
BCT2020**Low Power, Low Dropout, RF-Linear Regulators****GENERAL DESCRIPTION**

The BCT2020 series low-power, low-dropout, CMOS linear voltage regulators operate from a 1.6V to 5.5V input voltage and deliver up to 300mA output current. They are the perfect choice for low voltage, low power applications. A low ground current makes this part attractive for battery operated power systems. The BCT2020 series also offer low dropout voltage to prolong battery life in portable electronics. Systems requiring a quiet voltage source, such as RF applications, will benefit from the BCT2020 series low output noise and high PSRR.

Other features include a 10nA logic-controlled shutdown mode, short current limit and thermal shutdown protection.

The BCT2020 has auto-discharge function to quickly discharge VOUT in the disable status.

The BCT2020 is available in Green SOT23-5 , SC70-5, UTDFN1X1-4L packages. It operates over an ambient temperature range of -40°C to +85°C .

FEATURES

- Low Dropout Voltage
- Thermal Overload Protection
- Built-In Fold Back Protection Circuit
- 20μA Low Supply Current
- 10nA Logic-Controlled Shutdown
- 1.6V to 5.5V Input Voltage Range
- Fixed Outputs of 1.2V, 1.8V, 2.8V, 3.0V, and 3.3V
- Adjustable Output from 0.8V to 5.0V
- Short Auto-Discharge Function
- 300mA Output Current
- High Output Voltage Accuracy
- Quick Start-Up Time
- -40°C to +85°C Operating Temperature Range
- Available in Green SOT23-5 , SC70-5, UTDFN1X1-4L Packages

APPLICATIONS

Cellular Telephones
Cordless Telephones
PCMCIA Cards
Modems
MP3 Player
Hand-Held Instruments
Palmtop Computers
Electronic Planners
Portable/Battery-Powered Equipment

ORDERING INFORMATION

Order Number	V _{OUT} (V)	Package Type	Temperature Range	Marking	QTY/Reel
BCT2020EUK12-TR	1.2	SOT23-5	-40°C to +85°C	K2XX	3000
BCT2020EUK18-TR	1.8	SOT23-5	-40°C to +85°C	K8XX	3000
BCT2020EUK28-TR	2.8	SOT23-5	-40°C to +85°C	K8XX	3000
BCT2020EUK30-TR	3.0	SOT23-5	-40°C to +85°C	K0XX	3000
BCT2020EUK33-TR	3.3	SOT23-5	-40°C to +85°C	K3XX	3000
BCT2020EUKAJ-TR	ADJ	SOT23-5	-40°C to +85°C	KJXX	3000
BCT2020EXK12-TR	1.2	SC70-5	-40°C to +85°C	K2XX	3000
BCT2020EXK18-TR	1.8	SC70-5	-40°C to +85°C	K8XX	3000
BCT2020EXK28-TR	2.8	SC70-5	-40°C to +85°C	K8XX	3000
BCT2020EXK30-TR	3.0	SC70-5	-40°C to +85°C	K0XX	3000
BCT2020EXK33-TR	3.3	SC70-5	-40°C to +85°C	K3XX	3000
BCT2020EXKAJ-TR	ADJ	SC70-5	-40°C to +85°C	KJXX	3000
BCT2020ELS12-TR	1.2	UTDFN1x1-4L	-40°C to +85°C	B2X	10000
BCT2020ELS18-TR	1.8	UTDFN1x1-4L	-40°C to +85°C	B8X	10000
BCT2020ELS28-TR	2.8	UTDFN1x1-4L	-40°C to +85°C	B8X	10000
BCT2020ELS30-TR	3.0	UTDFN1x1-4L	-40°C to +85°C	B0X	10000
BCT2020ELS33-TR	3.3	UTDFN1x1-4L	-40°C to +85°C	B3X	10000

Note:

"X" or "XX" in Marking will be appeared as the batch code.



BCT2020

Low Power, Low Dropout RF-Linear Regulators

ABSOLUTE MAXIMUM RATINGS

IN to GND.....	-0.3V to 6.0V
Output Short-Circuit Duration.....	Infinite
EN to GND.....	-0.3V to 6.0V
OUT,BP/FB to GND.....	-0.3V to (VIN +0.3V)
Power Dissipation, $P_D@T_A=25^{\circ}\text{C}$	
SOT23-5.....	0.48W
SC70-5.....	0.38W
UTDFN1x1-4L.....	0.45W
Package Thermal Resistance	
SOT23-5, θ_{JA}	260°C/W
SC70-5, θ_{JA}	330°C/W
UTDFN1x1-4L, θ_{JA}	280°C/W
Junction Temperature.....	150°C
Storage Temperature Range.....	-65°C to 150°C
Lead Temperature (Soldering, 10 sec).....	260°C
ESD Susceptibility	
HBM.....	4000V
MM.....	400V

RECOMMENDED OPERATING CONDITIONS

Operating Voltage Range.....	1.6V to 5.5V
Operating Temperature Range	-40°C to $+85^{\circ}\text{C}$

OVERSTRESS CAUTION

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.

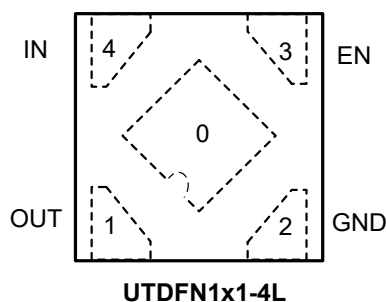
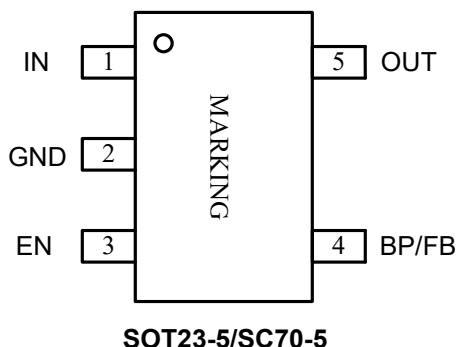
ESD SENSITIVITY CAUTION

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.

