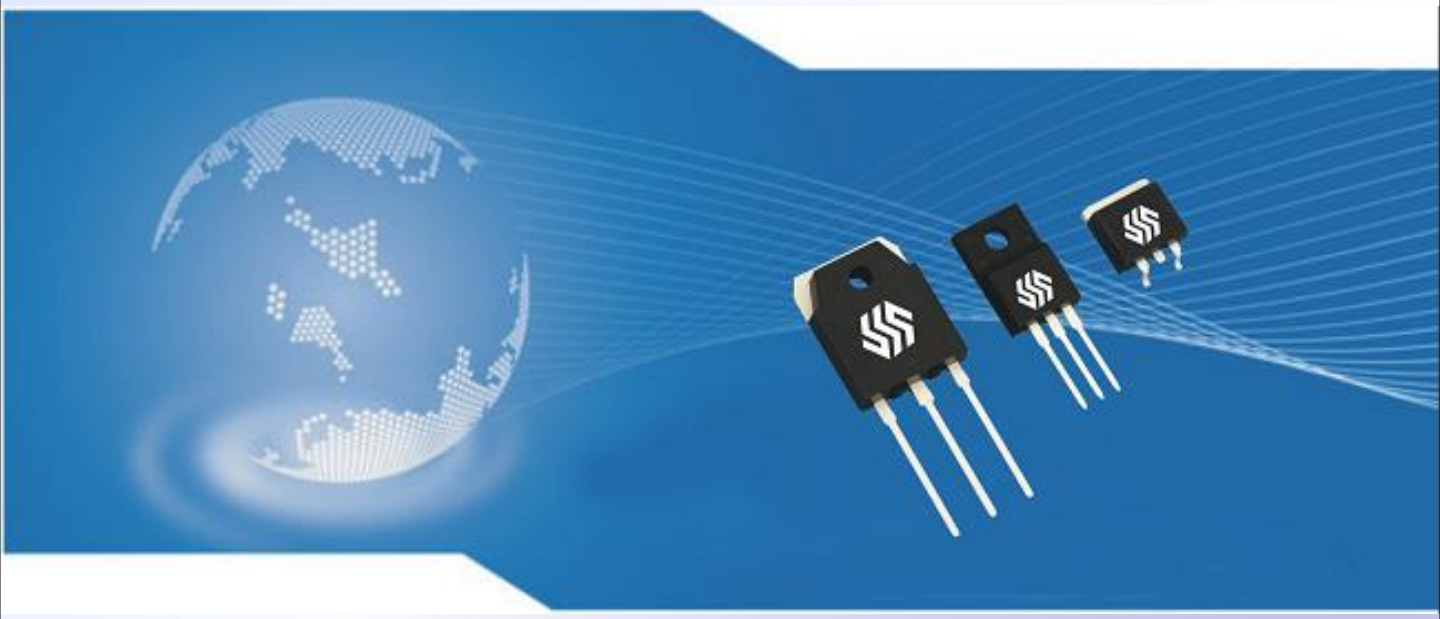
SUPER-SEMI



SUPER-MOSFET

Super Gate Metal Oxide Semiconductor Field Effect Transistor

100V Super Gate Power MOSFET
SG*100N042

Rev. 0.9
Jul. 2021

www.supersemi.com.cn

SGB100N042/SGP100N042
100V N-Channel MOSFET

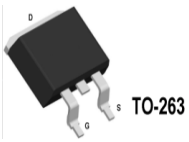
Description

The SG-MOSFET uses advanced trench MOSFET technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of RDS(ON) and gate charge.
This device is ideal for power switching applications, high frequency circuits and uninterruptible power supplies.

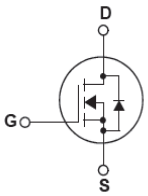
Features

- VDS 100V
- ID (at Vgs=10V) 120A
- Typ. RDS(on) (at Vgs=10V) 3.7mΩ
- Low Gate Charge (typ. Qg = 71nC)
- 100% avalanche tested

SGB100N042



SGP100N042



Absolute Maximum Ratings

Symbol	Parameter	SGB_P100N042	Unit
V_{DS}	Drain-Source Voltage	100	V
I_D	Continuous Drain Current - TC = 25℃ - TC = 100℃	 120* 75*	A
I_{DM}	Drain Current - Pulsed (Note 1)	480*	A
V_{GS}	Gate-Source voltage	±20	V
I_{AS}	Avalanche Current, single pulse (Note 5)	38	A
E_{AS}	Avalanche Energy, single pulse, L=1mH (Note 5)	720	mJ
P_D	Power Dissipation - TC = 25℃ (Note 2)	120	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	℃

* Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	SGB_P100N042	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.0	℃/W
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink Typ.	0.5	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62	℃/W

