Pd Lead Free Package and Finish

Applications:
- Switch Mode Power Supply(SMPS)
- Uninterruptible Power Supply(UPS)
- Power Factor Correction (PFC)
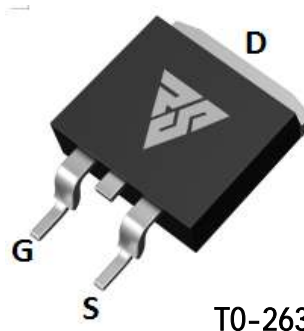
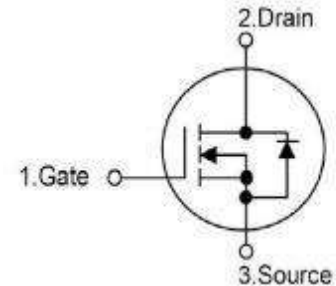| ID	RDS(ON)(Typ)	VDSS
9A	1.2Ω	900V

Features:
- Fast switching speed
- 100% avalanche tested
- Improved dv/dt capability

Ordering Information

T0-263

Not to Scale

Part Number	Package	Marking
RS9N90S	TO-263	RS9N90S

Absolute Maximun Ratings Tc=25 unless otherwise specified

Symbol	Parameter	RS9N90S	Units
VDSS	Drain-to-Source Voltage	900	V
ID	Continuous Drain Current	9	A
IDM	Pulsed Drain Current (Note*1)	36	A
PD	Power Dissipation	178	W
VGS	Gate-to-Source Voltage	±30	V
EAS	Single Pulse Avalanche Engergy L=10mH VDD=50V RG=25Ω TJ=25	245	mJ
IAS	Avalanche Current (Note*1)	7	A
EAR	Repetitive Avalanche Energy (Note*1)	0.98	mJ
TL TPKG	Maximum Temperature for Soldering	300	
	Leads at 0.063in(1.6mm)from Case for 10 seconds Package Body for 10 seconds	260	
TJ and TSTG	Operating Junction and Storage Temperature Range	-55 to 150	

* Drain Current Limited by Maximum Junction Temperature

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" Table may cause permanent damage to the device.

Thermal Resistance

Symbol	Parameter	RS9N90S	Units	Test Conditions
RθJC	Junction-to-Case	0.7	/W	Drain lead soldered to water cooled heatsink, PD adjusted for a peak junction temperature of +150
RθJA	Junction-to-Ambient	62.5		1 cubic foot chamber, free air.

OFF Characteristics　TJ=25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
BV$_{DSS}$	Drain-to-source Breakdown Voltage	900	--	--	V	V$_{GS}$=0V,I$_D$=250μA
I$_{DSS}$	Drain-to-Source Leakage Current	--	--	1.0	μA	V$_{DS}$=900V,V$_{GS}$=0V
I$_{GSS}$	Gate-to-Source Forward Leakage	--	--	100	nA	V$_{GS}$=+30V, V$_{DS}$=0V
	Gate-to-Source Reverse Leakage	--	--	-100		V$_{GS}$=-30V ,V$_{DS}$=0V

ON Characteristics　TJ=25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
R$_{DS(on)}$	Static Drain-to-Source On-Resistance (Note*2)	--	1.2	1.55	Ω	V$_{GS}$=10V,I$_D$=4.5A
V$_{GS(TH)}$	Gate Threshold Voltage	3.0	--	4.0	V	V$_{GS}$=V$_{DS}$,I$_D$=250μA

Resistive Switching Characteristics　Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
t$_{d(ON)}$	Turn-on Delay Time	--	46	--	nS	V$_{DS}$=450V I$_D$=9A R$_G$=25Q
t$_{rise}$	Rise Time	--	35	--		
t$_{d(OFF)}$	Turn-OFF Delay Time	--	317	--		
t$_{fall}$	Fall Time	--	56	--		

Dynamic Characteristics　Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
C$_{iss}$	Input Capacitance	--	1514	--	pF	V$_{GS}$=0V V$_{DS}$=25V f=1.0MHz
C$_{oss}$	Output Capacitance	--	150	--		
C$_{rss}$	Reverse Transfer Capacitance	--	32	--		
Q$_g$	Total Gate Charge	--	64	--	nC	V$_{DS}$=720V I$_D$=9A V$_{GS}$=10V
Q$_{gs}$	Gate-to-Source Charge	--	7	--		
Q$_{gd}$	Gate-to-Drain("Miller"）Charge	--	34	--		

