
BCT2021

70dB, 300mA, Fast Response Linear Regulators

GENERAL DESCRIPTION

The BCT2021 series are low power, High PSRR , Fast Response CMOS linear voltage regulators. The BCT2021 is optimized for wide variety of applications by supporting an input voltage range from 1.6V to 6V. This device features an internal soft-start to lower the inrush current which provides a controlled voltage to the load and minimizes the input voltage drop during start up.

Other features include a shutdown mode, current limit, Foldback current Limit and thermal shutdown protection.

The BCT2021 is available in Green SOT23-3 SOT23-5, SC70-5 and UTDFN1x1-4L packages. It operates over an ambient temperature range of -40°C to +85°C.

FEATURES

- Excellent Load and Line Transient Response
- High PSRR(70dB at 1KHz)
- 300mA Output Current
- 35μA Ground Current at no Load
- 1.6V to 6V Input Voltage Range
- Fixed Output Voltage 1.0V, 1.2V, 1.8V, 2.5V, 2.8V, 3.0V, 3.3V
- Thermal-Overload Protection
- Quick_discharge Function
- Undervoltage Lockout Function
- Output Current Limit
- Foldback Current Limit
- Soft start time 130us
- Available in Green SOT23-3 , SOT23-5 , SC70-5, UTDFN1x1-4L Packages

APPLICATIONS

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

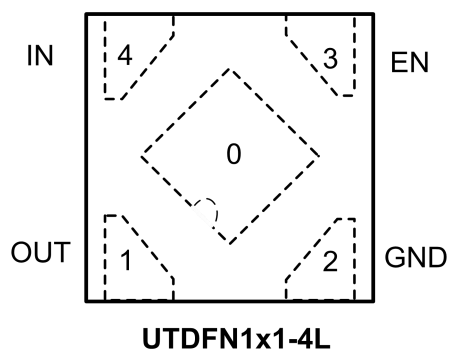
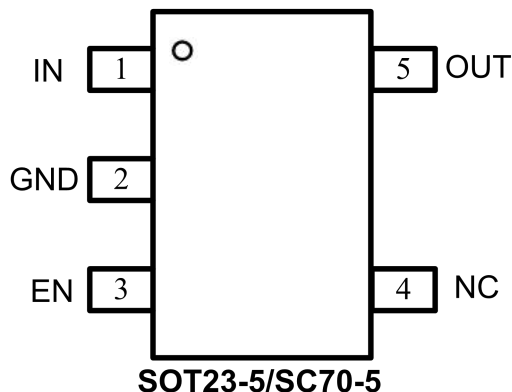
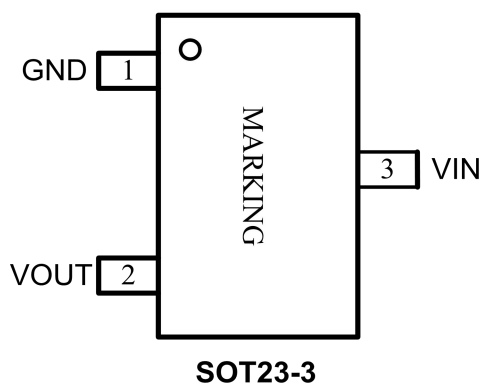
ORDERING INFORMATION

Order Number	V _{OUT} (V)	Package Type	Temperature Range	Marking	QTY/Reel
BCT2021EUK10-TR	1.0	SOT23-5	-40°C to +85°C	b0XX	3000
BCT2021EUK12-TR	1.2	SOT23-5	-40°C to +85°C	b2XX	3000
BCT2021EUK18-TR	1.8	SOT23-5	-40°C to +85°C	bKXX	3000
BCT2021EUK25-TR	2.5	SOT23-5	-40°C to +85°C	b5XX	3000
BCT2021EUK28-TR	2.8	SOT23-5	-40°C to +85°C	bKXX	3000
BCT2021EUK30-TR	3.0	SOT23-5	-40°C to +85°C	b0XX	3000
BCT2021EUK33-TR	3.3	SOT23-5	-40°C to +85°C	b3XX	3000
BCT2021EUR10-TR	1.0	SOT23-3	-40°C to +85°C	b0XX	3000
BCT2021EUR12-TR	1.2	SOT23-3	-40°C to +85°C	b2XX	3000
BCT2021EUR18-TR	1.8	SOT23-3	-40°C to +85°C	bKXX	3000
BCT2021EUR25-TR	2.5	SOT23-3	-40°C to +85°C	b5XX	3000
BCT2021EUR28-TR	2.8	SOT23-3	-40°C to +85°C	bKXX	3000
BCT2021EUR30-TR	3.0	SOT23-3	-40°C to +85°C	b0XX	3000
BCT2021EUR33-TR	3.3	SOT23-3	-40°C to +85°C	b3XX	3000
BCT2021EXK10-TR	1.0	SC70-5	-40°C to +85°C	b0XX	3000
BCT2021EXK12-TR	1.2	SC70-5	-40°C to +85°C	b2XX	3000
BCT2021EXK18-TR	1.8	SC70-5	-40°C to +85°C	bKXX	3000
BCT2021EXK25-TR	2.5	SC70-5	-40°C to +85°C	b5XX	3000
BCT2021EXK28-TR	2.8	SC70-5	-40°C to +85°C	bKXX	3000
BCT2021EXK30-TR	3.0	SC70-5	-40°C to +85°C	b0XX	3000
BCT2021EXK33-TR	3.3	SC70-5	-40°C to +85°C	b3XX	3000
BCT2021ELS10-TR	1.0	UTDFN1x1-4L	-40°C to +85°C	b0X	10000
BCT2021ELS12-TR	1.2	UTDFN1x1-4L	-40°C to +85°C	b2X	10000
BCT2021ELS18-TR	1.8	UTDFN1x1-4L	-40°C to +85°C	bKX	10000
BCT2021ELS25-TR	2.5	UTDFN1x1-4L	-40°C to +85°C	b5X	10000
BCT2021ELS28-TR	2.8	UTDFN1x1-4L	-40°C to +85°C	bKX	10000
BCT2021ELS30-TR	3.0	UTDFN1x1-4L	-40°C to +85°C	b0X	10000
BCT2021ELS33-TR	3.3	UTDFN1x1-4L	-40°C to +85°C	b3X	10000