Electrical Characteristics TC = 25℃ unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250μA, T_J = 25℃	100	110	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=100V, V_{GS}=0V, T_J=25℃ V_{DS}=80V, V_{GS}=0V, T_J=85℃	-	-	1 10	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	2.0	2.8	3.5	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10V, I_D = 50A	-	3.7	4.2	mΩ
Rg	Gate resistance	VGS=0V, VDS=0V, f=1MHz	-	1.4	-	Ω
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 50V, V_{GS} = 0V, f=1MHz	-	4440	-	pF
C_{oss}	Output Capacitance		-	775	-	pF
C_{rss}	Reverse Transfer Capacitance		-	13	-	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DS} = 50V, R_G = 5Ω, I_D = 25A , V_{GS} = 10V (Note 3, 4)	-	28	-	ns
t_r	Turn-On Rise Time		-	17	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	53	-	ns
t_f	Turn-Off Fall Time		-	32	-	ns
Q_g	Total Gate Charge	V_{DS} = 50V, I_D = 25A, V_{GS} = 0~10V (Note 3, 4)	-	71	-	nC
Q_{gs}	Gate-Source Charge		-	18.1	-	nC
Q_{gd}	Gate-Drain Charge		-	17.8	-	nC
$V_{plateau}$	Gate plateau voltage		-	4.2	-	V
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		-	-	120	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		-	-	480	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0V, I_S = 50A	-	0.9	1.4	V
trr	Reverse Recovery Time	VGS = 0V, VDS = 50V, IS = 25A, dIF/dt =100A/μs	-	85	-	ns
Qrr	Reverse Recovery Charge		-	0.25	-	μC
Irrm	Peak Reverse Recovery Current		-	6	-	A

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature TJ(MAX)=150°C. Ratings are based on low frequency and duty cycles to keep initial TJ=25°C.
2. The power dissipation PD is based on TJ(MAX)=150°C, using ≤ 10s junction-to-ambient thermal resistance.
3. Pulse Test: Pulse width ≤ 300us, Duty Cycle ≤ 2%
4. Essentially Independent of Operating Temperature Typical Characteristics
5. V_{DD}=50V, L=1mH, Rg=25Ω, Starting TJ=25 ℃

