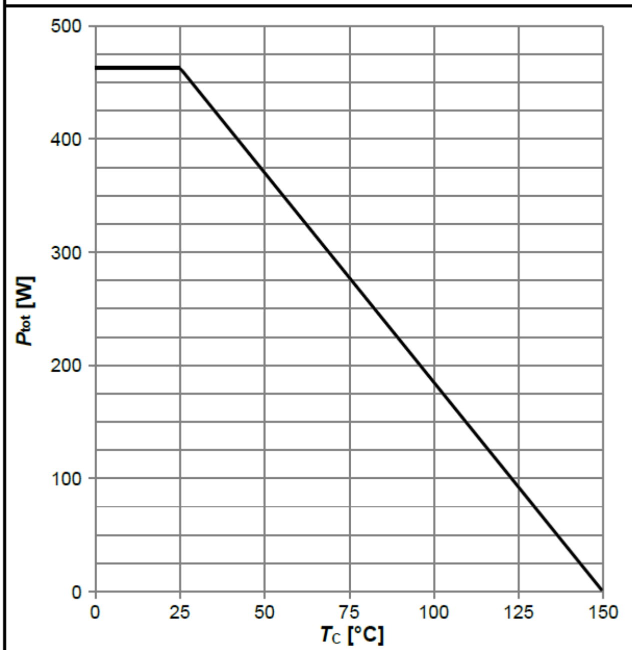
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250µA, T_J = 25℃	600	--	--	V
		V_{GS} = 0V, I_D = 250µA, T_J = 150℃	--	650	--	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	I_D = 250µA, Referenced to 25℃	--	0.6	--	V/℃
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 600V, V_{GS} = 0V -T_J = 25℃ -T_J = 150℃	--	-- 1000	10 -	µA µA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 30V, V_{DS} = 0V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -30V, 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 = 45A	--	28	35	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 40V, I_D = 45A	--	30	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz	--	7900	-	pF
C_{oss}	Output Capacitance		--	370	-	pF
C_{rss}	Reverse Transfer Capacitance		--	21	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 480V, I_D = 45A R_G = 20Ω (Note 4)	--	60	--	ns
t_r	Turn-On Rise Time		--	32	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	130	--	ns
t_f	Turn-Off Fall Time		--	7	--	ns
Q_g	Total Gate Charge	V_{DS} = 480V, I_D = 45A V_{GS} = 10V (Note 4)	--	360	-	nC
Q_{gs}	Gate-Source Charge		--	67	--	nC
Q_{gd}	Gate-Drain Charge		--	215	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	90	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	300	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0V, I_S = 45A	--	0.9	1.5	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_S = 45A dI_F/dt =100A/µs	--	280	--	ns
Q_{rr}	Reverse Recovery Charge		--	22	--	µC

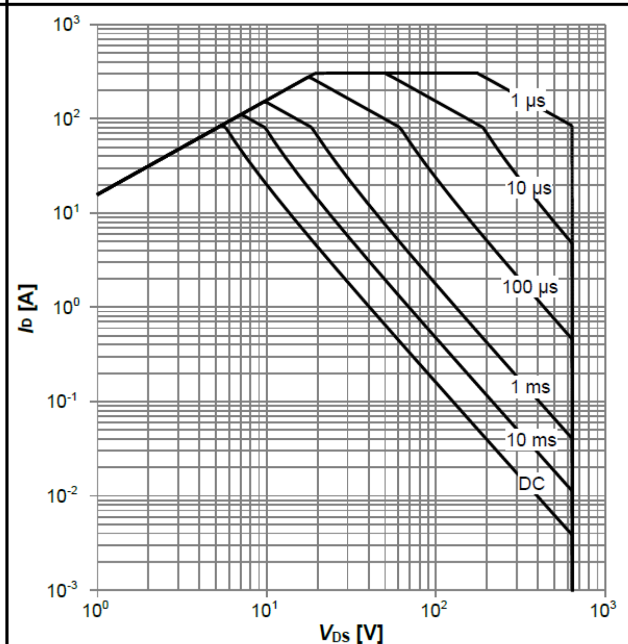
1) Co(er) is a fixed capacitance that gives the same stored energy as Coss while VDS is rising from 0 to 80% V(BR)DSS
2) Co(tr) is a fixed capacitance that gives the same charging time as Coss while VDS is rising from 0 to 80% V(BR)DSS