Note: "b" in Marking is product short code for BCT2021.

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

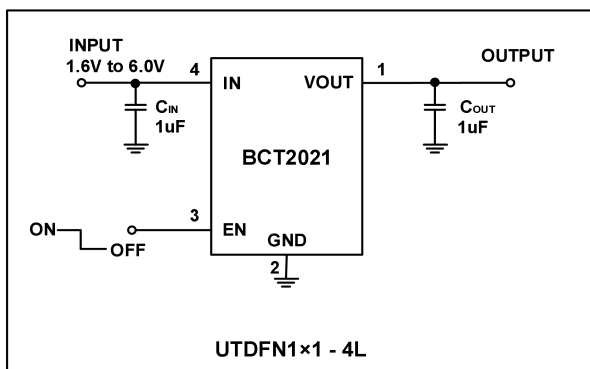
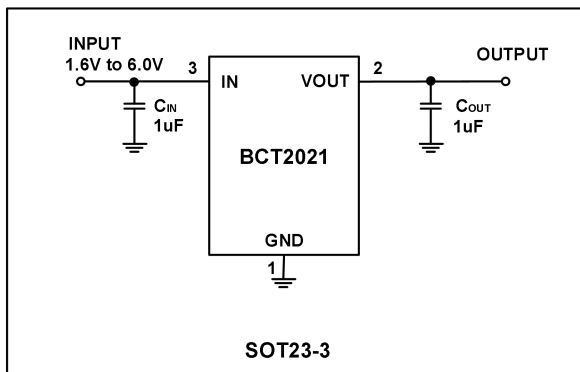
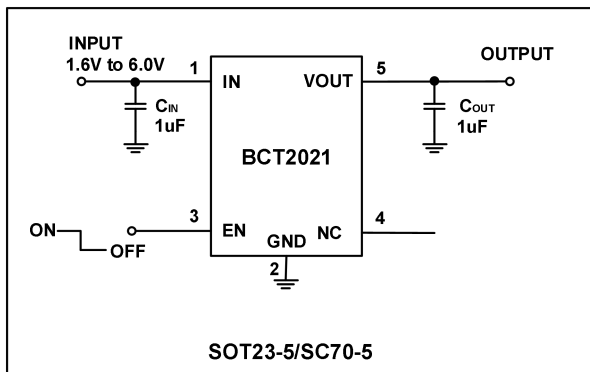
PIN CONFIGURATION (TOP VIEW)



PIN DESCRIPTION

PIN			NAME	FUNCTION
SOT23-3	SOT23-5 SC70-5	UTDFN1x1-4L		
1	2	2	GND	Ground.
2	5	1	OUT	Regulator Output.
3	1	4	IN	Input of Supply Voltage.
-	3	3	EN	Enable Control Input. Active high.
-	4	-	NC	No Connection
-	-	0	Exposed Pad	Leave floating or tie to GND.

TYPICAL APPLICATION CIRCUIT





BCT2021

70dB PSRR, 300mA

Fast Response Linear Regulators

ABSOLUTE MAXIMUM RATINGS

VIN, EN, VOUT to GND.....	-0.3V to 6.0V
Output Short-Circuit Duration.....	Infinite
Package Thermal Resistance	
SOT23-3, θ_{JA}	300°C/W
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
Operating Temperature Range.....	-40°C to +85°C
Storage Temperature Range.....	-65°C to 150°C
Lead Temperature (Soldering, 10 sec).....	260°C
ESD Susceptibility	
HBM.....	2000V

RECOMMENDED OPERATING CONDITIONS

Operating Voltage Range.....	1.6V to 6V
Operating Temperature Range	-40°C to +85°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.

ELECTRICAL CHARACTERISTICS

($V_{IN} = V_{OUT(NOMINAL)} + 1V$, unless otherwise specified, Typical values are at $25^{\circ}C$.)

