

2N7002T



N-Channel Enhancement Mode Trench Power MOSFET

Voltage: 60 Volts

Current: 0.12 Ampers

Package: SOT-523

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)

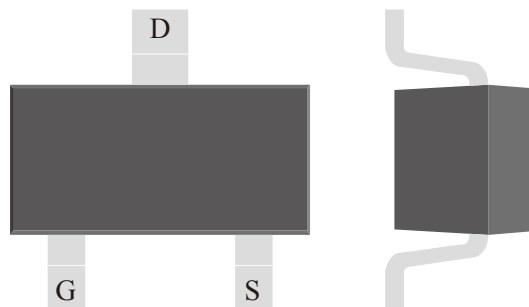
Typical Applications

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

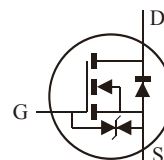
Product Summary

VDS Min.@Tj	60	V
Id Min.@Ta	0.12	A
RDS(ON)(TYP)@10V	3000	mΩ

Diagram:



Polarity:



*100% UIS TESTED

*100% ΔVDS TESTED

Absolute Maximum Ratings (Ta=25°C Unless Otherwise Specified)

Parameter	Test Conditions	Symbol	Ratings	Unit
Drain-Source Voltage		V _{DS}	60	V
Gate-Source Voltage		V _{GS}	±20	V
Continuous Drain Current (Note 1)	Ta= 25 °C	I _D	0.115	A
	Ta= 100 °C		0.074	
Drain Current-Pulse (Note 1)	Tj< 150 °C	I _{DM}	0.46	A
Maximum Power Dissipation Power Dissipation Derating Factor Above 25°C	Ta= 25 °C	P _D	150	mW
	Ta= 100 °C		60	
Derating Factor		D _F	1.20	mW/°C
Min Human Body Model		ESD	1	KV

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

Parameter	Test Conditions	Symbol	Typ.	Unit
Junction Temperature		T _J	-55 to 150	°C
Storage Temperature Range		T _{STD}	-55 to 150	°C
Thermal Resistance Junction To Ambient With Steady-State	Still Air Environment With Ta=25°C	R _{θJA}	833	°C/W

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

2.If not specified,at least protection diode for the gate

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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}	60	--	--	V
Bvdss Temperature Coefficient	ID=250uA,Reference25℃	ΔBV _{DSS} /ΔT _J	--	0.07	--	V/℃
Drain-Source Leakage Current	VDS= 60 V,VGS=0V	I _{DSS}	--	--	100	nA
Gate-Body Leakage Current	VGS= ±20 V,VDS=0V	I _{GSS}	--	--	±1	uA
Forward Transconductance	ID= 0.2 A,VDS= 5 V	g _{fs}	80	--	500	mS
Static On Characteristics						
Gate Threshold Voltage	VGS= VDS ID=250uA	V _{GS(TH)}	1	1.7	2.5	V
Drain-Source On Resistance	ID= 0.5 A,VGS= 10.0 V	R _{DS(ON)}	--	3000	7500	mΩ
	ID= 0.05 A,VGS= 2.5 V		--	1000	3000	
	ID= 0.05 A,VGS= 2.2 V		--	1200	5000	
Dynamic Characteristics						
Input Capacitance	VDS= 30 V	C _{iss}	--	50	--	pF
Output Capacitance	VGS= 0 V	C _{oss}	--	25	--	pF
Reverse Transfer Capacitance	F= 1 MHZ	C _{rss}	--	5	--	pF
Switching Paramters With Inductive Load(Test Circuit & Waveform See Fig.14)						
Turn-On Delay Time	VDS= 30 V VGS= 10.0 V	t _{d(on)}	--	5.6	--	ns
Turn-Off Delay Time	RG= 10.0 Ω	t _{d(off)}	--	25	--	ns
Drain-Source Diode Characteristics And Maximum Ratings (Test Circuit & Waveform See Fig.16)						
Max. Diode Forward Cuurent		I _S	--	--	0.115	A
Max. Pulsed Forward Cuurent		I _{SM}	--	--	0.460	A
Diode Forward Voltage	ID= 0.25 A,VGS=0V	V _{SD}	--	0.6	1.0	V

