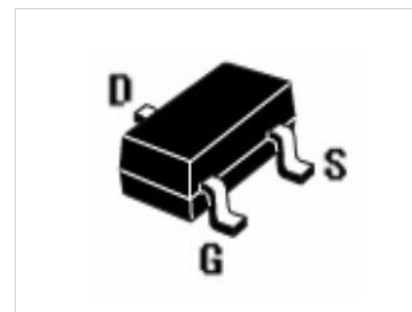


Description

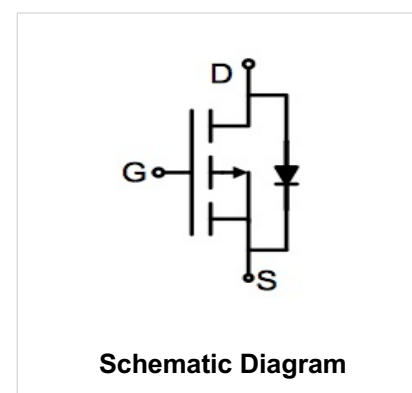
- The WTM2301 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a battery protection or in other switching application.



SOT-23 Top View

Features

- $V_{DS} = -20V$, $I_D = -3A$
 $R_{DS(ON)} < 85m\Omega @ V_{GS} = -4.5V$
 $R_{DS(ON)} < 78m\Omega @ V_{GS} = -10V$
- High power and current handling capability
- Lead free product is acquired
- Surface mount package



Schematic Diagram

Application

- Battery protection.
- Load switch
- Power management

Package and order information

Device	Device Marking	Device Package	Reel Size	Tape width	Quantity
WTM2301	A1SHB	SOT-23	Ø180mm	8 mm	3000 pcs

Absolute Maximum Ratings (TA=25°C, RH=45%-75%, unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	-20	V
Gate-Source Voltage	V_{GS}	±12	V
Drain Current-Continuous	I_D	-3	A
Drain Current-Pulsed (Note 1)	I_{DM}	-10	A
Maximum Power Dissipation	P_D	1	W
Operating Junction and Storage Temperature Range	T_J & T_{STG}	-55 to +150	°C

Thermal Characteristic

Parameter	Symbol	Value	Unit
Thermal Resistance and Junction-to-Ambient (Note 2)	$R_{\theta JA}$	125	°C/W

Electrical Characteristics (TA = 25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	$B_{V_{DS}}$	$V_{GS}=0V, I_D = -250\mu A$	-20	-22	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-20V, V_{GS}=0V$	-	-	-1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 12V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D = -250\mu A$	-0.4	-0.7	-1	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=-4.5V, I_D = -3A$	-	71	85	m Ω
		$V_{GS} = -10V, I_D = -2A$	-	60	78	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=-5V, I_D = -2A$	5	-	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C_{iss}	$V_{DS}=-10V, V_{GS}=0V, F=1.0MHz$	-	395	-	PF
Output Capacitance	C_{oss}		-	72	-	PF
Reverse Transfer Capacitance	C_{rss}		-	53	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = -10V, I_D = -1A$ $V_{GS} = -4.5V, R_{GEN} = 10\Omega$	-	11	-	nS
Turn-on Rise Time	t_r		-	35	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	30	-	nS
Turn-Off Fall Time	t_f		-	10	-	nS
Total Gate Charge	Q_g	$V_{DS}=-10V, I_D=-3A, V_{GS}=-2.5V$	-	3.3	12	nC
Gate-Source Charge	Q_{gs}		-	0.7	-	nC
Gate-Drain Charge	Q_{gd}		-	1.3	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S = 1.3A$	-	-	-1.2	V
Diode Forward Current (Note 2)	I_S		-	-	-3	A