PARAMETER	SYM	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage	V_{IN}		1.6		6.0	V
Output Voltage Accuracy ⁽¹⁾		$I_{OUT}=30mA$	-2.0		2.0	%
Maximum Output Current				300		mA
Current Limit	I_{LIM}		350	500		mA
Foldback Current Limit	I_{short}	$V_{out}=0V$		250		mA
Ground Pin Current	I_Q	No load, $EN = V_{IN}$		35	60	μA
Dropout Voltage ⁽²⁾	V_{DROP}	$I_{OUT}=300mA$	$V_{OUT} = 1.0V$	1050	1200	mV
			$V_{OUT} = 1.2V$	850	1000	
			$V_{OUT} = 1.5V$	720	850	
			$V_{OUT} = 1.8V$	550	700	
			$V_{OUT} = 2.5V$	380	530	
			$V_{OUT} = 3.0V$	350	500	
			$V_{OUT} = 3.3V$	330	450	
Line Regulation	ΔV_{LNR}	$V_{IN}=V_{OUT}+1V$ to 6V, $I_{OUT}=30mA$			0.12	%/V
Load Regulation	ΔV_{LDR}	$I_{OUT}=1mA$ to 300mA		20		mV
Power Supply Rejection Ratio	PSRR	$f=100Hz$, $I_{LOAD}=30mA$		73		dB
		$f=1KHz$, $I_{LOAD}=30mA$		70		dB
Undervoltage lockout	V_{UVLO}	V_{IN} rising	0.66	0.82	0.98	V
	V_{UVLO_HYST}	V_{IN} falling		60		mV
Start-up time				130		μs
SHUTDWON						
EN Input Threshold	V_{IH}	$1.8V \leq V_{IN} \leq 6V$	1.4			V
	V_{IL}	$1.8V \leq V_{IN} \leq 6V$			0.4	
EN Input Bias Current	I_{IN}	$V_{EN}=3V$		1		μA
Shutdown Supply Current	$I_{Q(SHDN)}$	$EN=0V$		0	1	μA
THERMAL PROTECTION						
Thermal Shutdown Temperature	T_{SHDN}			150		$^{\circ}C$
Thermal Shutdown Hysteresis	ΔT_{SHDN}			30		$^{\circ}C$

NOTE:

1. $V_{IN} = V_{OUT(NOMINAL)} + \text{Dropout or } 1.6V$, whichever is greater.

