

BSS138A



N-Channel Enhancement Mode Trench Power MOSFET

Voltage: 50 Volts

Current: 0.22 Ampers

Package: SOT-23

Features

- NH'S Advanced Trench Technology
- Low Rds(on) For Low On-State Loss
- High EAS For High Reliability
- Excellent Qg*Rds(on) Product(FOM)

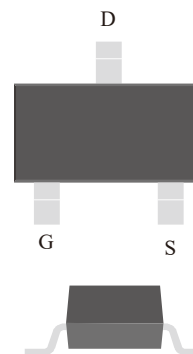
Typical Applications

- DC-DC Converter
- Battery Management System(BMS)
- Printed Circuit Board For Control Circuit
- Uninterruptible Power Supplies(UPS)

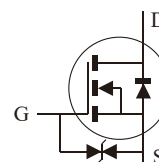
Product Summary

VDS Min.@Tj	50	V
Id Min.@Ta	0.2	A
RDS(ON)(TYP)@4.5V	1.1	Ω

Diagram:



Polarity:



***100% UIS TESTED**

***100% ΔVDS TESTED**

Absolute Maximum Ratings (Ta=25℃ Unless Otherwise Specified)

Parameter	Test Conditions	Symbol	Ratings	Unit
Drain-Source Voltage		V _{DS}	50	V
Gate-Source Voltage		V _{GS}	±20	V
Continuous Drain Current (Note 1)	Ta= 25 ℃	I _D	0.22	A
	Ta= 100 ℃		0.14	
Drain Current-Pulse (Note 1)	Tj< 150 ℃	I _{DM}	1	A
Maximum Power Dissipation Power Dissipation Derating Factor Above 25℃	Ta= 25 ℃	P _D	350	mW
	Ta= 100 ℃		140	
Derating Factor		D _F	3	mW/℃
Avalanche Current,Single Pulse (Note 1)	L= 0.5 mH	I _{AS}	1	A
Single Pulse Avalanche Energy (Note 1) Test Circuit & Waveform See Fig.16	L= 0.5 mH IAS= 1.0 A,RG= 10.0 Ω Starting Tj=25 ℃,VG= 4.5 V	E _{AS}	0.25	mJ

Thermal Characteristics (Ta=25℃ Unless Otherwise Specified)

Parameter	Test Conditions	Symbol	Typ.	Unit
Junction Temperature		T _J	-55 to 150	℃
Storage Temperature Range		T _{STD}	-55 to 150	℃
Thermal Resistance Junction To Ambient With Steady-State	Still Air Environment With Ta=25℃	R _{θJA}	357	℃/W

Notes: 1.Pulse Width Limited By Max. Junction Temperature. (See Fig. 13).

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Electrical Characteristics (Ta=25°C Unless Otherwise Specified)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Static Off Characteristics						
Drain-Source Breakdown Voltage	VGS=0V,ID=250uA	BV _{DSS}	50	--	--	V
Bvdss Temperature Coefficient	ID=250uA,Reference25℃	ΔBV _{DSS} /ΔT _J	--	0.06	--	V/℃
Drain-Source Leakage Current	VDS= 40 V,VGS=0V	I _{DSS}	--	--	1	uA
Gate-Body Leakage Current	VGS= ±20 V,VDS=0V	I _{GSS}	--	--	±100	nA
Forward Transconductance	ID= 0.1 A,VDS= 5 V	g _{fs}	--	100	--	mS
Static On Characteristics						
Gate Threshold Voltage	VGS= VDS ID=250uA	V _{GS(TH)}	0.8	1.0	1.45	V
Drain-Source On Resistance	ID= 0.1 A,VGS= 4.5 V	R _{DS(ON)}	--	1.1	3.0	Ω
	ID= 0.1 A,VGS= 2.5 V		--	1.3	4.0	
Dynamic Characteristics						
Input Capacitance	VDS= 20 V	C _{iss}	--	23.0	--	pF
Output Capacitance	VGS= 0 V	C _{oss}	--	3.5	--	pF
Reverse Transfer Capacitance	F= 1 MHZ	C _{rss}	--	2.9	--	pF
Switching Paramters (Test Circuit & Waveform See Fig.14)						
Turn-On Delay Time	VDS= 20 V	t _{d(on)}	--	3.8	--	ns
Turn-On Rise Time	VGS= 4.5 V	t _r	--	3.0	--	ns
Turn-Off Delay Time	RG= 10.0 Ω	t _{d(off)}	--	19.0	--	ns
Turn-Off Rise Time		t _f	--	10.0	--	ns
Gate Charge Paramters (Test Circuit & Waveform See Fig.15)						
Total Gate Charge	VDS= 20 V	Q _g	--	0.5	--	nC
Gate-Source Charge	VGS= 4.5 V	Q _{gs}	--	0.1	--	nC
Gate-Drain Charge	ID= 0.1 A	Q _{gd}	--	0.2	--	nC
Drain-Source Diode Characteristics And Maximum Ratings (Test Circuit & Waveform See Fig.17)						
Max. Diode Forward Cuurent		I _s	--	--	0.2	A
Max. Pulsed Forward Cuurent		I _{SM}	--	--	0.8	A
Diode Forward Voltage	ID= 0.1 A,VGS=0V	V _{SD}	--	0.80	1.2	V
Reverse Recovery Time	ID= 0.1 A,di/dt= 100 A/us	t _{rr}	--	4.0	--	ns
Reverse Recovery Charge	VGS= 4.5 V,VDD= 20 V	Q _{rr}	--	9.0	--	nC