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

Typical Electrical and Thermal Characteristics

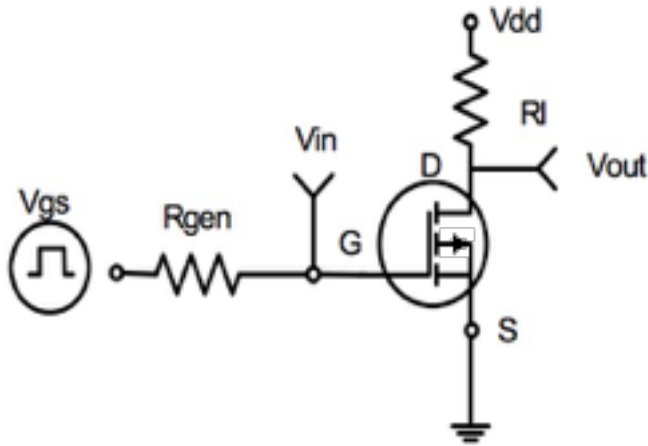


Figure 1 - Switching Test Circuit

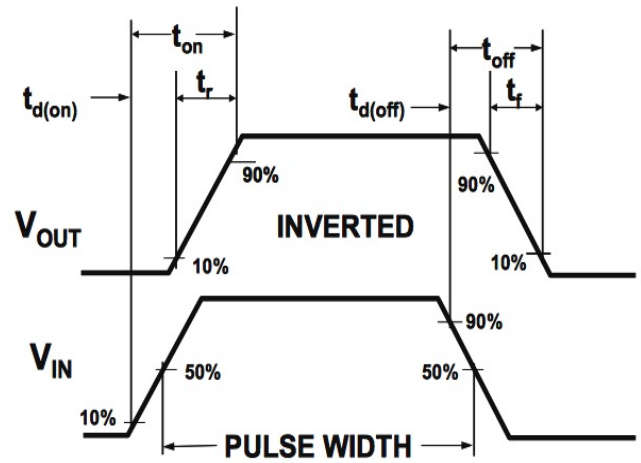


Figure 2 - Switching Waveforms

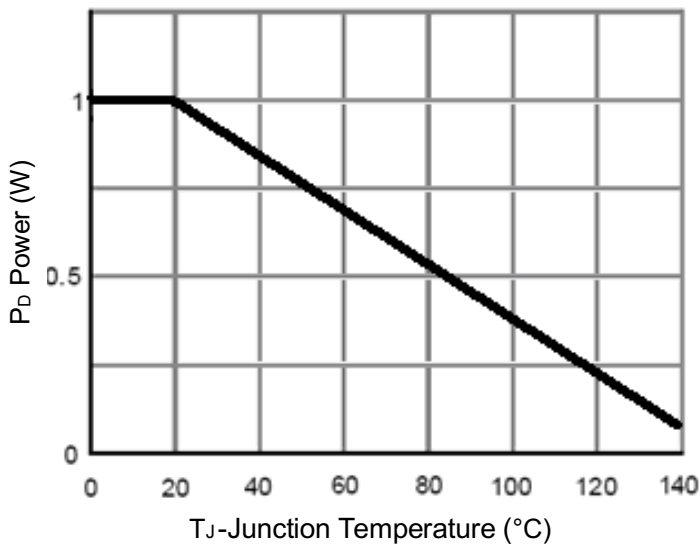


Figure 3 - Power Dissipation

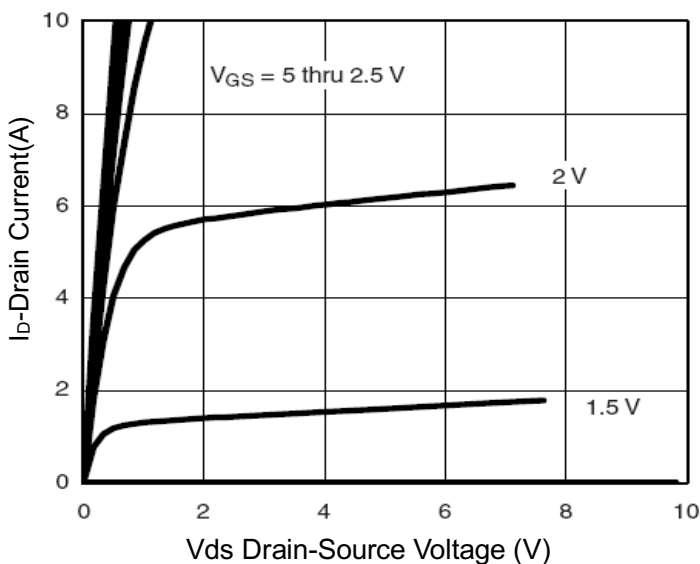
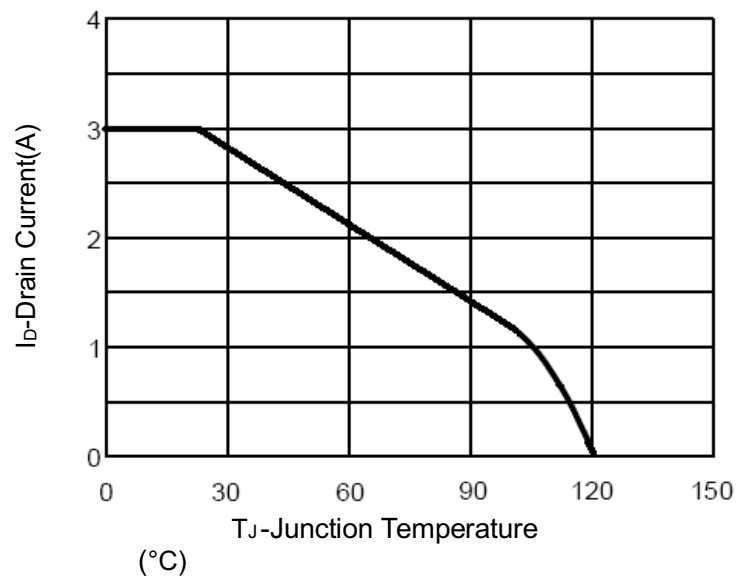


