

Descriptions

This -16V -9A P-Channel Enhancement Mode MOSFET in a SOT-23 plastic package.

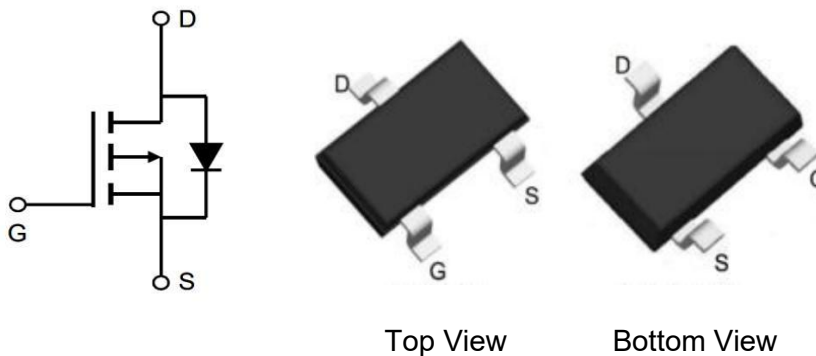
Features

- Advanced trench cell design
- Low Thermal Resistance
- Low Gate Charge
- Halogen-Free & Lead-Free

Application

- Load Switch for Portable Devices
- Voltage controlled small signal switch

Equivalent Circuit & Pinning



Marking

See Marking Instructions

Absolute Maximum Ratings(Ta=25°C)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V _{DS}	-16	V
Gate-Source Voltage		V _{GS}	±12	V
Continuous Drain Current	T _c = 25°C	I _b	-9	A
Peak Drain Current, Pulsed ¹⁾		I _{DM}	-38	A
Power Dissipation	T _c = 25°C	P _{tot}	1.25	W
Operating Junction and Storage Temperature Range		T _J , T _{stg}	-55~150	°C

Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance from Junction to Ambient ²⁾	R _{θJA}	100	°C/W

Note:

1) Pulse width ≤100us, duty cycle ≤1%, limited by T_{Jmax}.

2) Device mounted on FR-4 substrate PC board, 2ozcopper, with 1-inch square copper plate in still air.

Characteristics at Ta = 25°C unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit
STATIC PARAMETERS					
Drain-Source Breakdown Voltage at I _D = -250 μA	BV _{DSS}	-16			V
Drain-Source Leakage Current at V _{DS} = -16V, V _{GS} = 0V	I _{DSS}			-1	μA
Gate Leakage Current at V _{GS} = ±12V, V _{DS} =0V	I _{GSS}			±100	nA
Gate-Source Threshold Voltage at V _{DS} = V _{GS} , I _D = -250 μA	V _{GS(th)}	-0.5		-0.9	V
Drain-Source On-State Resistance at -V _{GS} = 4.50V, -I _D = 3.0A at -V _{GS} =2.5V, -I _D =2.0A	R _{DS(on)}		18 24	25 33	mΩ
DYNAMIC PARAMETERS					
Gate Resistance at f = 1 MHz, V _{GS} =0 V	R _g		14		Ω
Forward Transconductance at -V _{DS} =5V, -I _D =2 A	g _{FS}	5			S
Input Capacitance at V _{GS} =0 V, V _{DS} = -10V, f = 1 MHz	C _{iss}		1357		pF
Output Capacitance at V _{GS} =0 V, V _{DS} = -10V, f = 1 MHz	C _{oss}		499		
Reverse Transfer Capacitance at V _{GS} =0 V, V _{DS} = -10V, f = 1 MHz	C _{rss}		273.6		
Gate charge total at -V _{DS} =10V, -V _{GS} =8V, -I _D = 1A	Q _g		26.1		nC
Gate to Source Charge at -V _{DS} =10V, -V _{GS} =8V, -I _D = 1A	Q _{gs}		1.71		
Gate to Drain Charge at -V _{DS} =10V, -V _{GS} =8V, -I _D = 1A	Q _{gd}		20.48		
Turn-On Delay Time at -V _{GS} =2.5 V, -V _{DS} = 10 V, -I _D = 180 A, R _{GEN} =2Ω	td(on)		15.2		nS
Turn-On Rise Time at -V _{GS} =2.5 V, -V _{DS} = 10 V, -I _D = 180 A, R _{GEN} =2Ω	t _r		33.11		
Turn-Off Delay Time at -V _{GS} =2.5 V, -V _{DS} = 10 V, -I _D = 180 A, R _{GEN} =2Ω	td(off)		219.4		
Turn-Off Fall Time at -V _{GS} =2.5 V, -V _{DS} = 10 V, -I _D = 180 A, R _{GEN} =2Ω	t _f		217.64		
Body-Diode PARAMETERS6					
Drain-Source Diode Forward Voltage at -I _S = 2A, V _{GS} = 0V	V _{SD}			-1.0	V
Reverse Recovery Time at I _S = -0.75A, dI _{SD} /dt = 100 A/μs	trr		22		nS
Reverse Recovery Charge at I _S =-0.75 A, dI _{SD} /dt = 100 A/μs	Q _{rr}		27.7		nC

