



ABSOLUTE MAXIMUM RATINGS

IN to GND.....	-0.3V to 6V
EN to GND.....	-0.3V to V_{IN}
OUT, BP/FB to GND.....	-0.3V to $(V_{IN}+0.3V)$
Output Short-Circuit Duration.....	Infinite
Power Dissipation, $P_D@T_A=25$	
SOT-23-5.....	0.4W
SC70-5.....	0.3W
Package Thermal Resistance	
SOT-23-5, J_A	260 $^{\circ}C/W$
SC70-5, J_A	330 $^{\circ}C/W$
Junction Temperature.....	150
Operating Temperature Range.....	-40 to +85
Storage Temperature Range.....	-65 to 150
Lead Temperature (Soldering, 10 sec).....	260
ESD Susceptibility	
HBM.....	2000V
MM.....	200V

NOTE:

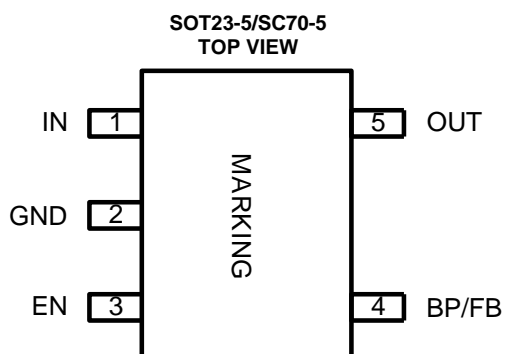
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

CAUTION

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. Broadchip recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

Broadchip reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact Broadchip sales office to get the latest datasheet.

PIN CONFIGURATION



PIN DESCRIPTION

PIN	NAME	FUNCTION
1	IN	Regulator Input. Supply voltage can range from 2.5V to 5.5V. Bypass with a 1uF capacitor to GND.
2	GND	Ground.
3	EN	Shutdown Input. A logic low reduces the supply current to 10nA. Connect to IN for normal operation.
4	BP	Reference-Noise Bypass (fixed voltage version only). Bypass with a low-leakage 0.01uF ceramic capacitor for reduced noise at the output.
	FB	Adjustable Voltage Version Only. This is used to set the output voltage of the device.
5	OUT	Regulator Output.

ELECTRICAL CHARACTERISTICS

($V_{IN} = V_{OUT(NOMINAL)} + 0.5V^{(1)}$, Full = -40 to +85, unless otherwise specified.)

PARAMETER	SYM	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage	V_{IN}		2.5		5.5	V
Output Voltage Accuracy ⁽¹⁾		$I_{OUT}=0.1mA$	-2.5		2.5	%
Maximum Output Current		SOT-23-5		300		mA
		$V_{OUT}=1.2V, 1.5V, 1.8V, SC70-5$		150		
		$V_{OUT}>2V, SC70-5$		250		
Current Limit	I_{LIM}			800		mA
Ground Pin Current	I_Q	No load, EN=2V		100	200	uA
Dropout Voltage ⁽²⁾		$I_{OUT}=1mA$		0.9		mV
		$I_{OUT}=300mA$		270	400	
Line Regulation	V_{LNR}	$V_{IN}=2.5V$ or ($V_{OUT}+0.5V$) to 5.5V, $I_{OUT}=1mA$		0.02	0.05	%/V
Load Regulation	V_{LDR}	$I_{OUT}=0.1mA$ to 300mA, $C_{OUT}=1uF, V_{OUT}>2V$		0.002	0.005	%/mA
		$I_{OUT}=0.1mA$ to 300mA, $C_{OUT}=1uF, V_{OUT} \geq 2V$		0.004	0.008	
Output Voltage Noise	e_n	f=10Hz to 100kHz, $C_{BP}=0.01uF, C_{OUT}=10uF$		30		μV_{RMS}
Power Supply Rejection Ratio	PSRR	$C_{BP}=0.1uF,$ $I_{LOAD}=50mA, C_{OUT}=1uF,$ $V_{IN}=V_{OUT}+1V$	f=217Hz		77	dB
			f=1kHz		74	
SHUTDOWN⁽³⁾						
EN Input Threshold	V_{IH}	$V_{IN}=2.5V$ to 5.5V,		1.5		V
	V_{IL}	$V_{EN}=-0.3V$ to V_{IN}			0.3	
EN Input Bias Current	$I_{B(SHDN)}$	EN=0V or EN=5.5V		0.01	1	uA
Shutdown Supply Current	$I_{Q(SHDN)}$	EN=0.4V		0.01		uA
Shutdown Exit Delay ⁽⁴⁾		$C_{BP}=0.01uF, C_{OUT}=1uF,$ No Load		30		us
THERMAL PROTECTION						
Thermal Shutdown Temperature	T_{SHDN}			150		°C
Thermal Shutdown Hysteresis	T_{SHDN}			15		°C