Figure 5 - Output Characteristics

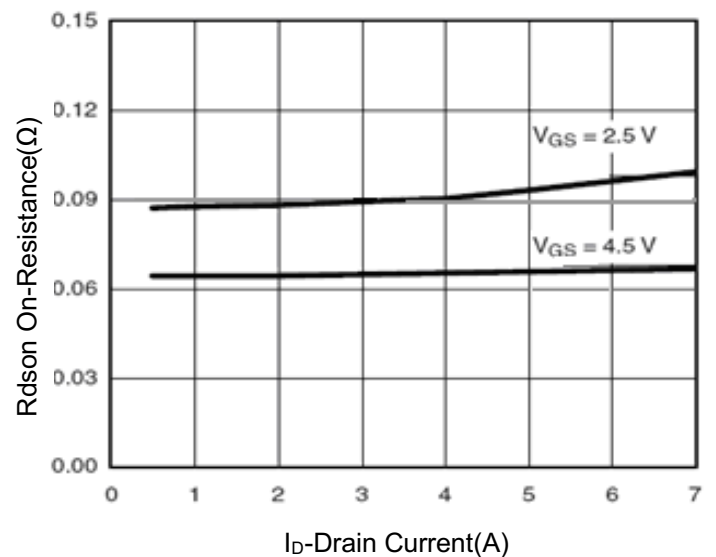


Figure 6 - Drain-Source On-Resistance

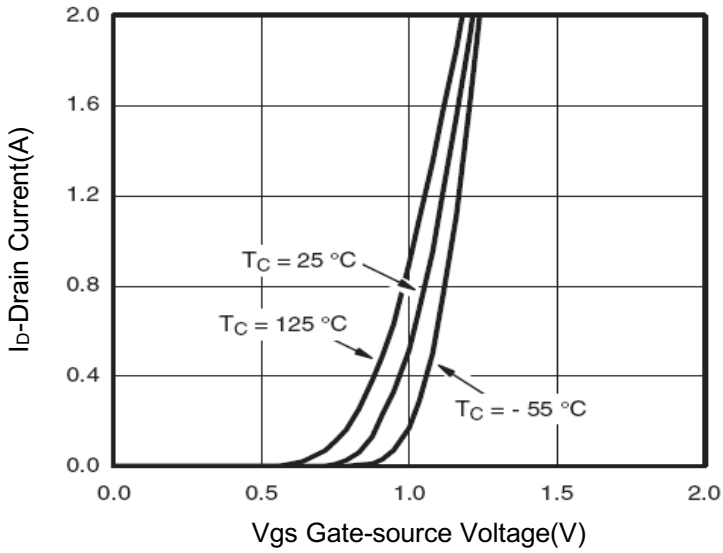


Figure 7 – Transfer Characteristics