Diagram 1: Power dissipation



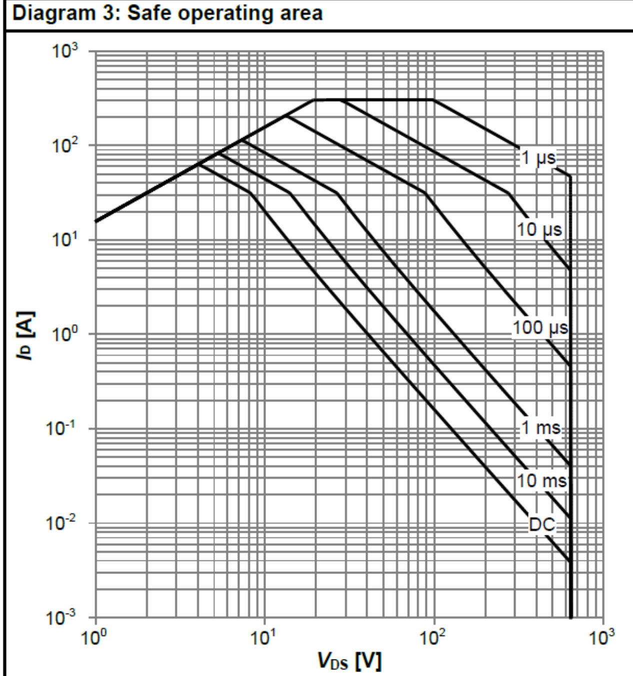
P_{tot}=f(T_C)

Diagram 2: Safe operating area



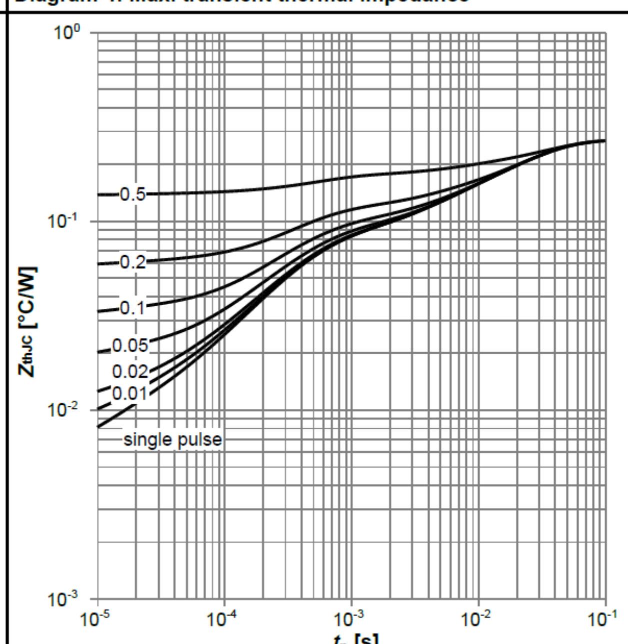
I_D=f(V_{DS}); T_C=25 °C; D=0; parameter: t_p

Diagram 3: Safe operating area



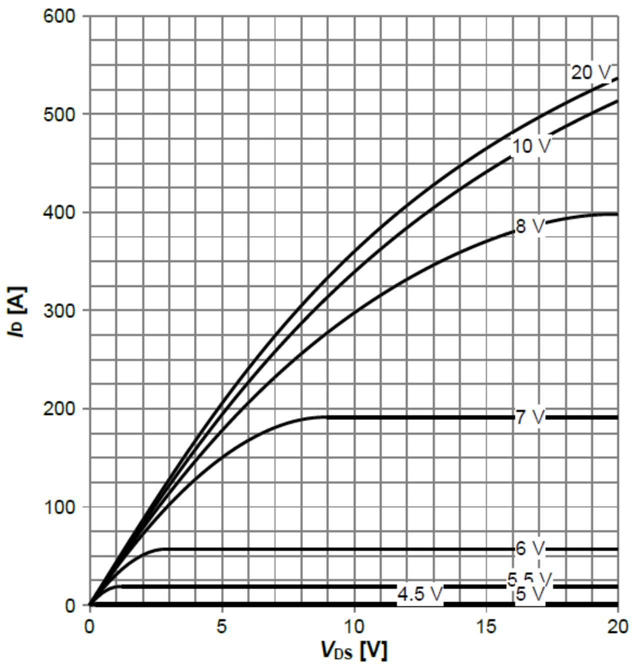
I_D=f(V_{DS}); T_C=80 °C; D=0; parameter: t_p

