30V, 200mA, Low Dropout Voltage Linear Regulator

Features

- Input Voltage Range: 3V to 30V
- Maximum Output Current:200mA
- 3uA Ground Current at no Load
- Output Voltage Accuracy: ±2% at +25'C
- 10nA Disable Current
- Dropout Voltage: 500mV at 100mA/V_{out} 5V
- Fixed Outputs of 1.8V, 2.5V, 3.0V, 3.3V, 4.0V, 4.2V, 4.4V, 5.0V
- Current Limit Protect
- Short Circuit Protection
- Thermal Shutdown Protection
- Available Packages: SOT-23, SOT-89, SOT23-5
- -40'C to +125'C Operating Temperature Range

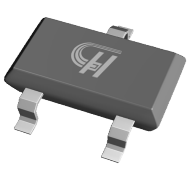
General Description

The HCR2420 series are a group of low-dropout (LDO) voltage regulators offering the benefits of wide input voltage range, low dropout voltage, low power consumption, and miniaturized packaging. Quiescent current of only 3μA makes these devices ideal for powering the battery-powered, always-on systems that require very little idle-state power dissipation to a longer service life.

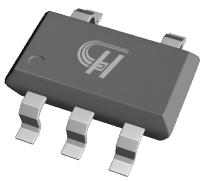
The HCR2420 series of linear regulators are stable with the ceramic output capacitor over its wide input range from 3V to 30V and the entire range of output load current (0mA to 200mA)

Applications

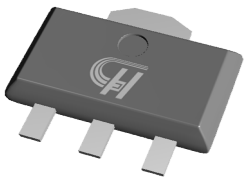
- Battery Powered Equipment
- Smoke Detectors and Sensors
- Microcontroller Applications
- Household Appliances



SOT-23



SOT23-5



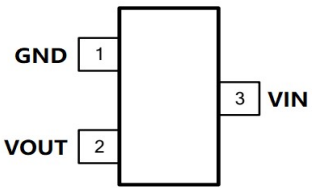
SOT-89

Figure 1. Package Type of HCR2420

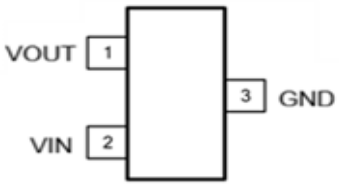
30V, 200mA, Low Dropout Voltage Linear Regulator

Pin Configuration

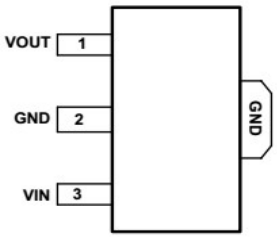
SOT-23(Top View)



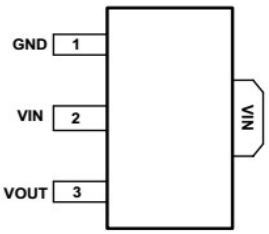
SOT-23R(Top View)



SOT-89(Top View)



SOT-89-3(L-Type) (Top View)



SOT-23-5

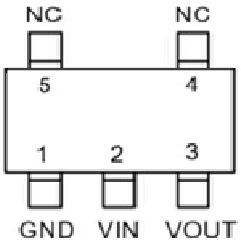


Figure 2. Pin Configuration of HCR2420 (Top View)

Pin Function Table

SOT-23	SOT-23R	SOT-89	SOT-89-3 (L-Type)	SOT-23-5	Name	Pin Function
1	3	2	1	1	GND	Ground
2	1	1	3	3	VOUT	Output Voltage
3	2	3	2	2	VIN	Power Input Voltage
-	-	-	-	4, 5	NC	No Connected

Typical Application Circuit

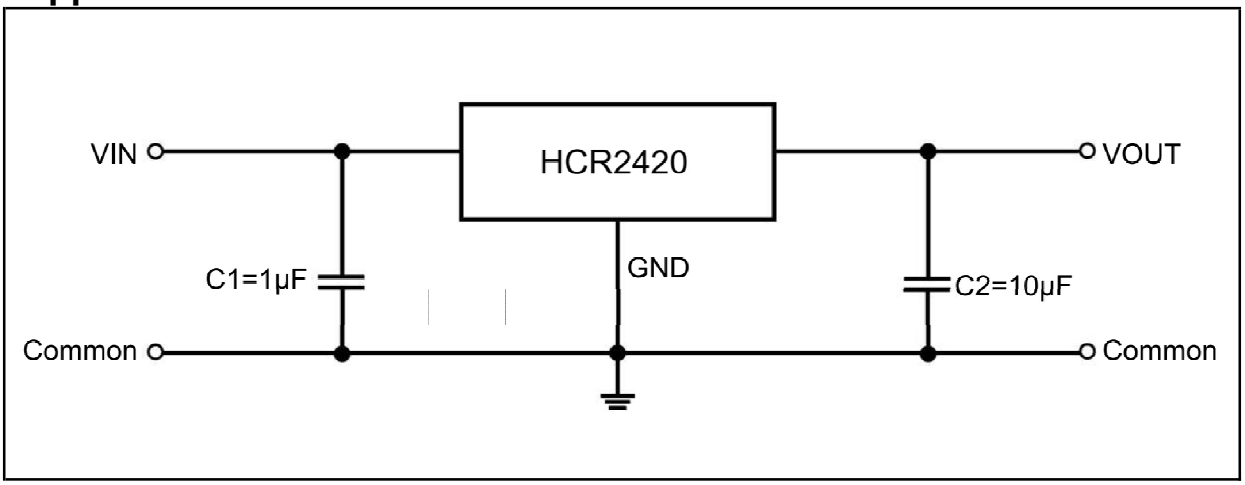
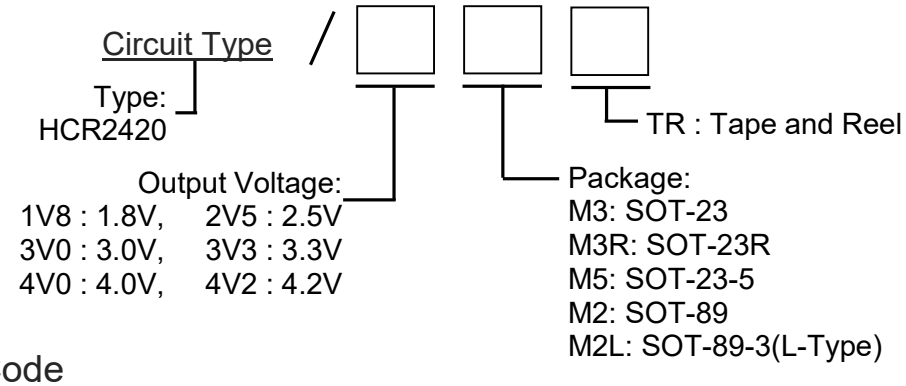