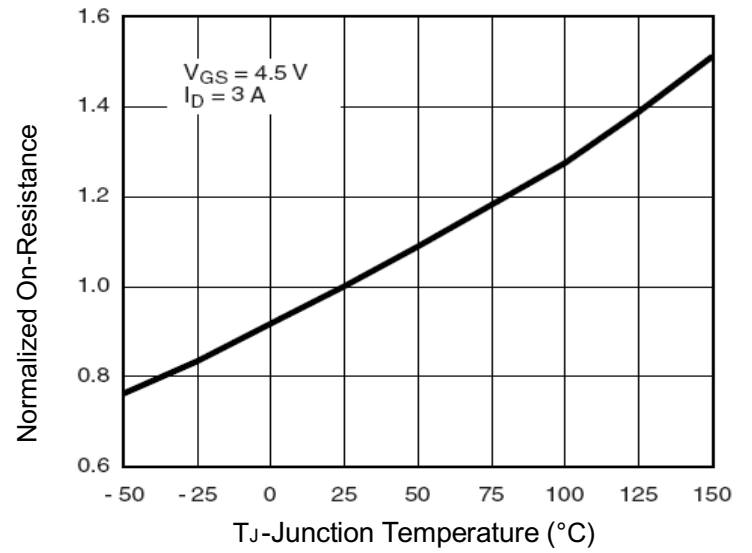


Figure 8 – Drain-Source On-Resistance

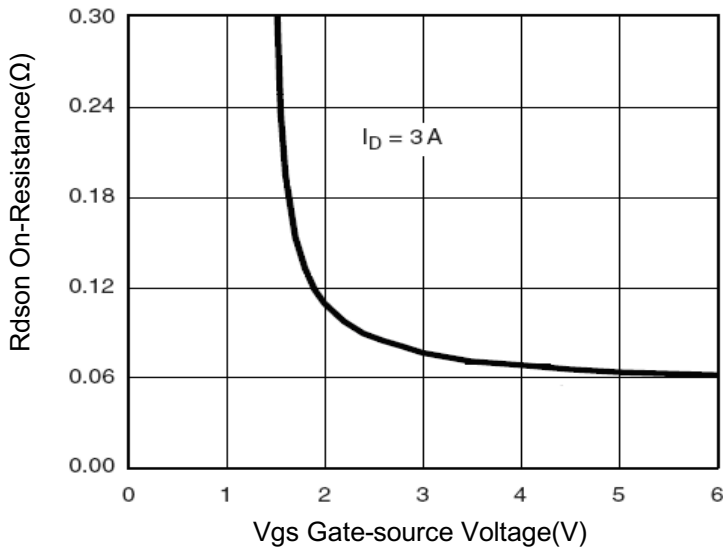


Figure 9 – Rdson vs Vgs

