SUPER-MOSFET

Super Gate Metal Oxide Semiconductor Field Effect Transistor

100V Super Gate Power Transistor
SG*100N45T

Rev. 1.0
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www.supersemi.com.cn

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SG-FET
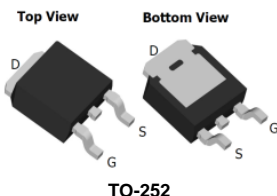
SGT100N45T/SGP100N45T
100V N-Channel MOSFET

Description

The SG-MOSFET uses 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), Ciss and Coss. This device is ideal for boost converters and synchronous rectifiers for consumer, telecom, industrial power supplies and LED backlighting.
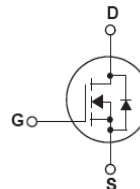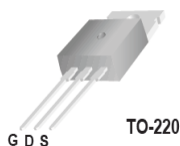
Features

- VDS   100V
- ID (at Vgs=10V)   25A
- RDS(on) (at Vgs=10V)   <45mΩ

- 100% avalanche tested

SGT100N45T   SGP100N45T

Top View   Bottom View

TO-252   TO-220

Absolute Maximum Ratings

Symbol	Parameter	SGT_P100N45T	Unit
V_{DS}	Drain-Source Voltage	100	V
I_D	Drain Current -Continuous (TA = 25℃) -Continuous (TA = 100℃)	25* 16*	A
I_{DM}	Drain Current - Pulsed (Note 1)	100*	A
V_{GS}	Gate-Source voltage	±20	V
I_{AS}	Avalanche Current, single pulse (Note 1)	27	A
E_{AS}	Avalanche Energy, single pulse, L=0.5mH (Note 1)	360	mJ
P_D	Power Dissipation - TA = 25℃ (Note 2)	40	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	℃

* Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	SGT_P100N45T	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	3.1	℃/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 TJ = 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	115	-	V
I$_{DSS}$	Zero Gate Voltage Drain Current	V$_{DS}$ = 100V, V$_{GS}$ = 0V -T$_J$ = 125℃	-	- 10	1 -	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	2.3	3.2	4.1	V
R$_{DS(on)}$	Static Drain-Source On-Resistance	V$_{GS}$ = 10V, I$_D$ = 12A V$_{GS}$ = 6V, I$_D$ = 6A	-	38 48	45 62	mΩ
g$_{FS}$	Forward Transconductance	V$_{DS}$ = 5V, I$_D$ = 12A	-	16	-	S
Rg	Gate resistance	VGS=0V, VDS=0V, f=1MHz	-	1.5	-	Ω
Dynamic Characteristics						
C$_{iss}$	Input Capacitance	V$_{DS}$ = 50V, V$_{GS}$ = 0V, f=1MHz	-	890	-	pF
C$_{oss}$	Output Capacitance		-	60	-	pF
C$_{rss}$	Reverse Transfer Capacitance		-	40	-	pF
Switching Characteristics						
t$_{d(on)}$	Turn-On Delay Time	V$_{DS}$ = 50V, R$_G$ = 3Ω, I$_D$ = 6A , V$_{GS}$ = 10V (Note 3, 4)	-	9	-	ns
tr	Turn-On Rise Time		-	5	-	ns
t$_{d(off)}$	Turn-Off Delay Time		-	18	-	ns
tf	Turn-Off Fall Time		-	5	-	ns
Q$_g$	Total Gate Charge	V$_{DS}$ = 50V, I$_D$ = 6A, V$_{GS}$ = 0~10V (Note 3, 4)	-	14	-	nC
Q$_{gs}$	Gate-Source Charge		-	4	-	nC
Q$_{gd}$	Gate-Drain Charge		-	5	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I$_S$	Maximum Continuous Drain-Source Diode Forward Current		-	-	25	A
I$_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current		-	-	100	A
V$_{SD}$	Drain-Source Diode Forward Voltage	V$_{GS}$ = 0V, I$_S$ = 1A	-	0.7	1.0	V
trr	Reverse Recovery Time	V$_{GS}$ = 0V, V$_R$=50V, I$_S$ = 6A dI$_F$/dt =500A/µs (Note 3)	-	44	-	ns
Qrr	Reverse Recovery Charge		-	60	-	nC