Figure 3. Typical Application Circuit of HCR2420

30V, 200mA, Low Dropout Voltage Linear Regulator

Ordering Information



Ordering Code

Part Number	VOUT(V)	Temperature Range	Package	Package Type
HCR2420/1V8M3TR	1.8V	-40'C to +125'C	SOT-23	3000pcs/TR
HCR2420/2V5M3TR	2.5V	-40'C to +125'C	SOT-23	3000pcs/TR
HCR2420/3V0M3TR	3.0V	-40'C to +125'C	SOT-23	3000pcs/TR
HCR2420/3V3M3TR	3.3V	-40'C to +125'C	SOT-23	3000pcs/TR
HCR2420/4V0M3TR	4.0V	-40'C to +125'C	SOT-23	3000pcs/TR
HCR2420/4V2M3TR	4.2V	-40'C to +125'C	SOT-23	3000pcs/TR
HCR2420/4V4M3TR	4.4V	-40'C to +125'C	SOT-23	3000pcs/TR
HCR2420/5V0M3TR	5.0V	-40'C to +125'C	SOT-23	3000pcs/TR
HCR2420/1V8M3RTR	1.8V	-40'C to +125'C	SOT-23R	3000pcs/TR
HCR2420/2V5M3RTR	2.5V	-40'C to +125'C	SOT-23R	3000pcs/TR
HCR2420/3V0M3RTR	3.0V	-40'C to +125'C	SOT-23R	3000pcs/TR
HCR2420/3V3M3RTR	3.3V	-40'C to +125'C	SOT-23R	3000pcs/TR
HCR2420/4V0M3RTR	4.0V	-40'C to +125'C	SOT-23R	3000pcs/TR
HCR2420/4V2M3RTR	4.2V	-40'C to +125'C	SOT-23R	3000pcs/TR
HCR2420/4V4M3RTR	4.4V	-40'C to +125'C	SOT-23R	3000pcs/TR
HCR2420/5V0M3RTR	5.0V	-40'C to +125'C	SOT-23R	3000pcs/TR
HCR2420/1V8M2TR	1.8V	-40'C to +125'C	SOT-89	1000pcs/TR
HCR2420/2V5M2TR	2.5V	-40'C to +125'C	SOT-89	1000pcs/TR
HCR2420/3V0M2TR	3.0V	-40'C to +125'C	SOT-89	1000pcs/TR
HCR2420/3V3M2TR	3.3V	-40'C to +125'C	SOT-89	1000pcs/TR
HCR2420/4V0M2TR	4.0V	-40'C to +125'C	SOT-89	1000pcs/TR
HCR2420/4V2M2TR	4.2V	-40'C to +125'C	SOT-89	1000pcs/TR
HCR2420/4V4M2TR	4.4V	-40'C to +125'C	SOT-89	1000pcs/TR
HCR2420/5V0M2TR	5.0V	-40'C to +125'C	SOT-89	1000pcs/TR
HCR2420/1V8M2LTR	1.8V	-40'C to +125'C	SOT-89-3(L-Type)	1000pcs/TR
HCR2420/2V5M2LTR	2.5V	-40'C to +125'C	SOT-89-3(L-Type)	1000pcs/TR
HCR2420/3V0M2LTR	3.0V	-40'C to +125'C	SOT-89-3(L-Type)	1000pcs/TR
HCR2420/3V3M2LTR	3.3V	-40'C to +125'C	SOT-89-3(L-Type)	1000pcs/TR
HCR2420/4V0M2LTR	4.0V	-40'C to +125'C	SOT-89-3(L-Type)	1000pcs/TR
HCR2420/4V2M2LTR	4.2V	-40'C to +125'C	SOT-89-3(L-Type)	1000pcs/TR
HCR2420/4V4M2LTR	4.4V	-40'C to +125'C	SOT-89-3(L-Type)	1000pcs/TR
HCR2420/5V0M2LTR	5.0V	-40'C to +125'C	SOT-89-3(L-Type)	1000pcs/TR
HCR2420/1V8M5TR	1.8V	-40'C to +125'C	SOT-23-5	3000pcs/TR
HCR2420/2V5M5TR	2.5V	-40'C to +125'C	SOT-23-5	3000pcs/TR
HCR2420/3V0M5TR	3.0V	-40'C to +125'C	SOT-23-5	3000pcs/TR
HCR2420/3V3M5TR	3.3V	-40'C to +125'C	SOT-23-5	3000pcs/TR
HCR2420/4V0M5TR	4.0V	-40'C to +125'C	SOT-23-5	3000pcs/TR
HCR2420/4V2M5TR	4.2V	-40'C to +125'C	SOT-23-5	3000pcs/TR
HCR2420/4V4M5TR	4.4V	-40'C to +125'C	SOT-23-5	3000pcs/TR
HCR2420/5V0M5TR	5.0V	-40'C to +125'C	SOT-23-5	3000pcs/TR

Absolute Maximum Ratings Note 1

Ratings at 25'C ambient temperature unless otherwise specified

Parameter		Symbol	Value	Unit
Input Voltage from VIN to GND		VIN	-0.3 to 36	V
VOUT to GND Voltage		VOUT	-0.3 to 7	V
VIN to GND Voltage		VIN	-0.3 to 31	V
Output Current		IO	Internally Limited	-
Power Dissipation	SOT-23	Ptot	300	mW
	SOT-23-5		400	mW
	SOT-89		740	mW
Thermal Resistance Junction to Ambient	SOT-23	θJA	333	'C/W
	SOT-23-5		250	'C/W
	SOT-89		135	'C/W
Storage Temperature Range		TSTG	-60 to +150	'C
Operating Temperature Range		TOTR	-40 to +125	'C
Junction Temperature		TJ	150	'C
Lead Temperature (Soldering, 10s)		TLEAD	260	'C
Charge Device Model ESD Level		CDM	200	V
Human Body Model ESD level		HBM	4000	V

Note 1: Exceed these limits to damage to the device, exposure to absolute maximum rating conditions may affect the reliability of the chip.