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Typical Characteristics Curves

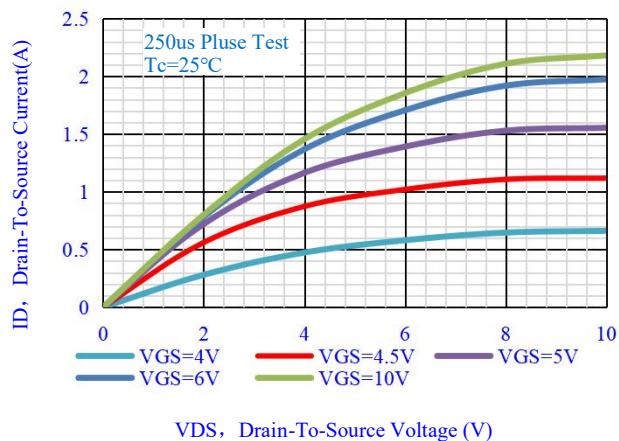


Fig.1-Output Characteristics

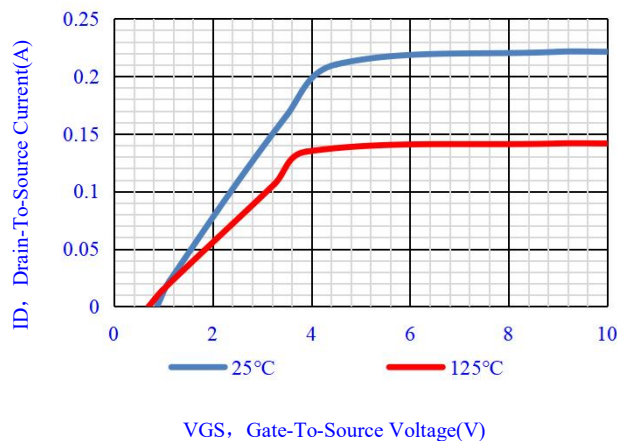


Fig.2- Transfer Characteristics

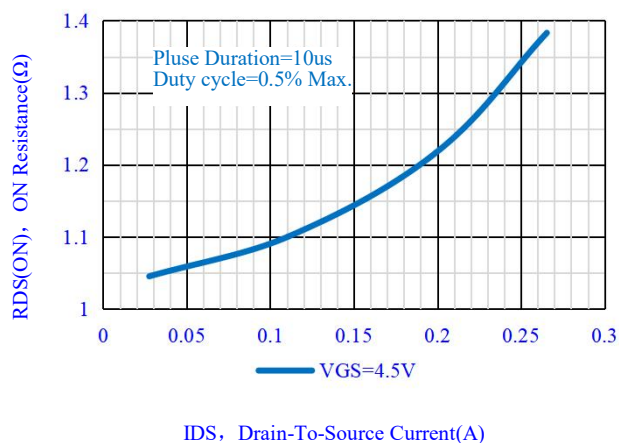


Fig.3- On Resistance vs. Drain Current