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
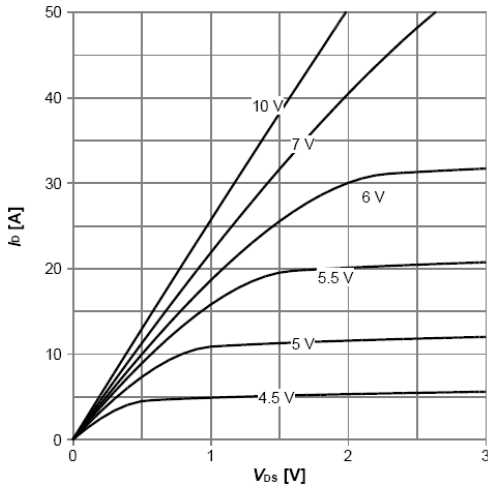
Typical Performance Characteristics
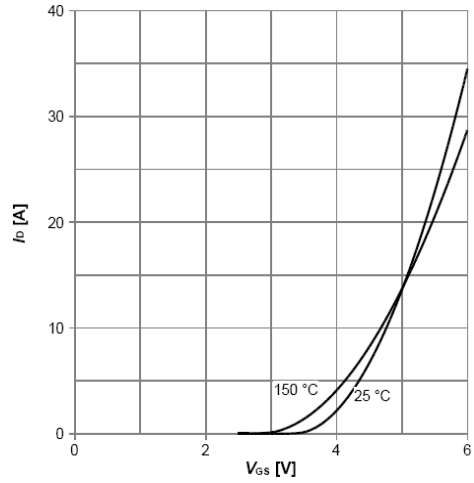
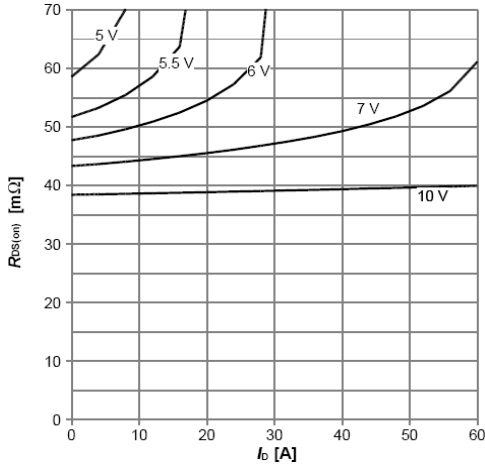Figure 1: On-Region Characteristics

Figure 2: Transfer Characteristics

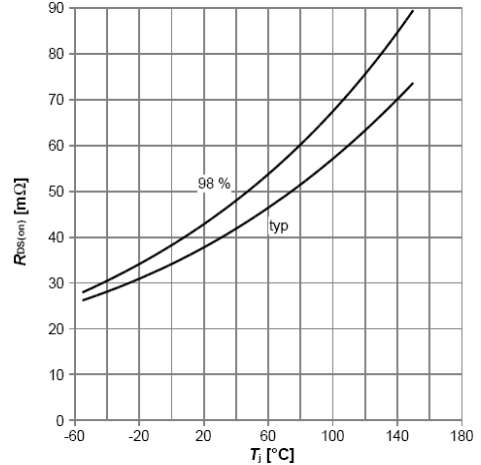Figure 3: On-Resistance vs Drain current and Gate voltage