Electrical Characteristics Curves

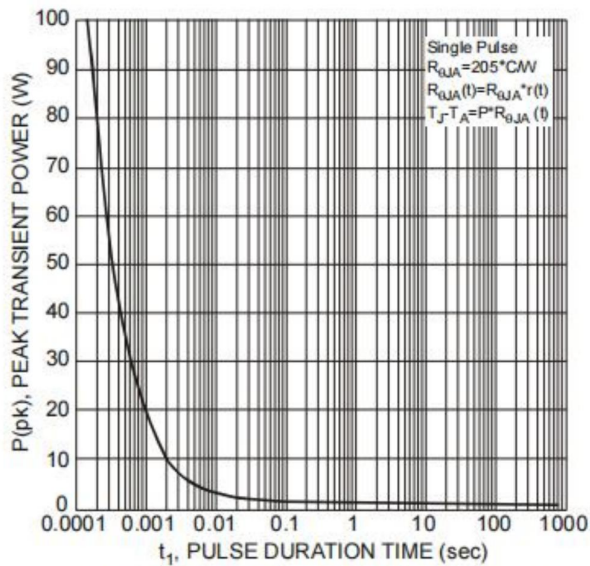


Fig. 1 Single Pulse Maximum Power Dissipation

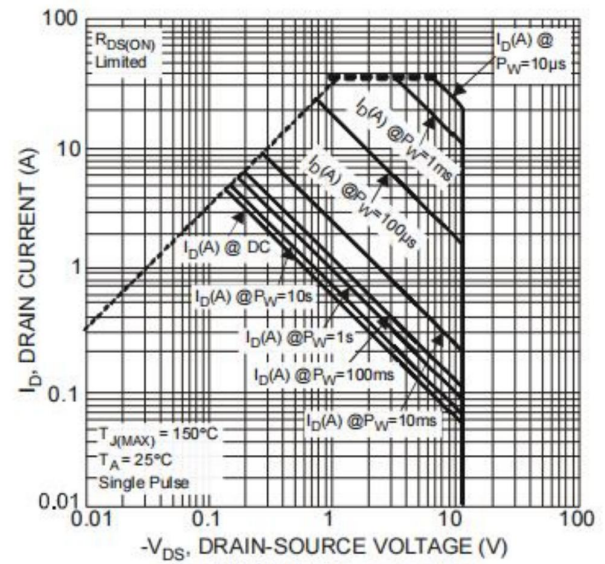


Fig. 2 SOA, Safe Operation Area

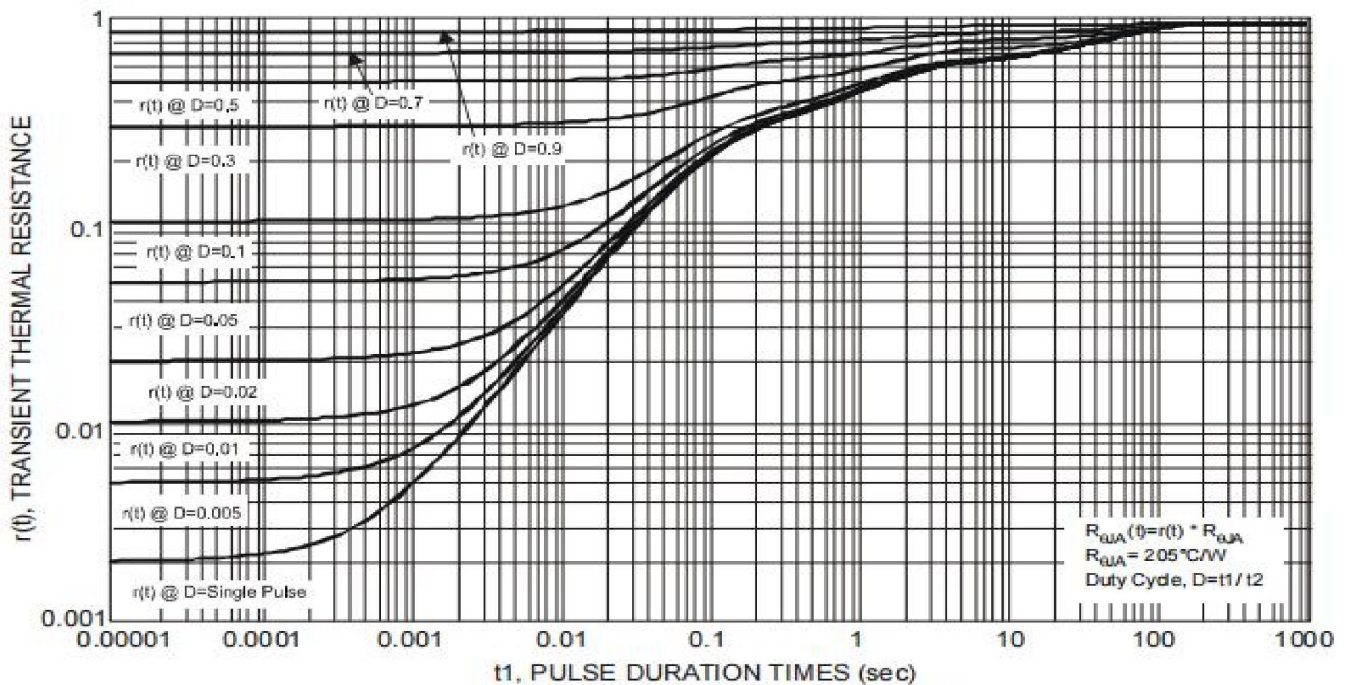


Fig. 03 Transient Thermal Resistance

Electrical Characteristics Curves

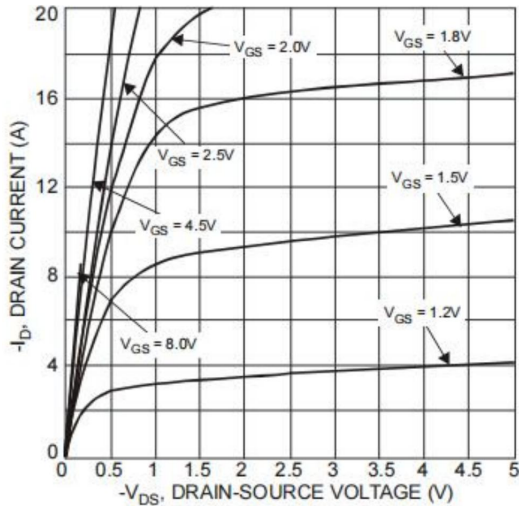


Fig. 4 Typical Output Characteristics