Typical Performance Characteristics

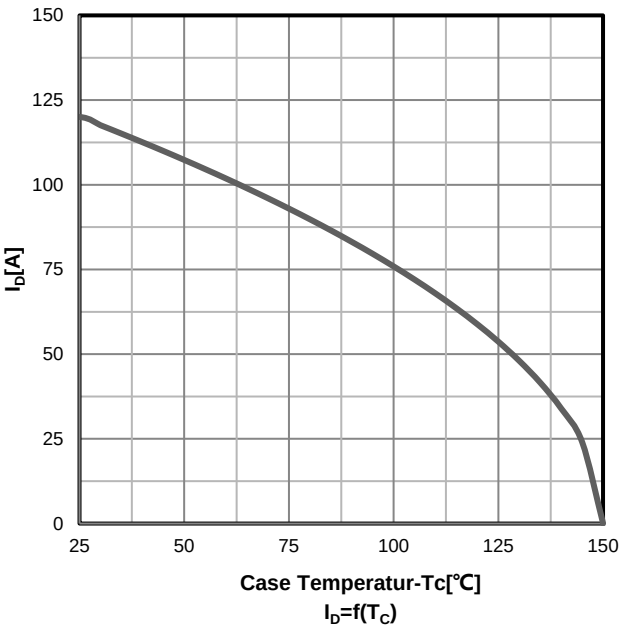


Figure 1: Continuous Drain Current vs Temperature

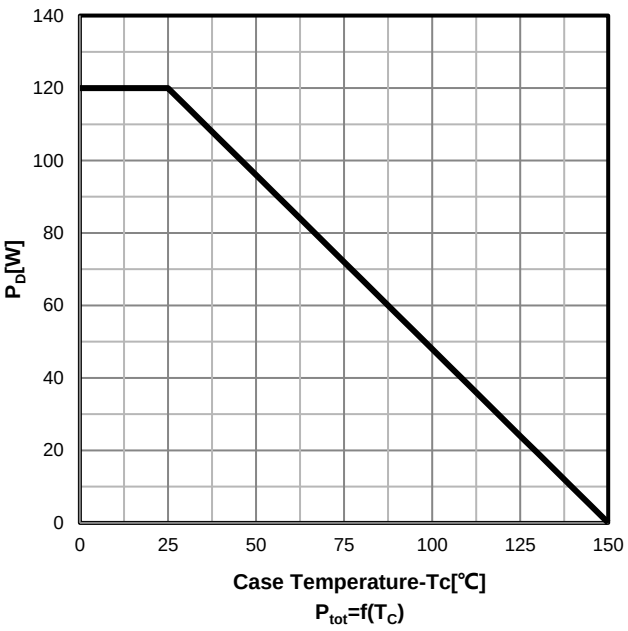


Figure 2: Power Dissipation

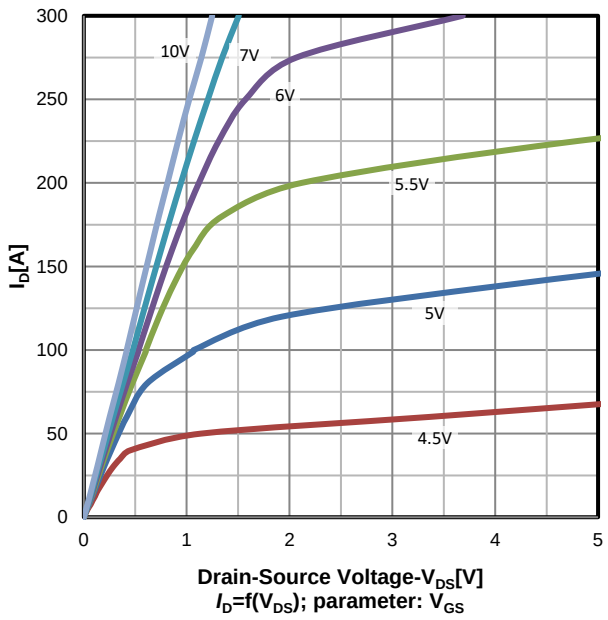


Figure 3: Typ. output characteristics

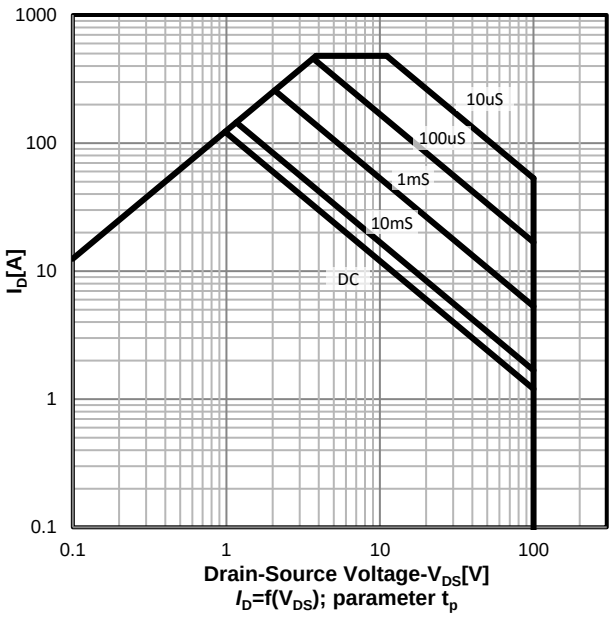


Figure 4: Maximum Forward Biased Safe Operating Area