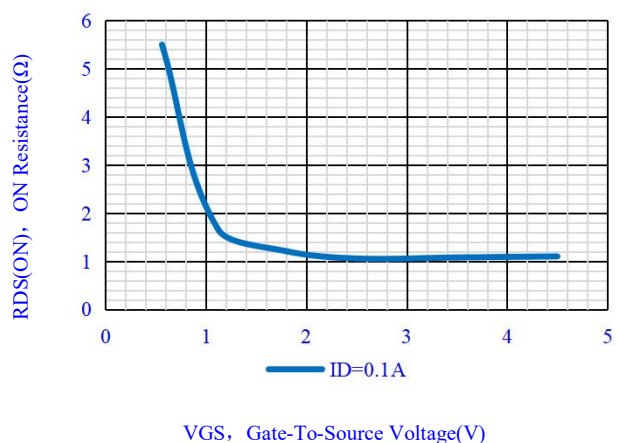


Fig.4- On Resistance vs. Gate Source Voltage

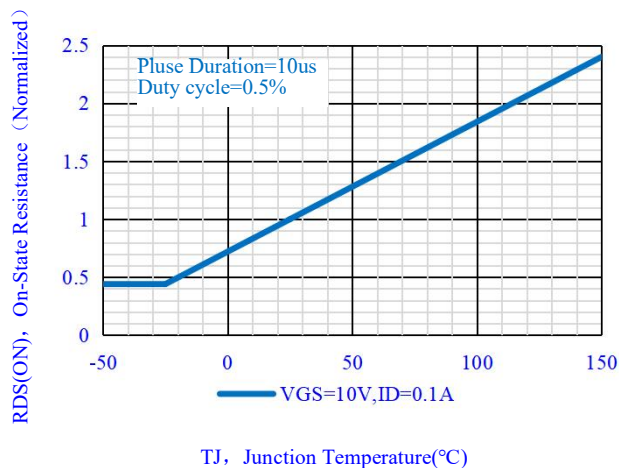


Fig.5- On Resistance vs. Junction Temperature

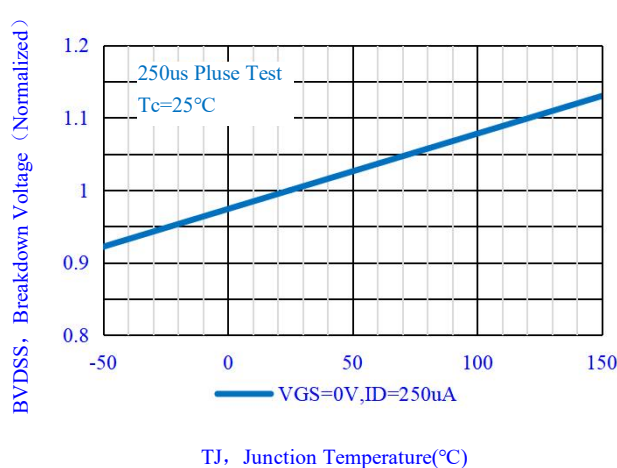


Fig.6- Breakdown Voltage vs. Junction Temperature

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Typical Characteristics Curves