Recommended Work Conditions

Parameter	Symbol	Min	Max	Unit
Input Voltage Range	VIN	3.0	30	V
Maximum Output Current	IO	-	200	mA
Operating Ambient Temperature	Ta	-40	+125	'C

Electrical Characteristics

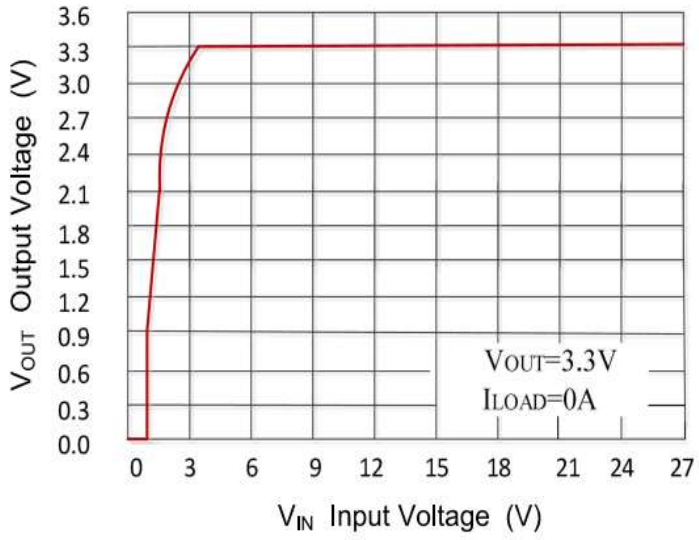
(VIN=VOUT+1V, CIN=1uF, COUT=10uF, TA=25'C, unless otherwise noted.)

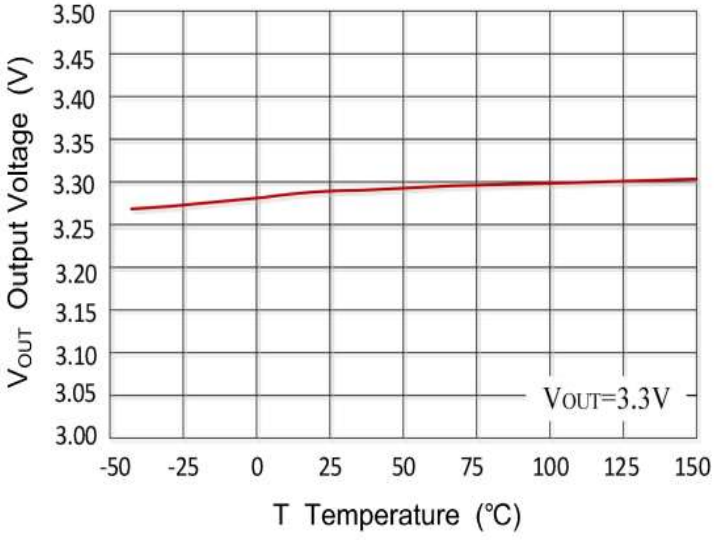
Parameter	Symbol	Test Conditions		Min.	Typ.	Max.	unit
Input Voltage	VIN	-		3.0	-	30	V
Output Voltage Accuracy	ΔVOUT	VIN=12V, IOUT=10mA		-2	-	+2	%
Max. Output Current	IOUT_Max	-		-	200	-	mA
Quiescent Current	IQ	VIN=12V, IOUT=0mA		-	-	3	uA
Dropout Voltage Note2	VDROP	1.8V≤VOUT≤3V	IOUT=100mA	-	500	750	mV
			IOUT=150mA	-	700	1100	
		3.3V≤VOUT≤3.6V	IOUT=100mA	-	500	700	
			IOUT=150mA	-	800	990	
		4V≤VOUT≤5V	IOUT=100mA	-	500	700	
			IOUT=150mA	-	700	990	
Line Regulation	ΔVLINE	VIN=VOUT+2 to 24V, IOUT=1mA		-	0.1	-	mV/V
Load Regulation	ΔVLOAD	1mA<IOUT<150mA, VIN=7V		-	0.1	-	mV/mA
Limit Current	ILIMIT	VIN=VOUT+2V		-	350	-	mA
Short Current	ISHORT	The Output Short-Circuit Current to the Ground		-	120	-	mA
Power Supply Rejection Ratio	PSRR	VIN=12V, IOUT=1mA, f=1KHz		-	60	-	dB
Thermal Shutdown Temperature	TSHDN	Shutdown, Temp increasing		-	154	-	'C
Thermal Reset Temperature	TSHDN	Reset, Temp increasing		-	125	-	'C

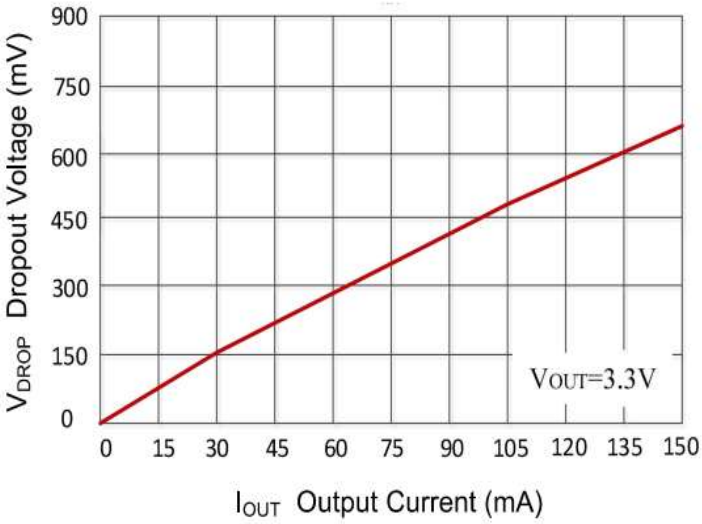
Note2: The dropout voltage is defined as VIN-VOUT, When VOUT is 98% of the normal value of VOUT.