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Typical Characteristics Curves

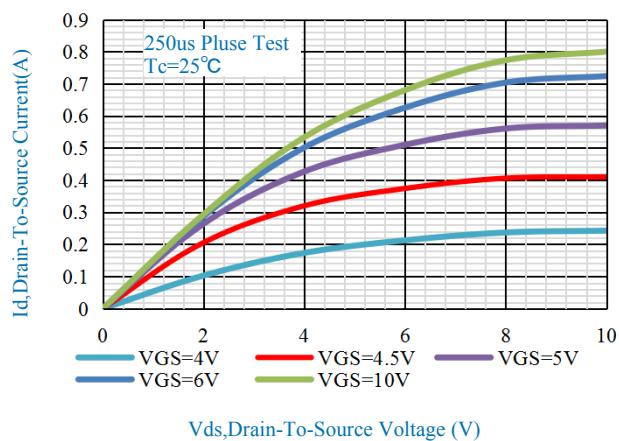


Fig.1-Output Characteristics

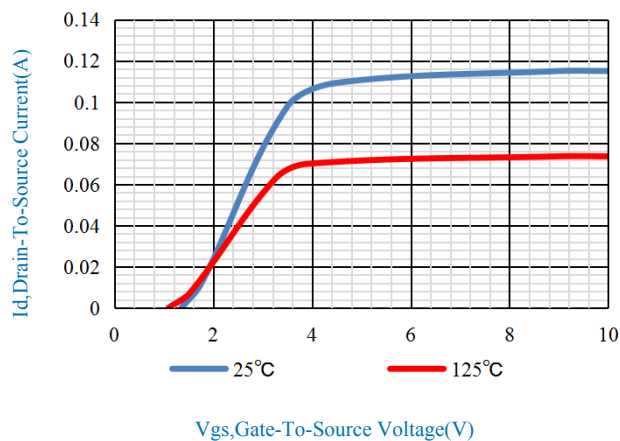


Fig.2-Transfer Characteristics

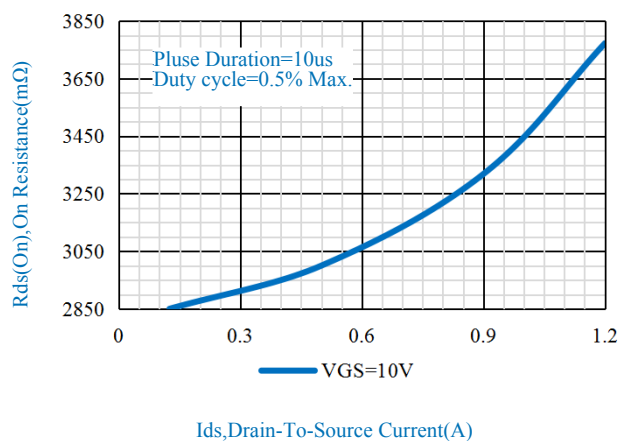


Fig.3-On Resistance Vs. Drain Current

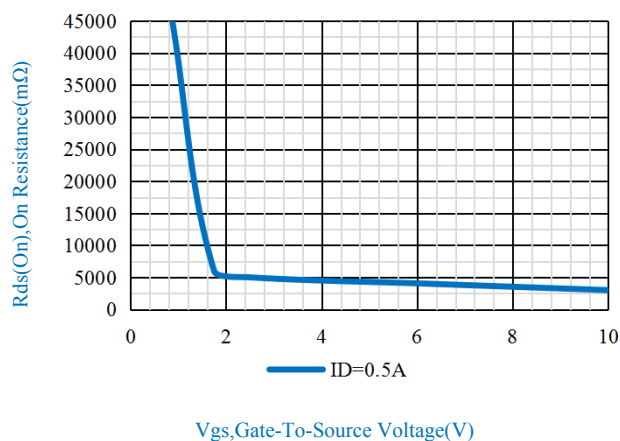