DISCLAIMER

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 (TOP VIEW)



PIN DESCRIPTION

PIN		NAME	FUNCTION
SOT23-5 SC70-5	UTDFN 1X1-4L		
1	4	IN	Regulator Input. Supply voltage can range from 1.6V to 5.5V. Bypass with a 1 μ F capacitor to GND.
2	2	GND	Ground.
3	3	EN	Enable Pin. This pin has an internal pull-down resistor. A logic low reduces the supply current to less than 1 μ A. Connect to IN for normal operation.
4	-	BP	Reference-Noise Bypass Pin (fixed voltage version only). Bypass with a low-leakage 0.01 μ F ceramic capacitor for reduced noise at the output. The capacitor is recommended to be placed very close to the pin for high PSRR. (Note, It can be floated, but don't connect the BP pin to any DC Voltage.)
		FB	Adjustable Voltage Version Only. This is used to set the output voltage of the device.
5	1	OUT	Regulator Output.
-	0	Exposed Pad	The exposed pad should be connected to a large ground plane to maximize thermal performance.

ELECTRICAL CHARACTERISTICS

(($V_{IN} = V_{OUT(NOMINAL)} + 0.5V$ or $1.6V$, whichever is greater, Full = $-40^{\circ}C$ to $+85^{\circ}C$, unless otherwise noted.))

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
Input Voltage	V_{IN}			$+25^{\circ}C$	1.6		5.5	V
Output Voltage Accuracy		$I_{OUT} = 0.1mA$		$+25^{\circ}C$	-2.5		+2.5	%
Feedback Voltage	V_{FB}	$I_{OUT} = 0.1mA$, BCT2020-ADJ		$+25^{\circ}C$	0.78	0.8	0.82	V
Maximum Output Current (1)				$+25^{\circ}C$	300			mA
Current Limit	I_{LIM}			$+25^{\circ}C$	360	560		mA
Supply Pin Current	I_Q	No Load, $V_{EN} = V_{IN}$		$+25^{\circ}C$		20	26	μA
Dropout Voltage (2)	V_{DROP}	$I_{OUT} = 300mA$	$1.2V \leq V_{OUT} < 1.8V$	$+25^{\circ}C$		590	800	mV
			$1.8V \leq V_{OUT} < 2.5V$	$+25^{\circ}C$		320	420	
			$2.5V \leq V_{OUT} < 3.0V$	$+25^{\circ}C$		215	280	
			$3.0V \leq V_{OUT} < 3.6V$	$+25^{\circ}C$		190	250	
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	$V_{IN} = 1.6V$ or $(V_{OUT} + 0.5V)$ to $5.5V$, $I_{OUT} = 1mA$	$1.8V \leq V_{OUT} \leq 3.3V$	$+25^{\circ}C$		0.01	0.06	%V
			$V_{OUT} < 1.8V$ or $V_{OUT} > 3.3V$	$+25^{\circ}C$		0.01	0.1	
Load Regulation	ΔV_{OUT}	$I_{OUT} = 0.1mA$ to $300mA$		$+25^{\circ}C$		12	40	mV
Short Current Limit	I_{SHORT}	$V_{OUT} = 0V$		$+25^{\circ}C$		200		mA
Power Supply Rejection Ratio	PSRR	$C_{BP} = 0\mu F$, $I_{OUT} = 30mA$, $C_{OUT} = 1\mu F$, $V_{IN} = V_{OUT} + 1V$, $\Delta V_{RIPPLE} = 0.2V_{P-P}$	$f = 217Hz$	$+25^{\circ}C$		80		dB
			$f = 1kHz$	$+25^{\circ}C$		70		
		$C_{BP} = 0.01\mu F$, $I_{OUT} = 30mA$, $C_{OUT} = 1\mu F$, $V_{IN} = V_{OUT} + 1V$, $\Delta V_{RIPPLE} = 0.2V_{P-P}$	$f = 217Hz$	$+25^{\circ}C$		82		
			$f = 1kHz$	$+25^{\circ}C$		70		
Output Voltage Noise	e_n	$C_{BP} = 0\mu F$, $f = 10Hz$ to $100kHz$, $C_{OUT} = 1\mu F$, $V_{OUT} = 1.8V$	$I_{OUT} = 0mA$	$+25^{\circ}C$		100		μV_{RMS}
			$I_{OUT} = 30mA$	$+25^{\circ}C$		200		
		$C_{BP} = 0.01\mu F$, $f = 10Hz$ to $100kHz$, $C_{OUT} = 1\mu F$, $V_{OUT} = 1.8V$	$I_{OUT} = 0mA$	$+25^{\circ}C$		30		
			$I_{OUT} = 30mA$	$+25^{\circ}C$		75		
Output Voltage Temperature Coefficient (3)	$\frac{\Delta V_{OUT}}{\Delta T_A \times V_{OUT}}$	$I_{OUT} = 0.1mA$		Full		30		ppm/ $^{\circ}C$

ELECTRICAL CHARACTERISTICS (Continued)

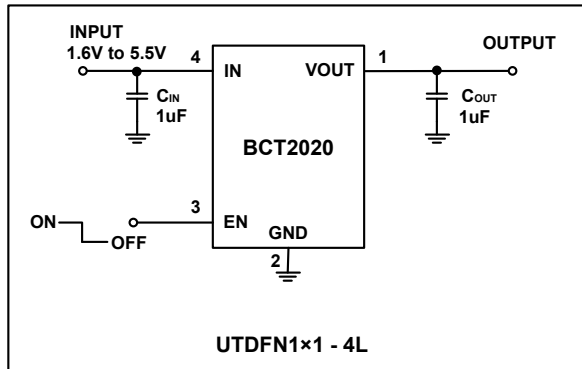
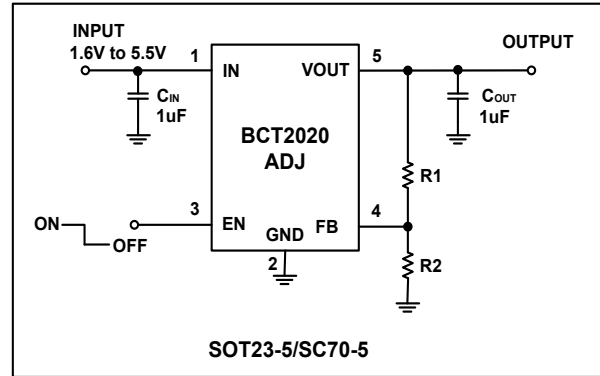
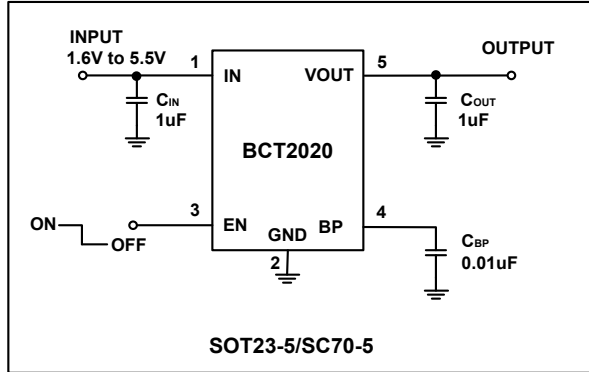
(($V_{IN} = V_{OUT(NOMINAL)} + 0.5V$ or $1.6V$, whichever is greater, Full = $-40^{\circ}C$ to $+85^{\circ}C$, unless otherwise noted.))