Diagram 4: Max. transient thermal impedance



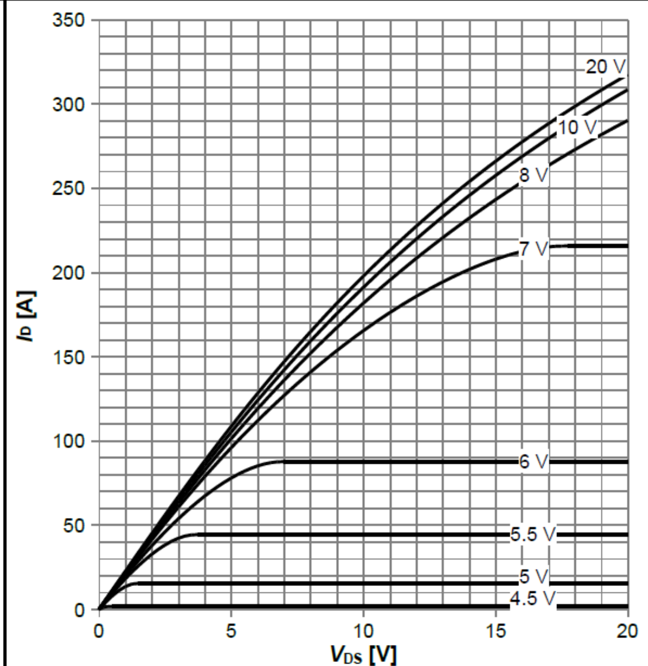
Z_{thJC} =f(t_P); parameter: D=t_p/T

Diagram 5: Typ. output characteristics



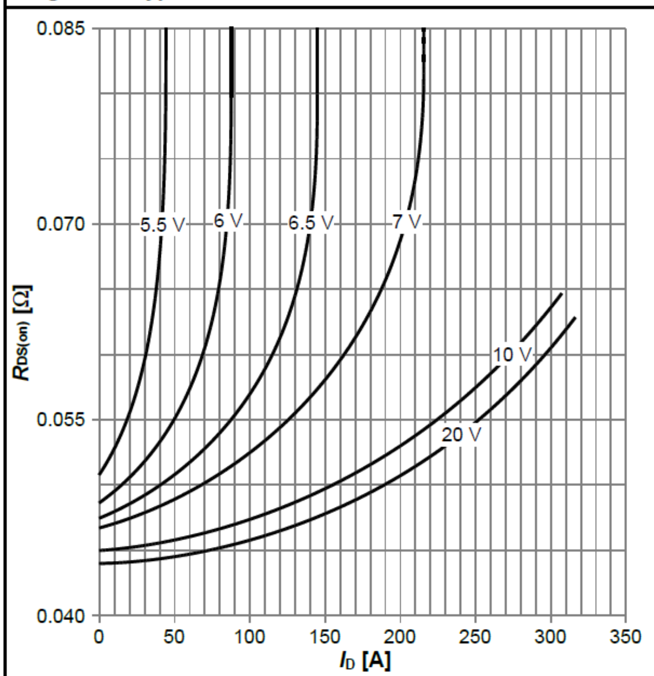
I_D=f(V_{DS}); T_j=25 °C; parameter: V_{GS}

Diagram 6: Typ. output characteristics



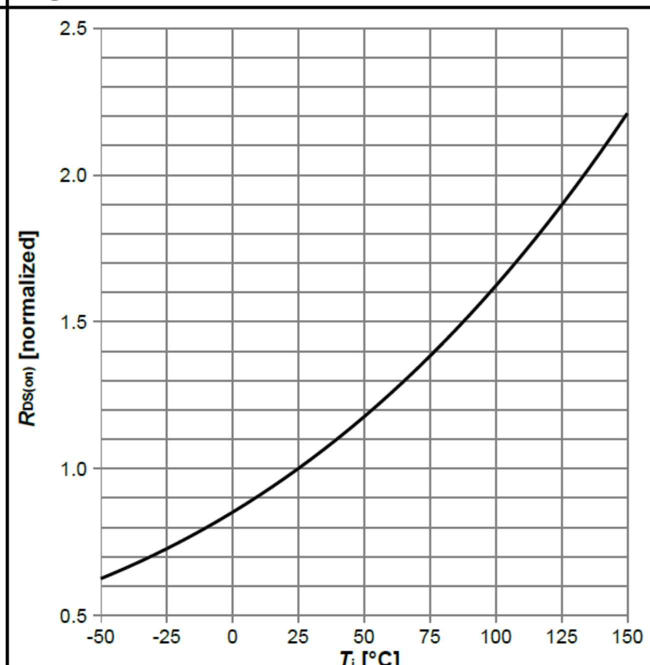
I_D=f(V_{DS}); T_j=125 °C; parameter: V_{GS}