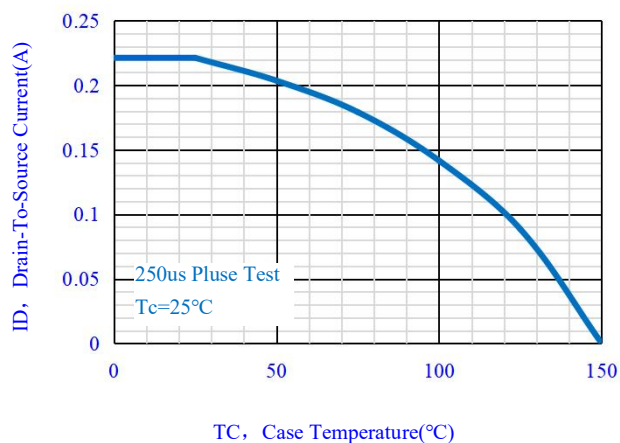


Fig.7-Maximum Continuous Drain Current vs. Case Temperature

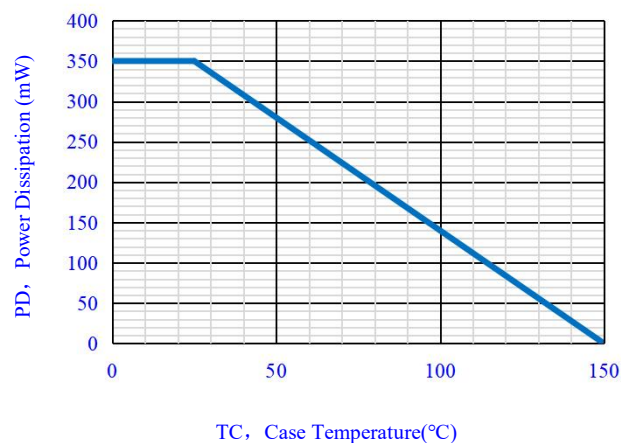


Fig.8-Maximum Power Dissipation vs. Case Temperature

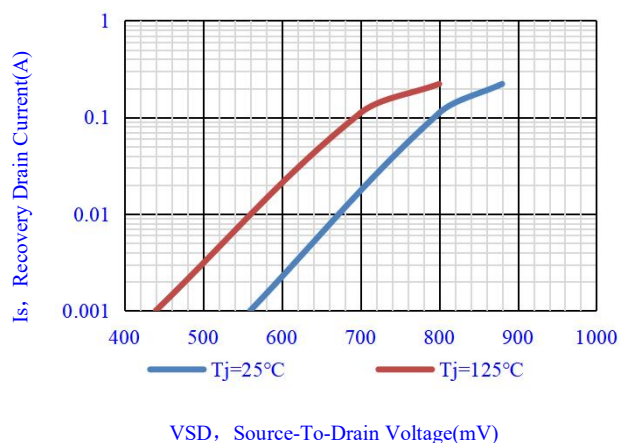


Fig.9- Source-To-Drain Diode Forward Voltage

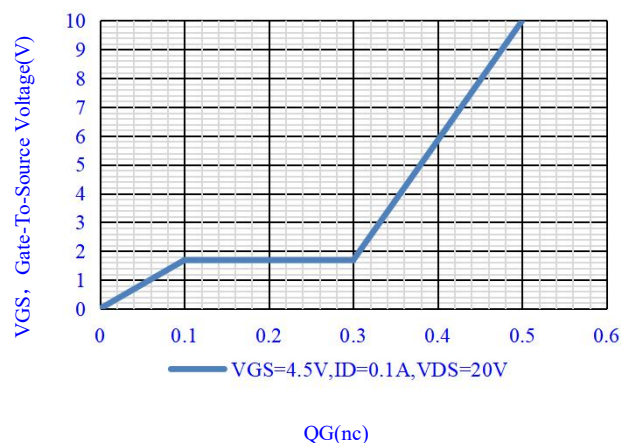


Fig.10-Gate Charge Waveform

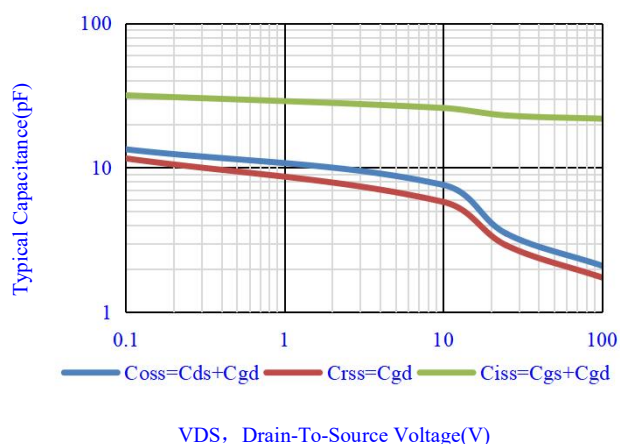


Fig.11-Typical Capacitance vs. Drain-To-Source Voltage

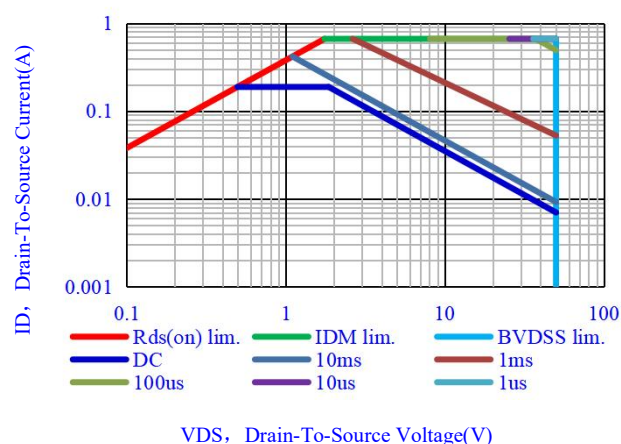


Fig.12-Maximum Safe Operating Area(SOA)