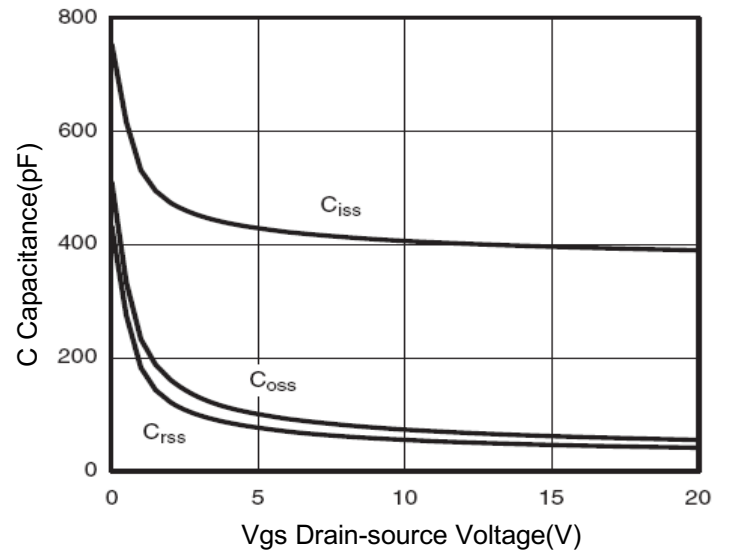


Figure 10 – Capacitance vs Vds

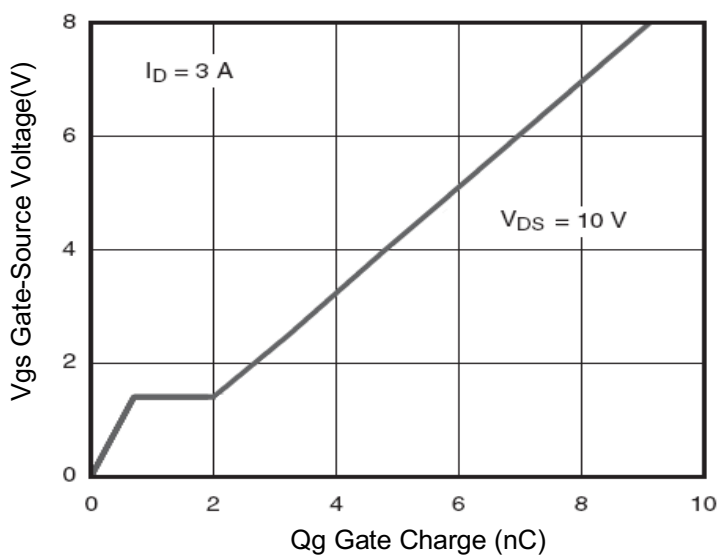


Figure 11 – Gate Charge

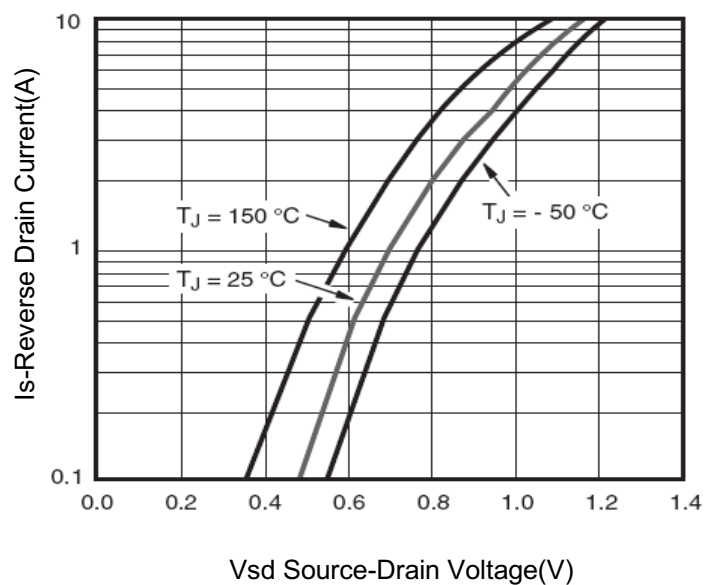