Fig.4-On Resistance Vs. Gate Source Voltage

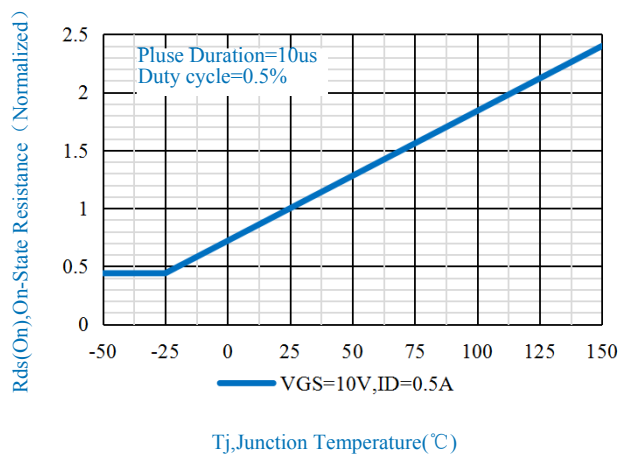


Fig.5-On Resistance Vs. Junction Temperature

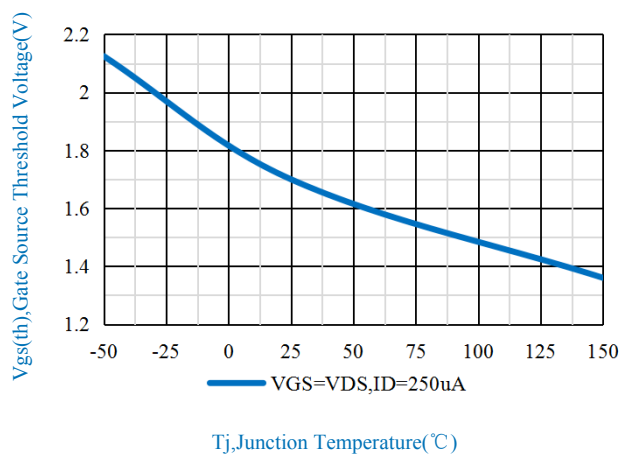


Fig.6-Gate Source Threshold Voltage Vs. Junction Temperature

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Typical Characteristics Curves

