

NTL190P02S3



P-Channel Depletion Type Small Signal MOSFET

Voltage: -20 Volts

Current: -7.50 Ampers

Package: SOT-23

Features

- NH'S Small Signal Mosfet Technology
- Excellent $Q_g \cdot R_{ds(on)}$ Product(FOM)
- Small Package
- Low Cost

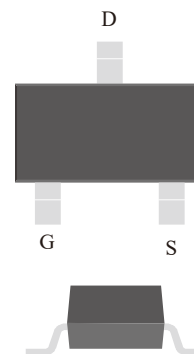
Typical Applications

- Small Signal Control Circuit
- Auxiliary Control Circuit
- Automotive Electronics
- Battery Management System(BMS)

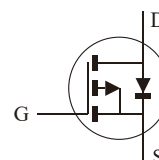
Product Summary

VDS Min.@T _j	-20	V
I _D Min.@Ta	-7.50	A
RDS(ON)(TYP)@-4.5V	19	mΩ

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}	-20	V
Gate-Source Voltage		V _{GS}	±12	V
Continuous Drain Current (Note 1)	Ta= 25 ℃	I _D	-7.5	A
	Ta= 100 ℃		-4.8	
Drain Current-Pulse (Note 1)	T _j < 150 ℃	I _{DM}	-30	A
Maximum Power Dissipation Power Dissipation Derating Factor Above 25℃	Ta= 25 ℃	P _D	2	W
	Ta= 100 ℃		0.8	
Derating Factor		D _F	0.02	W/℃

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}	63	℃/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}	-20	--	--	V
Bvdss Temperature Coefficient	ID=250uA,Reference25℃	ΔBV _{DSS} /ΔT _J	--	-0.02	--	V/℃
Drain-Source Leakage Current	VDS= -20 V,VGS=0V	I _{DSS}	--	--	-1	uA
Gate-Body Leakage Current	VGS= ±12 V,VDS=0V	I _{GSS}	--	--	±10	uA
Static On Characteristics						
Gate Threshold Voltage	VGS= VDS ID=-250uA	V _{GS(TH)}	-0.3	--	-1.0	V
Drain-Source On Resistance	ID= -3.8 A,VGS= -4.5 V	R _{DS(ON)}	--	19.0	24.0	mΩ
	ID= -3.8 A,VGS= -2.5 V		--	22.8	33.6	
Dynamic Characteristics						
Input Capacitance	VDS= -10 V	C _{iss}	--	1540.0	--	pF
Output Capacitance	VGS= 0 V	C _{oss}	--	160.0	--	pF
Reverse Transfer Capacitance	F= 1 MHZ	C _{rss}	--	154.0	--	pF
Switching Paramters (Test Circuit & Waveform See Fig.14)						
Turn-On Delay Time	VDS= -10 V	t _{d(on)}	--	13.0	--	ns
Turn-On Rise Time	VGS= -4.5 V	t _r	--	32.0	--	ns
Turn-Off Delay Time	RG= 0.0 Ω	t _{d(off)}	--	27.0	--	ns
Turn-Off Rise Time		t _f	--	9.0	--	ns
Gate Charge Paramters (Test Circuit & Waveform See Fig.15)						
Total Gate Charge	VDS= -10 V	Q _g	--	14.0	--	nC
Gate-Source Charge	VGS= -4.5 V	Q _{gs}	--	1.2	--	nC
Gate-Drain Charge	ID= -3.8 A	Q _{gd}	--	4.8	--	nC
Drain-Source Diode Characteristics And Maximum Ratings (Test Circuit & Waveform See Fig.17)						
Max. Diode Forward Cuurent		I _S	--	--	-7.5	A
Max. Pulsed Forward Cuurent		I _{SM}	--	--	-26.3	A
Diode Forward Voltage	ID= -3.8 A,VGS=0V	V _{SD}	--	-0.8	-1.3	V
Reverse Recovery Time	IS= -7.5 A,di/dt= 100 A/us	t _{rr}	--	160.0	--	ns
Reverse Recovery Charge	VGS= 0.0 V	Q _{rr}	--	60.0	--	nC
Reverse Recovery Current		I _{rr}	--	0.8	--	A
Forward Transconductance	ID= -4 A,VDS= -5 V	g _{fs}	--	18	--	S
Gate Resistance	VGS=0V,VDS=0V,Freq.=1MHz	R _g	--	5.1	--	Ω