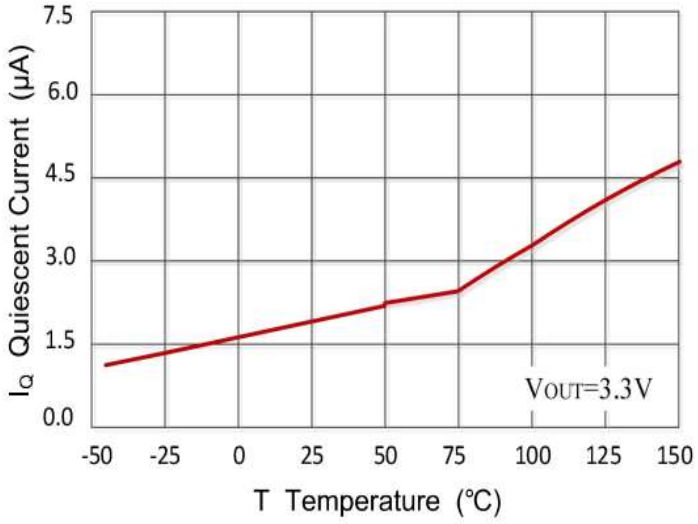
Typical Electrical Curves

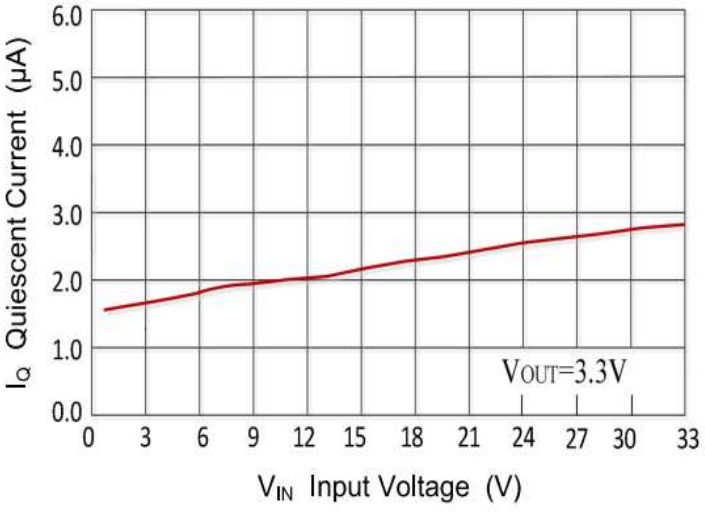
(VIN=VOUT+1V, CIN=1uF, COUT=10uF, TA=25'C, unless otherwise noted.)

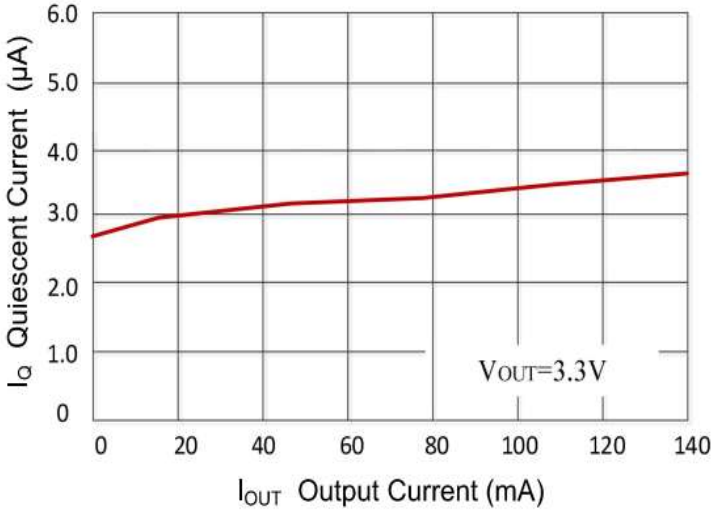








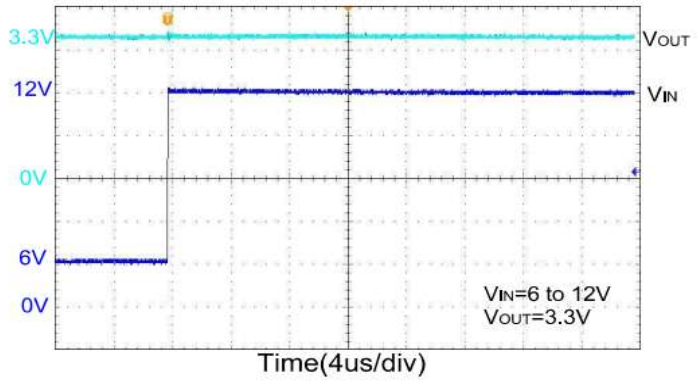




Typical Electrical Curves(Con.)

(VIN=VOUT+1V, CIN=1uF, COUT=10uF, TA=25'C, unless otherwise noted.)

Input jump



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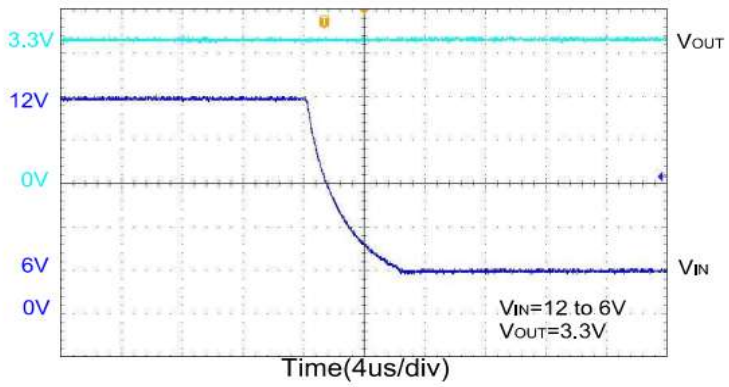

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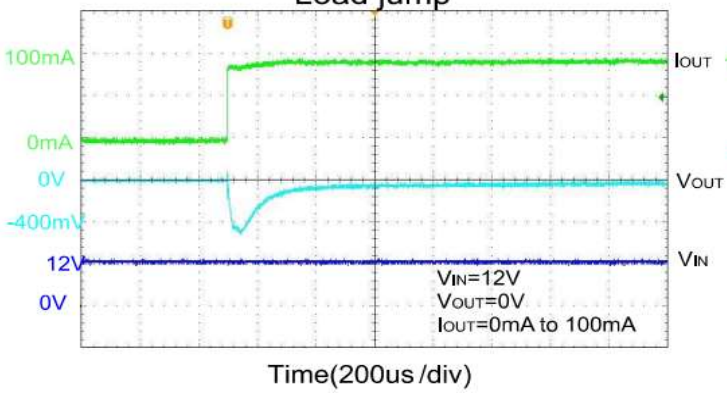