NOTES:

- $V_{IN} = V_{OUT(NOMINAL)} + 0.5V$ or 2.5V, whichever is greater.
- The dropout voltage is defined as $V_{IN} - V_{OUT}$, when V_{OUT} is 100mV below the value of V_{OUT} for $V_{IN} = V_{OUT} + 0.5V$.
(Only applicable for $V_{OUT} = +2.5V$ to $+5.0V$.)
- $V_{EN} = -0.3V$ to V_{IN}
- Time needed for V_{OUT} to reach 90% of final value.

Ver 1.5



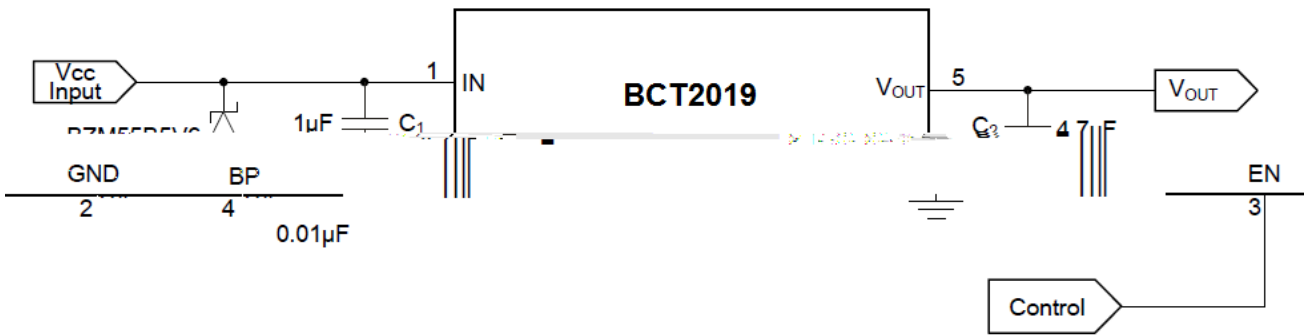
TYPICAL APPLICATION CIRCUIT

Standard 1% Resistor Values for Common Output Voltages of Adjustable Voltage Version

VOUT (V)	R1 (k)	R2 (k)
1.2	0	

APPLICATION NOTE

When LDO is used in handheld products, attention must be paid to voltage spikes which could damage BCT2019. In such applications, voltage spikes will be generated at charger interface and VBUS pin of USB interface when charger adapters and USB equipments are hot-plugged. Besides this, handheld products will be tested on the production line without battery. Test engineer will apply power from the connector pin which connects with positive pole of the battery. When external power supply is turned on suddenly, the voltage spikes will be generated at the battery connector. The voltage spikes will be very high, and it always exceeds the absolute maximum input voltage (6.0V) of LDO. In order to get robust design, design engineer needs to clear up this voltage spike. Zener diode is a cheap and effective solution to eliminate such voltage spike. For example, BZM55B5V6 is a 5.6V small package Zener diode which can be used to remove voltage spikes in cell phone designs. The schematic is shown below.



Bypass Capacitor and Low Noise

Connecting a 22nF between the BP pin and GND pin significantly reduces noise on the regulator output, it is critical that the capacitor connection between the BP pin and GND pin be direct and PCB traces should be as short as possible. There is a relationship between the bypass capacitor value and the LDO regulator turn on time. DC leakage on this pin can affect the LDO regulator output noise and voltage regulation performance.