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Typical Characteristics Curves

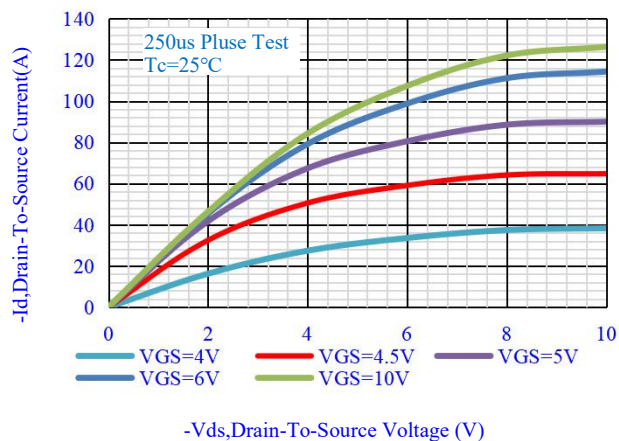


Fig.1-Output Characteristics

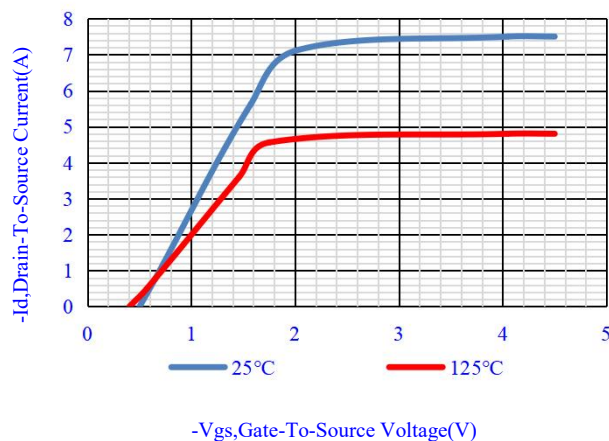


Fig.2-Transfer Characteristics

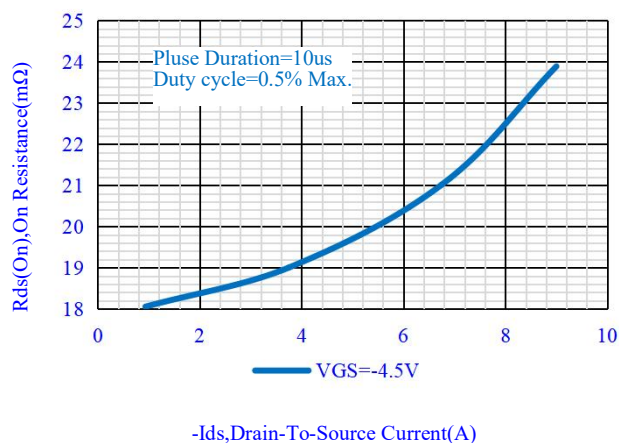


Fig.3-On Resistance Vs. Drain Current

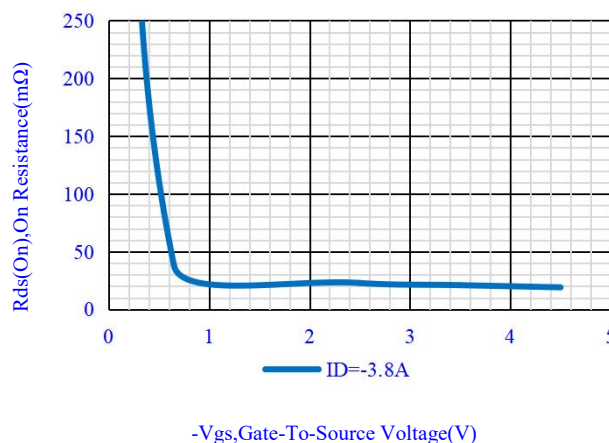