Source-Drain Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current	--	--	9	A	Integral pn-diode in MOSFET
I_{SM}	Maximum Pulsed Current	--	--	36	A	Integral pn-diode in MOSFET
V_{SD}	Diode Forward Voltage	--	--	1.4	V	I_S=4.5A,V_{GS}=0V
t_{rr}	Reverse Recovery Time	--	298	--	nS	V_{GS}=0V I_S=9A,di/dt=100A/µs
Q_{rr}	Reverse Recovery Charge	--	1.7	--	µC	V_{GS}=0V I_S=9A,di/dt=100A/µs

Notes:

＊1. Repetitive rating; pulse width limited by maximum junction temperature.

＊2. Pulse Test: Pulse width ≤ 300µs, Duty Cycle ≤ 1%

Typical Feature curve

Figure 1. Output Characteristics (T_J = 25ºC)
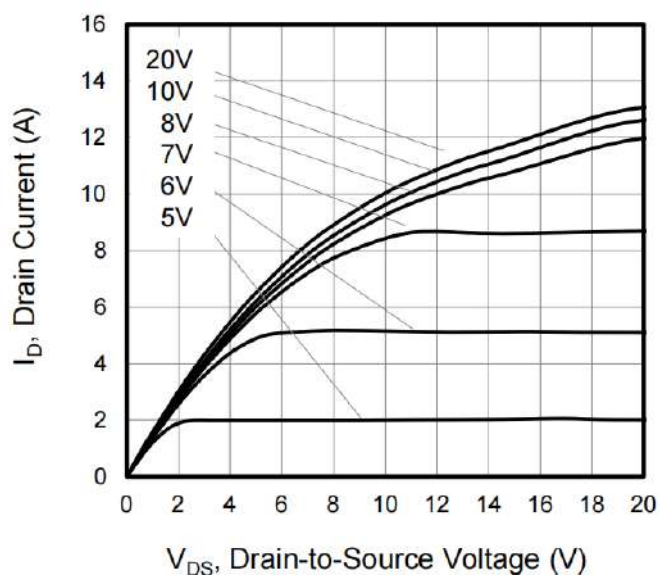
Figure 2. Body Diode Forward Voltage
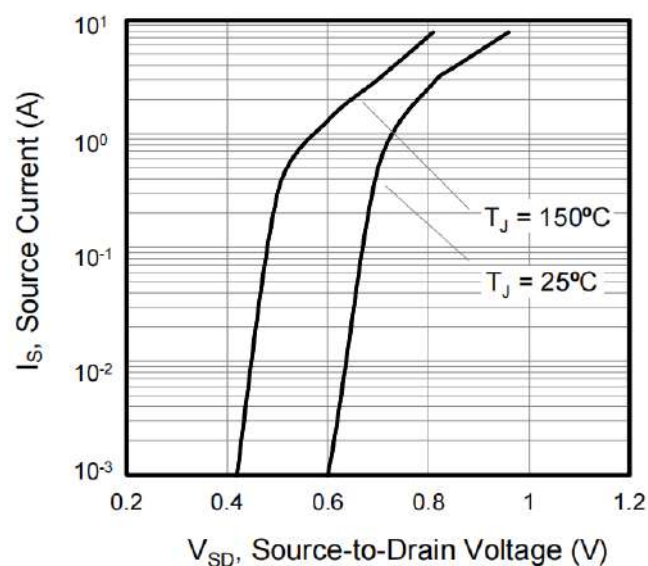
Figure 3. Drain Current vs. Temperature
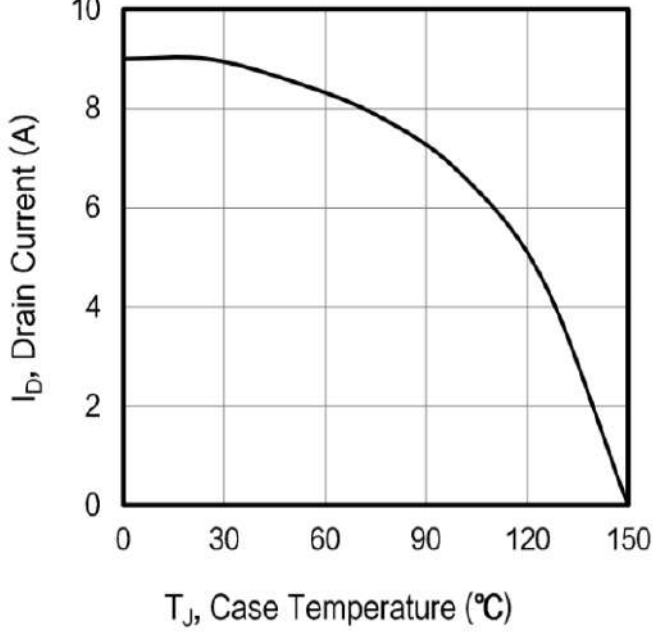
Figure 4. BV$_{DSS}$ Variation vs. Temperature
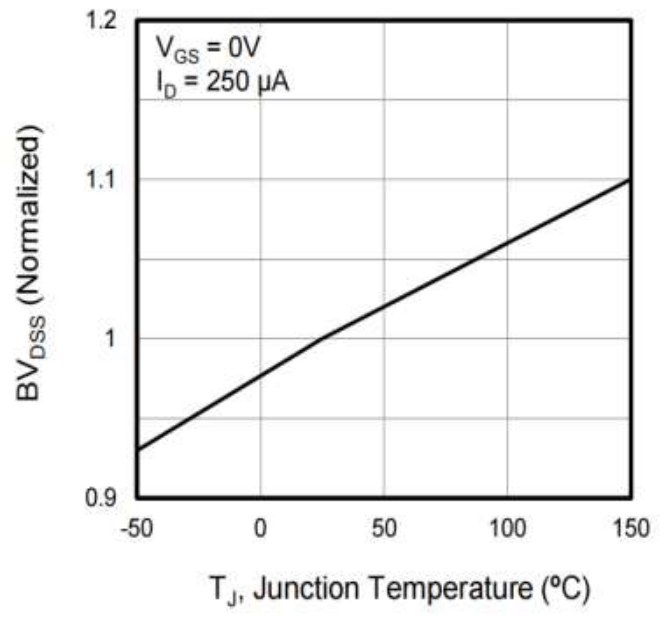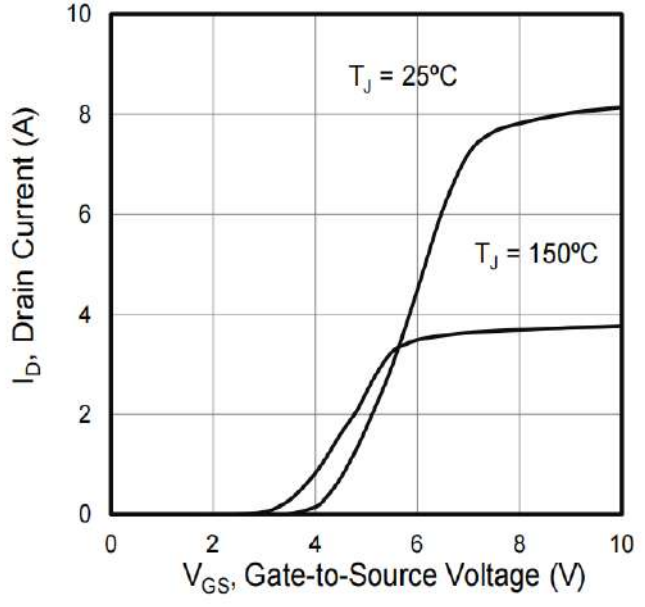