Figure 12 – Source-Drain Diode Forward

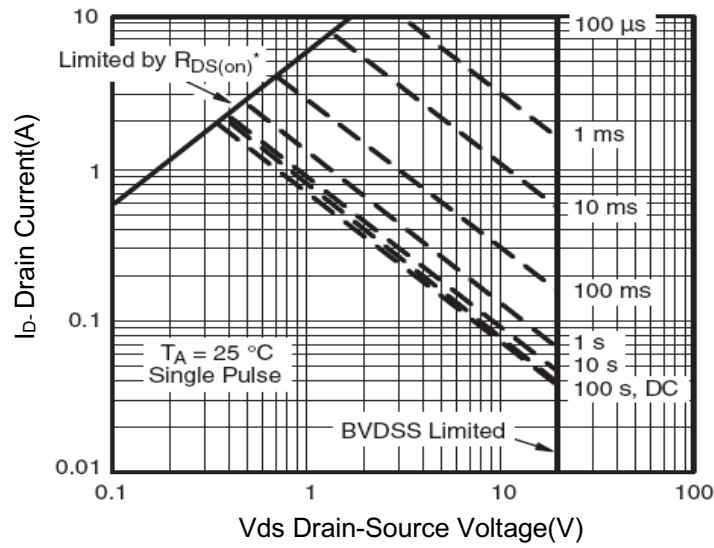


Figure 13 – Safe Operation Area

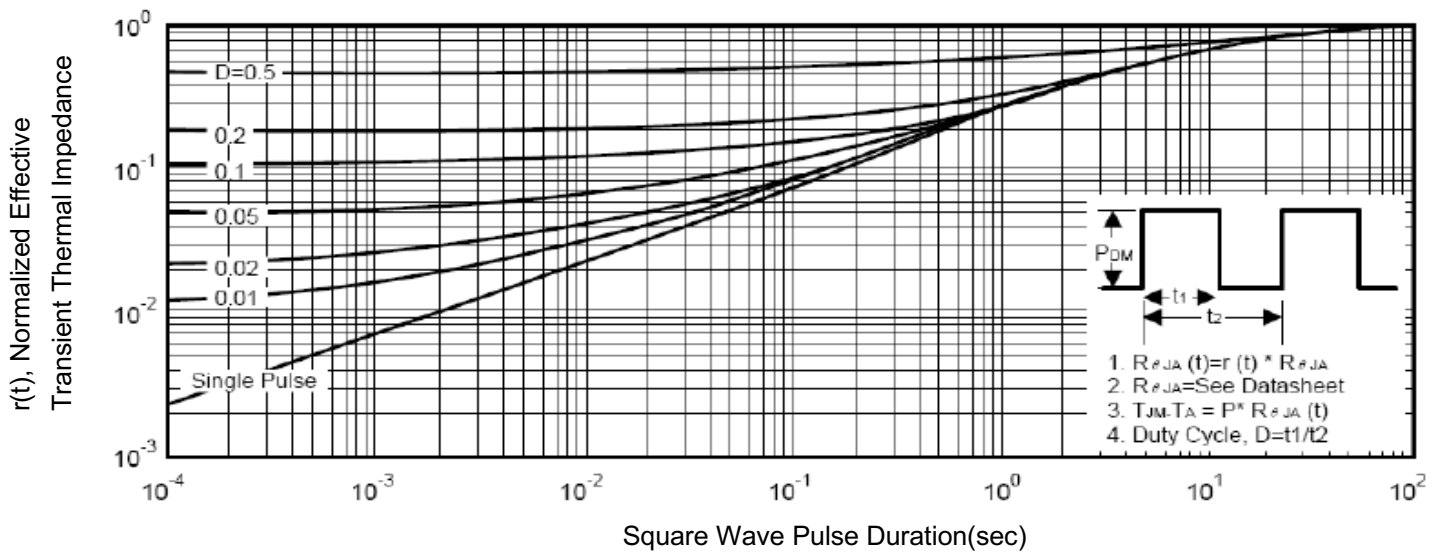
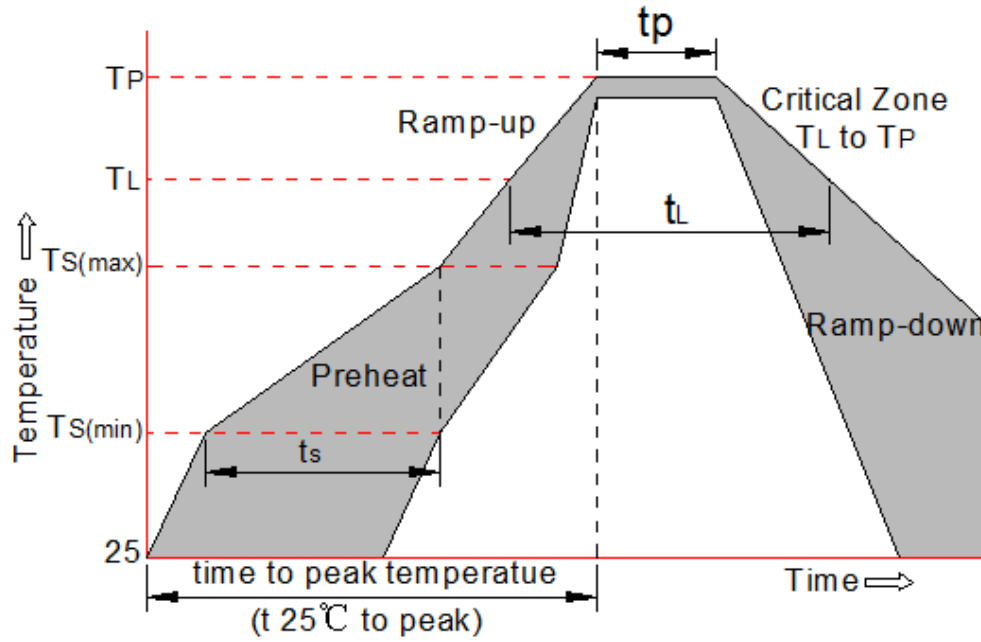