Fig.4-On Resistance Vs. Gate Source Voltage

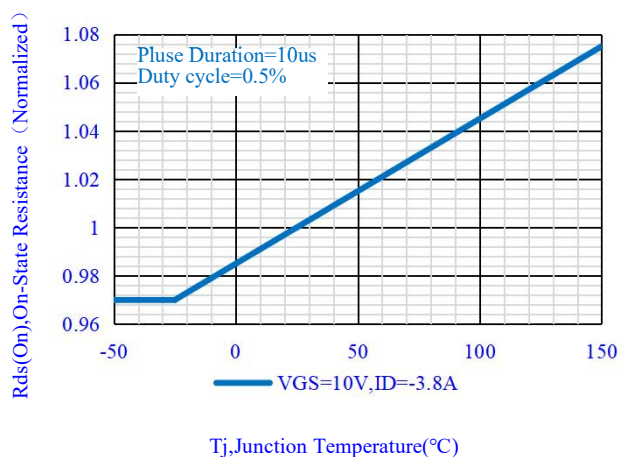


Fig.5-On Resistance Vs. Junction Temperature

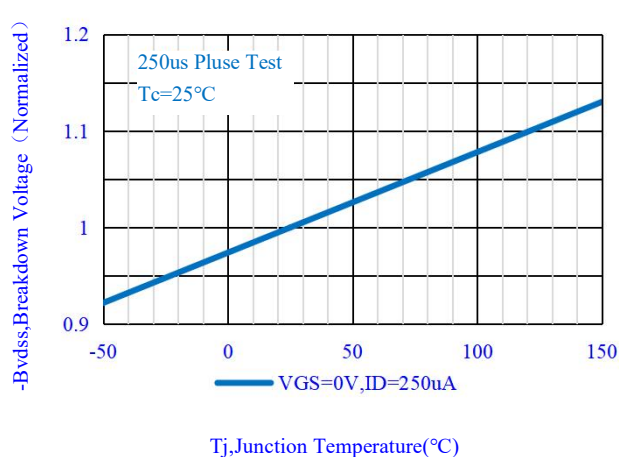


Fig.6-Breakdown Voltage Vs. Junction Temperature

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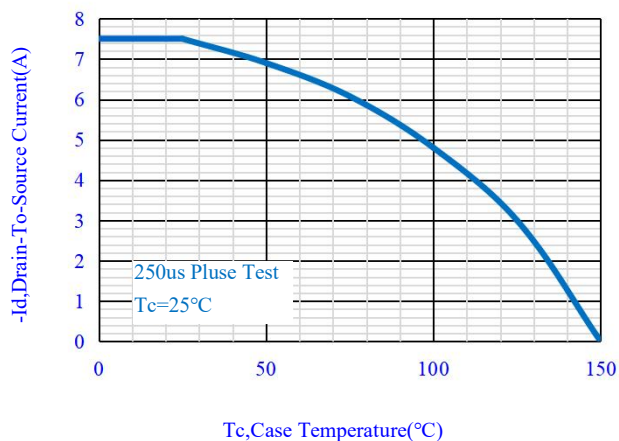