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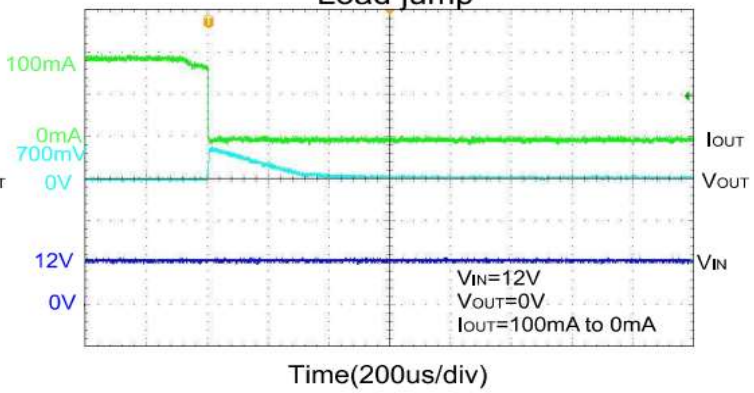
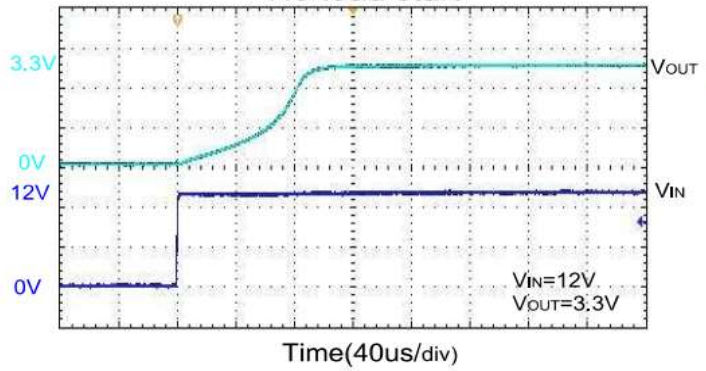
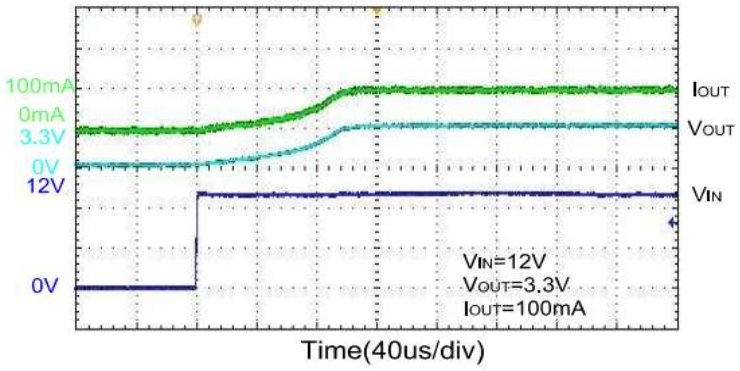