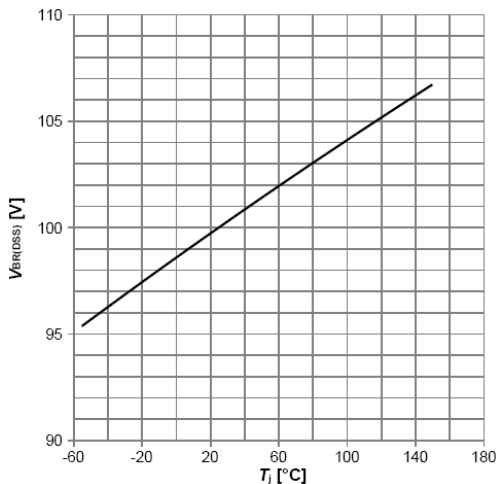Figure 4: On-Resistance vs Junction Temperature
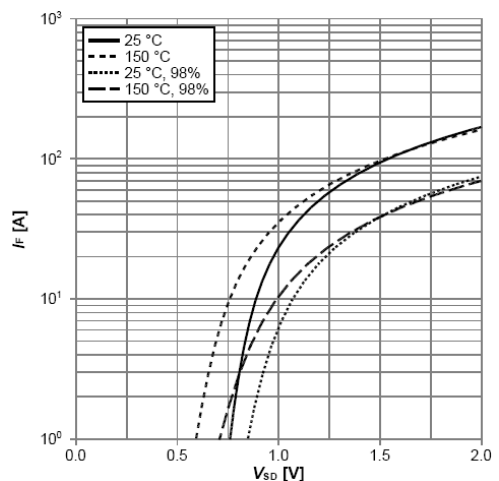
Figure 5: Drain-Source breakdown voltage

Figure 6: Body-Diode Characteristics
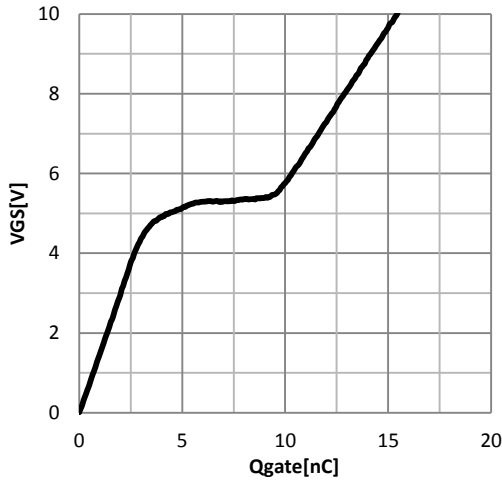
Typical Performance Characteristics
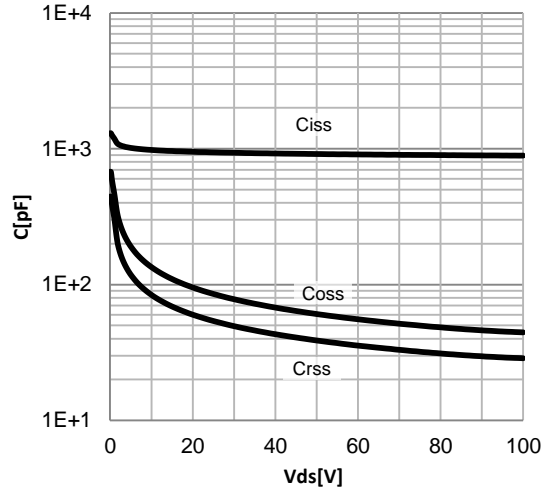
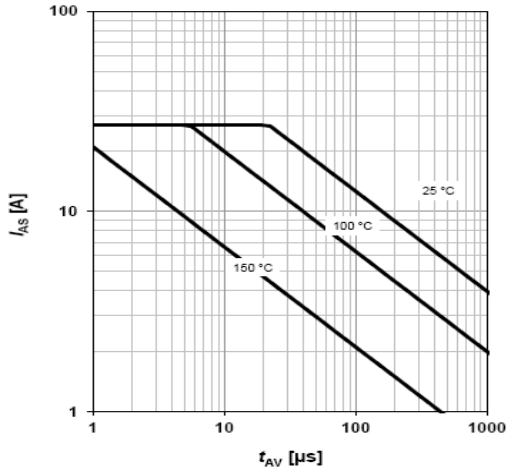Figure 7: Gate-Charge Characteristics