Fig.7-Maximum Continuous Drain Current Vs. Case Temperature

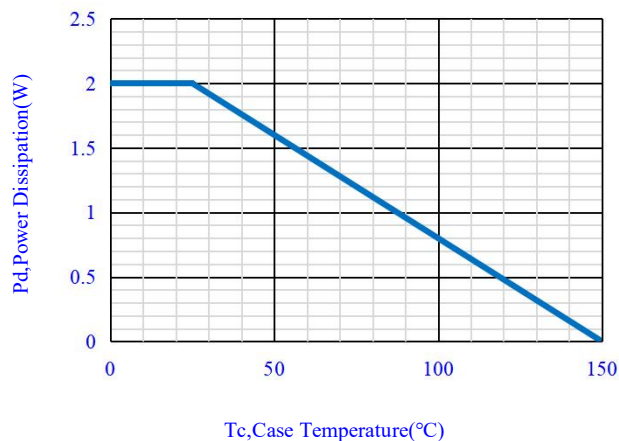


Fig.8-Maximum Power Dissipation Vs. Case Temperature

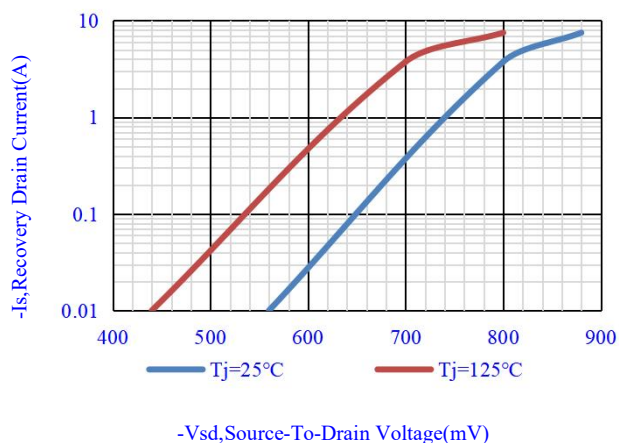


Fig.9-Source-To-Drain Diode Forward Voltage

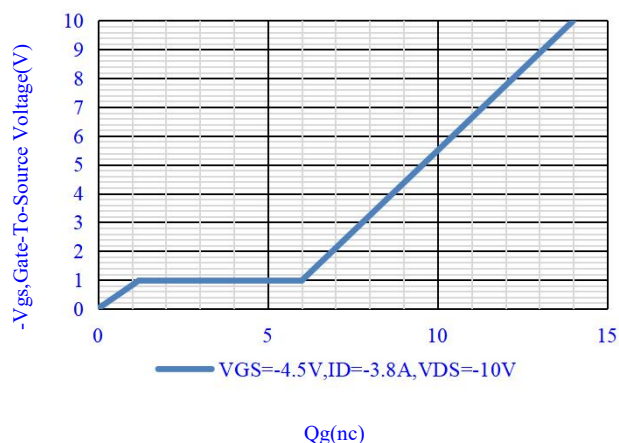


Fig.10-Gate Charge Waveform

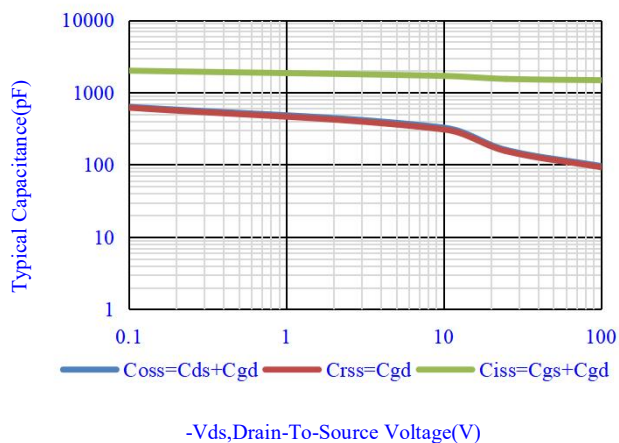


Fig.11-Typical Capacitance Vs. Drain-To-Source Voltage

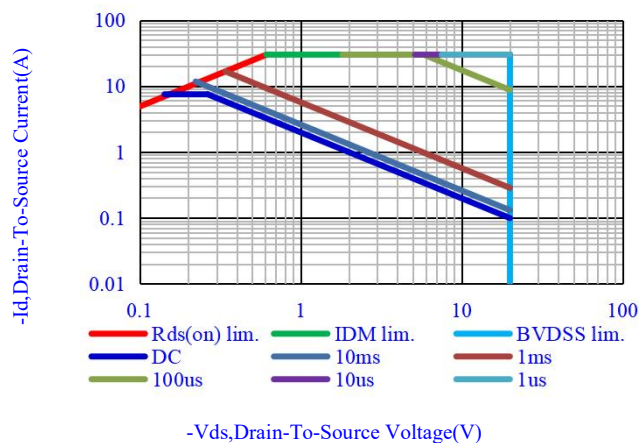


Fig.12-Maximum Safe Operating Area(SOA)

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Typical Characteristics Curves