Typical Performance Characteristics

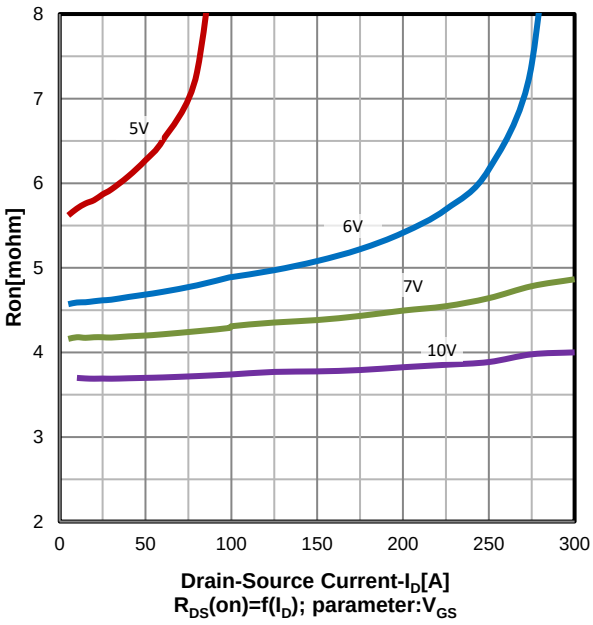


Figure 5: Typ. drain-source on resistance

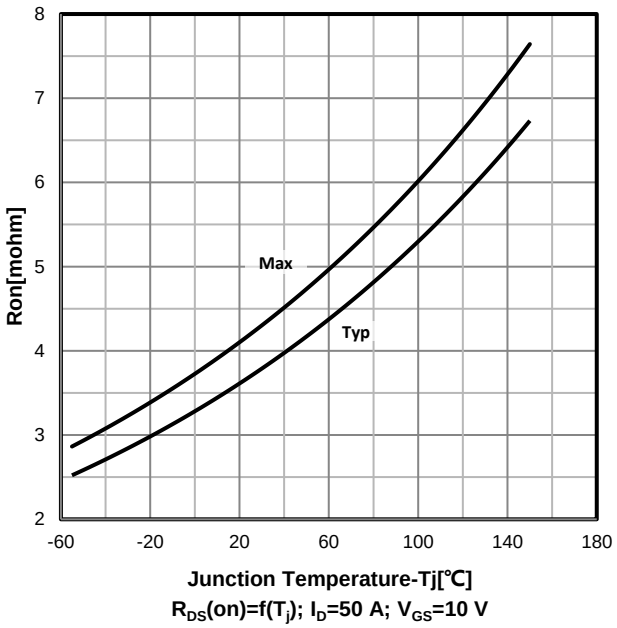


Figure 6: On-Resistance vs Junction Temperature

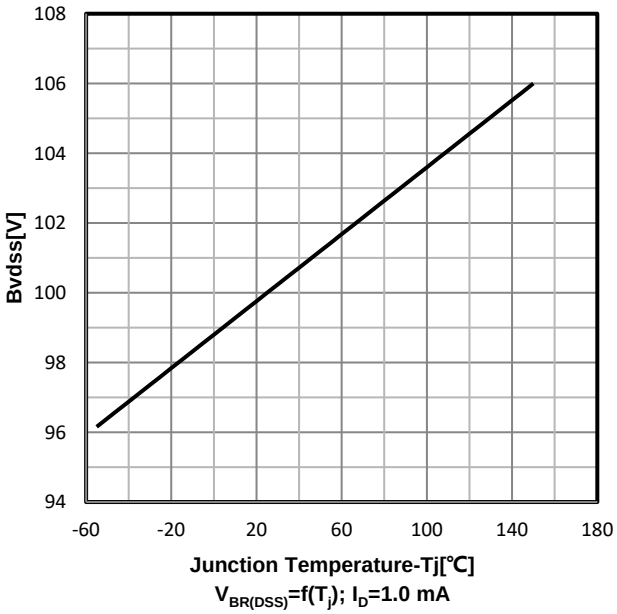


Figure 7: Drain-Source Breakdown Voltage

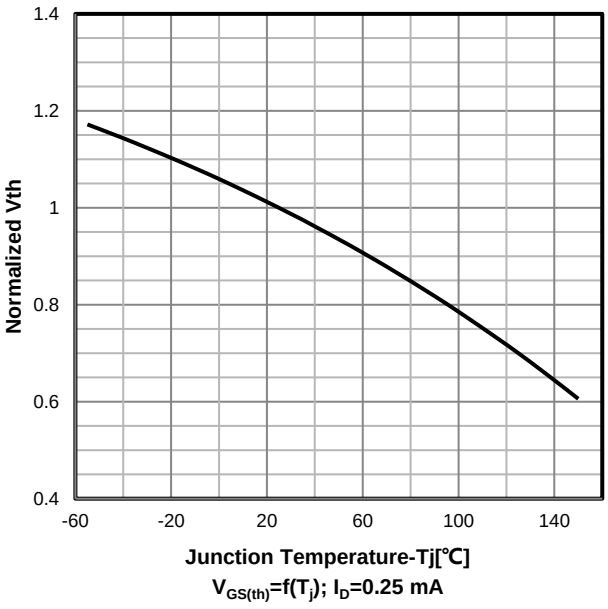


Figure 8: Vth vs Junction Temperature