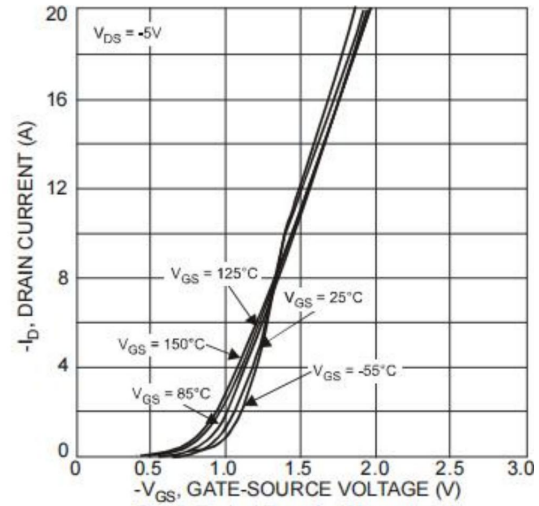


Fig. 5 Typical Transfer Characteristic

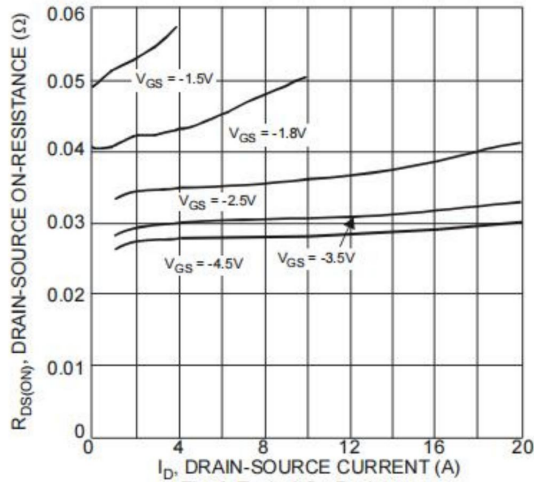


Fig. 6 Typical On-Resistance vs. Drain Current and Gate Voltage

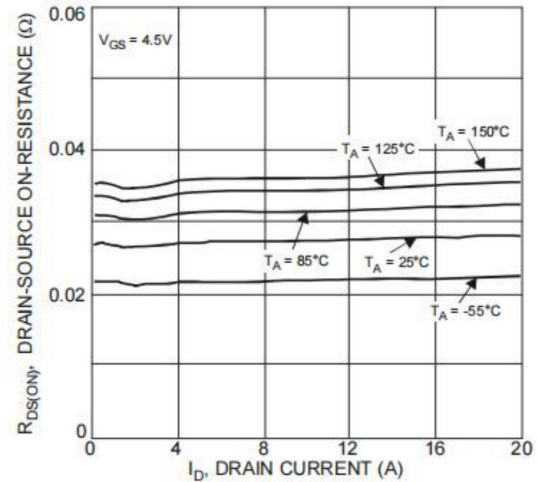


Fig. 7 Typical On-Resistance vs. Drain Current and Temperature

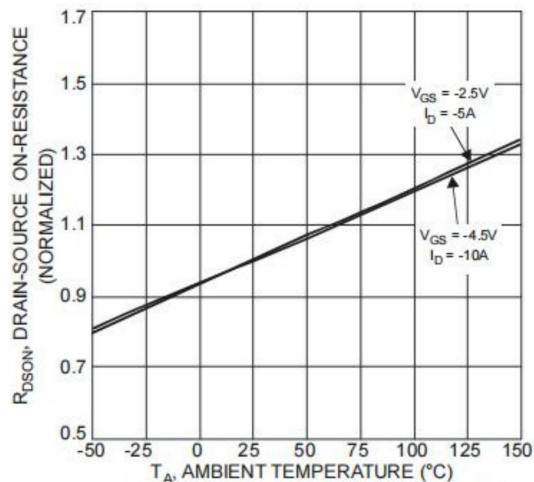