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
SHUTDOWN							
EN Input Threshold	V_{IH}	$V_{IN} = 1.6V$ to $5.5V$	Full	1.5			V
	V_{IL}		Full			0.4	
EN Input Bias Current	I_{BH}	$V_{EN} = 5.5V$	Full		0.8	2	μA
	I_{BL}	$V_{EN} = 0V$	Full		0.01	1	
Shutdown Supply Current	I_{SHDN}	$V_{EN} = 0V$	Full		0.01	1	μA
Start-Up Time ⁽⁴⁾	t_{STR}	$C_{OUT} = 1\mu F$, No Load, $C_{BP} = 0\mu F$	$+25^{\circ}C$		30		μs
R_{ON} of Discharge MOSFET		$V_{IN} = 4.0V$, $V_{EN} = 0V$	$+25^{\circ}C$		50		Ω
THERMAL PROTECTION							
Thermal Shutdown Temperature	T_{SHDN}				140		$^{\circ}C$
Thermal Shutdown Hysteresis	ΔT_{SHDN}				15		$^{\circ}C$

NOTES:

- Maximum output current is affected by the PCB layout, size of metal trace, the thermal conduction path between metal layers, ambient temperature and the other environment factors of system. Attention should be paid to the dropout voltage when $V_{IN} < V_{OUT} + V_{DROP}$.
- The dropout voltage is defined as $V_{IN} - V_{OUT}$, when V_{OUT} is 100mV below the value of V_{OUT} .
- Output voltage temperature coefficient is defined as the worst-case voltage change divided by the total temperature range.
- Time needed for V_{OUT} to reach 90% of final value.

TYPICAL APPLICATION CIRCUIT

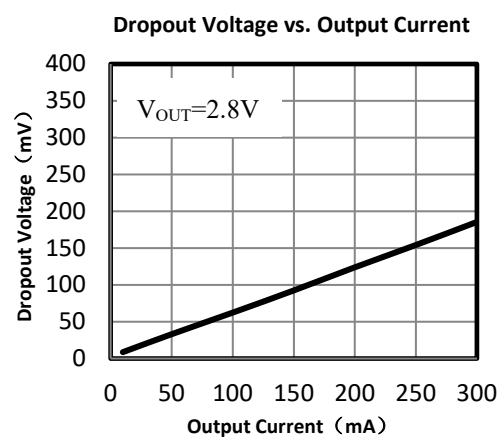
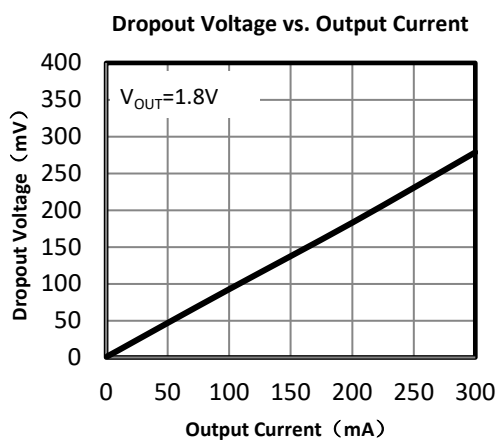
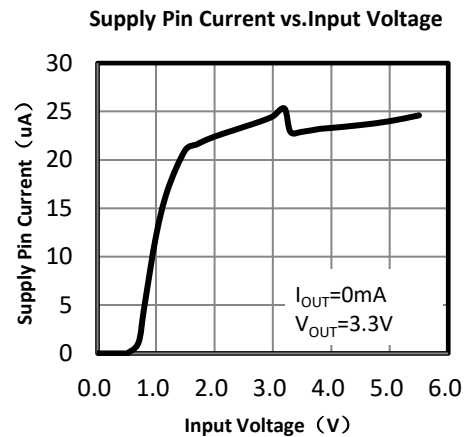
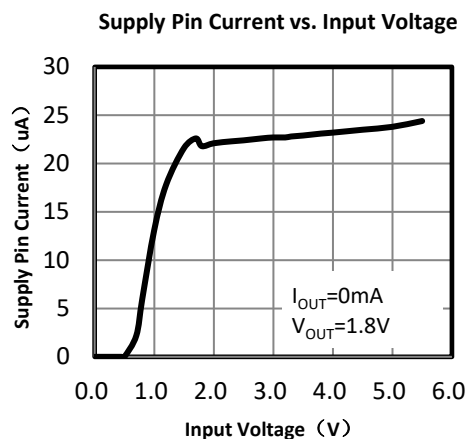
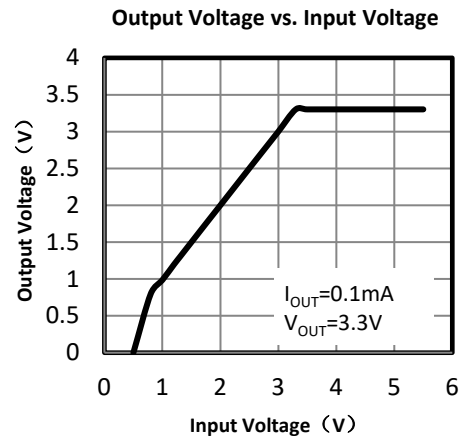
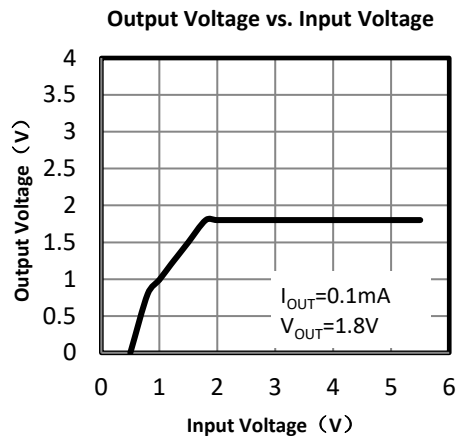