Figure 5. Transfer Characteristics
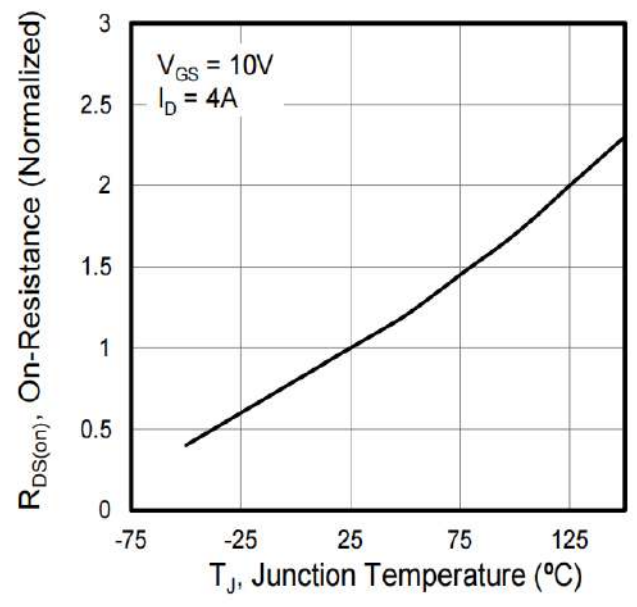

Figure 6. On-Resistance vs. Temperature

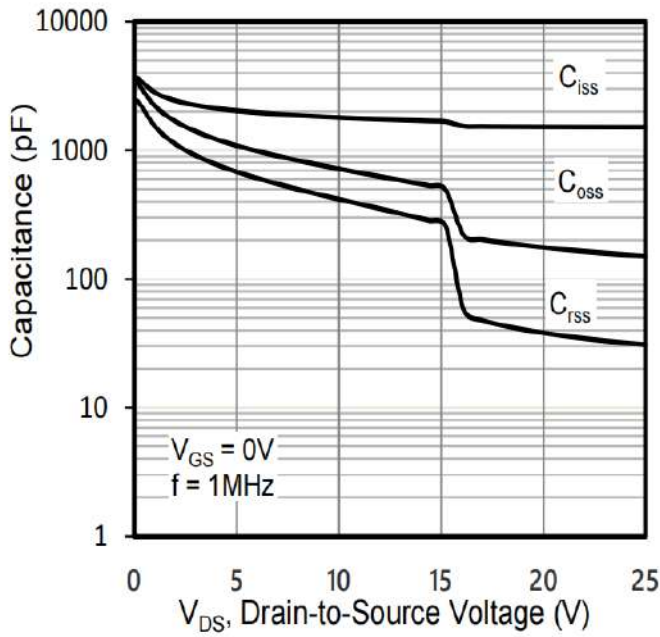## Figure 7. Capacitance

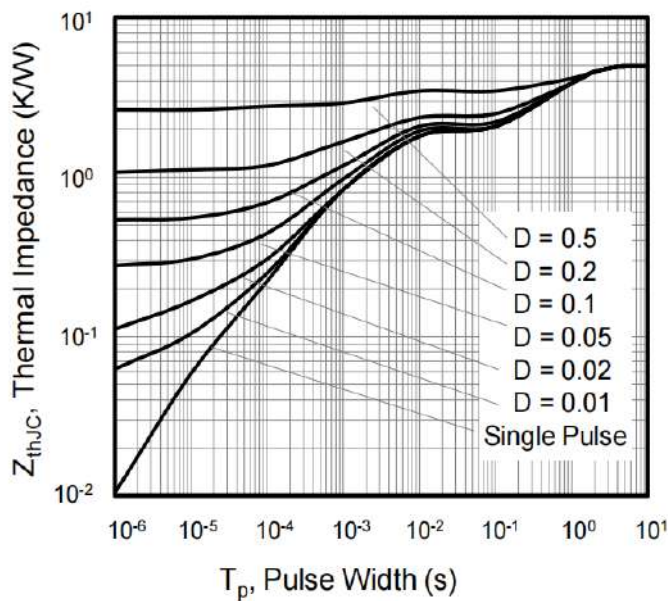## Figure 8. Gate Charge
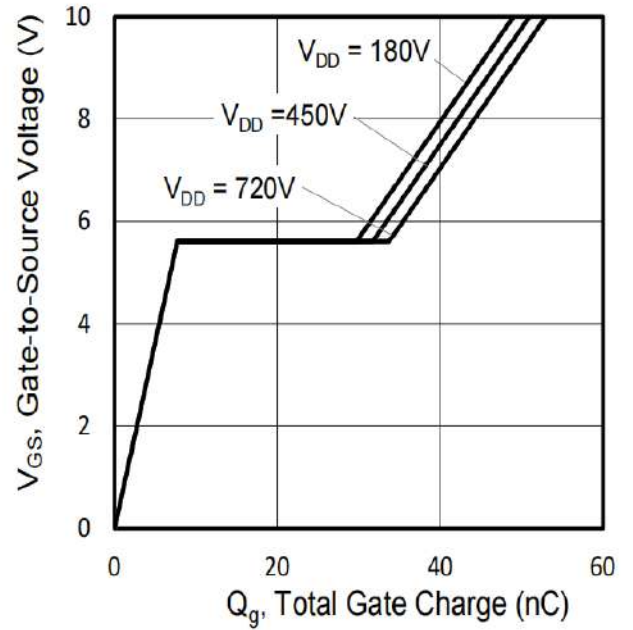
Figure 9. Transient Thermal Impedance