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Typical Characteristics Curves

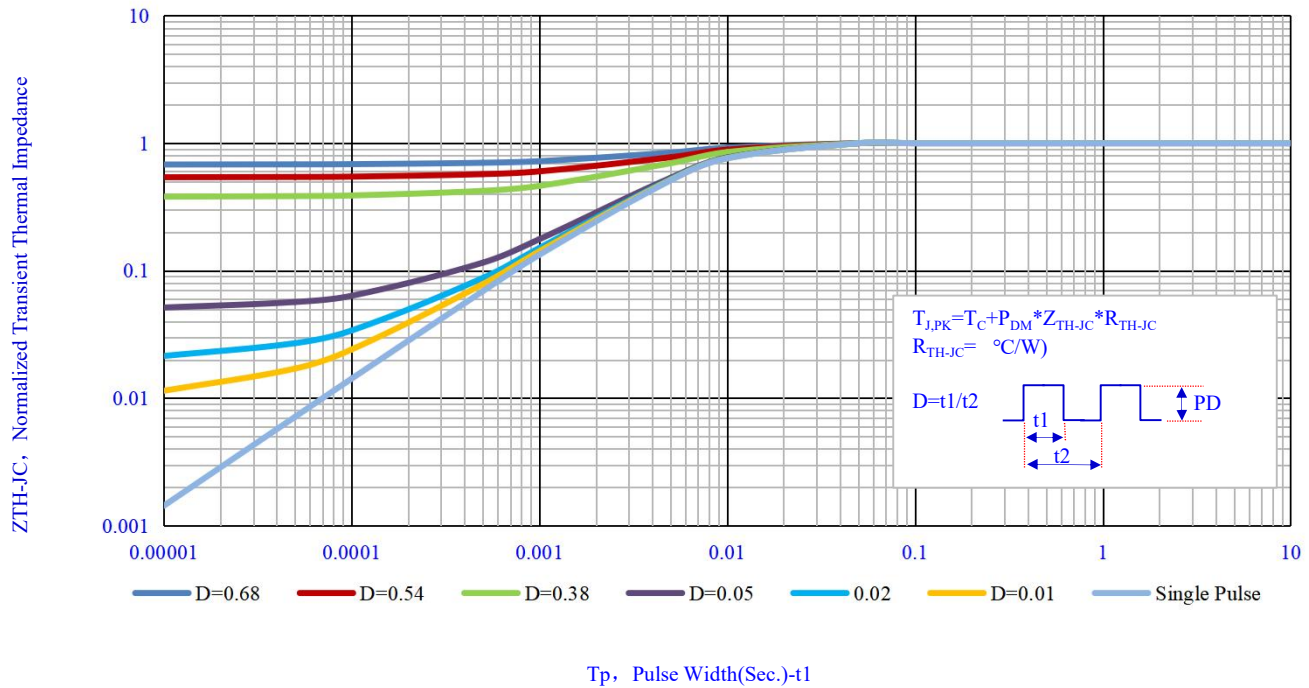


Fig.13- Normalized Maximum Transient Thermal Impedance vs.Pulse Width

Test Circuit & Waveform