NOTES: Choose R2 = 160kΩ to maintain a 5μA minimum load.
Calculate the value for R1 using the following equation:

$$R_1 = R_2 \times \left(\frac{V_{OUT}}{0.8V} - 1 \right)$$

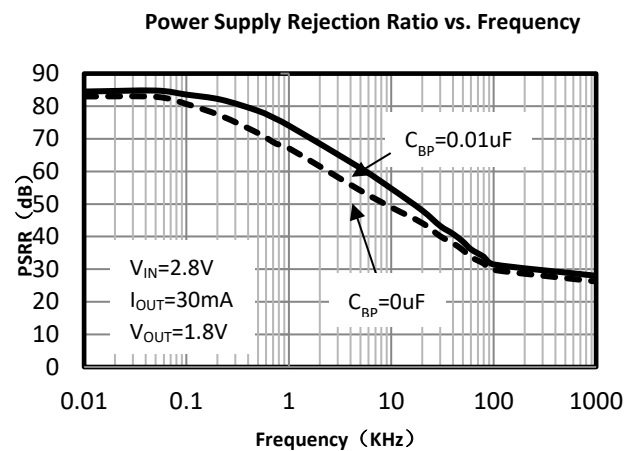
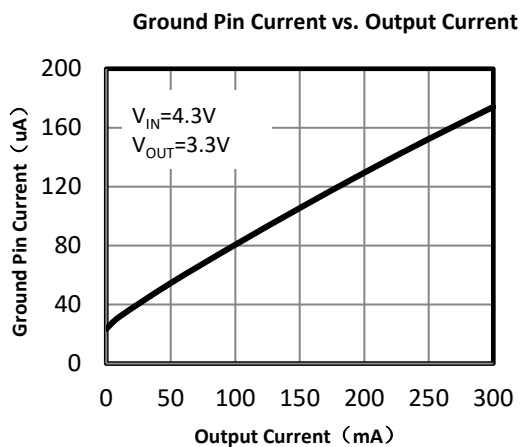
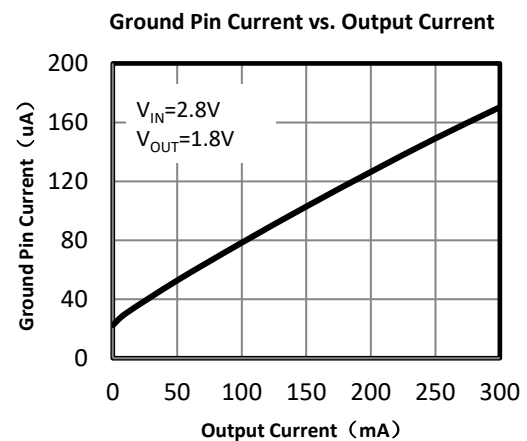
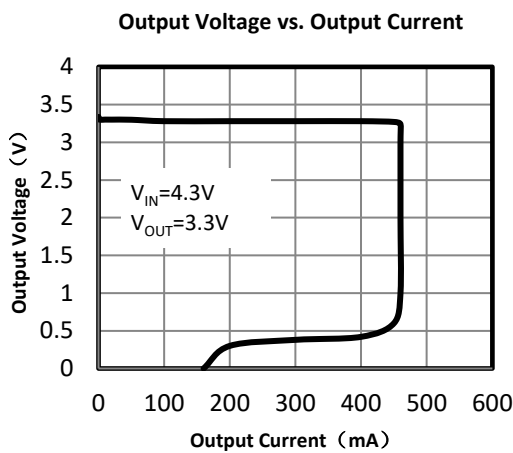
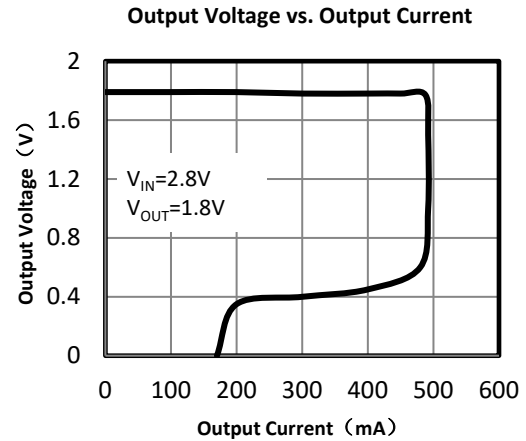
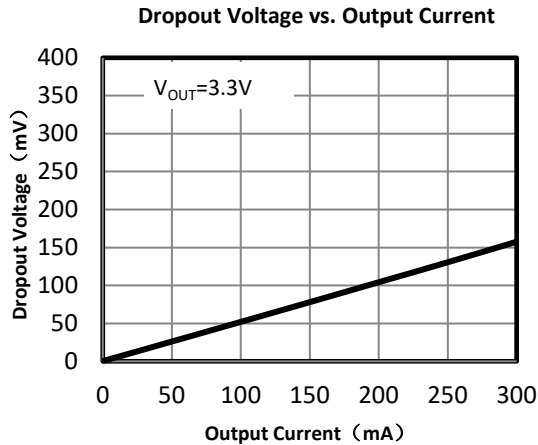
TYPICAL PERFORMANCE CHARACTERISTICS

$V_{EN} = V_{IN}$, $C_{IN} = 1\mu F$, $C_{OUT} = 1\mu F$, $C_{BP} = 0\mu F$, $T_A = +25^\circ C$, unless otherwise noted.



TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

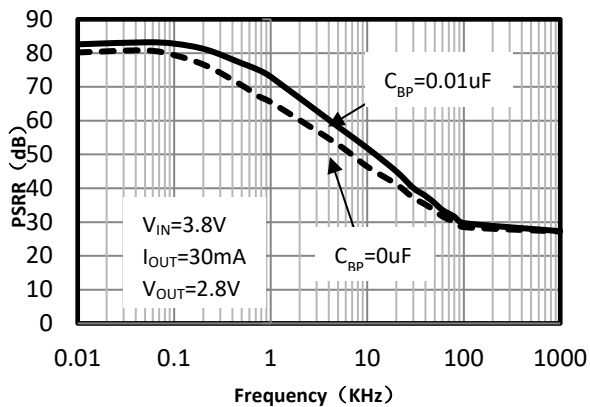
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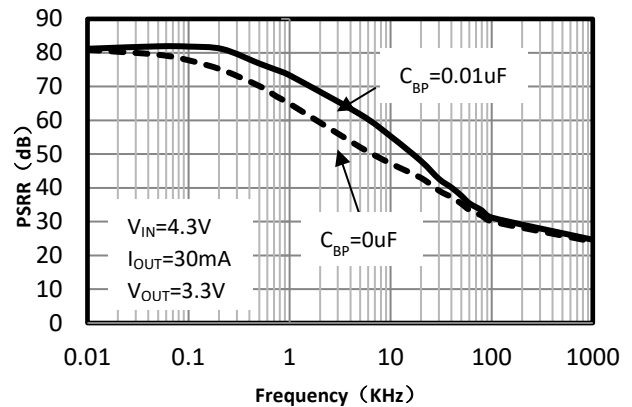
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