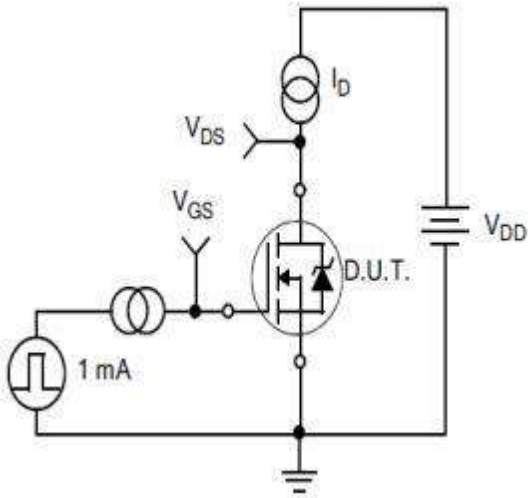## Test Circuits and Waveforms

$V_{GS}(TH)$
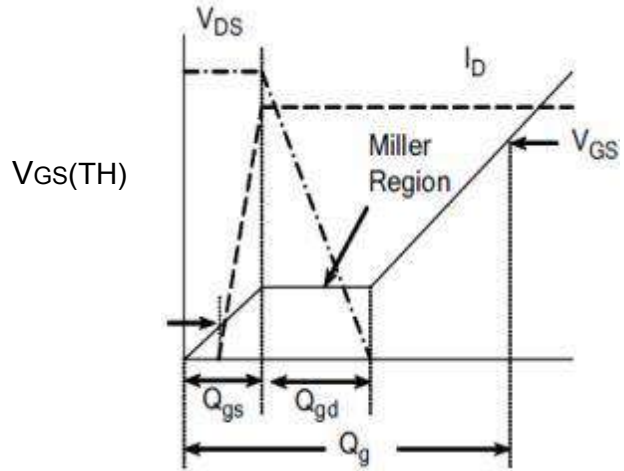
Figure A.
Gate Charge Test Circuit
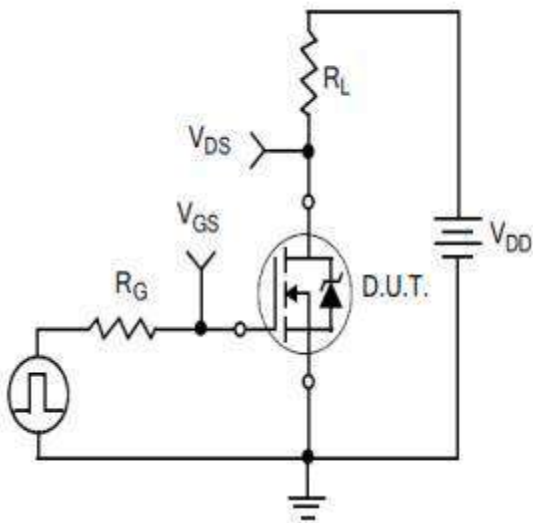
Figure B.
Gate Charge Waveform

Figure C.
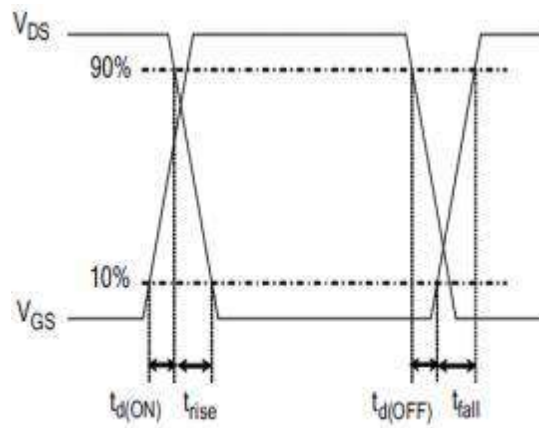Resistive Switching Test Circuit