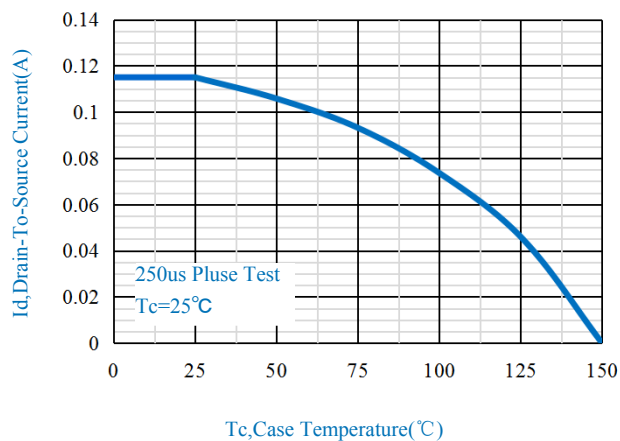


Fig.7-Maximum Continuous Drain Current Vs. Case Temperature

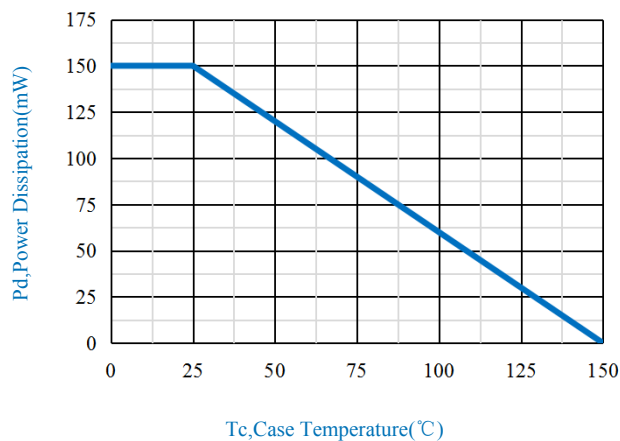


Fig.8-Maximum Power Dissipation Vs. Case Temperature

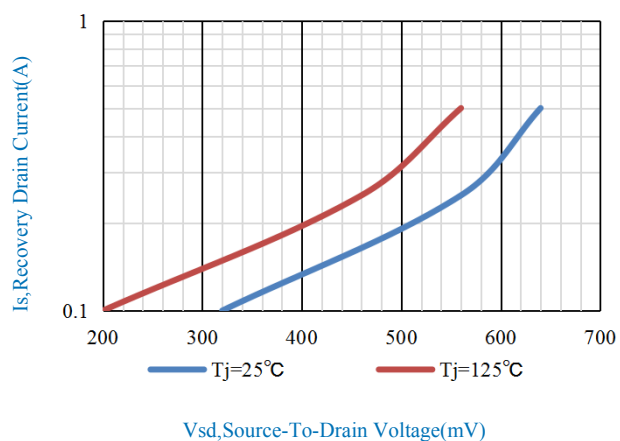


Fig.9-Source-To-Drain Diode Forward Voltage

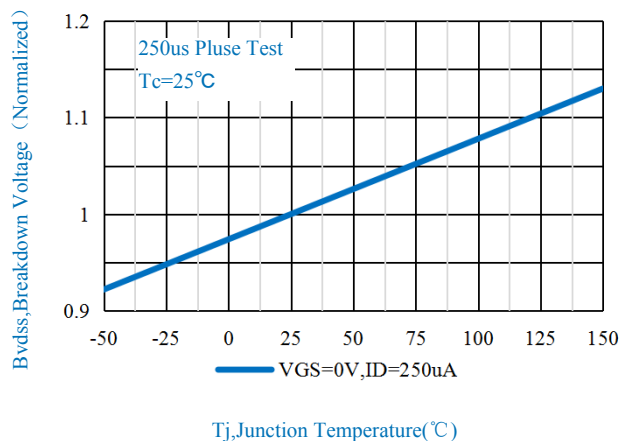


Fig.10-Breakdown Voltage Vs. Junction Temperature

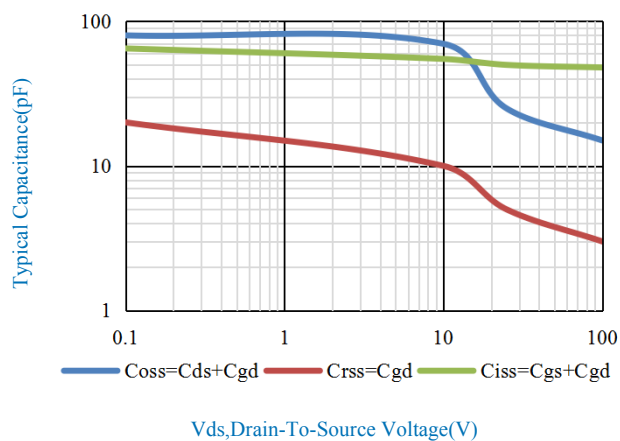


Fig.11-Typical Capacitance Vs. Drain-To-Source Voltage

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Typical Characteristics Curves

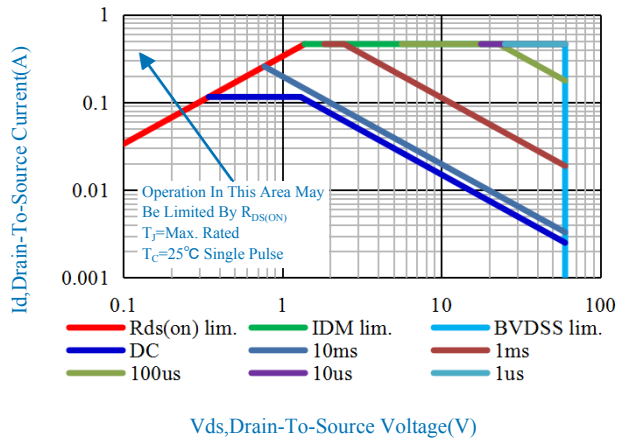


Fig.12-Maximum Safe Operating Area(SOA)