Diagram 7: Typ. drain-source on-state resistance



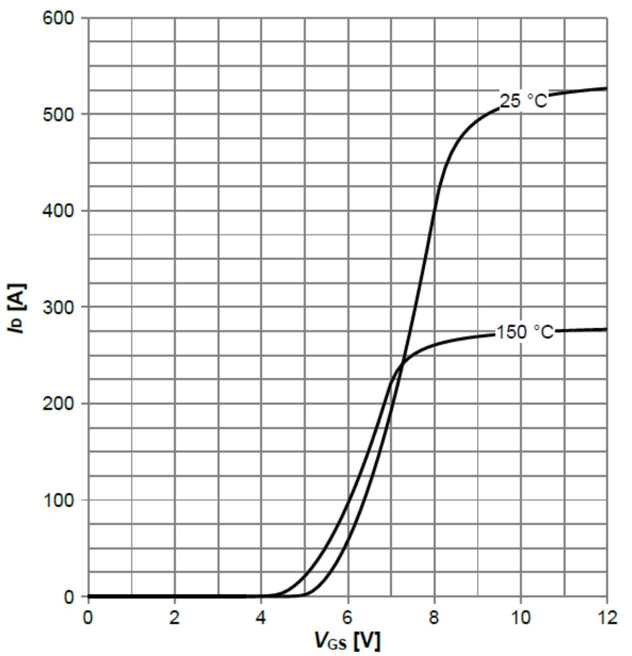
$R_{DS(on)}$=f(I_D); T_j=125 °C; parameter: V_{GS}

Diagram 8: Drain-source on-state resistance



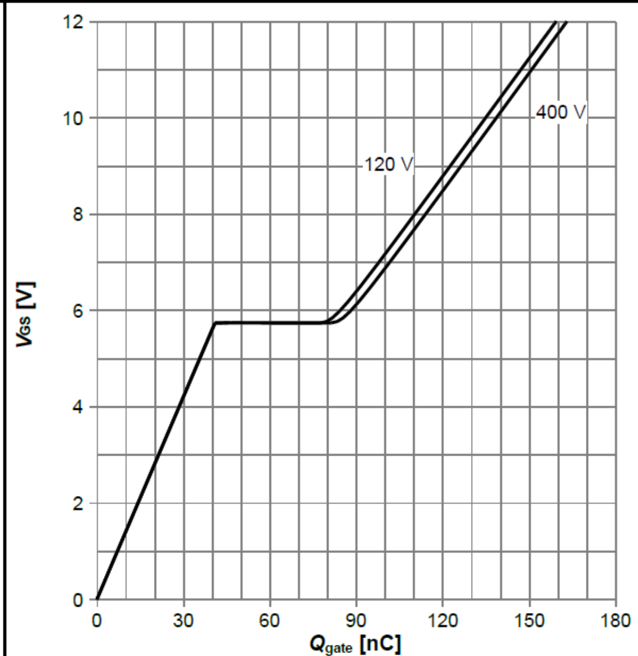
$R_{DS(on)}$=f(T_j); I_D=35.8 A; V_{GS}=10 V