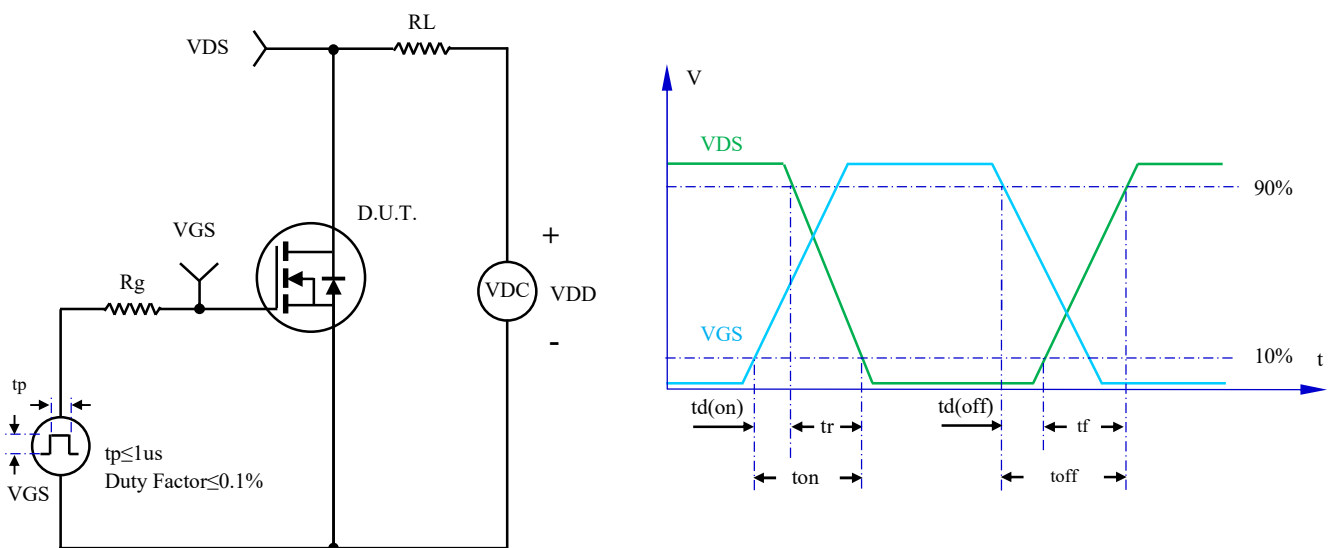


Fig.14- Resistive Switching Test Circuit & Waveform

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Test Circuit & Waveform

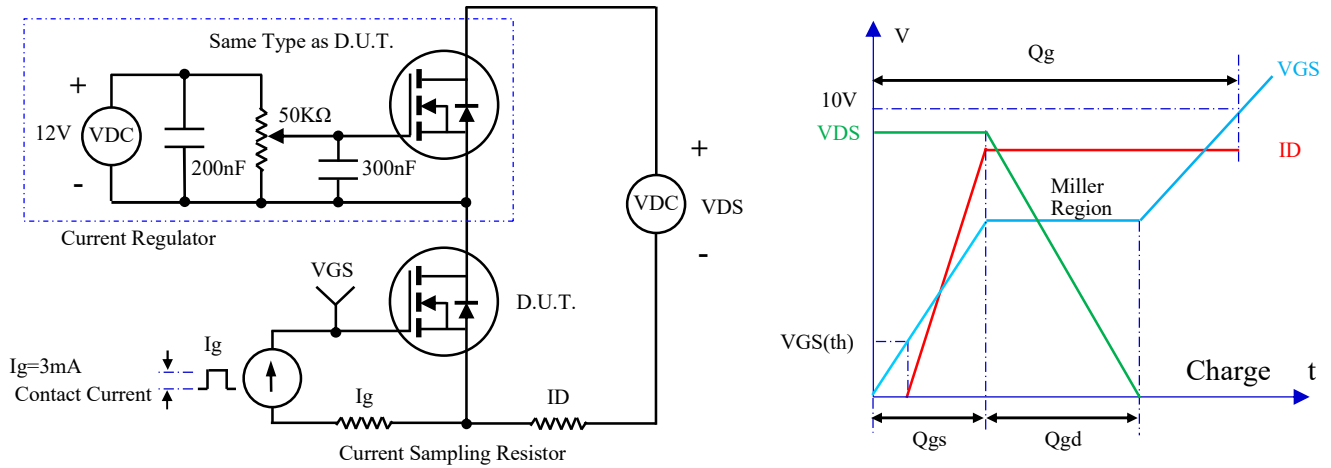


Fig.15- Gate Charge Test Circuit & Waveform