2. The dropout voltage is defined as $V_{IN} - V_{OUT}$, when V_{OUT} is 100mV below the value of V_{OUT} .

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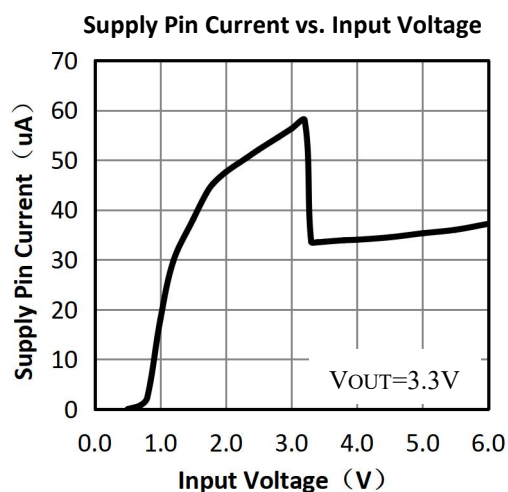
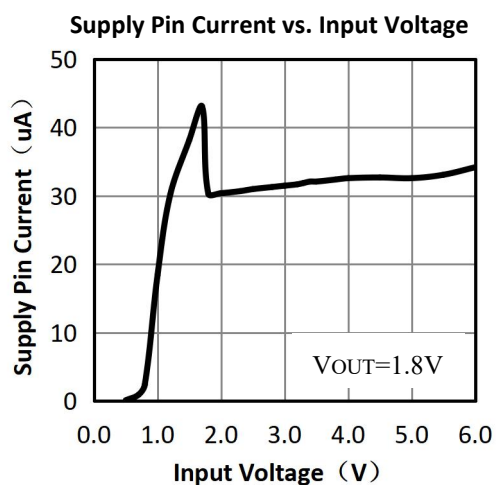
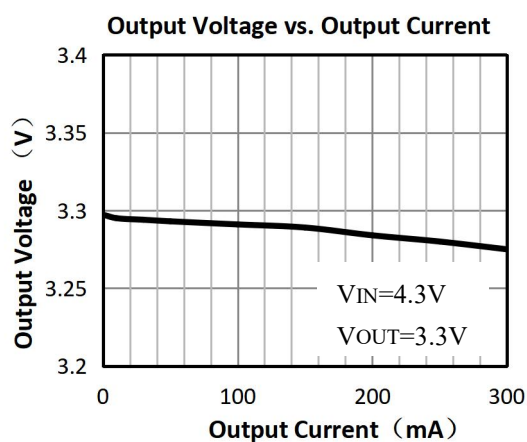
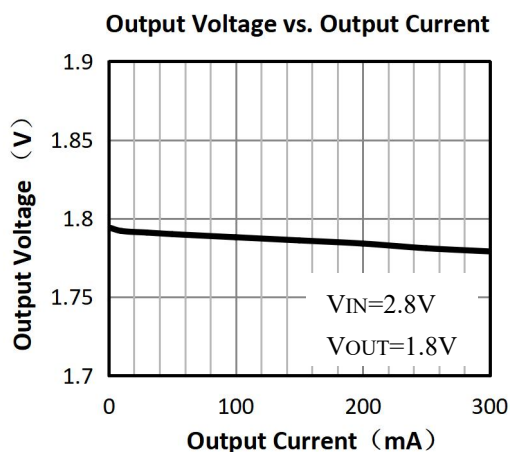
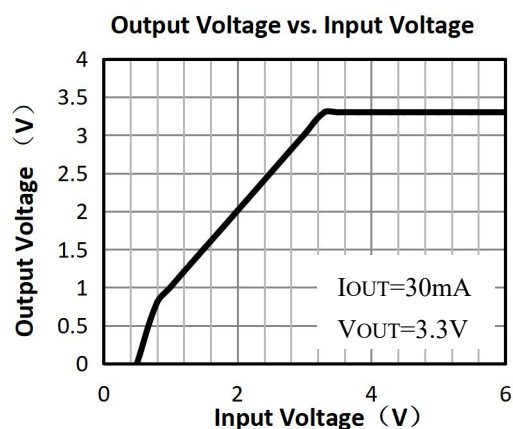
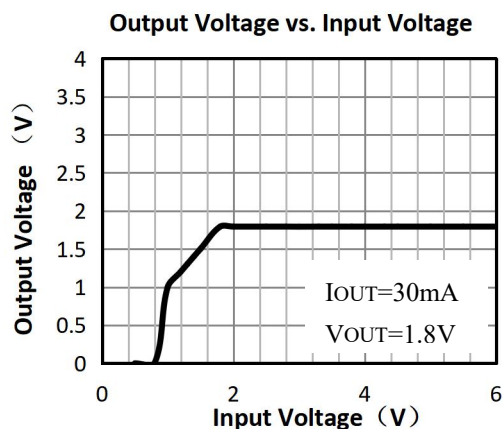
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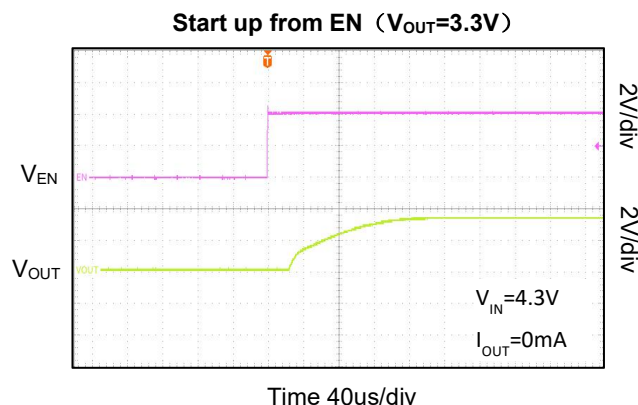
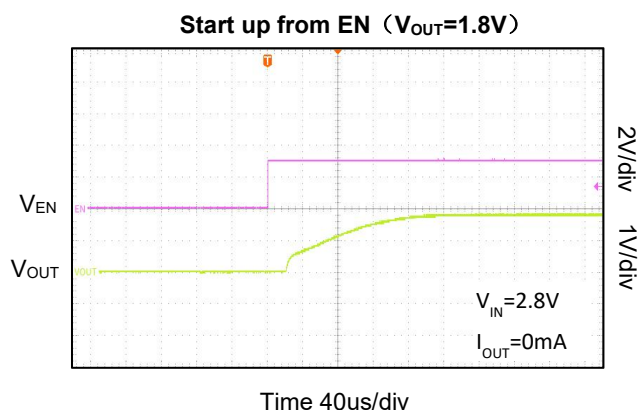
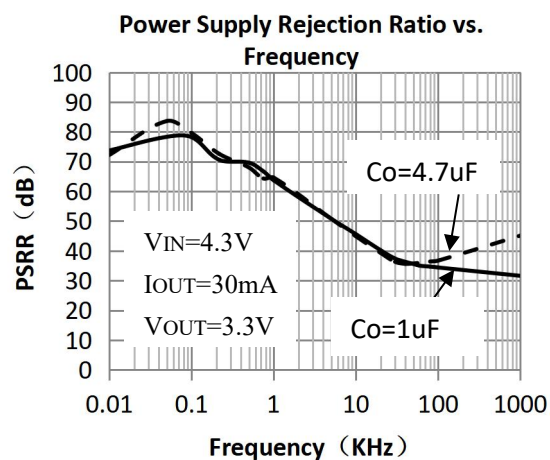
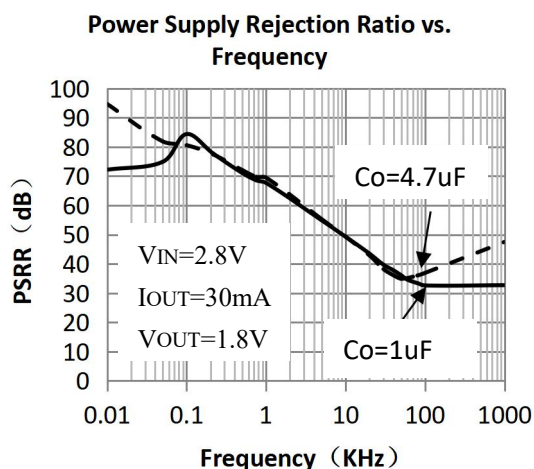
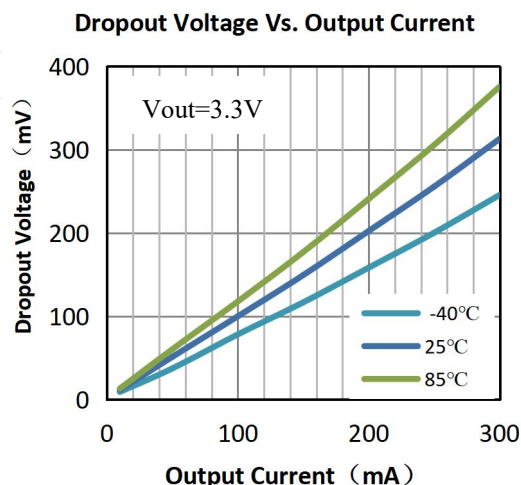
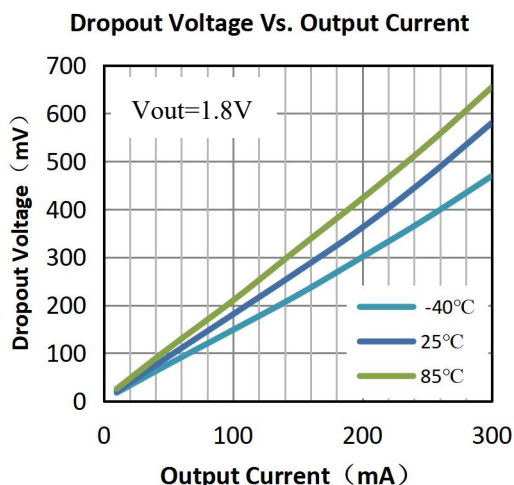
TYPICAL PERFORMANCE CHARACTERISTICS