Diagram 9: Typ. transfer characteristics



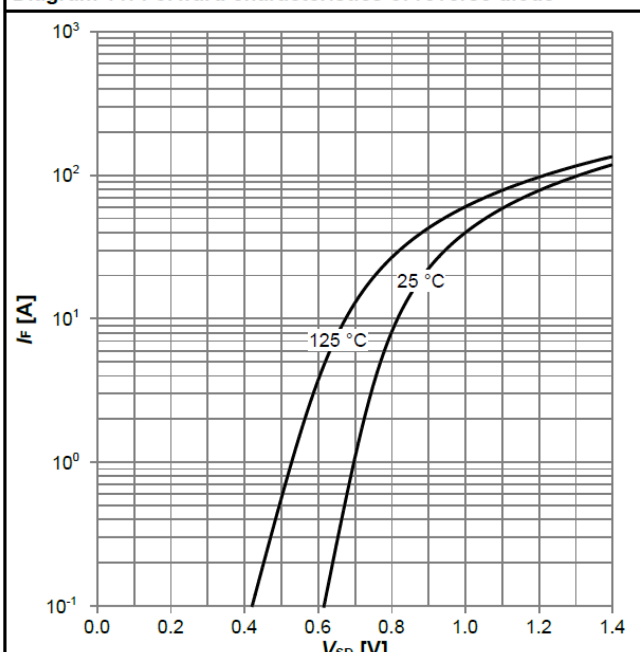
I_D=f(V_{GS}); V_{DS}=20V; parameter: T_j

Diagram 10: Typ. gate charge



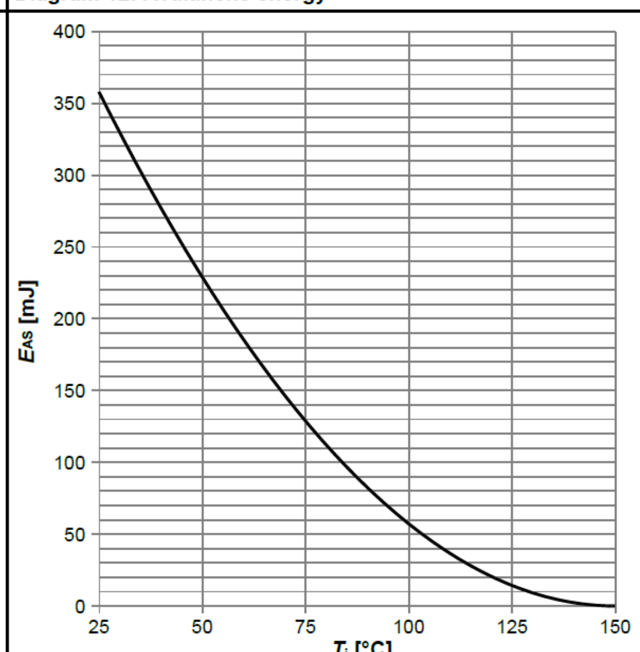
V_{GS}=f(Q_{gate}); I_D=35.8 A pulsed; parameter: V_{DD}