Figure D.
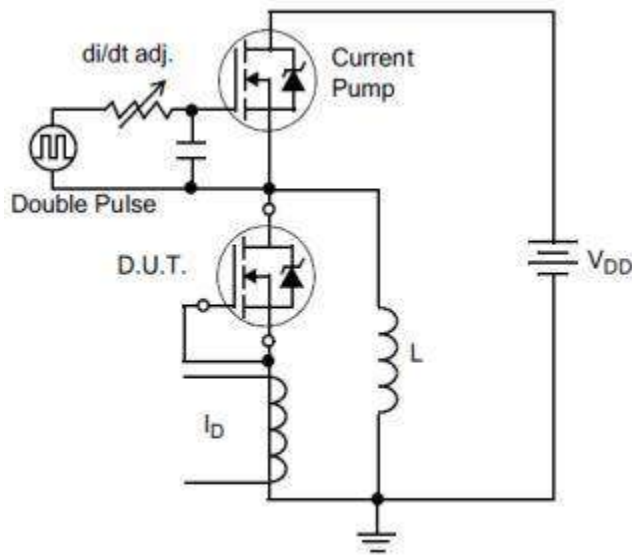Resistive Switching Waveforms

Test Circuits and Waveforms

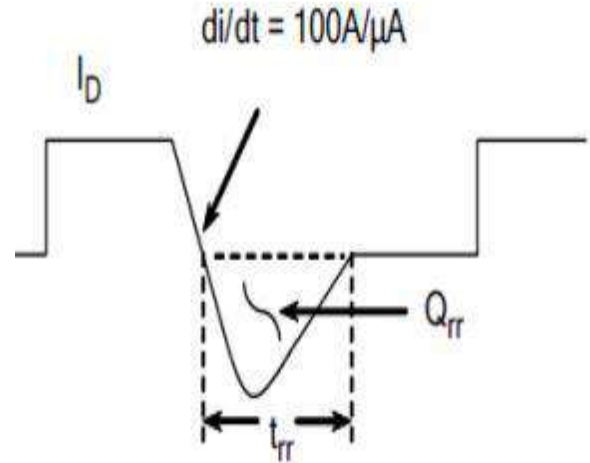Figure E.Diode Reverse Recovery
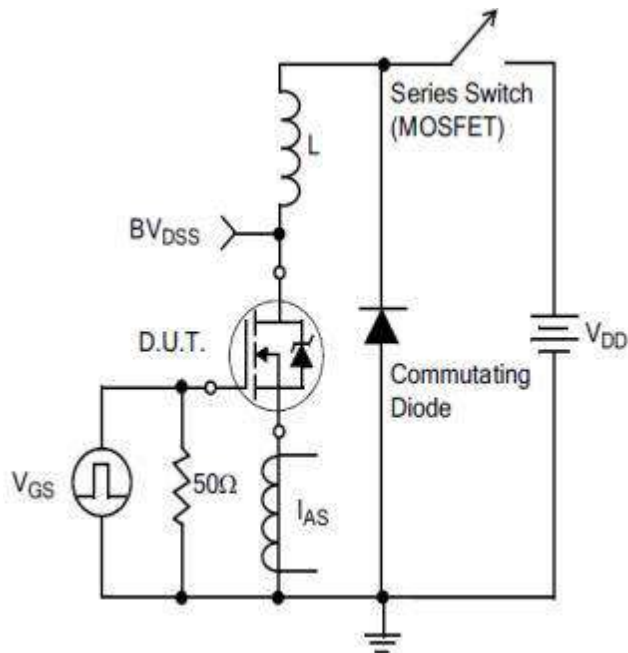Test Circuit