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



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

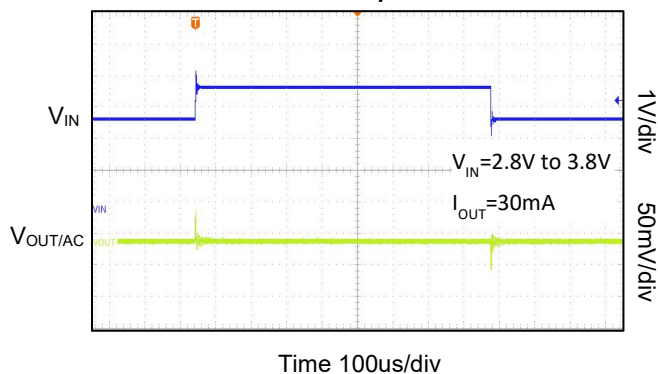
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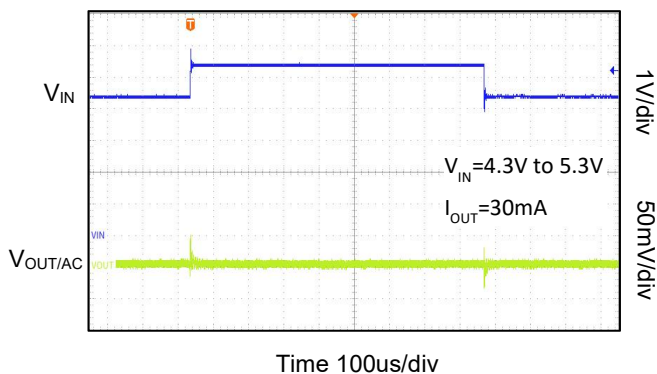
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

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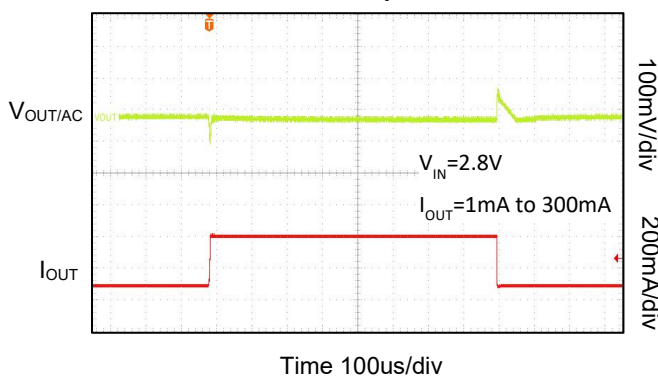
Line Transient Response ($V_{OUT}=1.8V$)



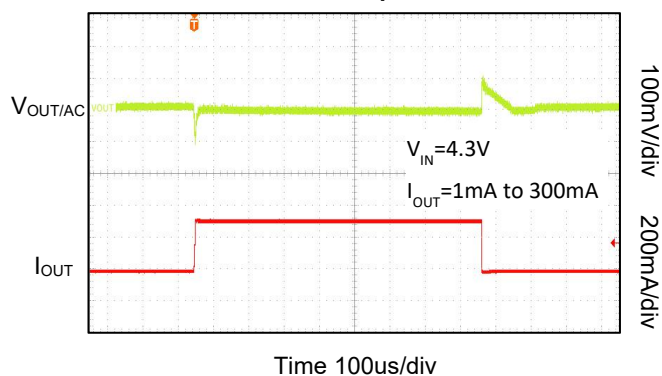
Line Transient Response ($V_{OUT}=3.3V$)



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



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



Input and Output Capacitor Requirements

The external input and output capacitors of BCT2021 series must be properly selected for stability and performance. Use a 1μF or larger input capacitor and place it close to the IC's VIN and GND pins. Any output capacitor meeting the minimum 1mΩ ESR (Equivalent Series Resistance) and effective capacitance between 1μF and 22μF requirement may be used. Place the output capacitor close to the IC's VOUT and GND pins. Increasing capacitance and decreasing ESR can improve the circuit's PSRR and line transient response.