Fig. 8 On-Resistance Variation with Temperature

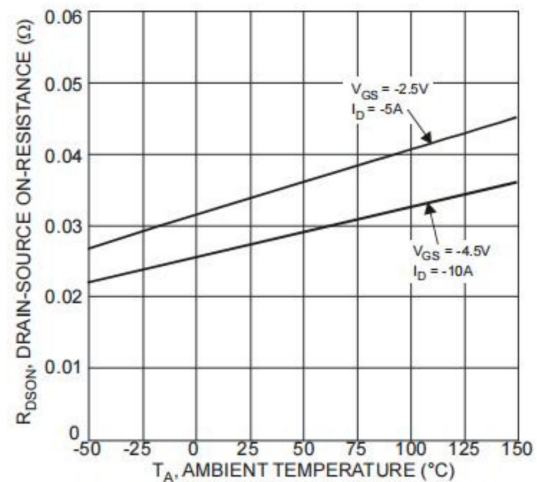


Fig. 9 On-Resistance Variation with Temperature

Electrical Characteristics Curves

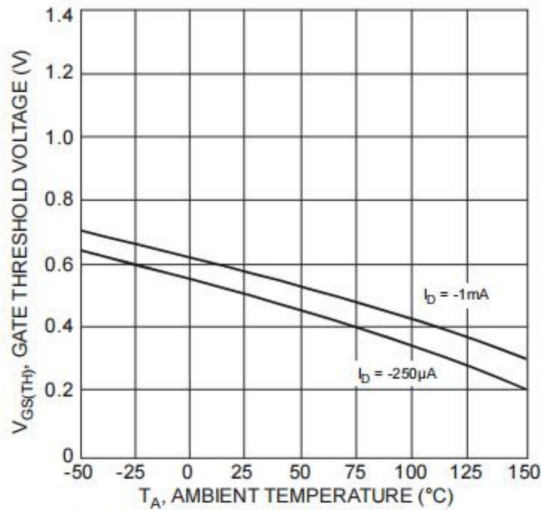


Fig. 10 Gate Threshold Variation vs. Ambient Temperature

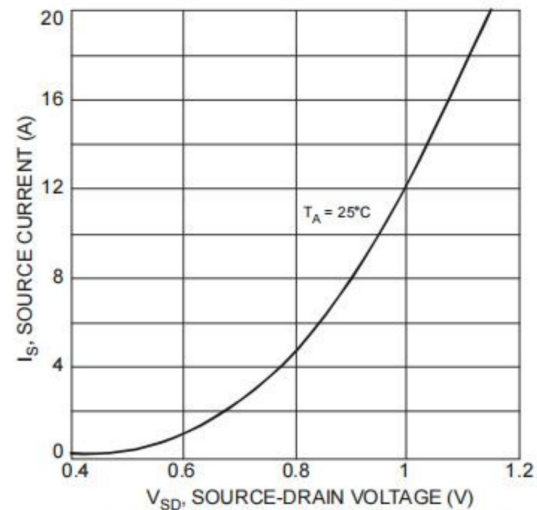


Fig. 11 Diode Forward Voltage vs. Current

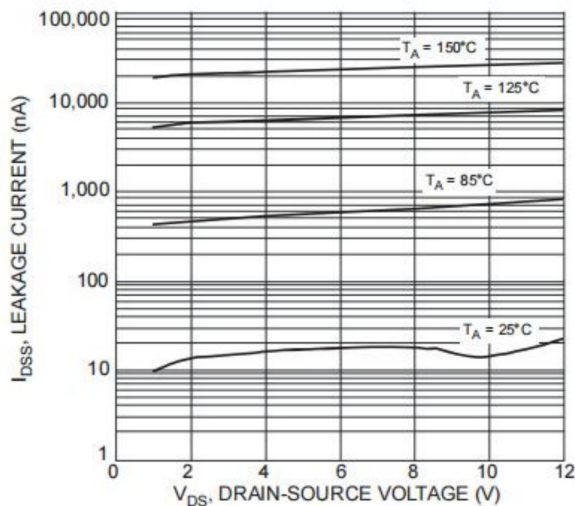