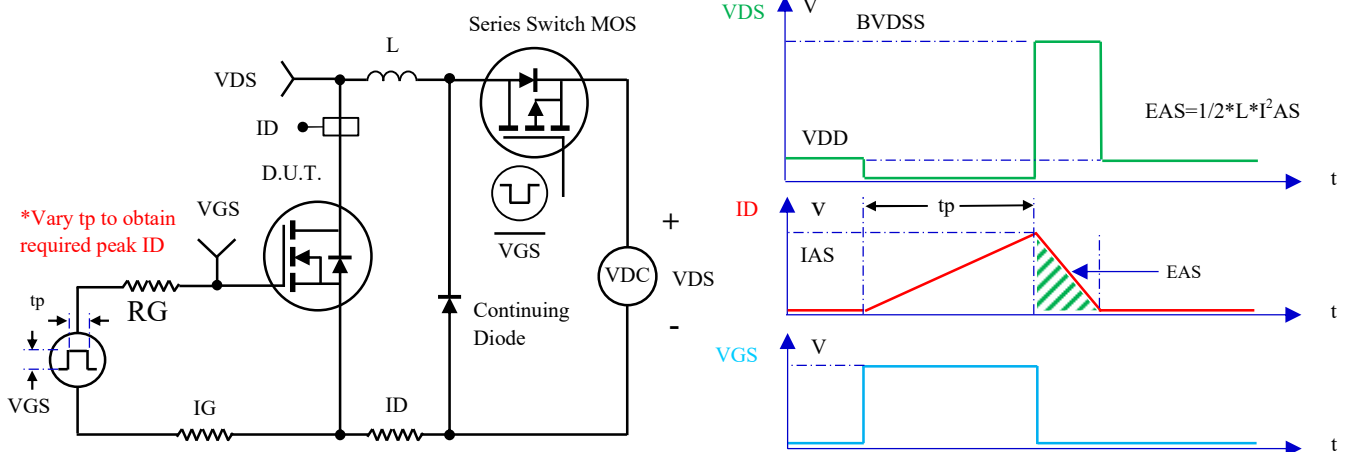


Fig.16- Unclamped Inductive Switching (UIS) Test Circuit & Waveform

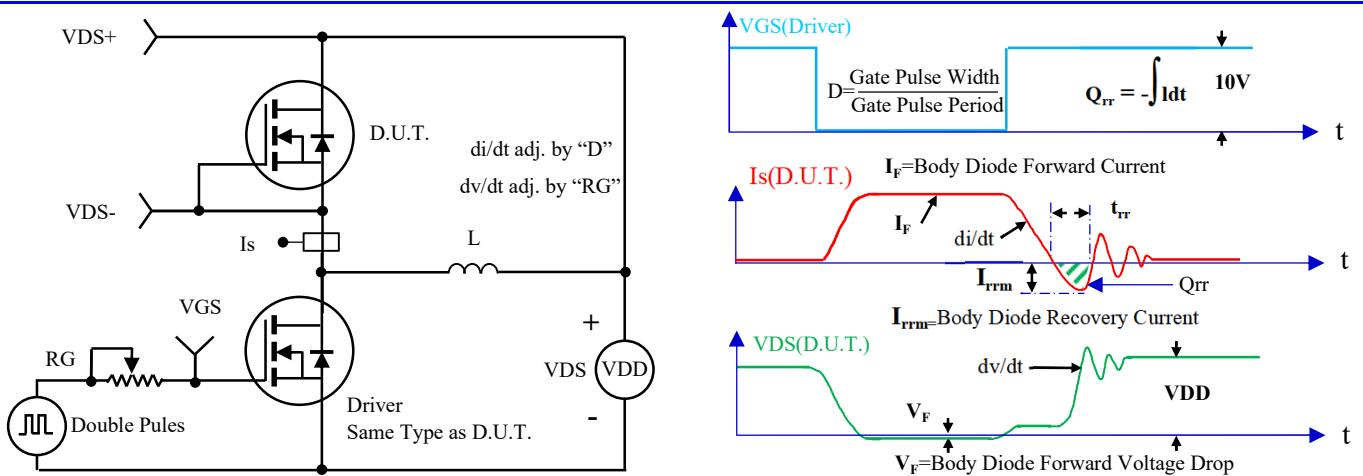


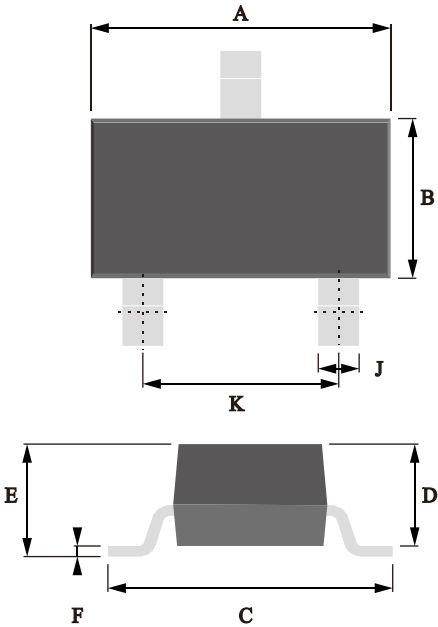
Fig.17- Diode Recovery Test Circuit & Waveform