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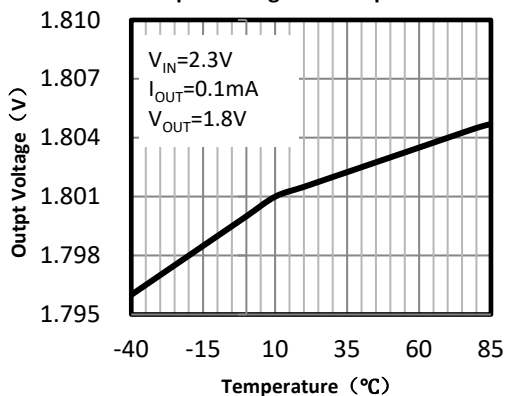
Power Supply Rejection Ratio vs. Frequency



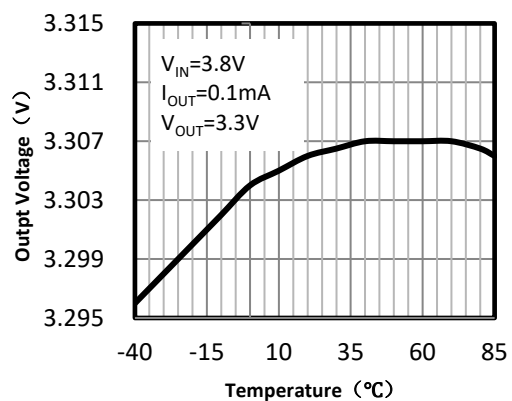
Power Supply Rejection Ratio vs. Frequency



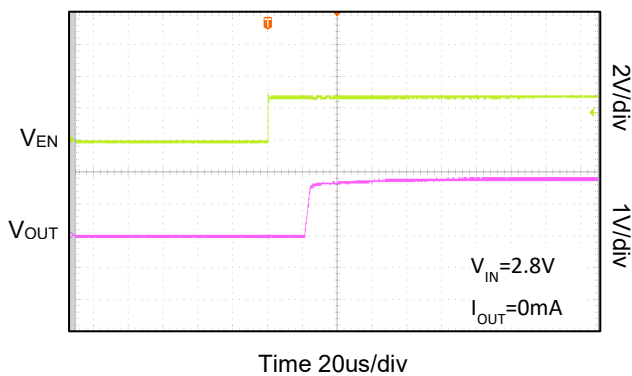
Output Voltage vs. Temperature



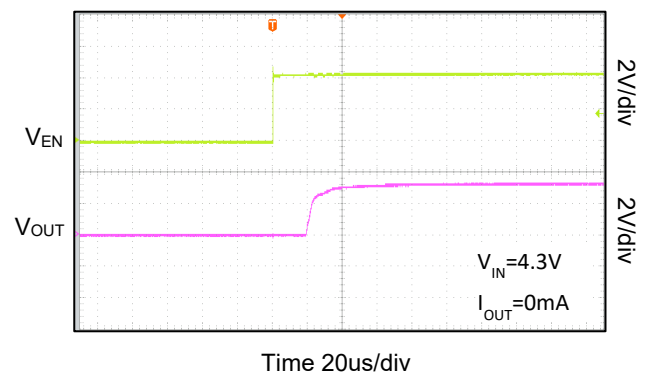
Output Voltage vs. Temperature



Start up from EN ($V_{OUT}=1.8V$)