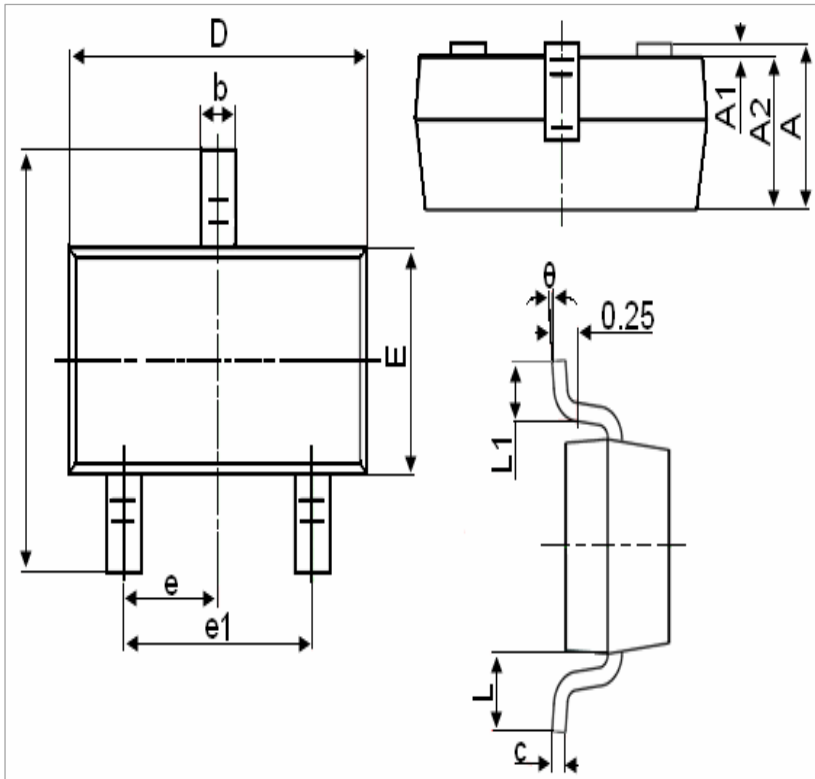
Figure 14 – Normalized Maximum Transient Thermal Impedance

Soldering parameters



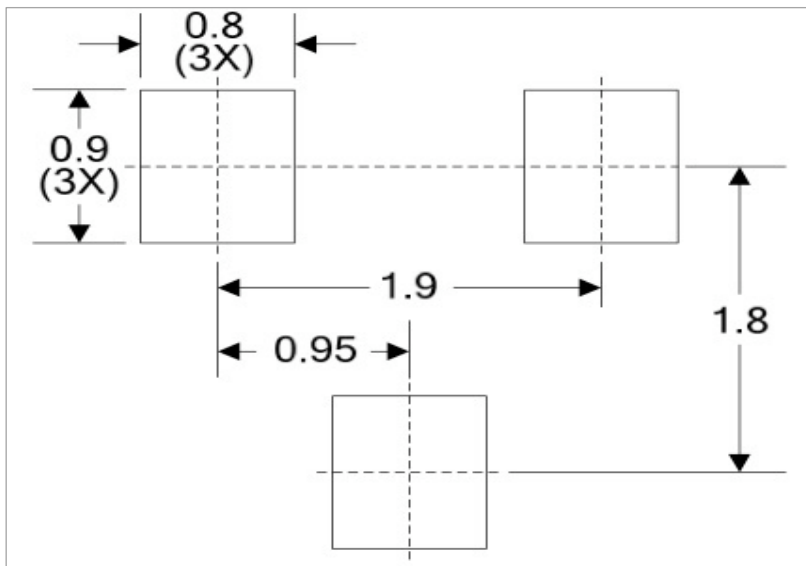
Reflow Condition		Pb-Free assembly
Pre Heat	-Temperature Min ($T_{s(min)}$)	+150°C
	-Temperature Max($T_{s(max)}$)	+200°C
	-Time (Min to Max) (t_s)	60-180 secs.
Average ramp up rate (Liquid us Temp (T_L) to peak)		3°C/sec. Max
$T_{s(max)}$ to T_L - Ramp-up Rate		3°C/sec. Max
Reflow	-Temperature(T_L) (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 (SOT-23)



Symbol	Dimensions in Millimeters	
	Min	Max
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950 TYP	
e1	1.800	2.000
L	0.55 REF	
L1	0.300	0.500
theta	0°	8°

Recommend PAD Layout



Notes:

1. All dimensions are in millimeters.
2. Tolerance $\pm 0.10\text{mm}$ (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

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