Diagram 11: Forward characteristics of reverse diode



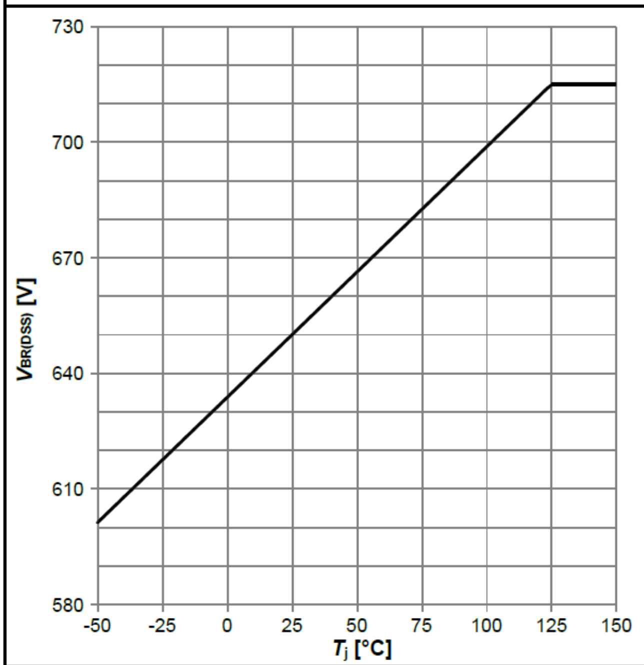
I_F=f(V_{SD}); parameter: T_j

Diagram 12: Avalanche energy



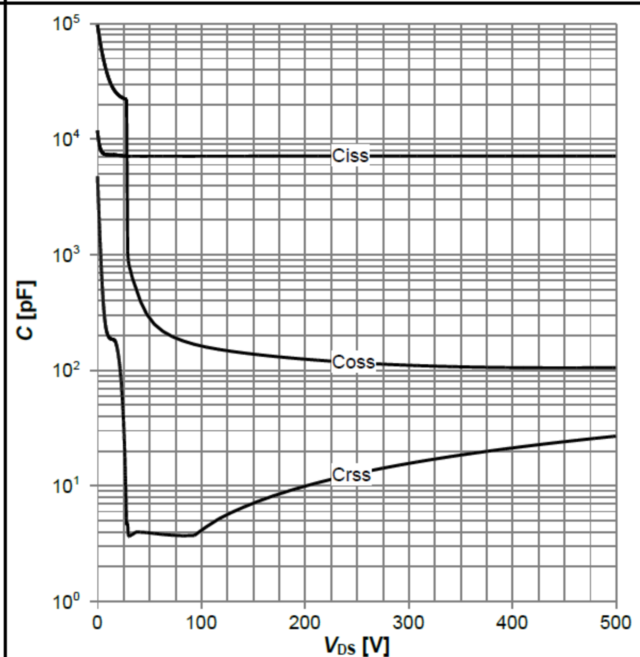
E_{AS}=f(T_j); I_D=7.3 A; V_{DD}=50 V

Diagram 13: Drain-source breakdown voltage



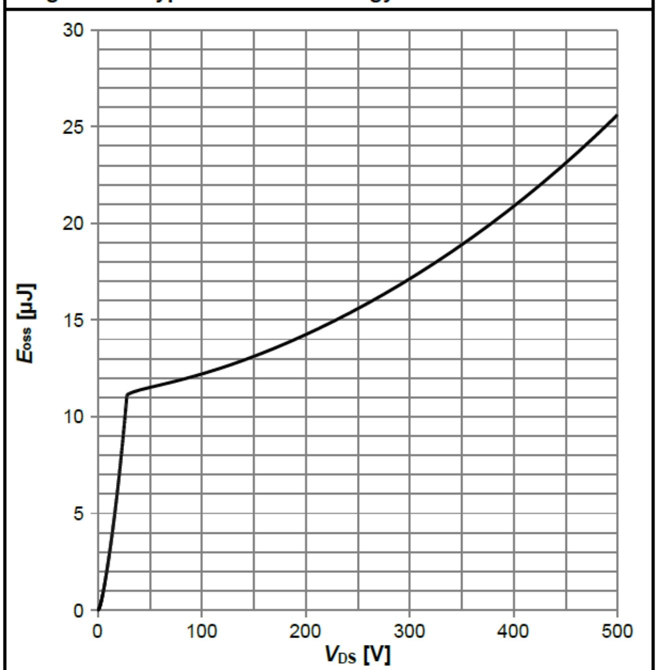
$V_{BR(DSS)}$=f(T_j); I_D=1 mA

Diagram 14: Typ. capacitances



C=f(V_{DS}); V_{GS}=0 V; f=250 kHz

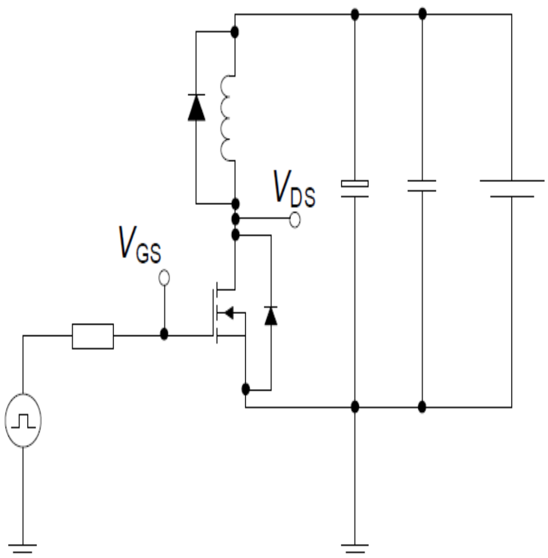
Diagram 15: Typ. Coss stored energy



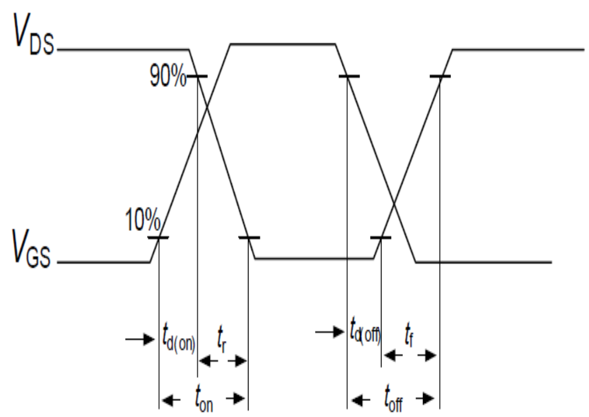
E_{oss}=f(V_{DS})