Figure F.Diode Reverse Recovery
Waveform

$$E_{AS}= \frac{I_{AS}^2 L}{2}$$

Figure G.Unclamped Inductive
Switching Test Circuit
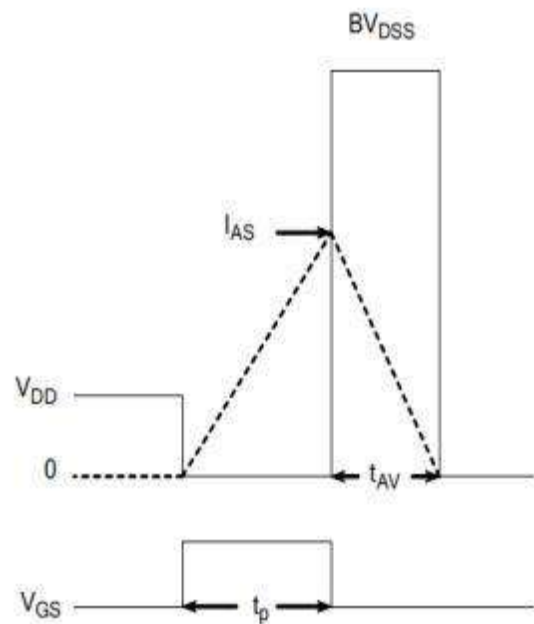
Figure H.Unclamped Inductive
Switching Waveforms

Package outline drawing

TO-263

Unit:mm

VIEW1

VIEW1
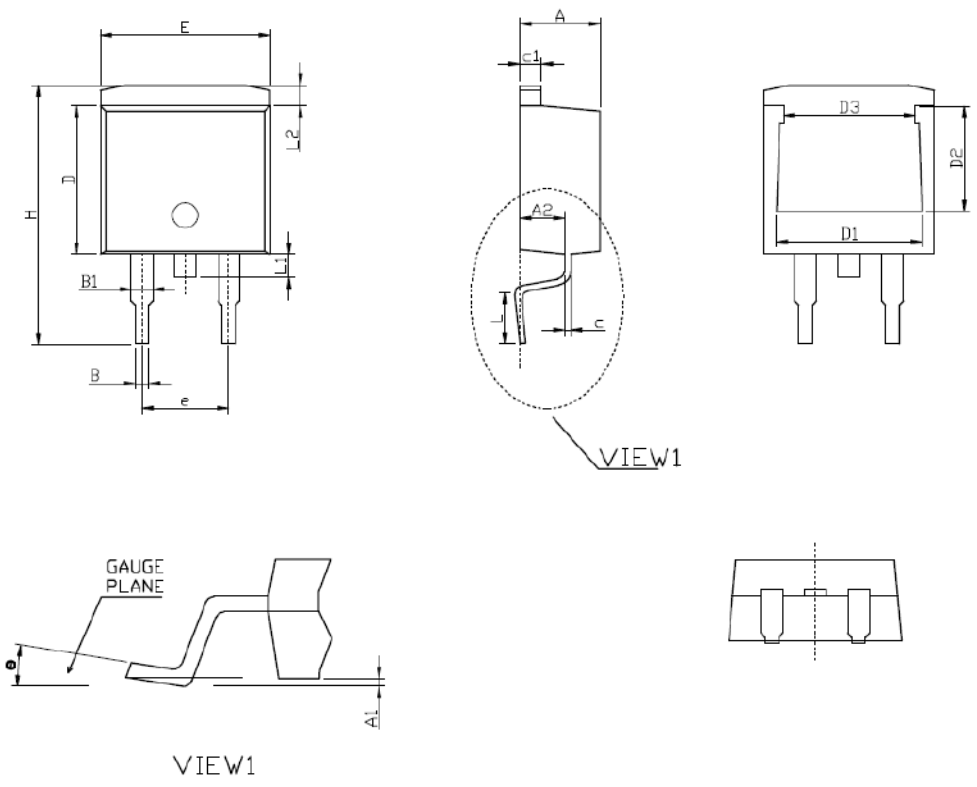
SYMBOLS	MILLIMETERS	
	MIN	MAX
A	4.40	4.90
A1	0.05	0.30
A2	2.40	2.80
B	0.72	0.92
B1	1.12	1.45
c	0.28	0.48
c1	1.17	1.37
D	8.46	8.86
D1	7.90	8.40
D2	5.50	5.90
D3	7.10	7.50
E	9.85	10.45
e	5.08BCS	
H	14.75	15.55
L	2.30	2.80
L1	1.20	1.60
L2	1.01	1.50

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