Fig. 12 Typical Drain-Source Leakage Current vs. Voltage

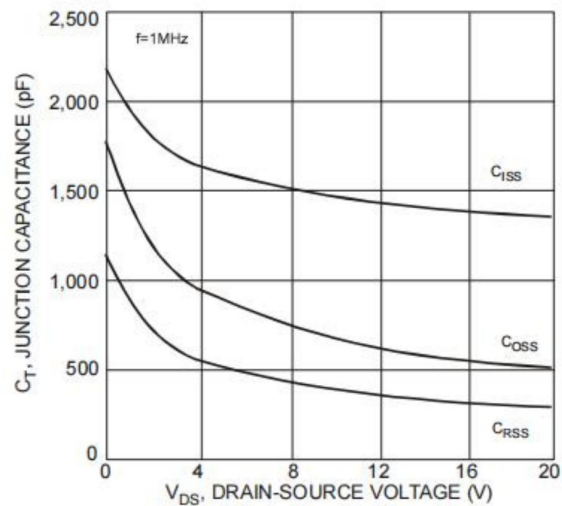


Fig. 13 Typical Junction Capacitance

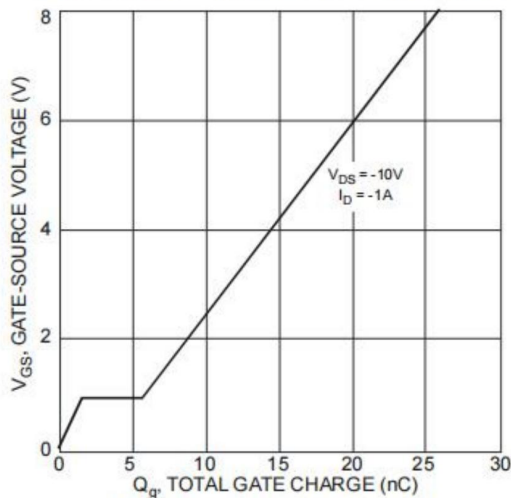


Fig. 14 Gate-Charge Characteristics

Test Circuits

Fig.1-1 Switching times test circuit

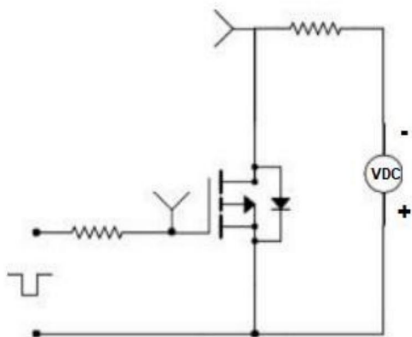


Fig.1-2 Switching Waveform

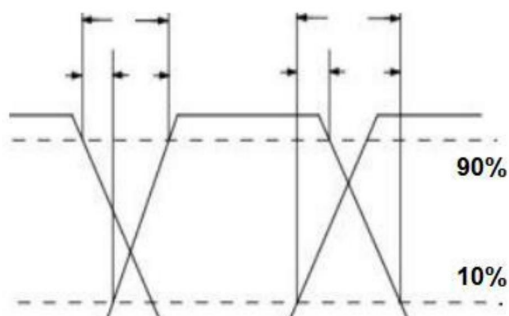