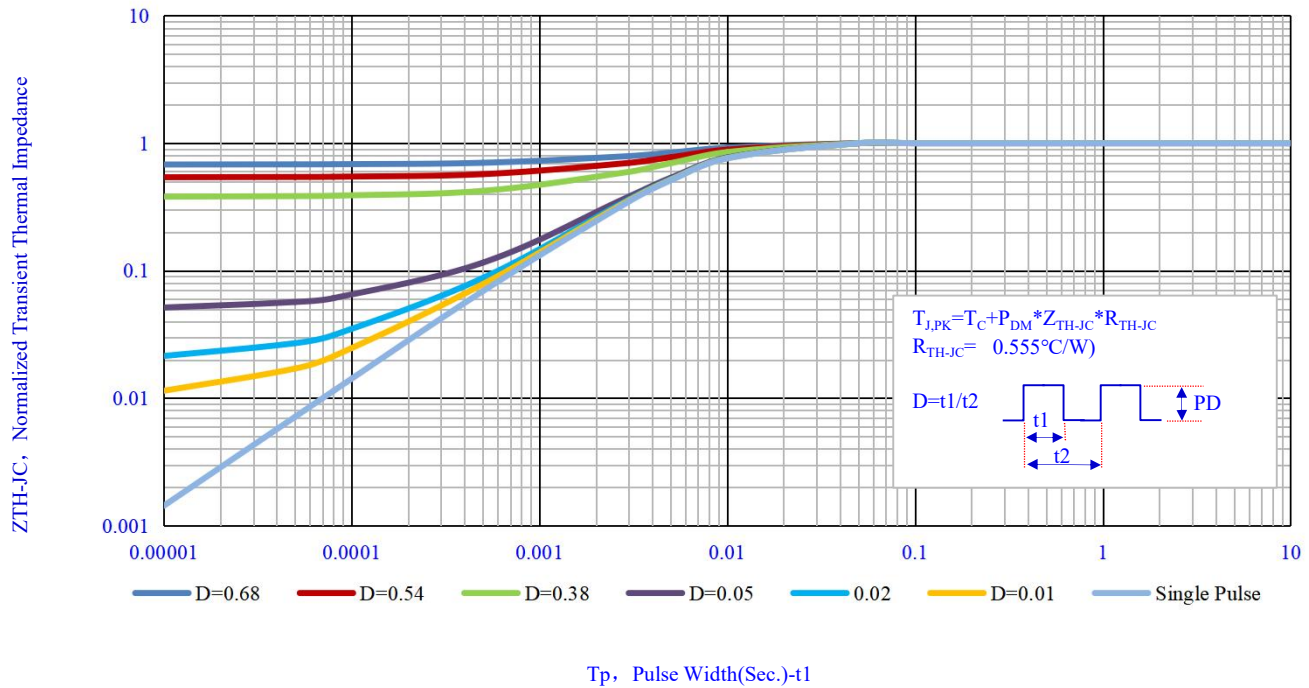


Fig.13- Normalized Maximum Transient Thermal Impedance Vs.Pulse Width

Test Circuit & Waveform

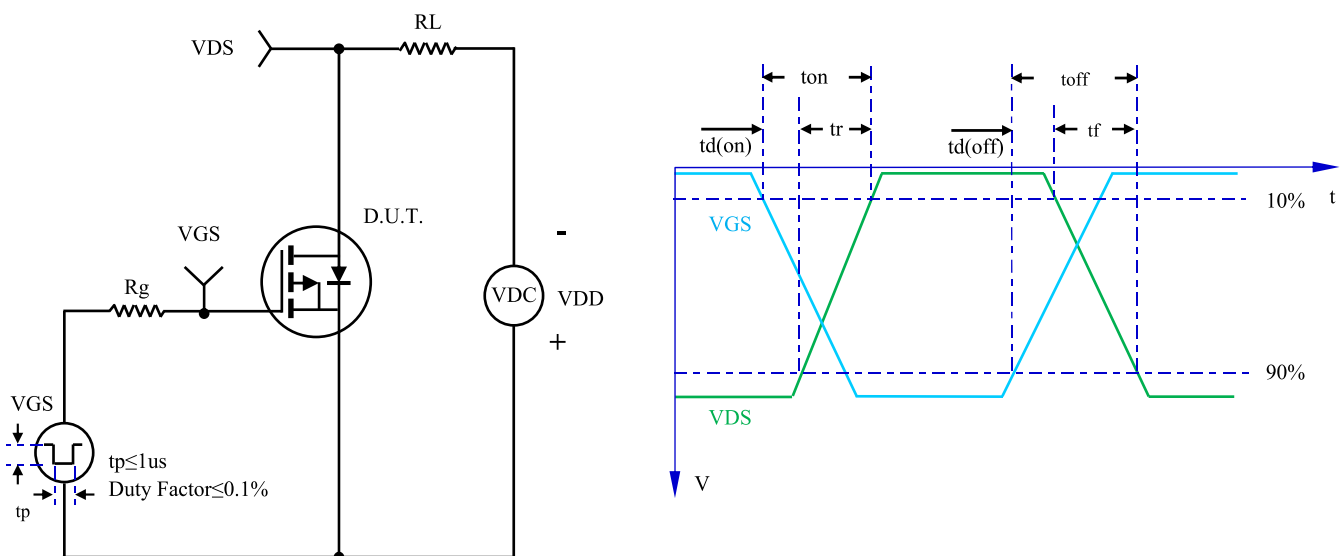


Fig.14- Resistive Switching Test Circuit & Waveform

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Test Circuit & Waveform