Thermal Considerations

Thermal protection limits power dissipation in BCT2021. When the operation junction temperature exceeds 150°C, the OTP circuit starts the thermal shutdown function turn the pass element off. The pass element turns on again after the junction temperature cools by 30°C.

For continue operation, do not exceed absolute maximum operation junction temperature 150°C. The power dissipation definition in device is:

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

The maximum power dissipation depends on the thermal resistance of IC package, PCB layout, the rate of surroundings airflow and temperature difference between junction to ambient. The maximum power dissipation can be calculated by following formula:

$$P_D(\text{MAX}) = (T_J(\text{MAX}) - T_A) / \theta_{JA}$$

Where $T_J(\text{MAX})$ is the maximum operation junction temperature 150°C, T_A is the ambient temperature and the θ_{JA} is the junction to ambient thermal resistance. For recommended operating conditions specification of BCT2021, where $T_J(\text{MAX})$ is the maximum junction temperature of the die (150°C) and T_A is the maximum ambient temperature. The junction to ambient thermal resistance (θ_{JA} is layout dependent) for SOT23-5 package is 260°C/W, on standard JEDEC 51-3 thermal test board. The maximum power dissipation at $T_A = 25^\circ\text{C}$ can be calculated by following formula:

$$P_D(\text{MAX}) = (150^\circ\text{C} - 25^\circ\text{C}) / 260^\circ\text{C/W} = 0.48\text{W (SOT23-5)}$$

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 BCT2021 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 $V_O = 2.8\text{V}$ of the BCT2021 can be calculated as:

$$P_D = (3.3\text{V} - 2.8\text{V}) \times 300\text{mA} + 3.3\text{V} \times 35\mu\text{A} \approx 0.15\text{W}$$



BCT2021

70dB PSRR, 300mA

Fast Response Linear Regulators

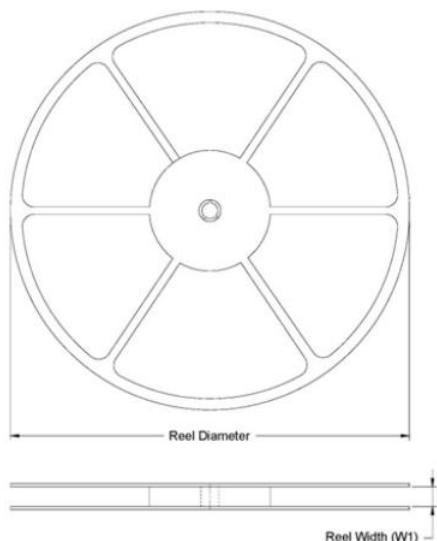
And the junction temperature, T_J , can be calculated as follows:

$$\begin{aligned} T_J &= T_A + P_D \times \theta_{JA} = 40^\circ\text{C} + 0.15\text{W} \times 260^\circ\text{C/W} \\ &= 40^\circ\text{C} + 39^\circ\text{C} = 79^\circ\text{C} < T_{J(\text{MAX})} = 150^\circ\text{C} \end{aligned}$$

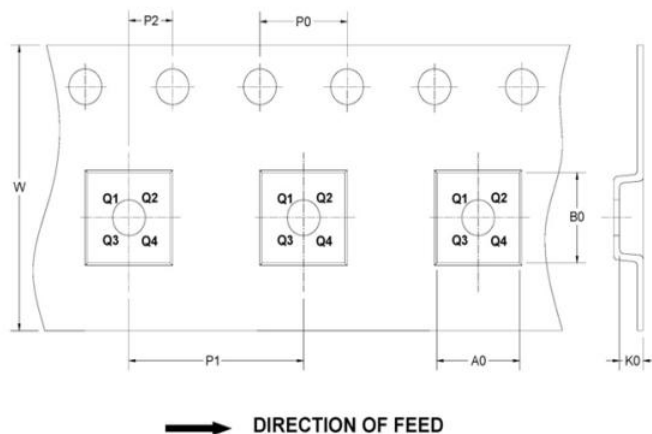
For this operating condition, T_J is lower than the absolute maximum operating junction temperature 150°C , so it is safe to use the BCT2021 in this configuration.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