Fig.2-1 Gate charge test circuit

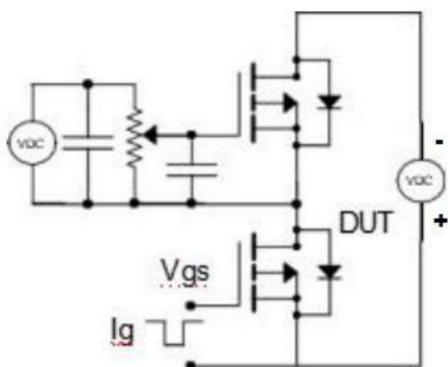


Fig.2-2 Gate charge waveform

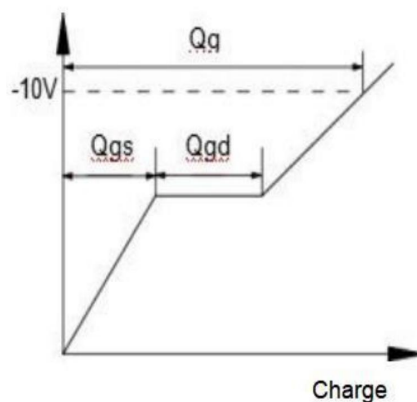


Fig.3-1 Avalanche test circuit

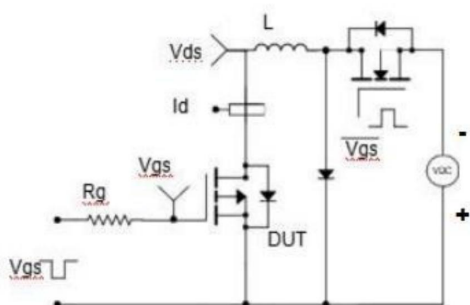
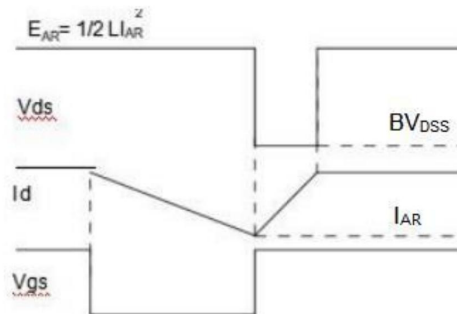


Fig.3-2 Avalanche waveform



Marking information

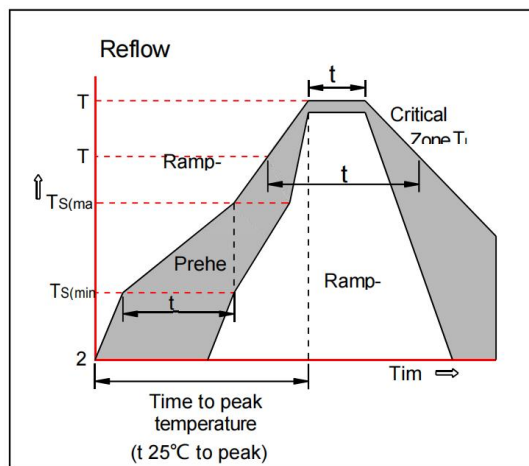
S23

Note:

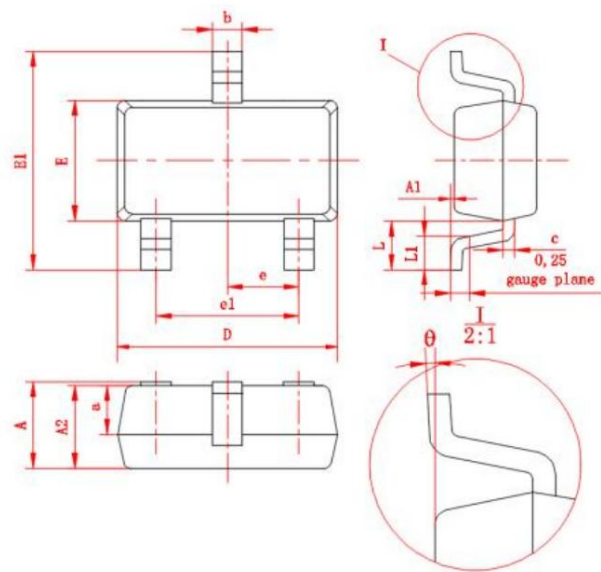
S23: Product Type

Soldering parameters

Reflow Condition		Pb-Free assembly (see as bellow)
Pre Heat	-Temperature Min ($T_{s(min)}$)	+150°C
	-Temperature Max($T_{s(max)}$)	+200°C
	-Time (Min to Max) (ts)	60-180 secs.
Average ramp up rate (Liquid us Temp (T_L) to peak)		3°C/sec. Max
$T_{s(max)}$ to T_L - Ramp-up Rate		3°C/sec. Max
Reflow	-Temperature(T_L)(Liquid us)	+217°C
	-Temperature(t_L)	60-150 secs.
Peak Temp (T_P)		+260(+0/-5)°C
Time within 5°C of actual Peak Temp (t_p)		30 secs. Max
Ramp-down Rate		6°C/sec. Max
Time 25°C to Peak Temp (T_P)		8 min. Max
Do not exceed		+260°C

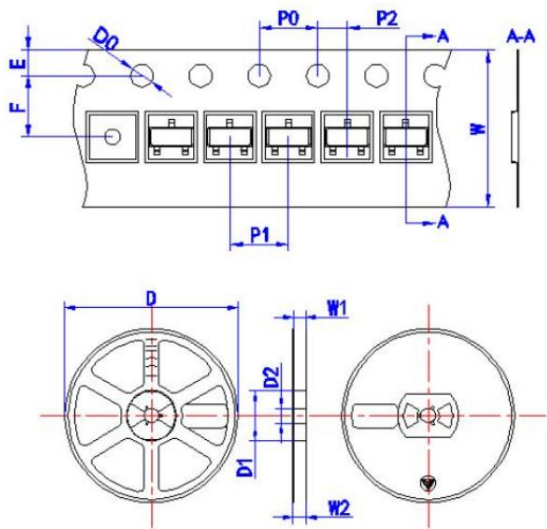


Package Outline Dimensions (Units: mm)



符号	尺寸		符号	尺寸		符号	尺寸	
	Min	Max		Min	Max		Min	Max
A	1.0	1.3	E	1.5	1.7	c	0.1	0.2
A1	0	0.1	E1	2.7	3.1	L	(0.65)	
A2	1.0	1.2	e	(0.95)		L1	0.3	0.6
a	(0.65)		e1	1.8	2.0	θ	0°	8°
D	2.8	3.0	b	0.3	0.5			

Package Outline Dimensions (Units: mm)



Symbol	Dimension in Millimeters
Tape	
D0	1.50+0.10/-0.00
E	1.75±0.10
F	3.50±0.10
P0	4.00±0.10
P1	4.00±0.10
P2	2.00±0.10
W	8.00+0.3/-0.1
Reel	
D	178.0±2.00
D1	54.40±1.00
D2	13.00±1.00
W1	9.50±1.00
W2	12.30±1.00