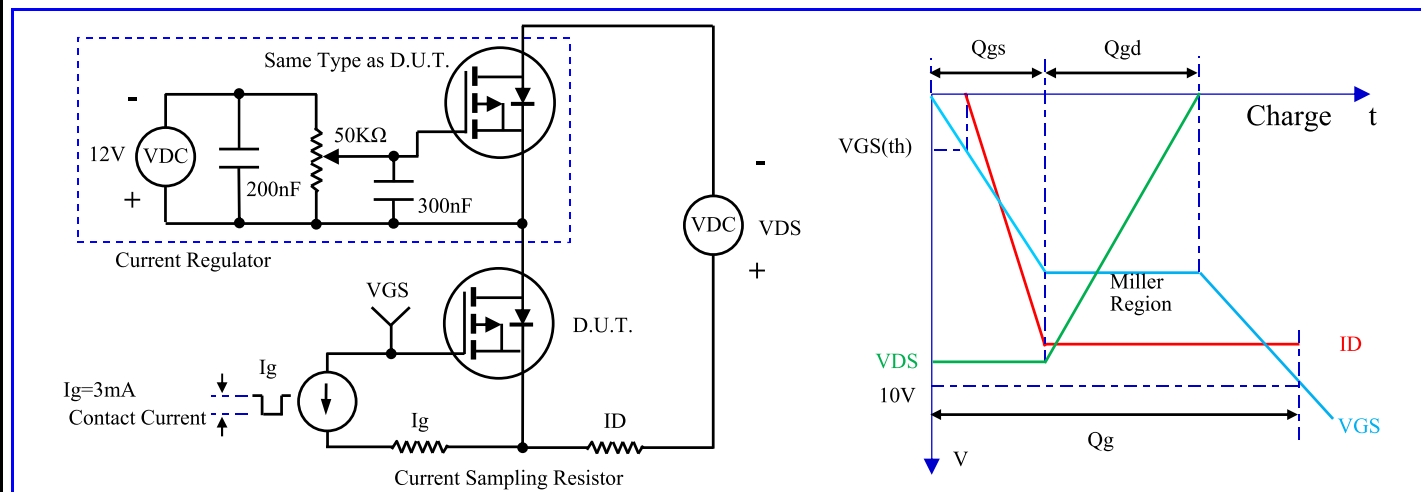


Fig.15-Gate Charge Test Circuit & Waveform

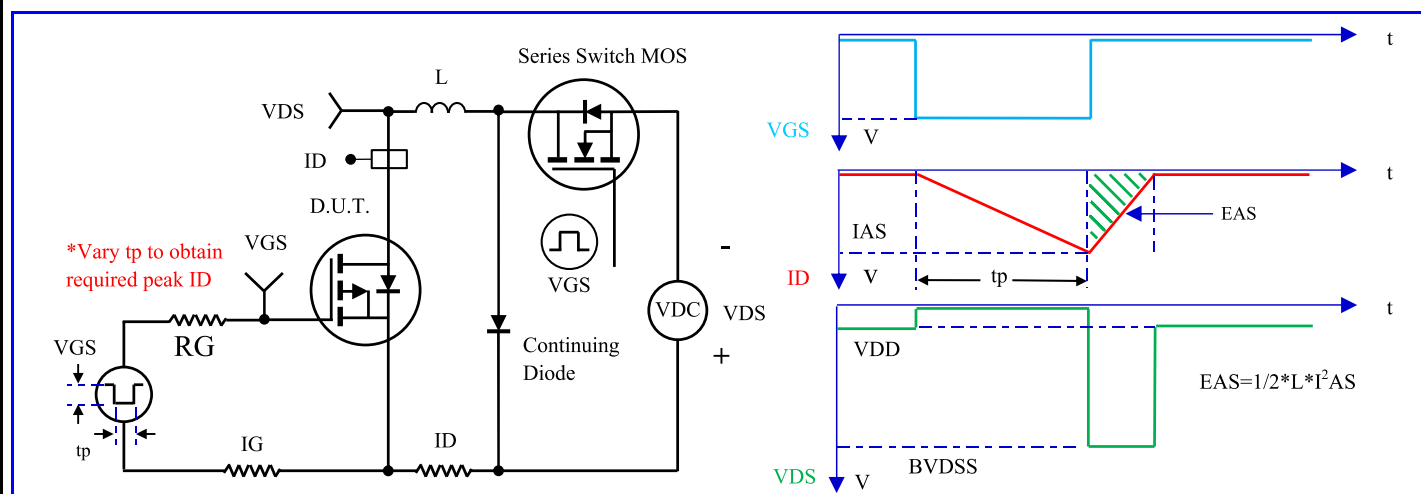


Fig.16- Unclamped Inductive Switching (UIS) Test Circuit & Waveform

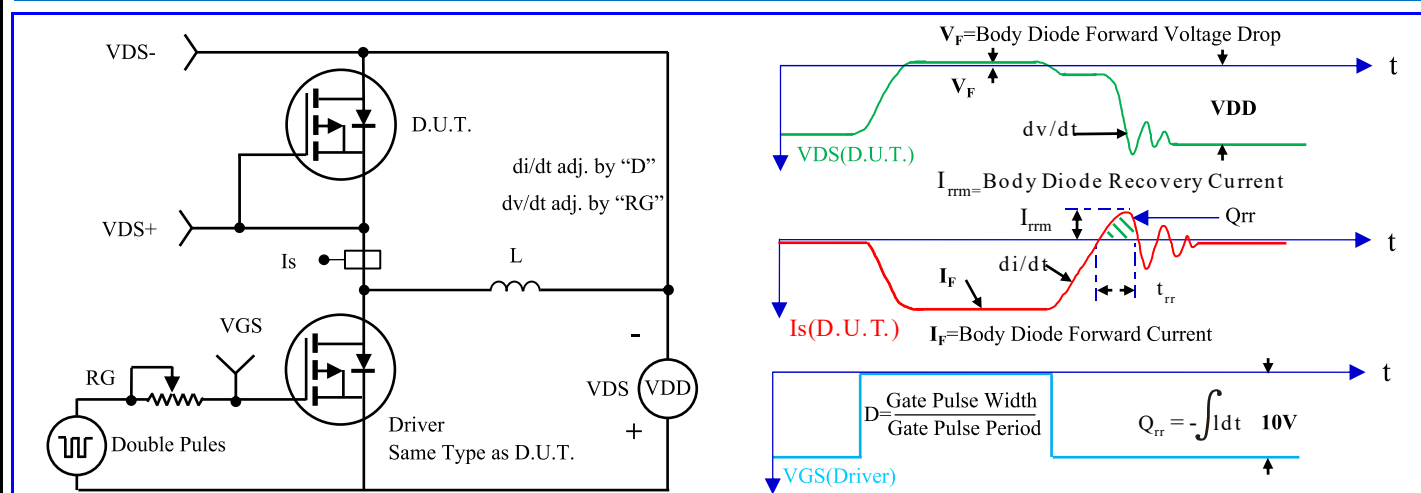


Fig.17- Diode Recovery Test Circuit & Waveform