Enable Function

The BCT2019 features an LDO regulator en-able/disable function. To assure the LDO regulator will switch on; the EN turn on control level must be greater than 1.2 volts. The LDO regulator will go into the shutdown mode when the voltage on the EN pin falls below 0.4 volts. For to protect the system, the BCT2019 have a quick discharge function. If the enable function is not needed in a specific application, it may be tied to VIN to keep the LDO regulator in a continuously on state.

Programming the BCT2019 Adjustable LDO regulator

The output voltage of the BCT2019 adjustable regulator is programmed using an external resistor divider as show in Figure as below. The output voltage is calculated using equation as below:

$$V_{OUT} = V_{REF} \left(1 + \frac{R1}{R2} \right)$$

Where:

$V_{REF}=1.207V$ typ (the internal reference voltage)

Resistors R1 and R2 should be chosen for approximately 50uA divider current. Lower value resistors can



$$P_D(\text{MAX}) = (125^\circ\text{C} - 25^\circ\text{C}) / 250 = 400\text{mW (SOT-23-5)}$$

The maximum power dissipation depends on operating ambient temperature for fixed $T_J(\text{MAX})$ and thermal resistance θ_{JA} . It is also useful to calculate the junction of temperature of the BCT2019 under a set of specific conditions. In this example let the Input voltage $V_{IN}=3.3\text{V}$, the output current $I_o=300\text{mA}$ and the case temperature $T_A=40^\circ\text{C}$ measured by a thermal couple during operation. The power dissipation for the $V_o=2.8\text{V}$ version of the BCT2019 can be calculated as:

$$P_D = (3.3\text{V} - 2.8\text{V}) \times 300\text{mA} + 3.6\text{V} \times 100\mu\text{A} \\ = 150\text{mW}$$

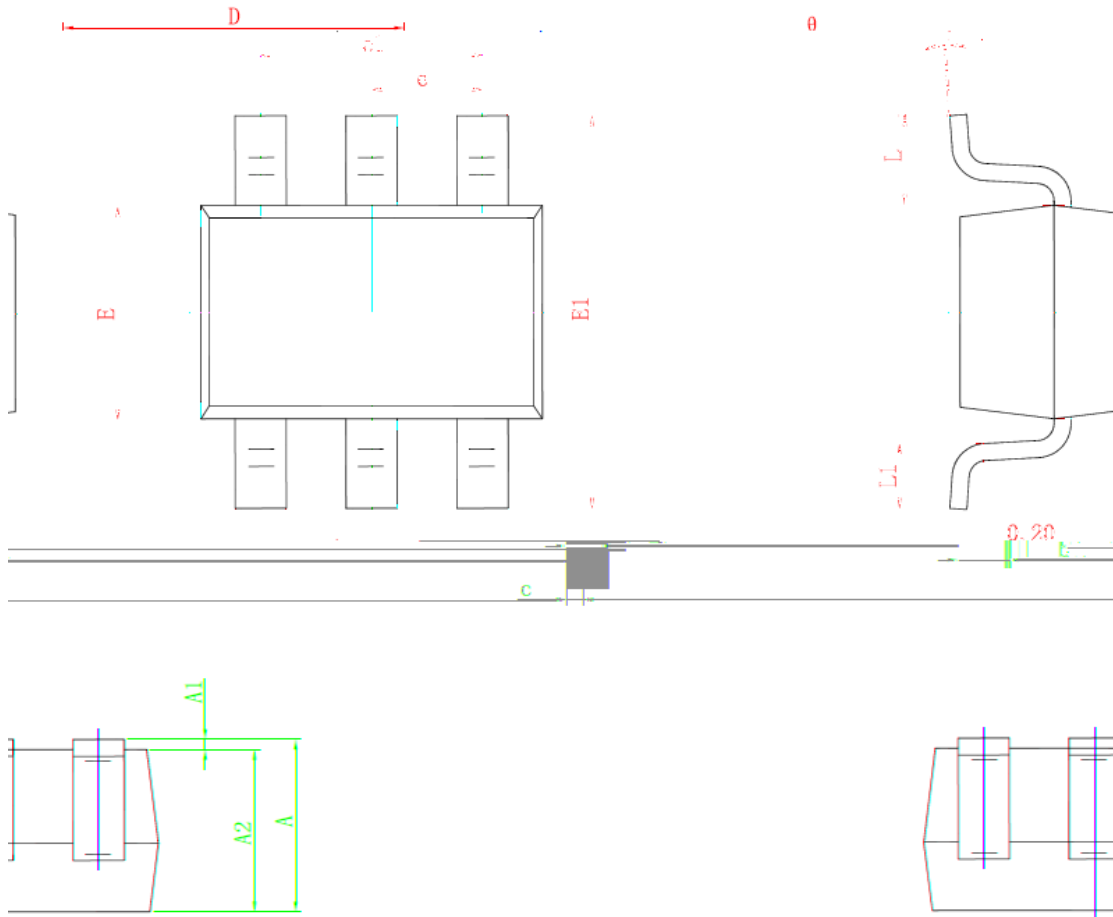
And the junction temperature, T_J , can be calculated as follows:

$$T_J = T_A + P_D \times \theta_{JA} = 40^\circ\text{C} + 0.15\text{W} \times 250^\circ\text{C/W} \\ = 40^\circ\text{C} + 37.5^\circ\text{C} = 77.5^\circ\text{C} < T_J(\text{MAX}) = 125^\circ\text{C}$$

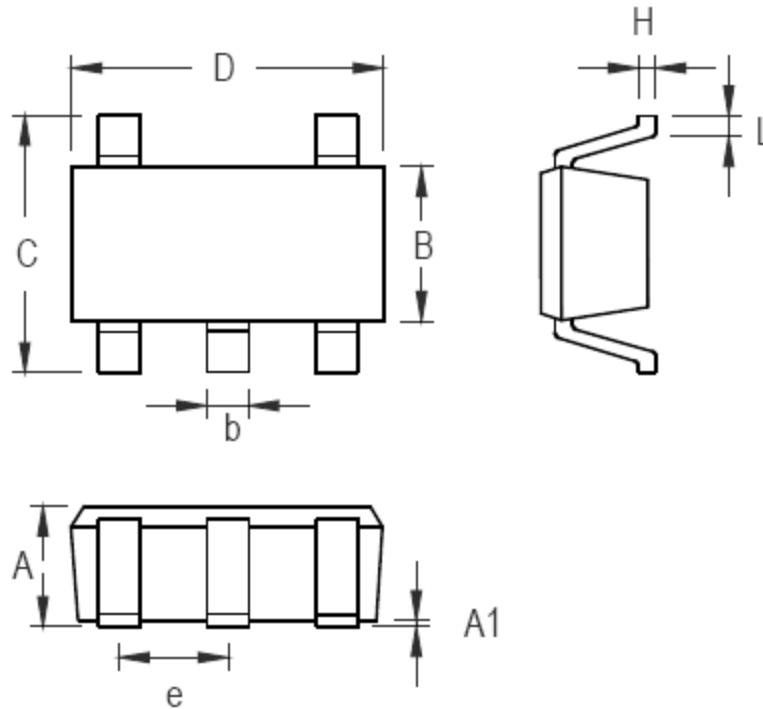
For this operating condition, T_J is lower than the absolute maximum operating junction temperature, 125°C , so it is safe to use the BCT2019 in this configuration.

PACKAGE OUTLINE DIMENSIONS

Packaging Mechanical: SC70 (C)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014

Packaging Mechanical: SOT23-5


Symbol	Dimensions In Millimeters	
	Min	Max
A	1.05	1.15
A1	0.03	0.15
B	1.5	1.7
b	0.28	0.45
C	2.75	3.05
D	2.82	3.02
e	0.95(BSC)	
H	0.12	0.23
L	0.35	0.55

SOT-23-5 Surface Mount Package