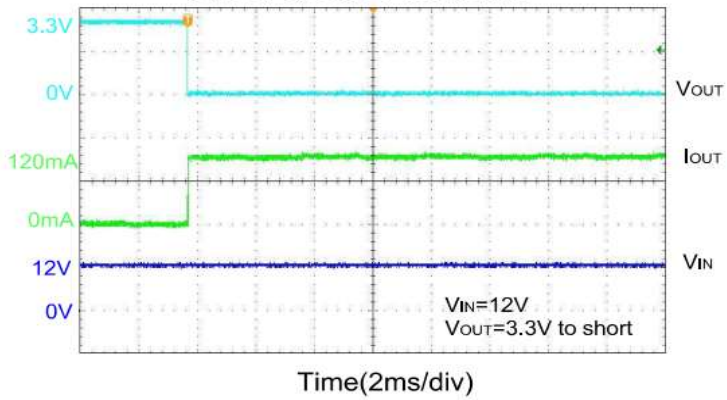
No-load start



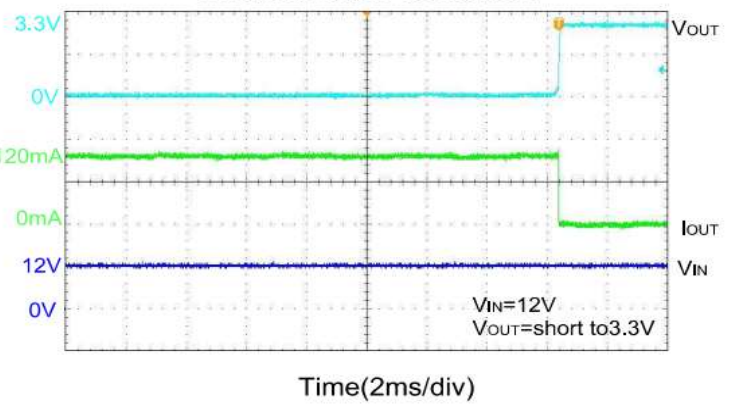
Start with load



Short-circuit Protection



Short-circuit Protection



Function Block Diagram

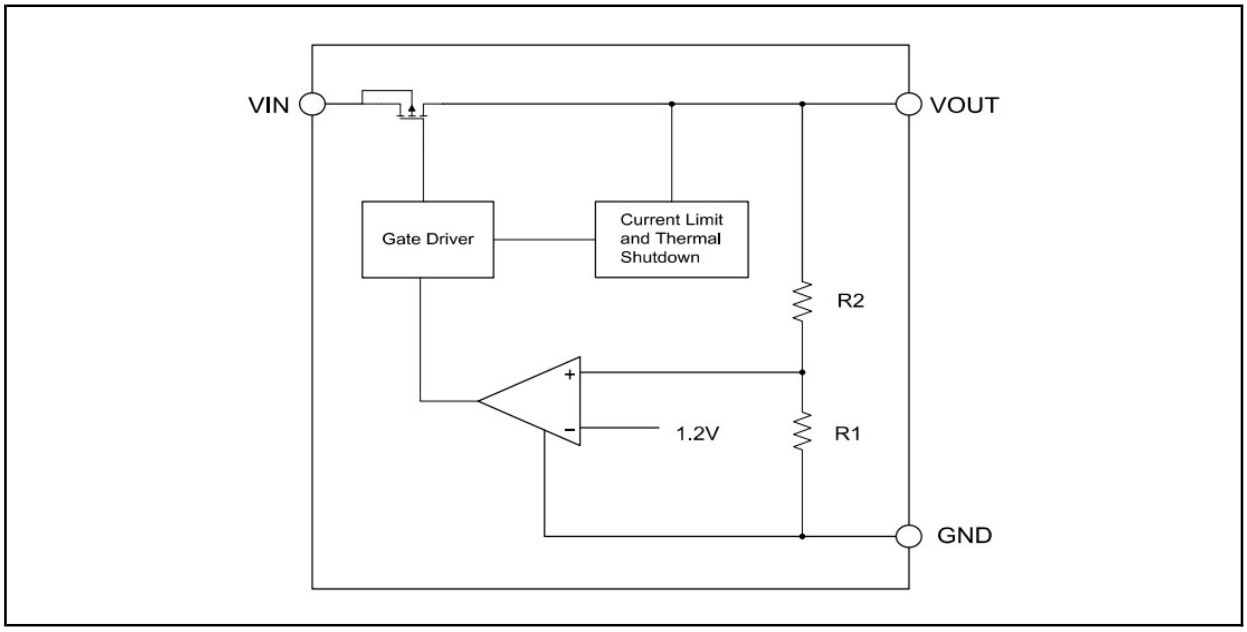


Figure 4. Function Block Diagram

Functional Description

Input Capacitor

A 1uF ceramic capacitor is recommended to connect between VIN and GND pins to decouple input power supply glitch and noise.The amount of the capacitance may be increased without limit. This input capacitor must be located as close as possible to the device to assure input stability and less noise. For PCB layout, a wide copper trace is required for both VIN and GND.

Output Capacitor

An output capacitor is required for the stability of the LDO. The recommended minimum output capacitance is 10uF, ceramic capacitor is recommended, and temperature characteristics are X7R or X5R. Higher capacitance values help to improve load/line transient response. The output capacitance maybe increased to keep low undershoot/overshoot. Place output capacitor as close as possible to V_{OUT} and GND pins.

Current Limit and Short Circuit Protection

When output current at VOUT pin is higher than current limit shreshold or the VOUT pin is direct short to GND, the current limit protection will be triggered and clamp the output current at a pre-designed level to prevent over-current and thermal damage.

Thermal Considerations

For continuous operation, do not exceed absolute maximum junction temperature. The maximum power dissipation depends on the thermal resistance of the IC package, PCB layout, rate of surrounding airflow, and difference between junction to ambient temperature. The maximum power dissipation can be calculated by the following formula:

$$P_{D(MAX)}=(T_{J(MAX)}-T_A)/R_{QJA}$$

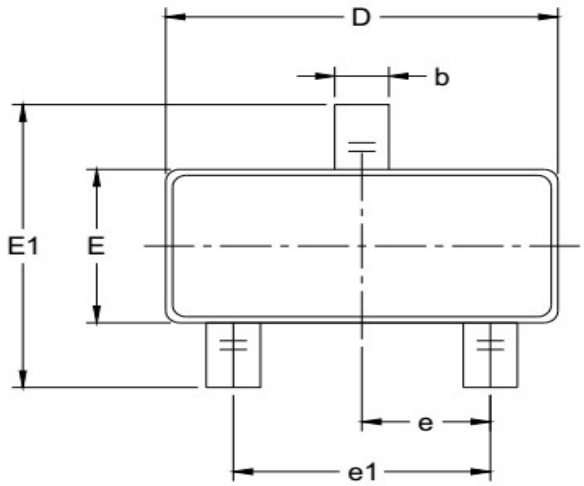
Where TJ(MAX) is the maximum operation junction temperature 125'C,T_A is the ambient temperature and the R_{QJA} is the junction to ambient thermal resistance. The Power dissipation definition in device is:

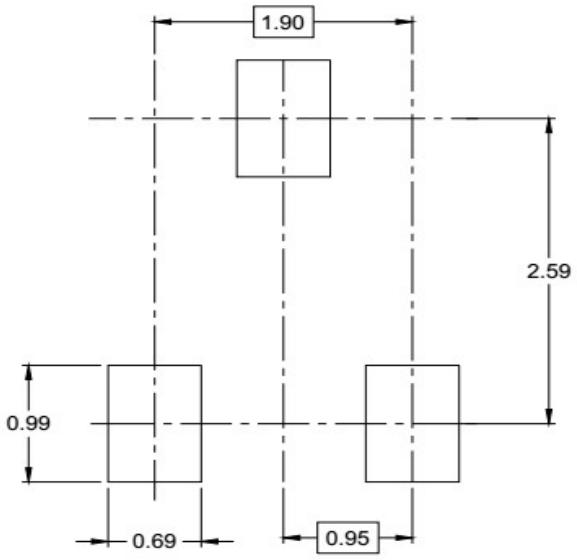
$$P_D=(V_{IN}-V_{OUT})\ X\ I_{OUT}+V_{IN}\ X\ I_Q$$

Mechanical Dimensions

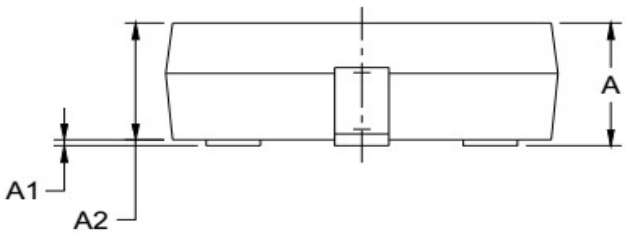
PKG:SOT-23 (M3)

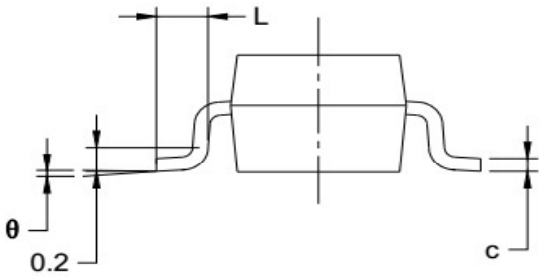
Unit: mm (inch)