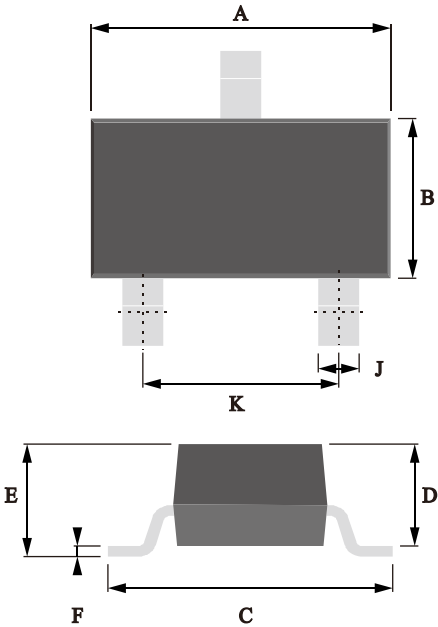
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OUTLINE DRAWINGS

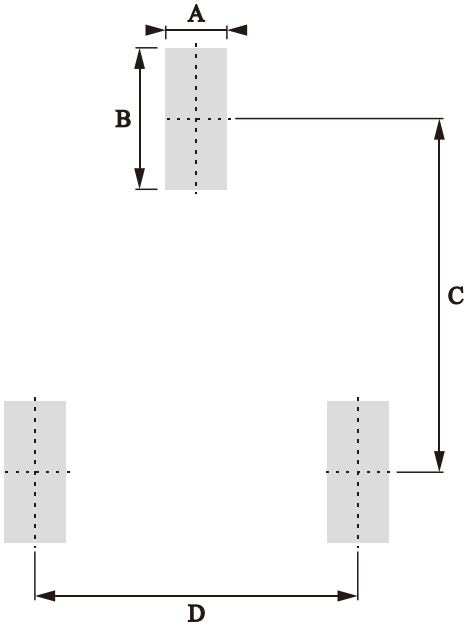
SOT-23



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

2007=Make

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