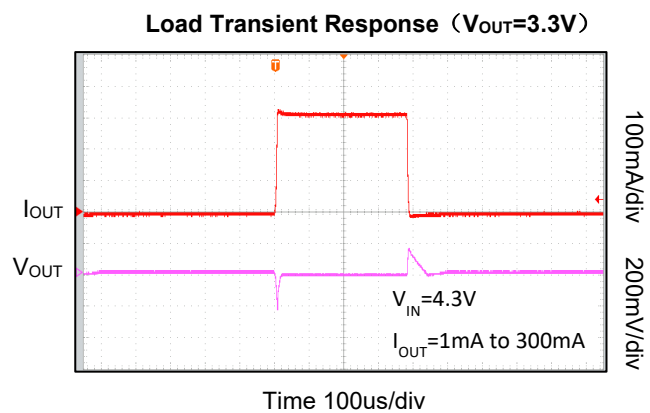
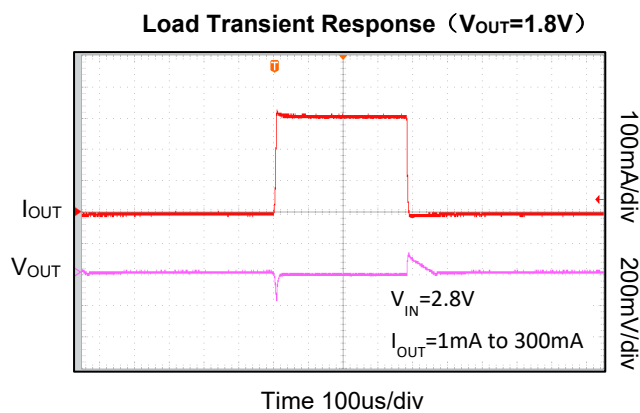
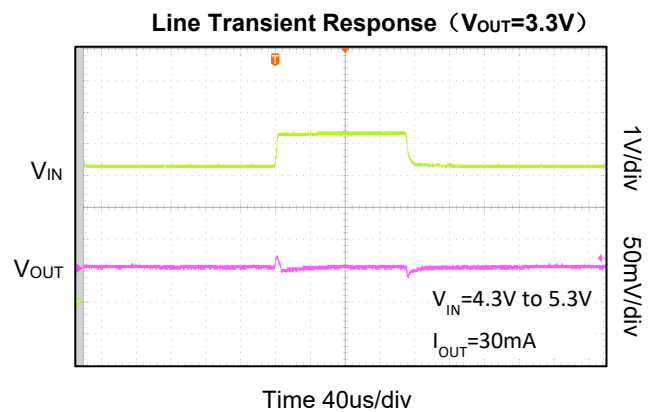
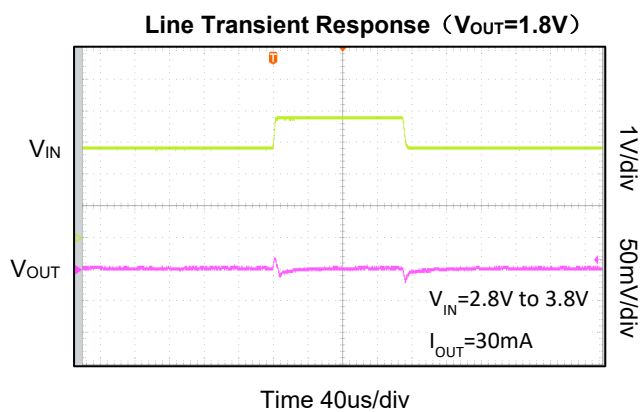
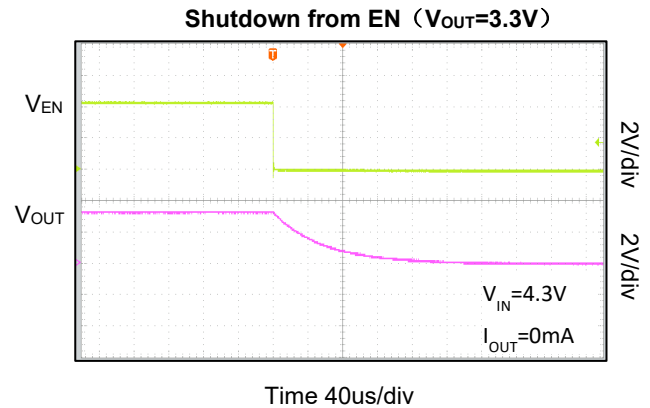
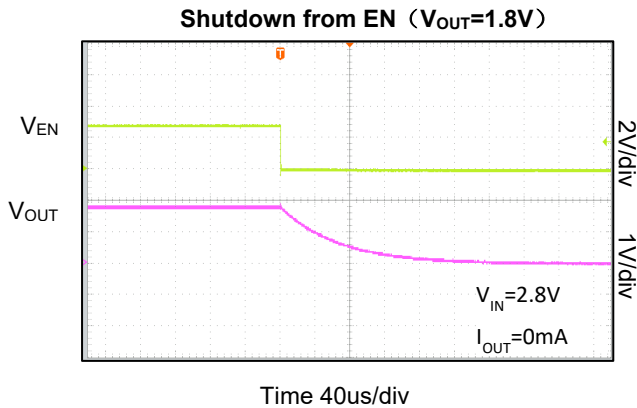


Start up from EN ($V_{OUT}=3.3V$)



TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

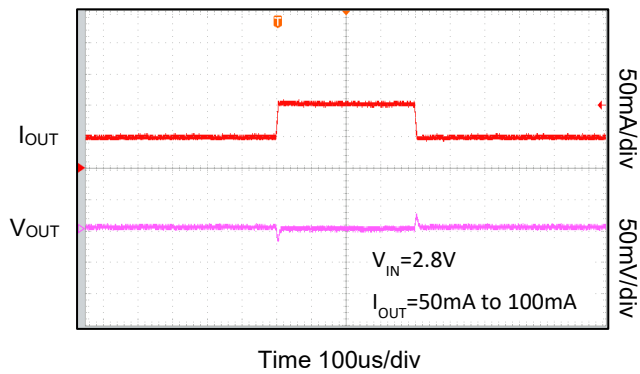
$V_{EN} = V_{IN}$, $C_{IN} = 1\mu F$, $C_{OUT} = 1\mu F$, $C_{BP} = 0\mu F$, $T_A = +25^\circ C$, unless otherwise noted.



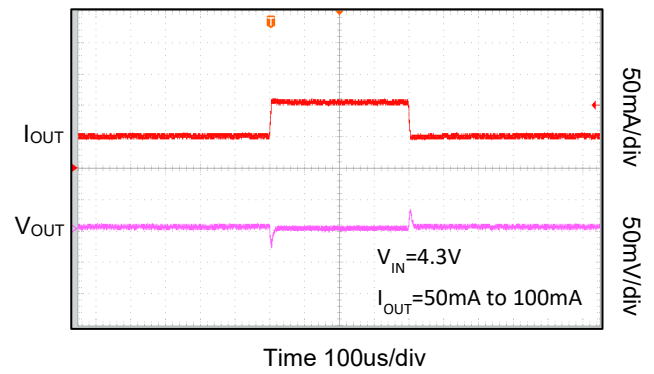
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

$V_{EN} = V_{IN}$, $C_{IN} = 1\mu F$, $C_{OUT} = 1\mu F$, $C_{BP} = 0\mu F$, $T_A = +25^\circ C$, unless otherwise noted.

Load Transient Response ($V_{OUT}=1.8V$)

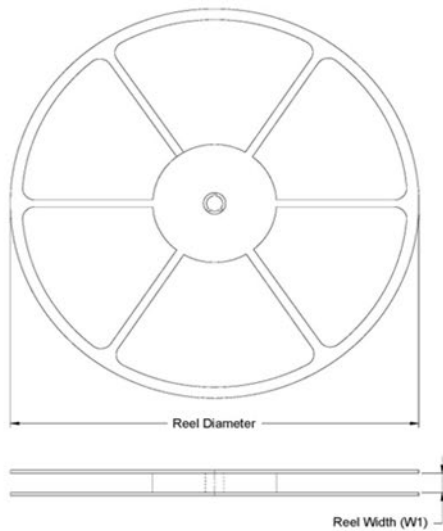


Load Transient Response ($V_{OUT}=3.3V$)