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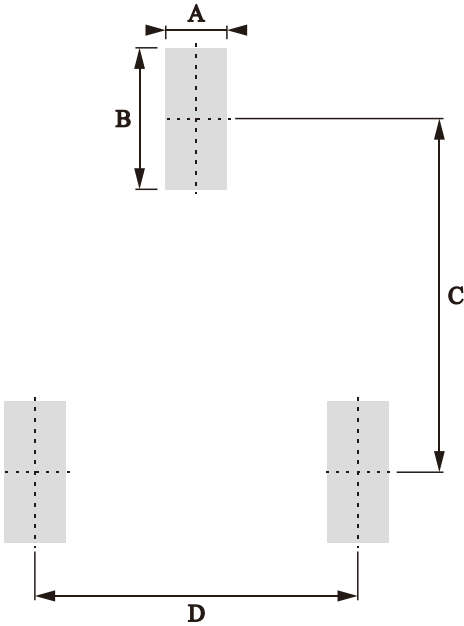
OUTLINE DRAWINGS



SOT-23

OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.80	-	3.20	0.1102	-	0.1260
B	1.15	-	1.45	0.0453	-	0.0571
C	2.25	-	2.65	0.0886	-	0.1043
D	0.85	-	1.15	0.0335	-	0.0453
E	0.90	-	1.20	0.0354	-	0.0472
F	0.08	-	0.18	0.0031	-	0.0071
J	0.30	-	0.50	0.0118	-	0.0197
K	1.70	-	2.10	0.0669	-	0.0827

RECOMMEDND LAYOUT DRAWINGS



SOT-23

OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	0.60	-	-	0.0000	-
B	-	0.80	-	-	0.0315	-
C	-	2.00	-	-	0.0787	-
D	-	1.90	-	-	0.0748	-

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MARKING INFORMATION



MARKING INSTRUCTIONS

.SS=Marking

PACKING INFORMATION

Package Type	Package Code	Product Weight Approx(g/Pcs)	Package Method	Quantity (Pcs/Min. Pack.)	Quantity (Pcs/Inner Box)	Quantity (Pcs/Carton)
SOT-23	P1	0.008	7" Reel	3000	45000	180000

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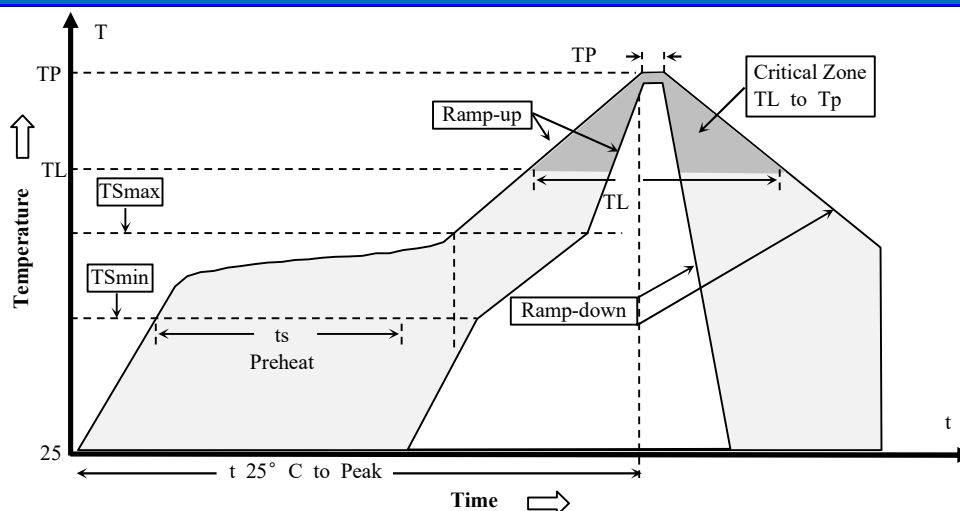
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Recommended wave soldering condition

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

Recommended temperature profile for IR reflow



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (T _{smax} to T _p)	3°C/second max.	3°C/second max.
Preheat -Temperature Min(T _S min) -Temperature Max(T _S max) -Time(t _s min to t _s max)	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: -Temperature (T _L) - Time (t _L)	183°C 60-150 seconds	217°C 60-150 seconds
Peak Temperature(T _P)	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(tp)	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : All temperatures refer to topside of the package, measured on the package body surface.

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