Typical Performance Characteristics

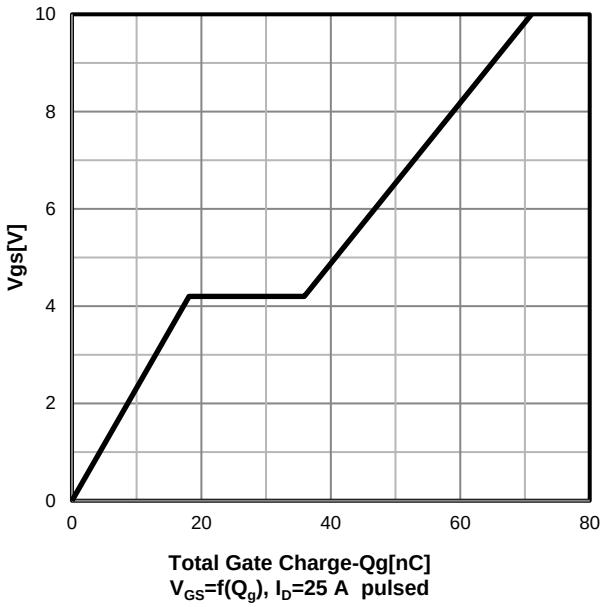


Figure 9: Gate-Charge Characteristics

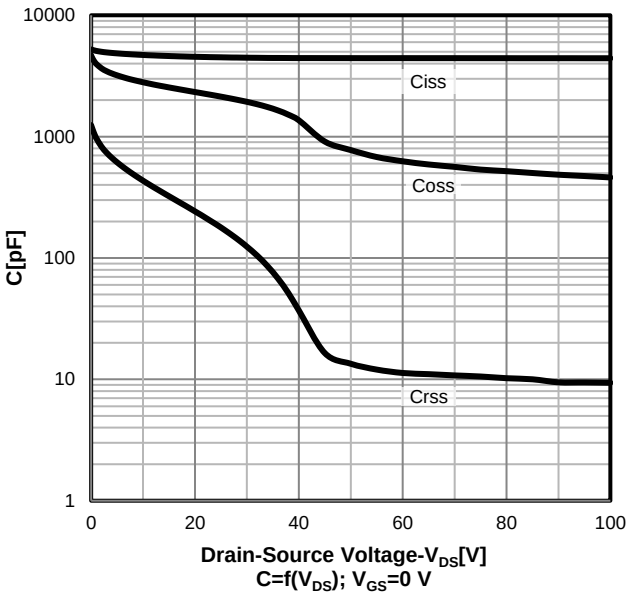


Figure 10: Capacitance Characteristics

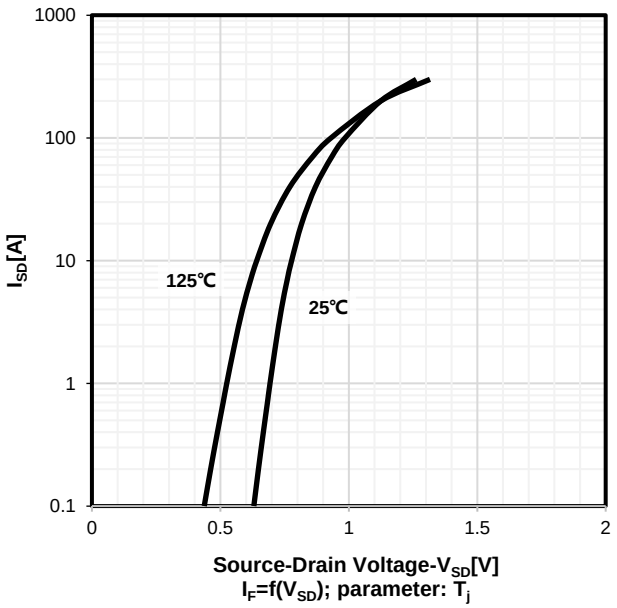


Figure 11: Body-Diode Characteristics

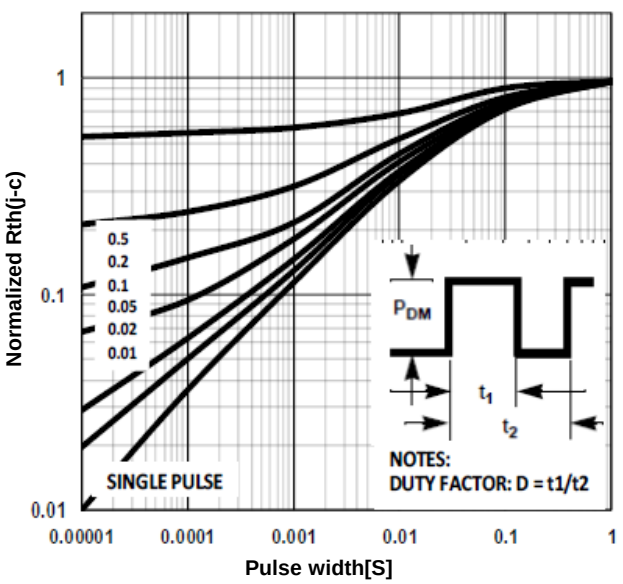
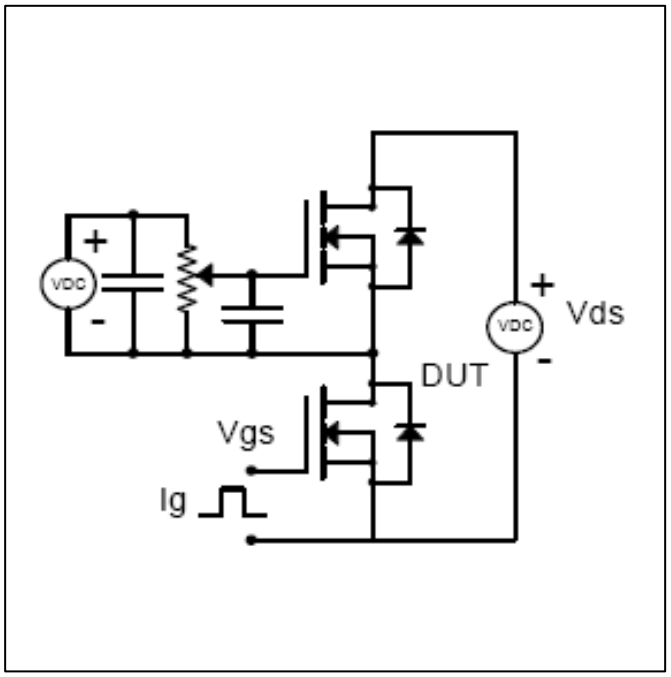
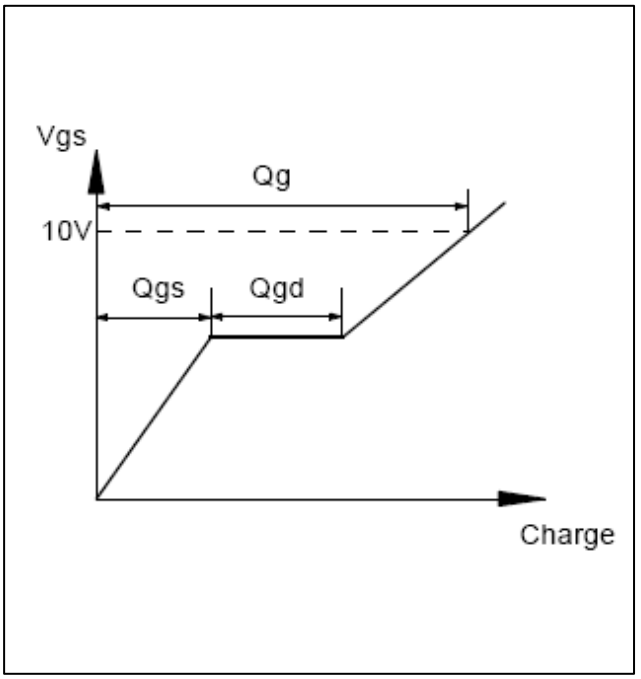