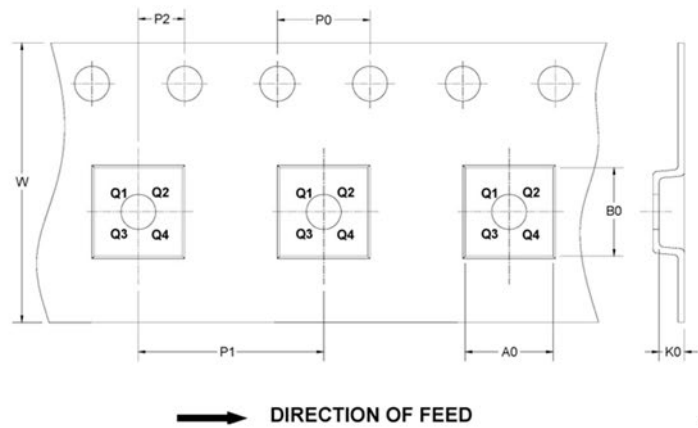


TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



KEY PARAMETER LIST OF TAPE AND REEL

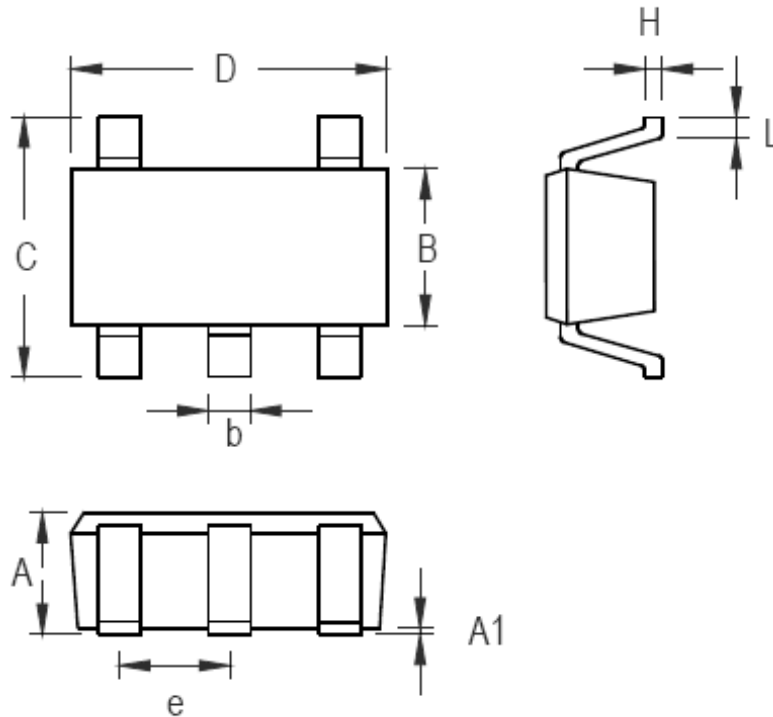
Device Name	Package Type	Reel Diameter	Unit: mm								Pin 1 Quadrant	Reel Q'ty
			Reel Width W1	A0	B0	K0	P0	P1	P2	W		
BCT2020EUKXX-TR	SOT23-5	7"	9	3.2	3.18	1.38	4	4	2	8	Q3	3000
BCT2020EXKXX-TR	SC70-5	7"	9.5	2.3	2.3	1.1	4	4	2	8	Q3	3000
BCT2020ELSXX-TR	UTDFN1x1-4L	7"	9.5	1.16	1.16	0.5	4	2	2	8	Q1	10000

Notes:

1. The above picture is for reference only, please refer to the value in the table below for the actual size.
2. For Pin 1 Orientation, please check the physical reel before use.

PACKAGE OUTLINE DIMENSIONS

SOT23-5

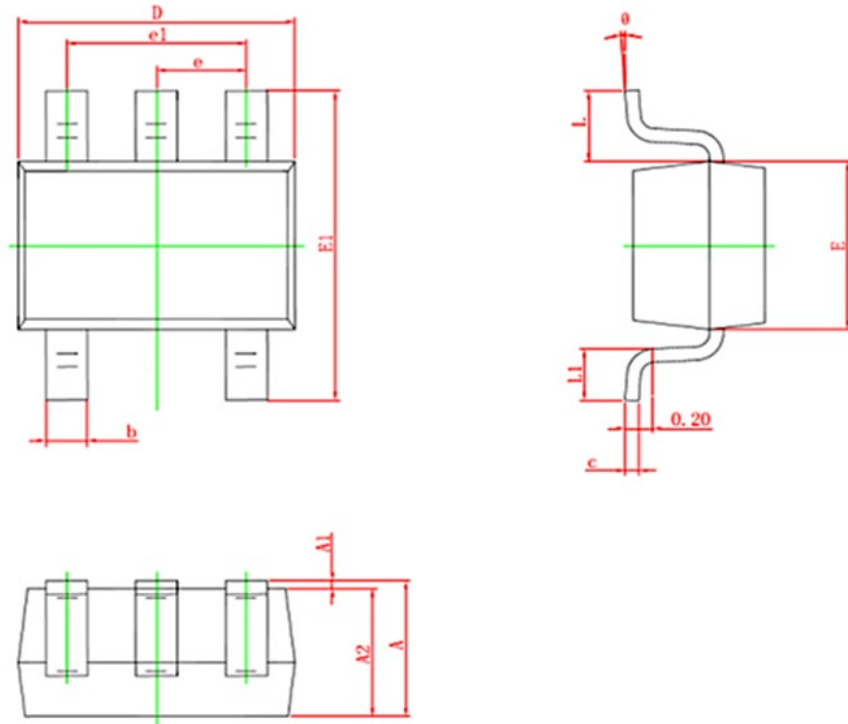


Symbol	Dimensions In Millimeters	
	Min	Max
A	1.05	1.15
A1	0.03	0.15
B	1.5	1.7
b	0.28	0.45
C	2.75	3.05
D	2.82	3.02
e	0.95(BSC)	
H	0.12	0.23
L	0.35	0.55

SOT23-5 Surface Mount Package

PACKAGE OUTLINE DIMENSIONS (Continued)

SC70-5

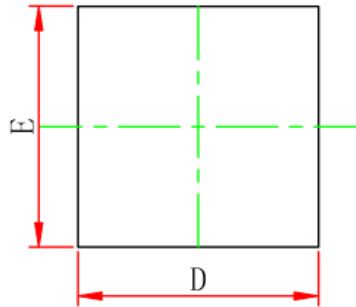


Symbol	Dimensions In Millimeters	
	Min.	Max.
A	0.900	1.100
A1	0.000	0.100
A2	0.900	1.000
b	0.150	0.350
c	0.110	0.175
D	2.000	2.200
E	1.150	1.350
E1	2.150	2.450
e	0.650 TYP.	
e1	1.200	1.400
L	0.525 REF.	
L1	0.260	0.460
θ	0°	8°