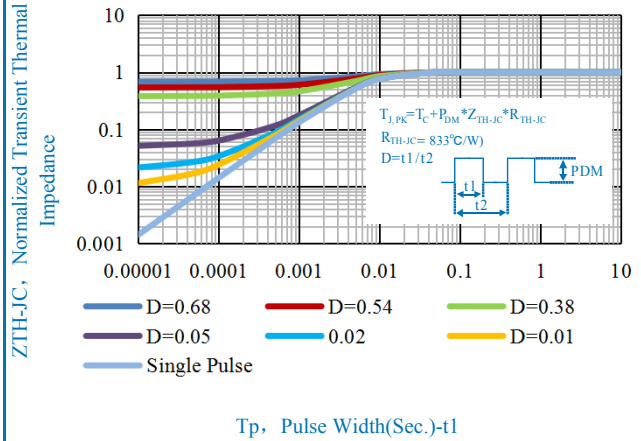


Fig.13- Normalized Maximum Transient Thermal Impedance Vs. Pulse Width

Inductive Load Test Circuit & Waveform

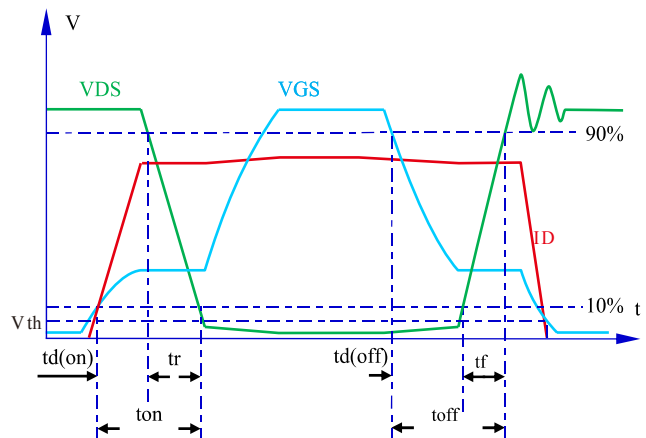
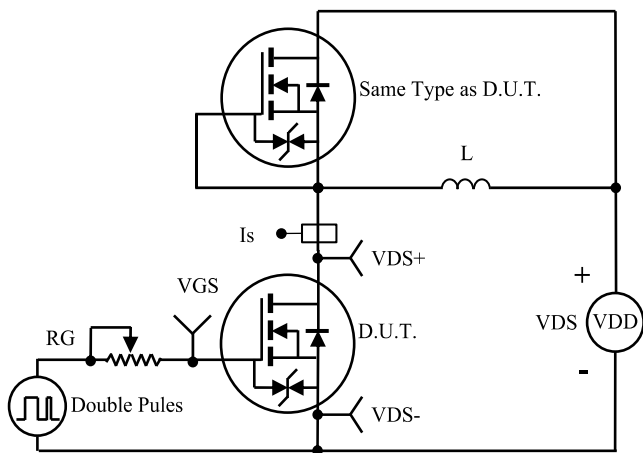