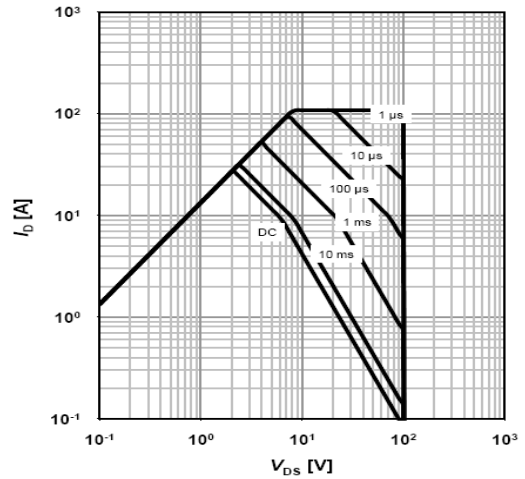Figure 8: Capacitance Characteristics

Figure 9: Avalanche Characteristics
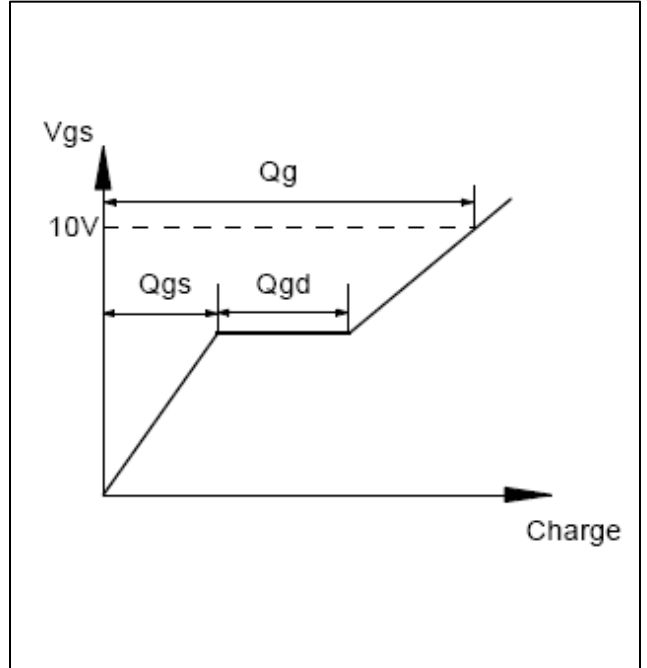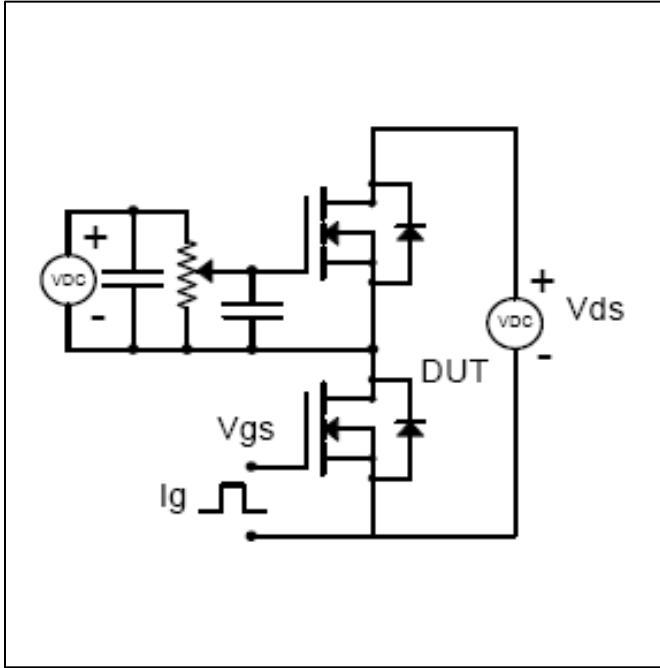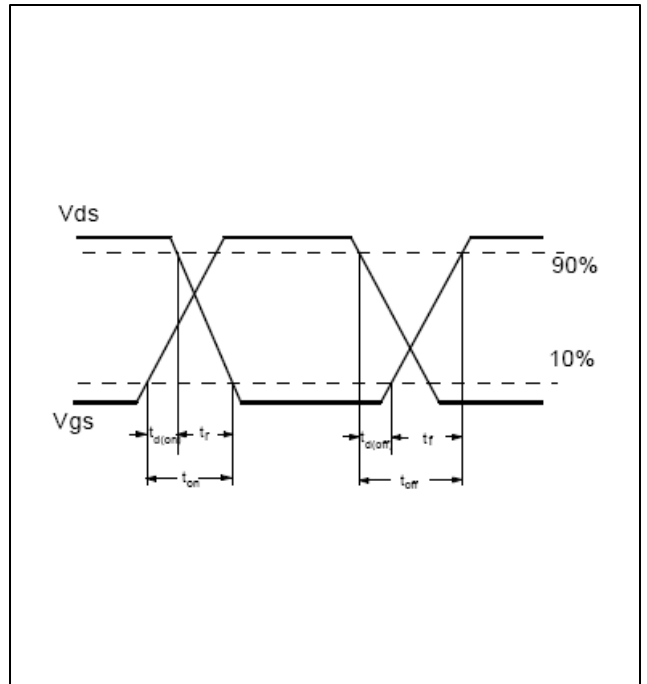