Figure 12: Maximum Transient Thermal Impedance

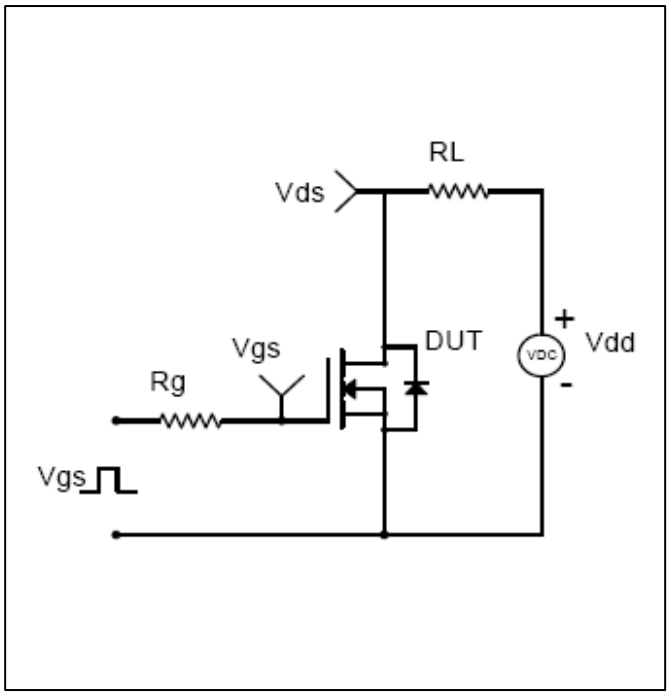
Test circuits

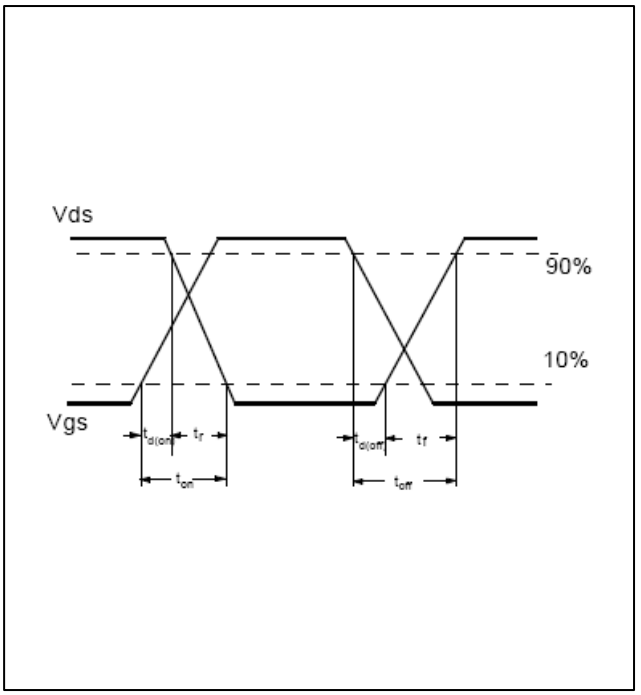
Gate Charge Test Circuit and Waveform





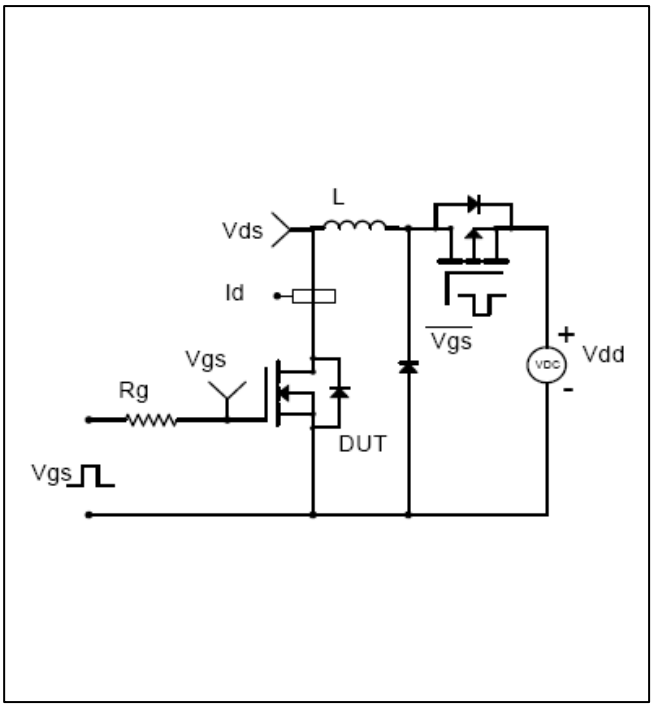
Resistive Switching Test Circuit and Waveforms