Fig.14- Inductive Switching Test Circuit & Waveform

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Test Circuit & Waveform

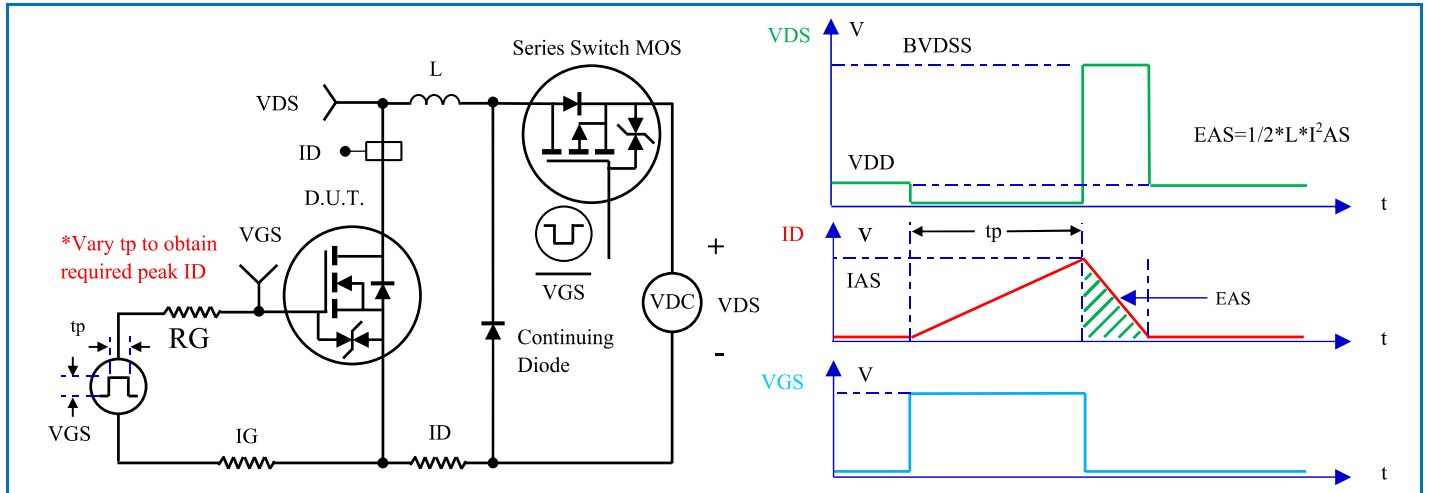


Fig.15- Unclamped Inductive Switching (UIS) Test Circuit & Waveform

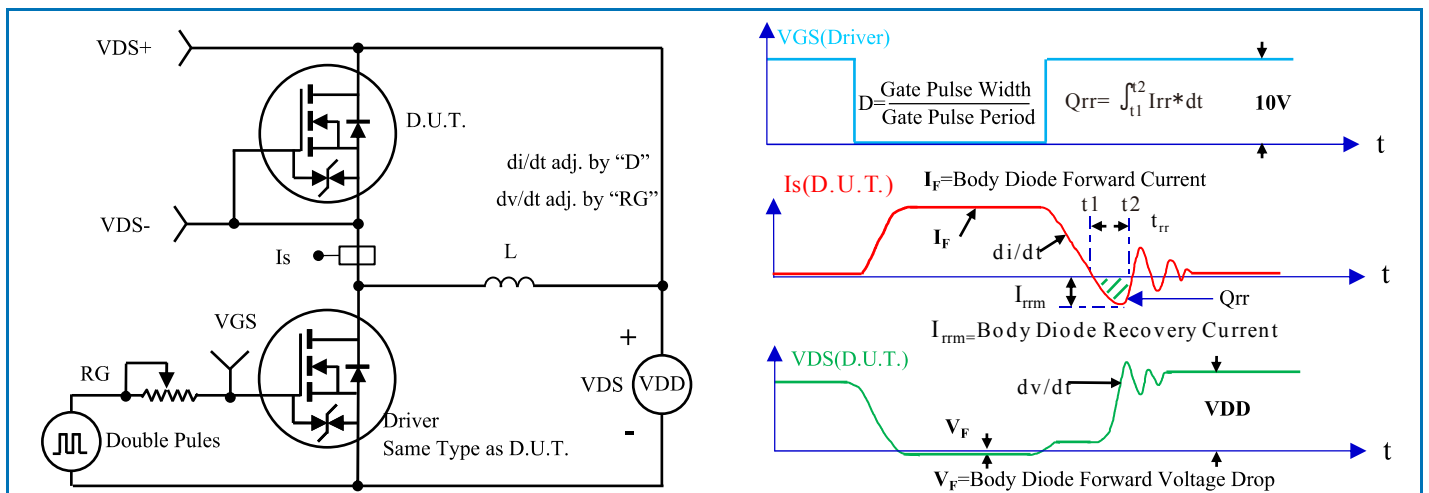


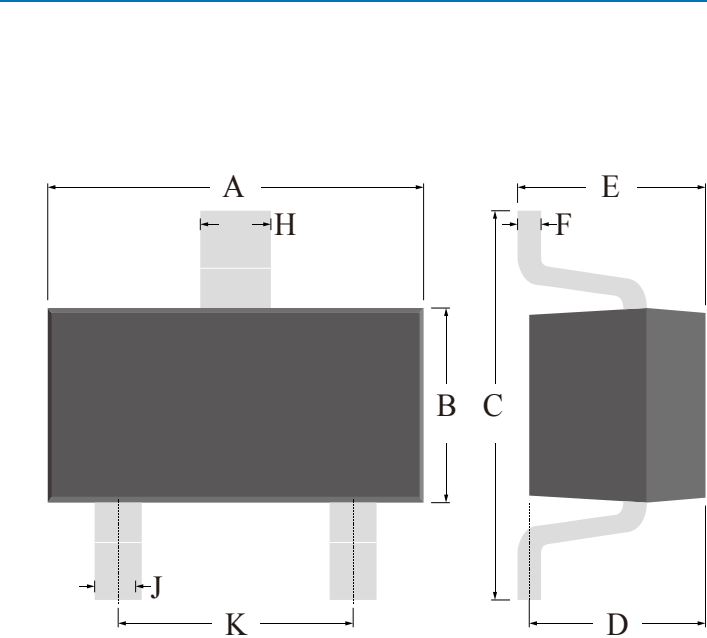
Fig.16- Diode Recovery Test Circuit & Waveform

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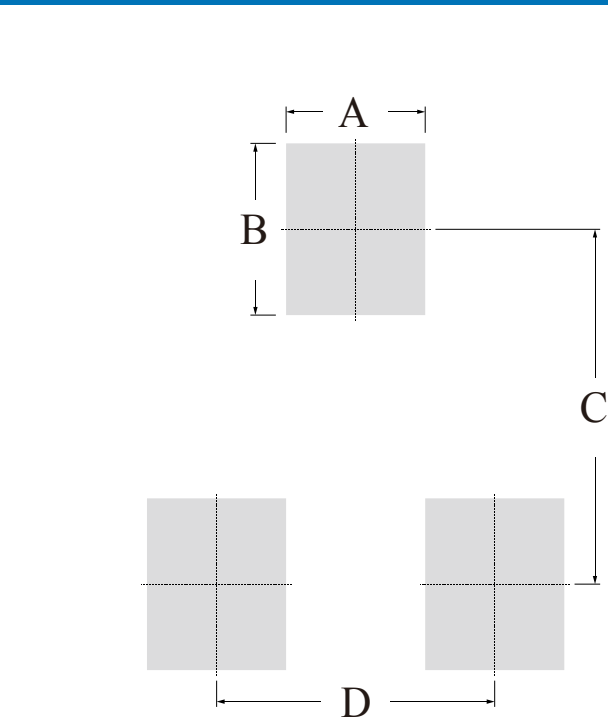
OUTLINE DRAWINGS



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OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	1.40	1.60	1.80	0.0551	-	0.0709
B	0.65	0.80	0.95	0.0256	-	0.0374
C	1.40	1.60	1.80	0.0551	-	0.0709
D	0.60	0.75	0.90	0.0236	-	0.0354
E	0.65	0.80	0.95	0.0256	-	0.0374
F	0.10	0.15	0.20	0.0039	-	0.0079
J	0.10	0.20	0.30	0.0039	-	0.0118
H	0.20	0.30	0.40	0.0079	-	0.0157
K	0.80	1.00	1.20	0.0315	-	0.0472

RECOMMEDND LAYOUT DRAWINGS



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OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	0.50	-	-	0.0000	-
B	-	0.60	-	-	0.0236	-
C	-	1.24	-	-	0.0488	-
D	-	1.00	-	-	0.0394	-

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MARKING INFORMATION



MARKING INSTRUCTIONS

K72=Mark

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-523	P1	0.002	7" Reel	3000	45000	180000

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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 _{Smin}) -Temperature Max (T _{Smax}) -Time(ts min to ts 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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Specification Revision History

Rev.	Date	Changed Items	Pre-Changed Content	Changed Content
A/1	2014-10-20	First Issue		
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