Figure 10: Maximum Forward Biased Safe Operating Area
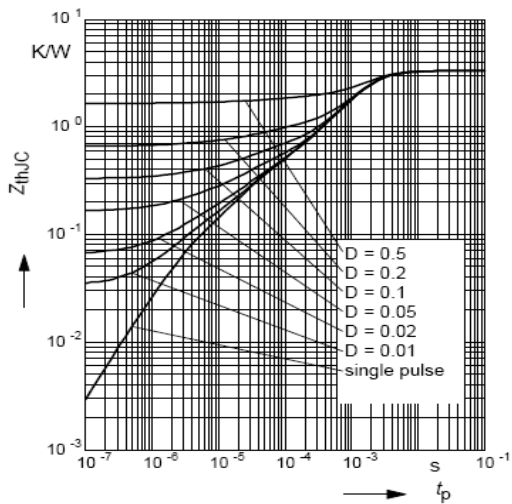
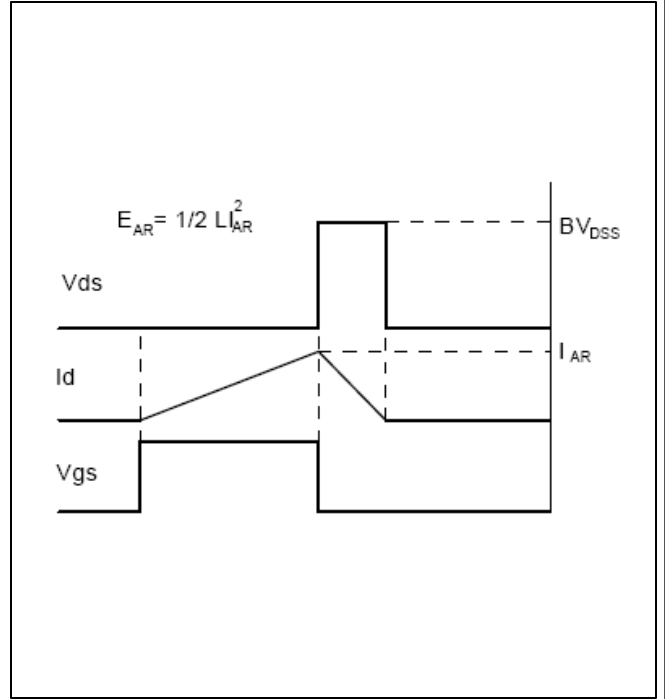Figure 11: Maximum Transient Thermal Impedance
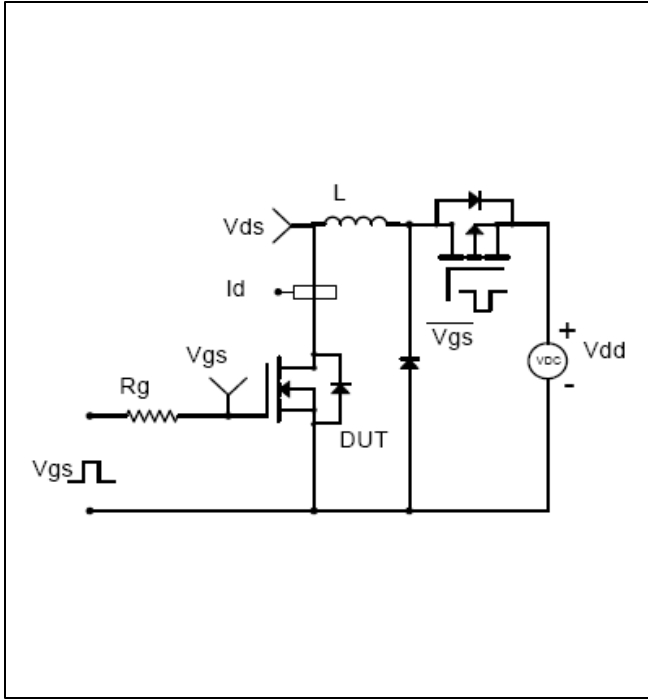
Test circuits