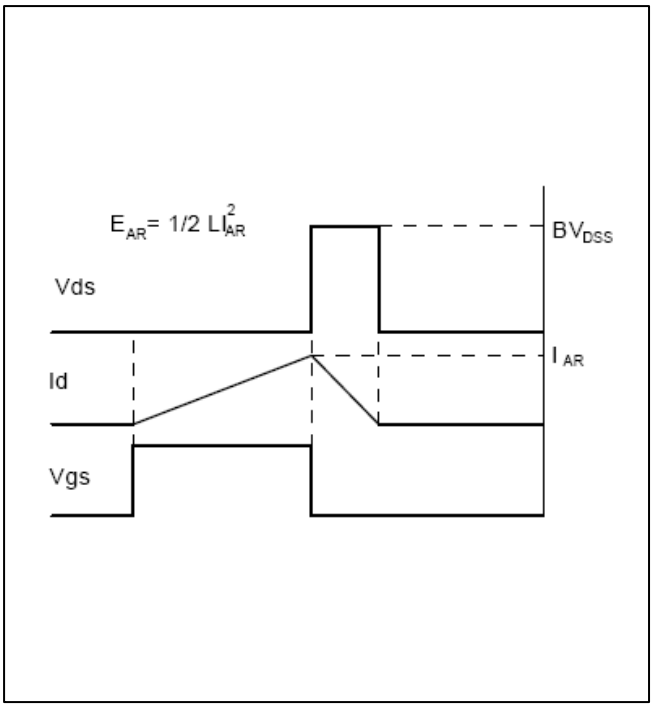




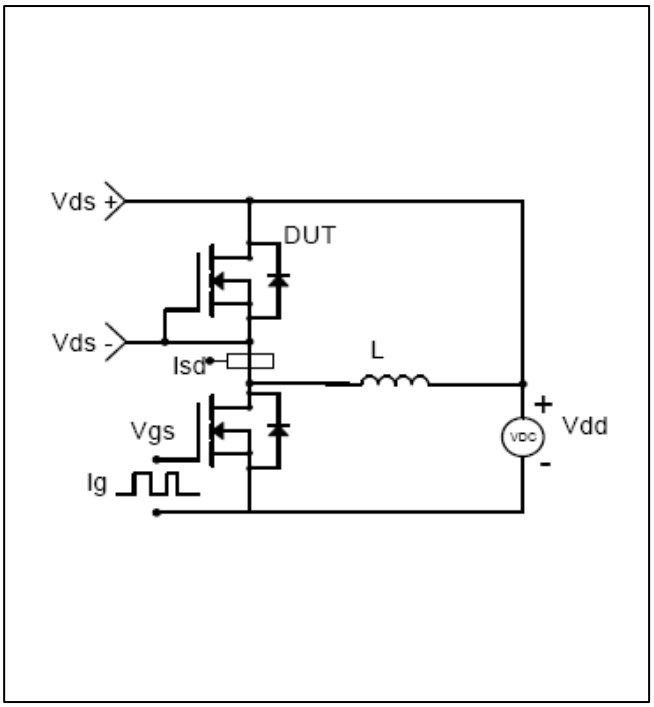
Test circuits

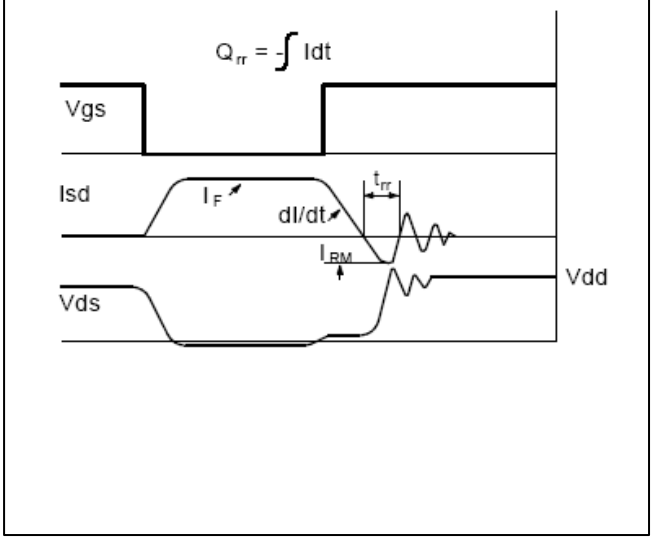
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms





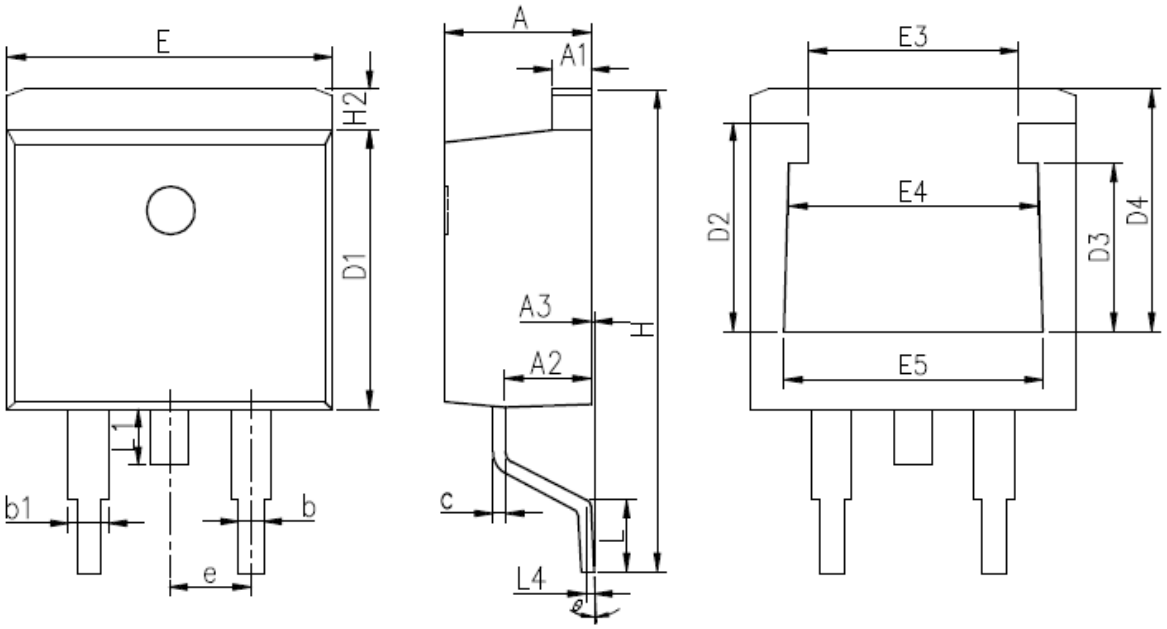
Diode Recovery Test Circuit & Waveforms

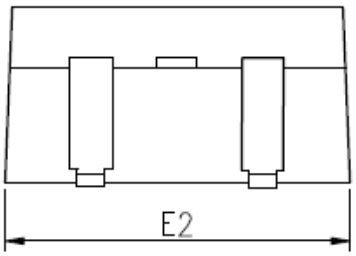




Package Outline

TO-263



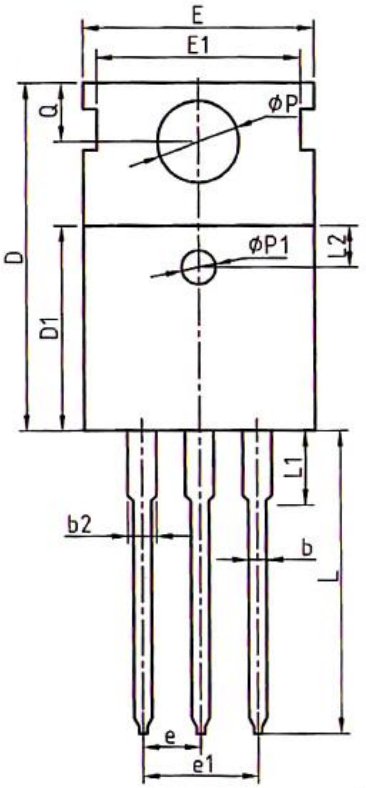


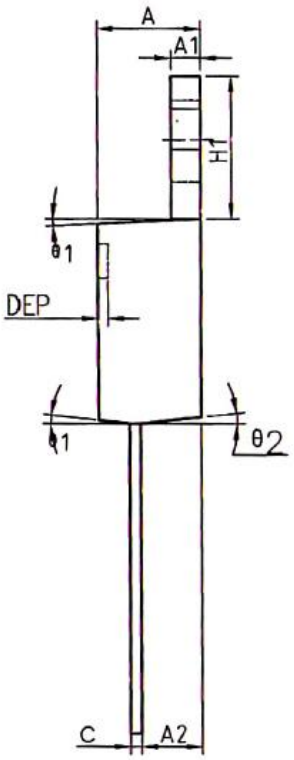
COMMON DIMENSIONS

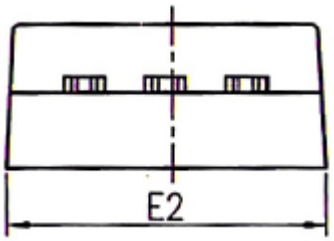
SYMBOL	MM		
	MIN	NOM	MAX
A	4.27	4.57	4.87
A1	1.22	1.27	1.42
A2	2.39	2.69	2.99
A3	0.00	0.13	0.20
b	0.70	0.81	1.01
b1	1.17	1.27	1.50
c	0.30	0.38	0.53
D1	8.40	8.70	9.00
D2	5.33	6.33	6.63
D3	4.54	5.54	5.84
D4	6.60	7.60	8.00
E	9.88	10.16	10.50
E2	9.80	10.10	10.40
E3	4.94	5.94	6.24
E4	6.67	7.67	7.97
E5	7.06	8.06	8.36
e		2.54 BSC	
H	14.70	15.10	15.50
H2	1.00	1.27	1.50
L	2.00	2.30	2.60
L1	1.35	1.55	1.75
L4		0.25 BSC	
θ	0°	5°	9°

Package Outline

TO-220







COMMON DIMENIONS

SYMBOL	MM		
	MIN	NOM	MAX
A	4.40	4.57	4.70
A1	1.27	1.30	1.37
A2	2.35	2.40	2.50
b	0.77	0.80	0.90
b2	1.17	1.27	1.36
c	0.48	0.50	0.56
D	15.40	15.60	15.80
D1	9.00	9.10	9.20
DEP	0.05	0.10	0.20
E	9.80	10.00	10.20
E1	–	8.70	–
E2	9.80	10.00	10.20
ΦP1	1.40	1.50	1.60
e		2.54BSC	
e1		5.08BSC	
H1	6.40	6.50	6.60
L	12.75	13.50	13.65
L1	–	3.10	3.30
L2		2.50REF	
ΦP	3.50	3.60	3.63
Q	2.73	2.80	2.87
θ1	5°	7°	9°
θ2	1°	3°	5°
θ3	1°	3°	5°

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