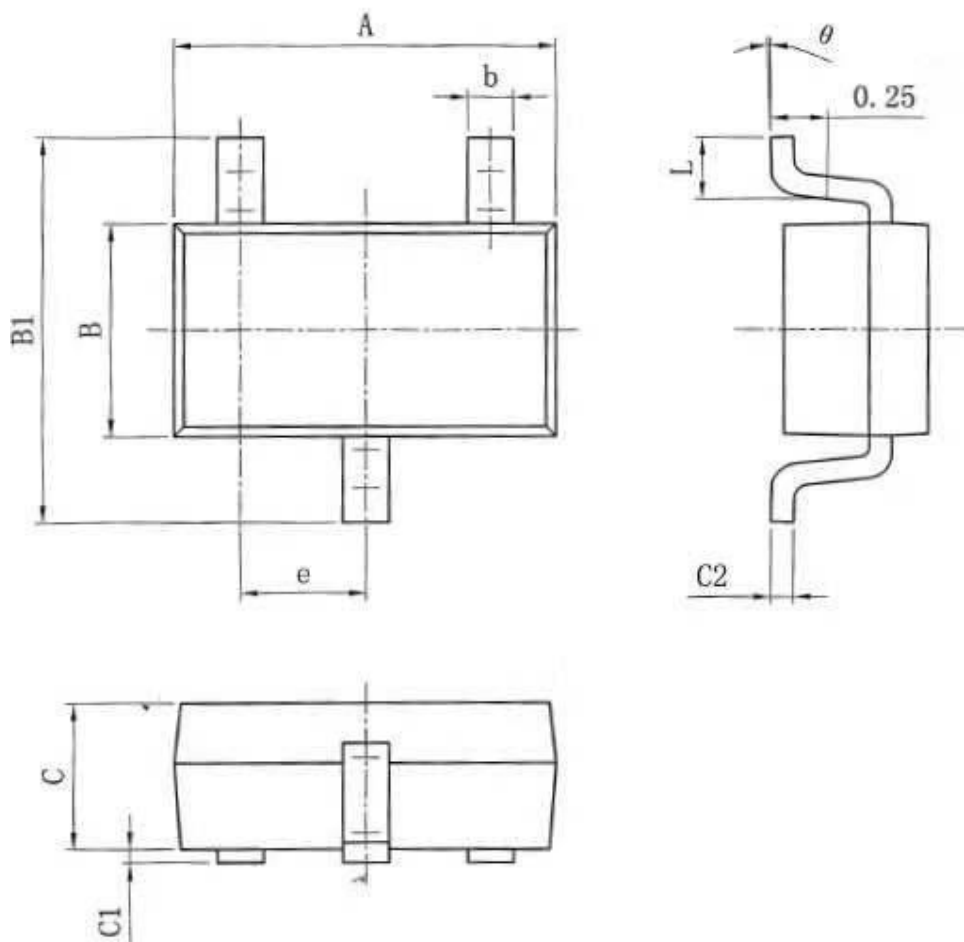
KEY PARAMETER LIST OF TAPE AND REEL

Device Name	Package Type	Reel Diameter	Unit: mm								Pin 1 Quadrant	Reel Q'ty
			Reel Width W1	A0	B0	K0	P0	P1	P2	W		
BCT2021EUKXX-TR	SOT23-5	7"	9	3.25	3.3	1.38	4	4	2	8	Q3	3000
BCT2021ELSXX-TR	UTDFN1x1-4L	7"	9.5	1.16	1.16	0.5	4	2	2	8	Q1	10000

Note: "XX" will be appeared as the Vout, XX=(10 / 12 / 18 / 25 / 28 / 30 / 33).

Package Outline Dimensions

SOT23-3

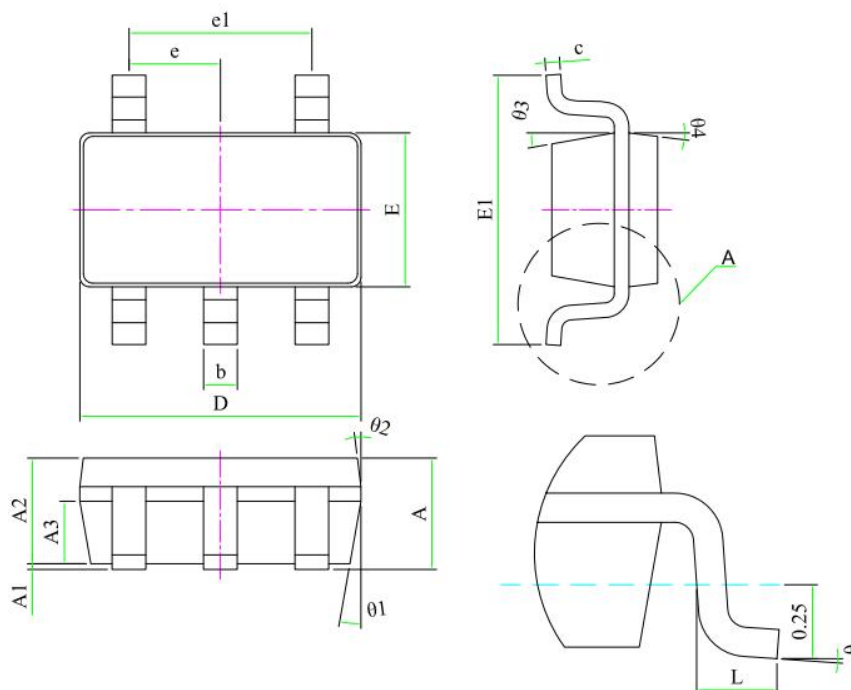


Symbol	Dimensions In Millimeters	
	Min	Max
A	2.82	3.02
e	0.95(BSC)	
b	0.28	0.45
B	1.50	1.70
B1	2.75	3.05
C	1.05	1.15
C1	0.03	0.15
C2	0.12	0.23
L	0.35	0.55
θ	0°	8°