Gate Charge Test Circuit and Waveform

Resistive Switching Test Circuit and Waveforms
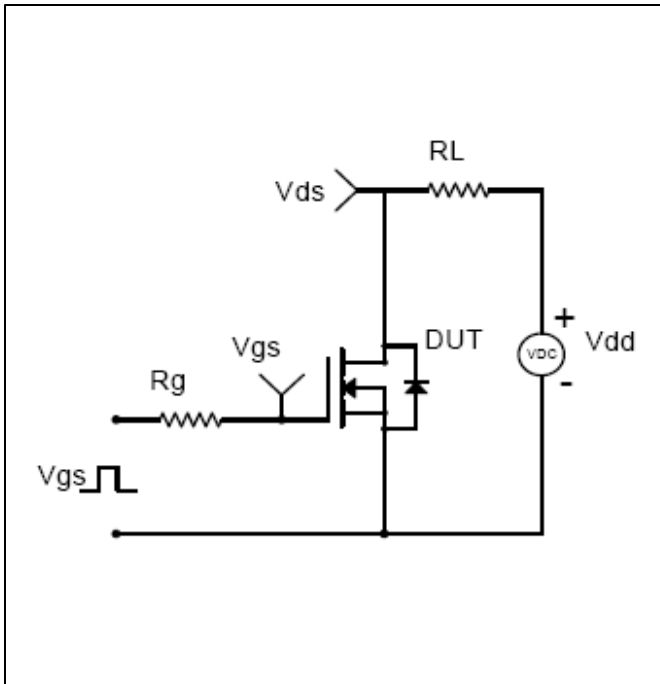
Test circuits