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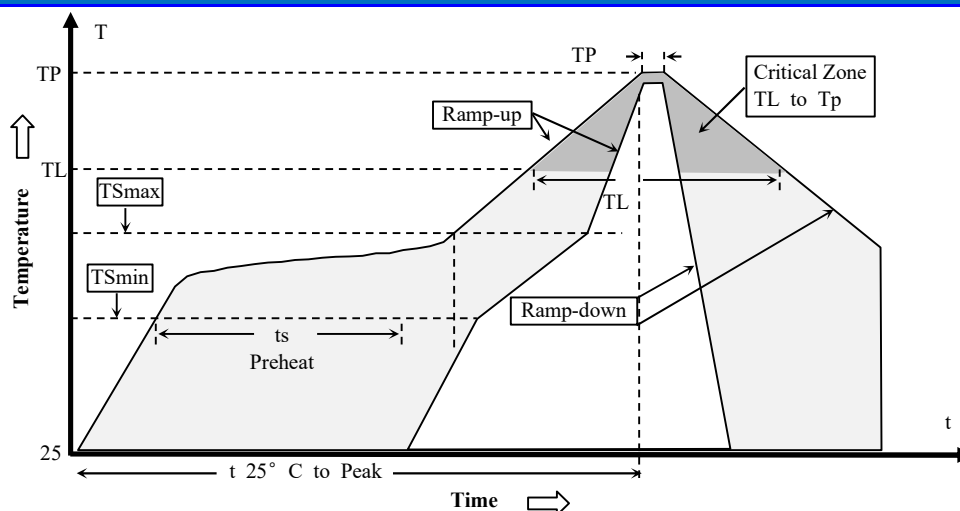
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Recommended wave soldering condition

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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