RECOMMENDED LAND PATTERN (Unit: mm)



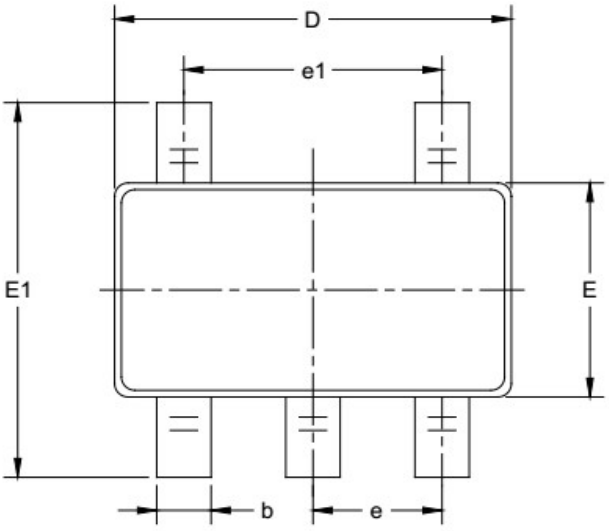


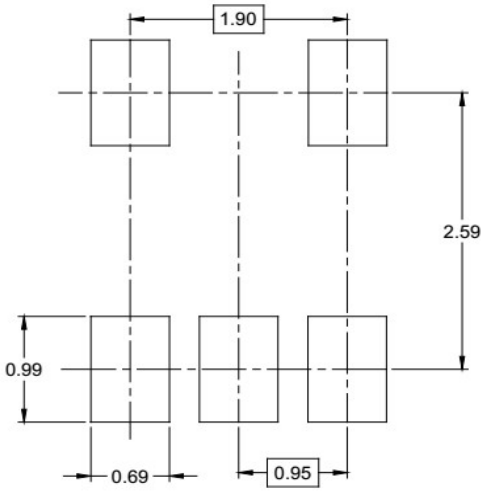
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

Mechanical Dimensions(Con.)

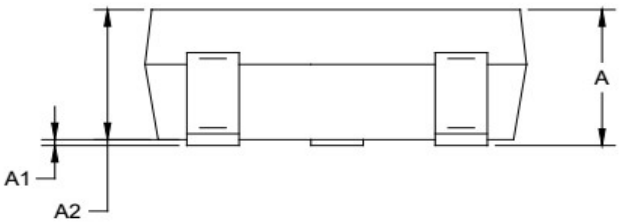
PKG:SOT23-5 (M5)

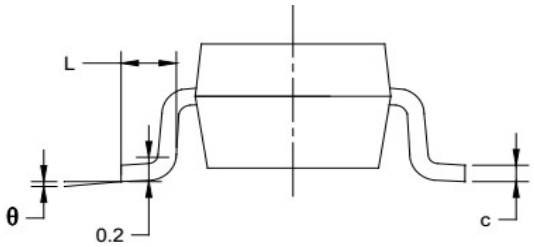
Unit: mm (inch)





RECOMMENDED LAND PATTERN (Unit: mm)



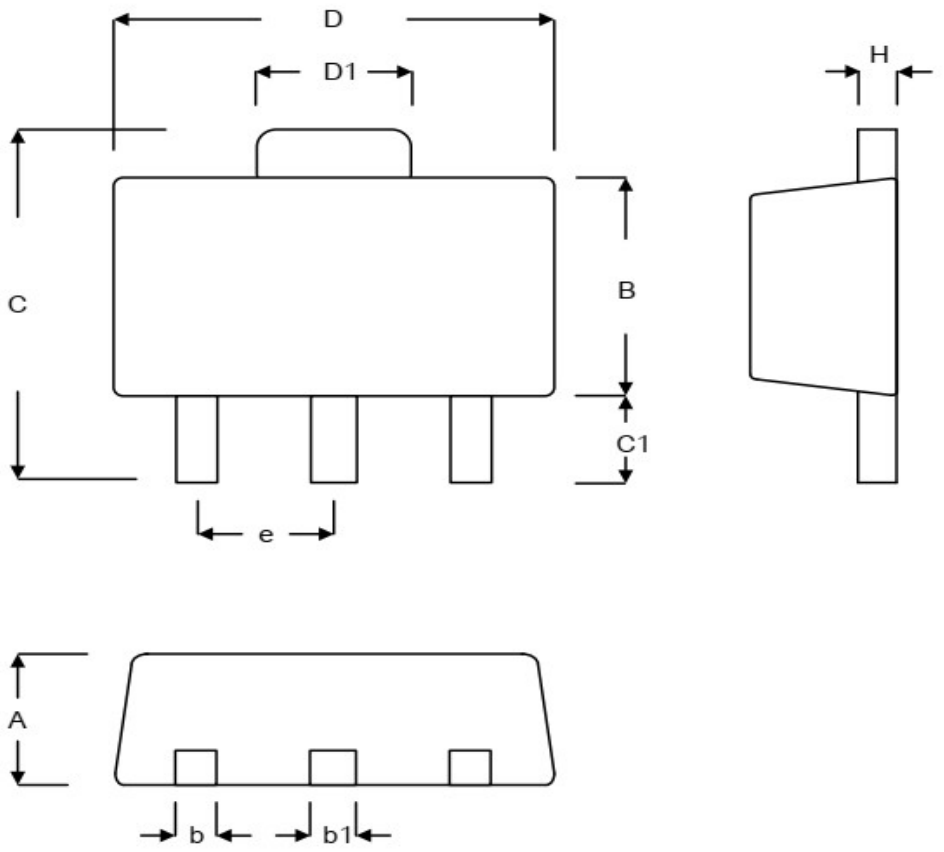


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

Mechanical Dimensions(Con.)