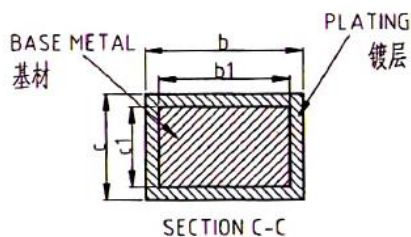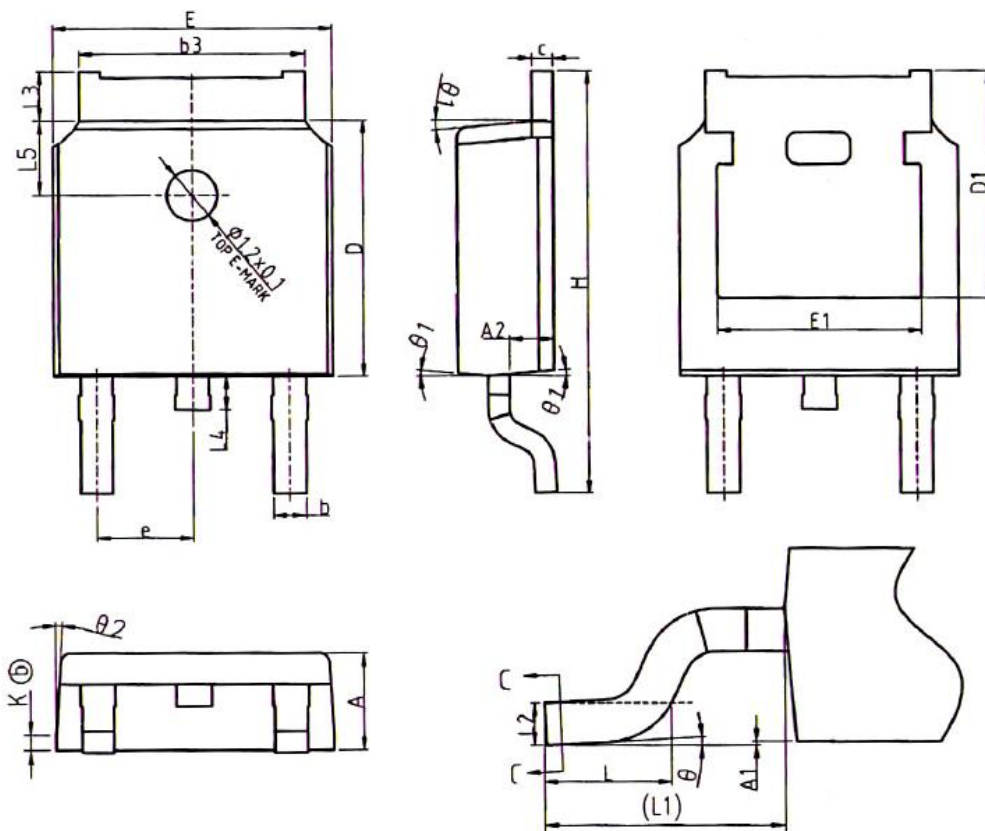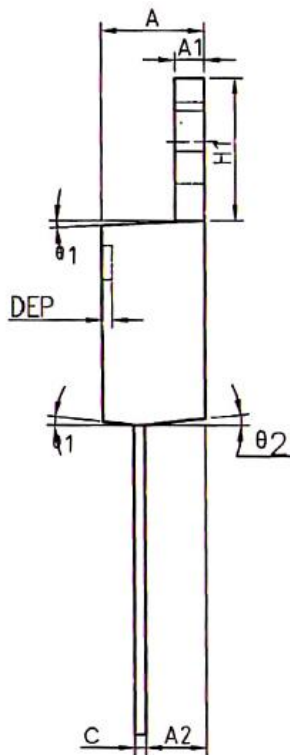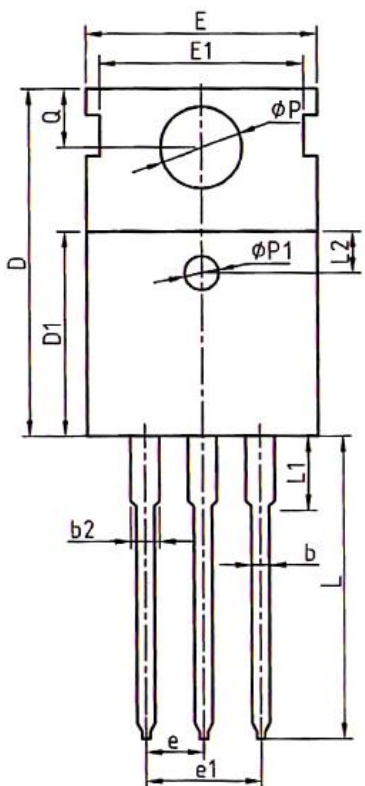## Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