Switching times test circuit and waveform for inductive load

Switching times test circuit for inductive load

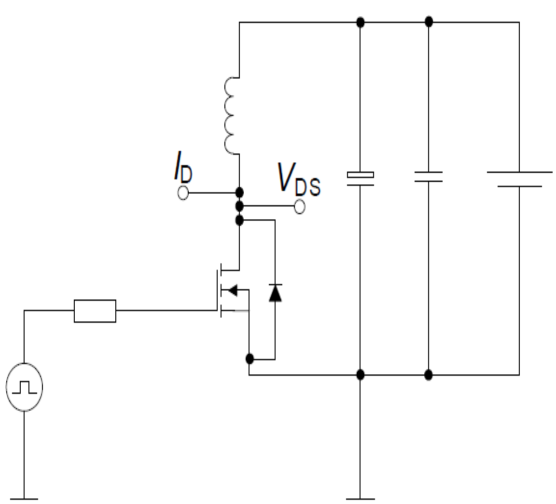


Switching time waveform

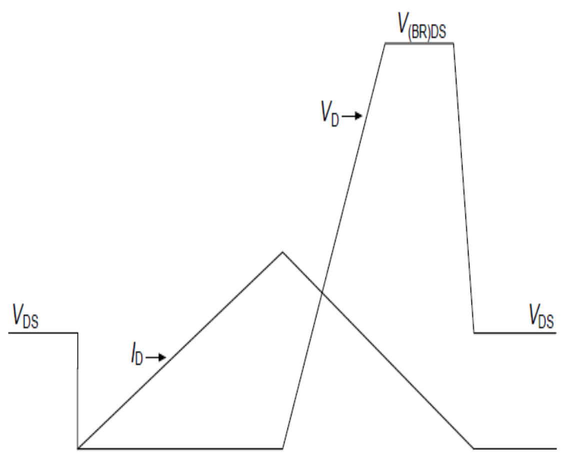


Unclamped inductive load test circuit and waveform

Unclamped inductive load test circuit

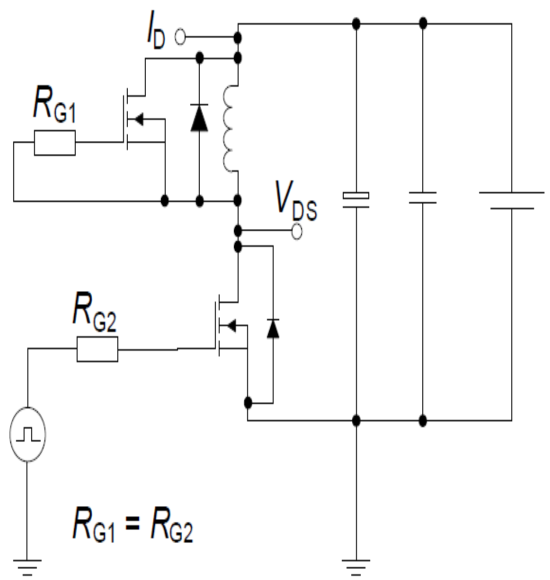


Unclamped inductive waveform

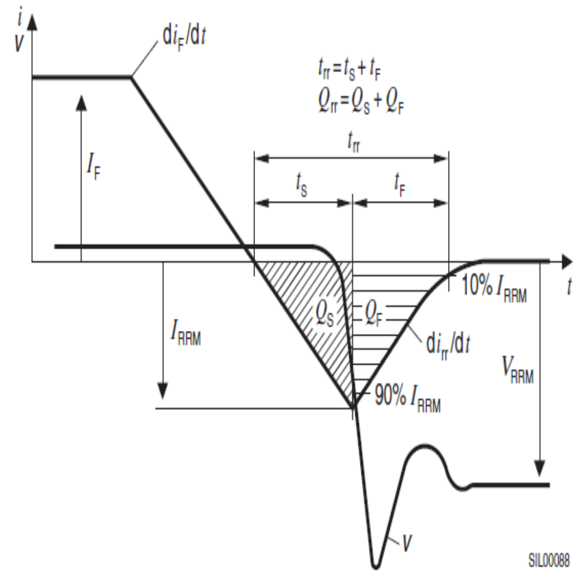


Test circuit and waveform for diode characteristics

Test circuit for diode characteristics



Diode recovery waveform



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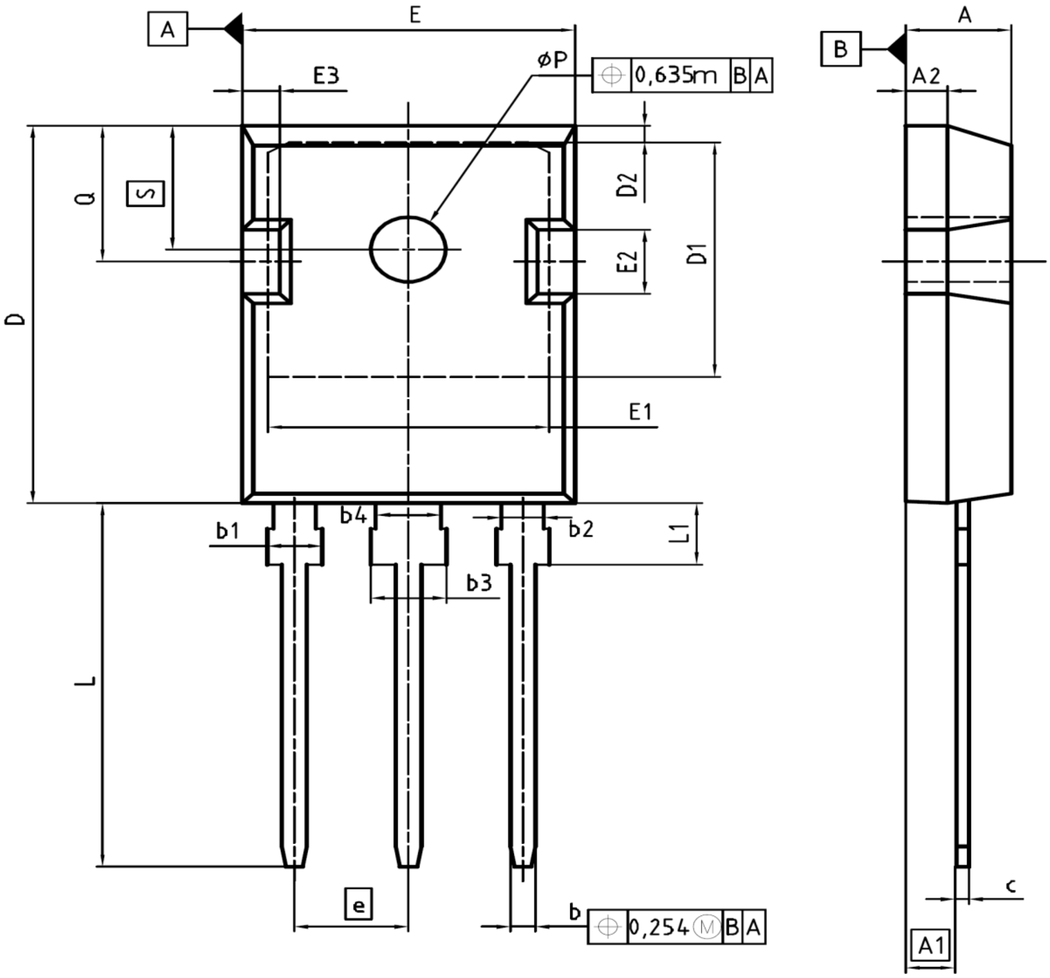
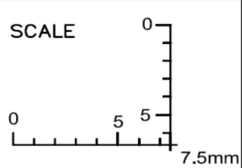


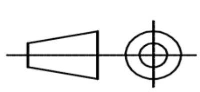
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	17.65	0.640	0.695
D2	0.95	1.35	0.037	0.053
E	15.70	16.13	0.618	0.635
E1	13.10	14.15	0.516	0.557
E2	3.68	5.10	0.145	0.201
E3	1.00	2.60	0.039	0.102
e	5.44		0.214	
N	3		3	
L	19.80	20.32	0.780	0.800
L1	4.10	4.47	0.161	0.176
øP	3.50	3.70	0.138	0.146
Q	5.49	6.00	0.216	0.236
S	6.04	6.30	0.238	0.248

DOCUMENT NO.
Z8B00003327

SCALE



EUROPEAN PROJECTION



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REVISION
04