PKG:SOT-89 (M2)

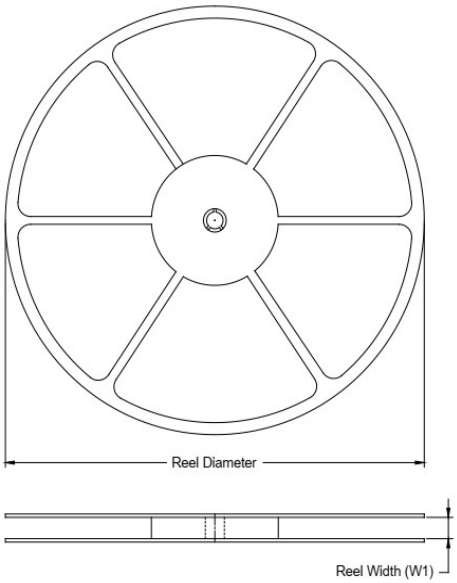
Unit: mm (inch)



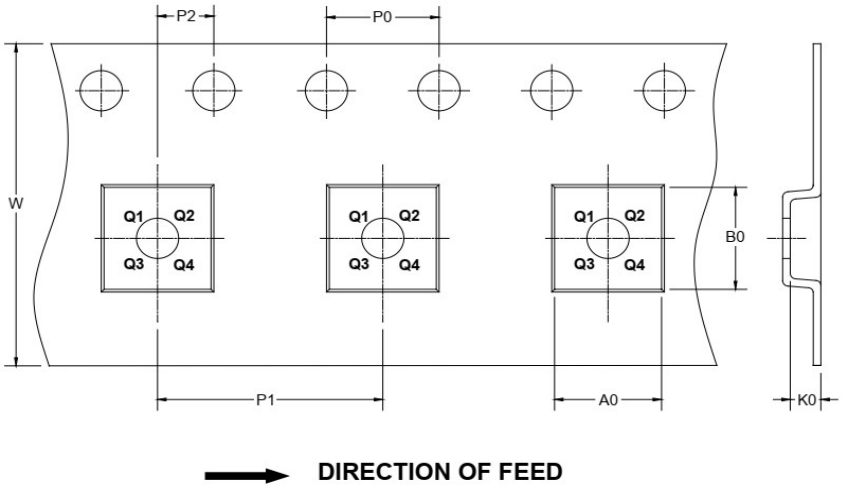
Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.397	1.600	0.055	0.063
b	0.356	0.483	0.014	0.019
B	2.388	2.591	0.094	0.102
b1	0.406	0.533	0.016	0.021
C	3.937	4.242	0.155	0.167
C1	0.787	1.194	0.031	0.047
D	4.394	4.597	0.173	0.181
D1	1.397	1.753	0.055	0.069
e	1.448	1.549	0.057	0.061
H	0.356	0.432	0.014	0.017

Tape and Reel Information

Reel Dimensions



Tape Dimensions



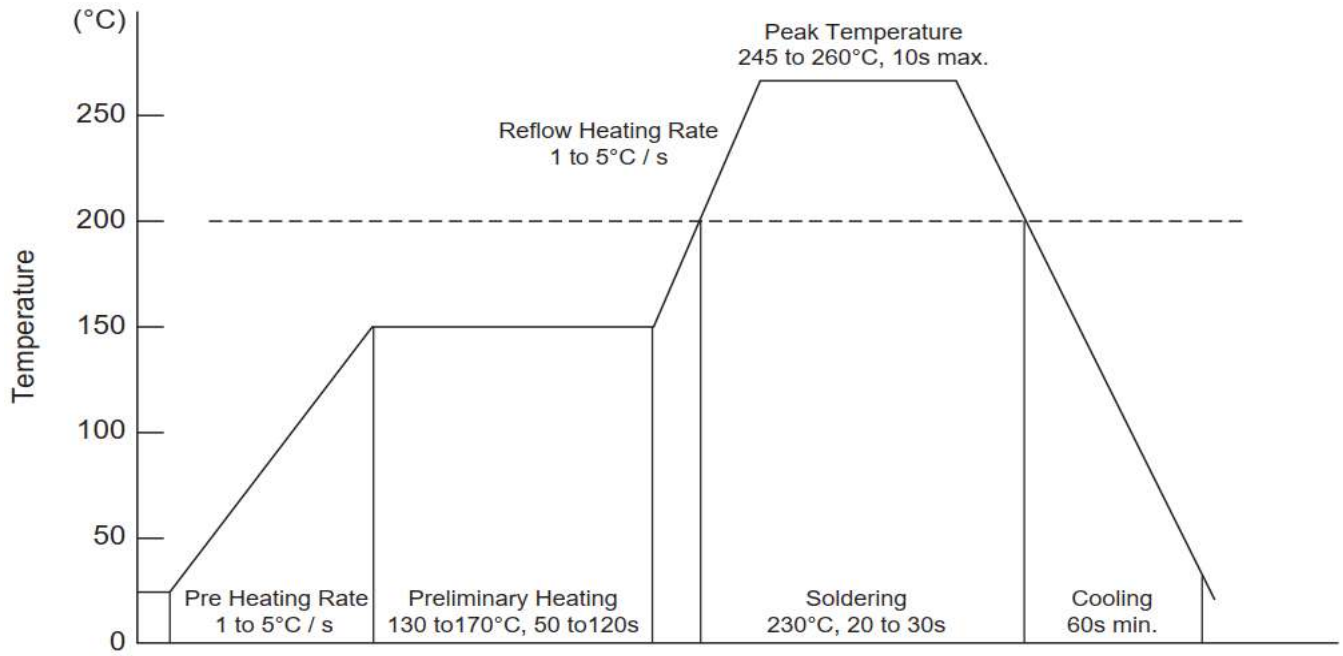
Note: The picture is only for reference. Please make the object as the standard.

Key Parameter list of tape and reel

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT-23	7"	9.5	3.20	3.20	1.40	4.0	4.0	2.0	8.0	Q3
SOT-23-5	7"	9.5	3.20	3.20	1.40	4.0	4.0	2.0	8.0	Q3
SOT-89	7"	13.2	4.85	4.45	1.85	4.0	8.0	2.0	12.0	Q3

Conditins of Soldering and Storage

- **Recommended condition of reflow soldering**



Recommended peak temperature is over 245'C, if peak temperature is below 245'C, you may adjust the following parameters:

* Time length of peak temperature (longer)
* Time length of soldering (longer)
* Thickness of solder paste (thicker)

- **Conditions of hand soldering**

* Temperature : 300'C
* Time : 3s max
* Times : one time

- **Storage conditions**

* Temperature

  5 to 40'C
* Humidity

  30 to 80% RH
* Recommended period

  One year after manufacturing