$$E_{AR} = 1/2\, LI_{AR}^2$$

Diode Recovery Test Circuit & Waveforms

$$Q_{rr} = \int I dt$$

Package Outline
TO-252
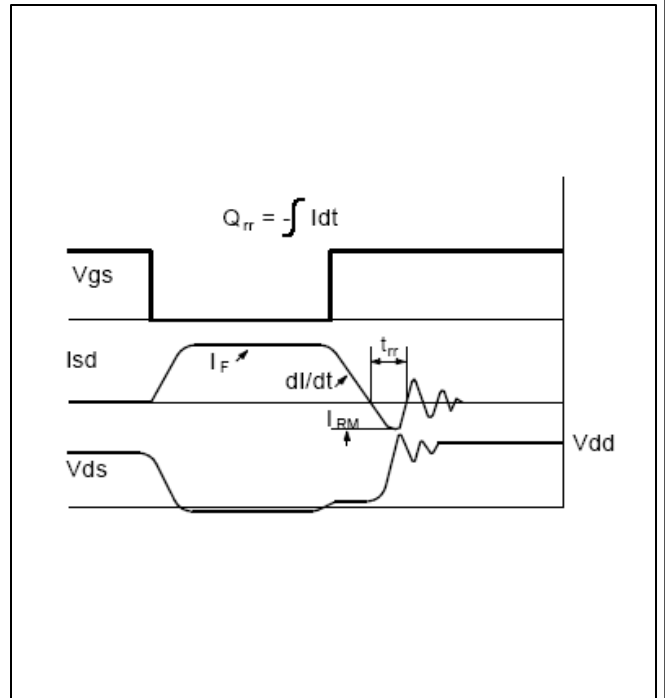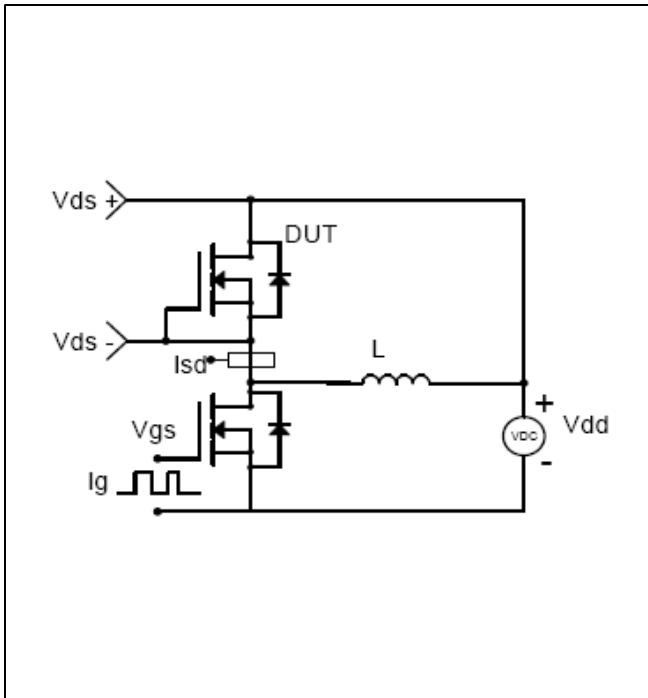
COMMON DIMENSIONS			
SYMBOL	MM		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0.00	-	0.10
A2	0.97	1.07	1.17
b	0.72	0.78	0.85
b1	0.71	0.76	0.81
b3	5.23	5.33	5.46
c	0.47	0.53	0.58
c1	0.46	0.51	0.56
D	6.00	6.10	6.20
D1	5.30REF		
E	6.50	6.60	6.70
E1	4.70	4.83	4.92
e	2.286BSC		
H	9.90	10.10	10.30
L	1.40	1.50	1.70
L1	2.90REF		
L2	0.51BSC		
L3	0.90	-	1.25
L4	0.60	0.80	1.00
L5	1.70	1.80	1.90
θ	0°	-	8°
θ1	5°	7°	9°
θ2	5°	7°	9°
K	0.40REF		

![Super logo]

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'