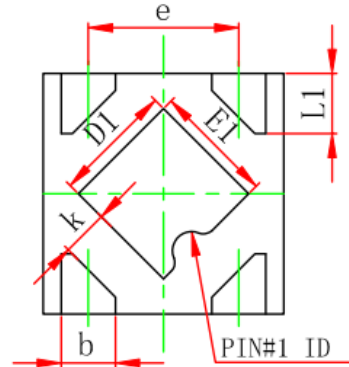
SC70-5 Surface Mount Package

PACKAGE OUTLINE DIMENSIONS (Continued)

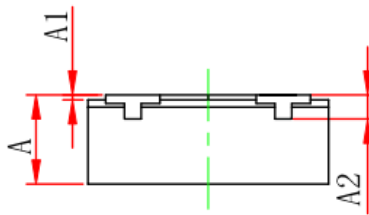
UTDFN1x1-4L



TOP VIEW



BOTTOM VIEW



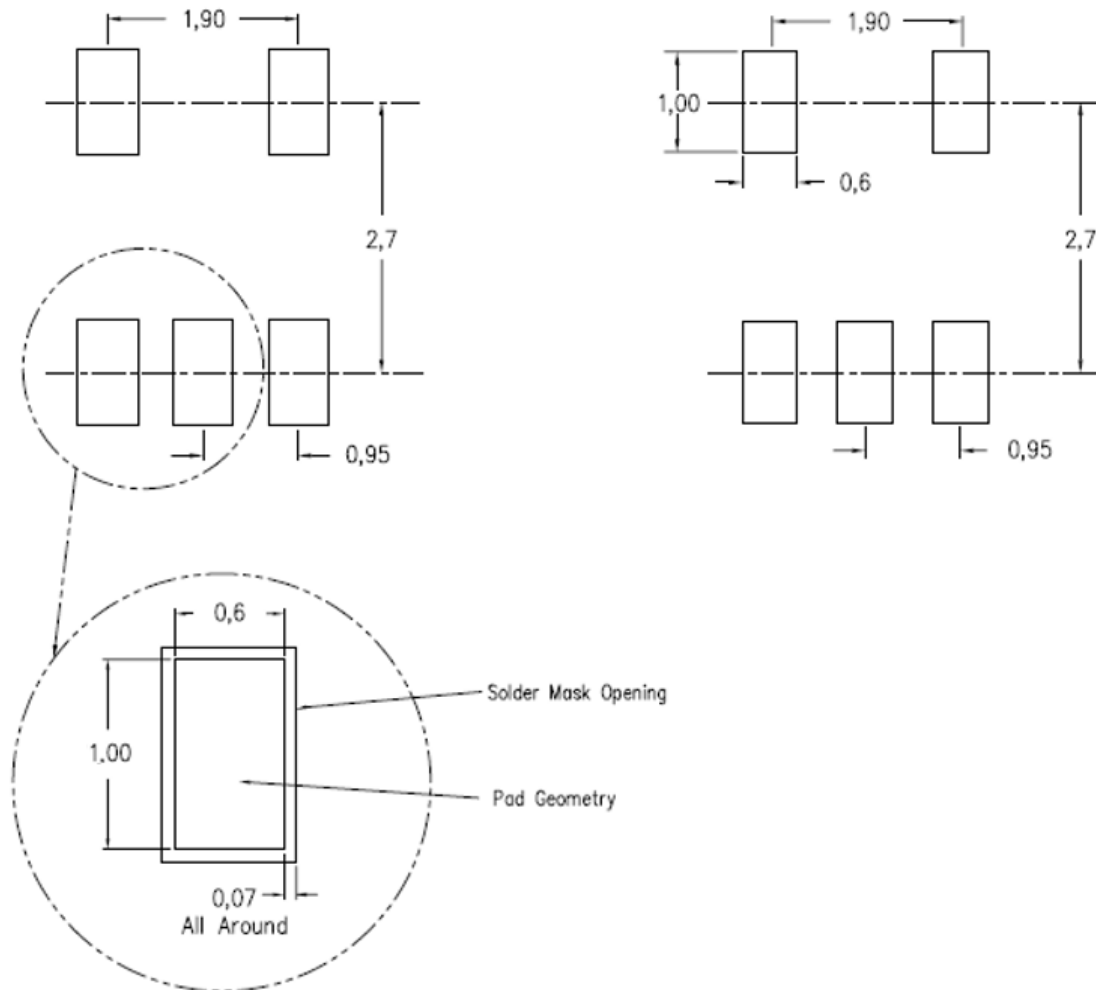
SIDE VIEW

Symbol	Dimensions In Millimeters	
	Min	Max
A	0.335	0.405
A1	0.000	0.050
A2	0.100 REF	
D	0.950	1.050
D1	0.450	0.550
E	0.950	1.050
E1	0.450	0.550
K	0.195 REF	
b	0.175	0.275
e	0.575	0.675
L	0.200	0.300

UTDFN1x1-4L Surface Mount Package

LAND PATTERN DATA

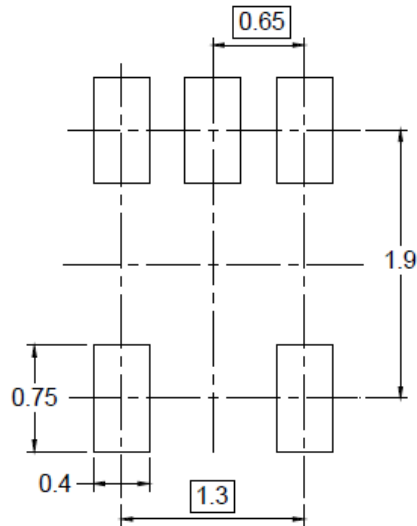
SOT23-5



RECOMMENDED PCB LAYOUT PATTERN (Unit: mm)

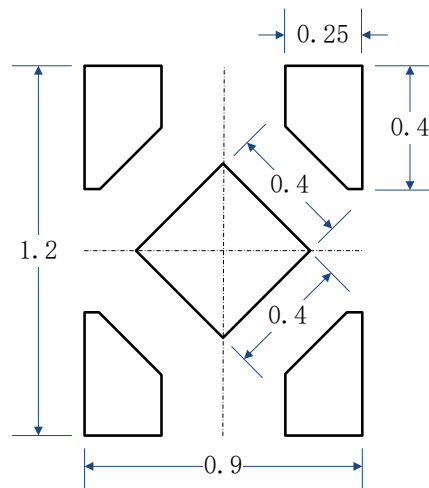
LAND PATTERN DATA (Continued)

SC70-5



RECOMMENDED PCB LAYOUT PATTERN (Unit: mm)

UTDFN1x1-4L



RECOMMENDED PCB LAYOUT PATTERN (Unit: mm)