SOT23-3 Surface Mount Package

Package Outline Dimensions

SOT23-5

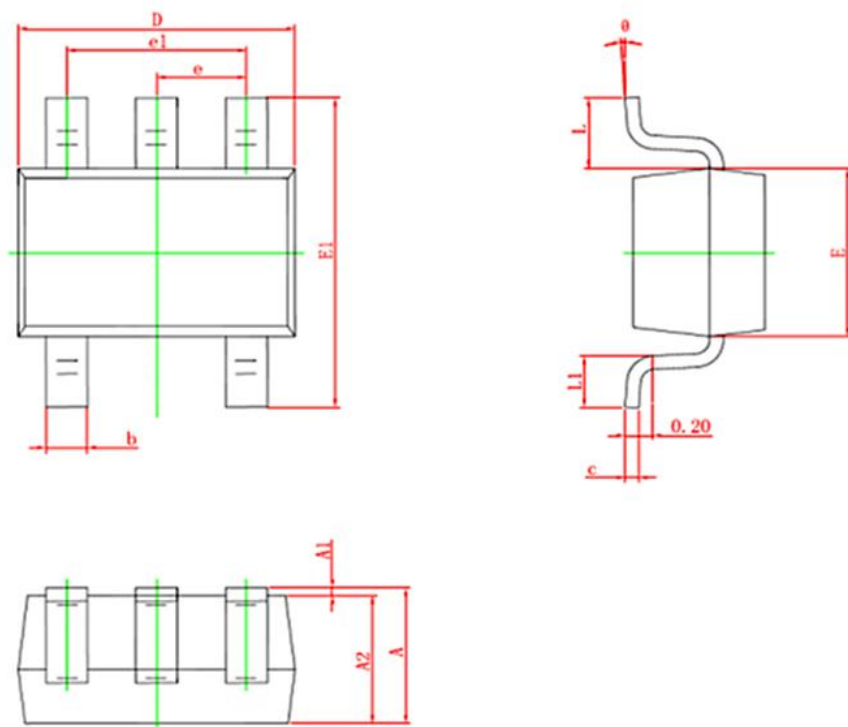


Symbol	Dimensions In Millimeters		
	Min	Nom	Max
A	1.05	1.15	1.25
A1	0.00	0.05	0.10
A2	1.05	1.10	1.15
A3	0.60	0.65	0.70
D	2.82	2.92	3.02
E	1.50	1.60	1.70
E1	2.65	2.80	2.95
L	0.30	0.45	0.60
b	0.28	0.35	0.42
c	0.10	0.15	0.20
e	0.95 (BSC)		
e1	1.80	1.90	2.00
θ	0°	—	8°
θ1	10°	—	14°
θ2	8°	—	12°
θ3	10°	—	14°
θ4	8°	—	12°

SOT23-5 Surface Mount Package

Package Outline Dimensions

SC70-5

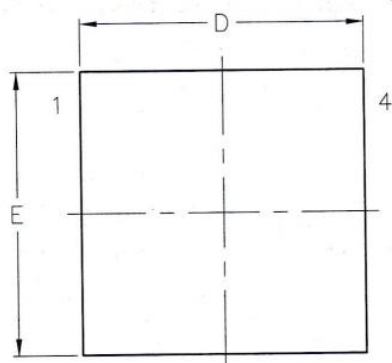


Symbol	Dimensions In Millimeters	
	Min.	Max.
A	0.900	1.100
A1	0.000	0.100
A2	0.900	1.000
b	0.150	0.350
c	0.110	0.175
D	2.000	2.200
E	1.150	1.350
E1	2.150	2.450
e	0.650 TYP.	
e1	1.200	1.400
L	0.525 REF.	
L1	0.260	0.460
θ	0°	8°

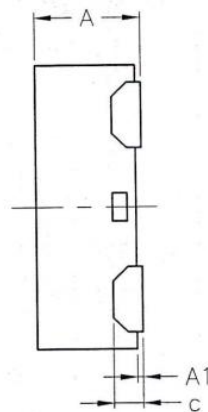
SC70-5 Surface Mount Package

Package Outline Dimensions

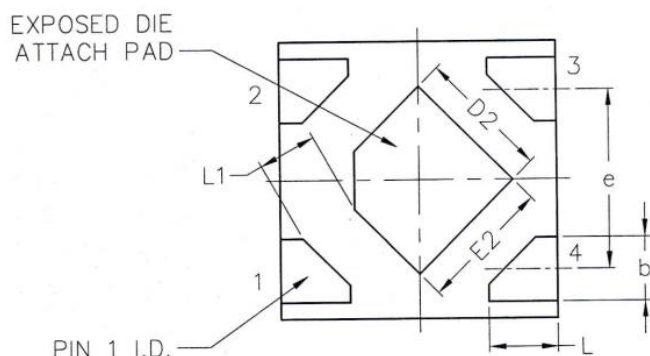
UTDFN1x1-4L



TOP VIEW



SIDE VIEW



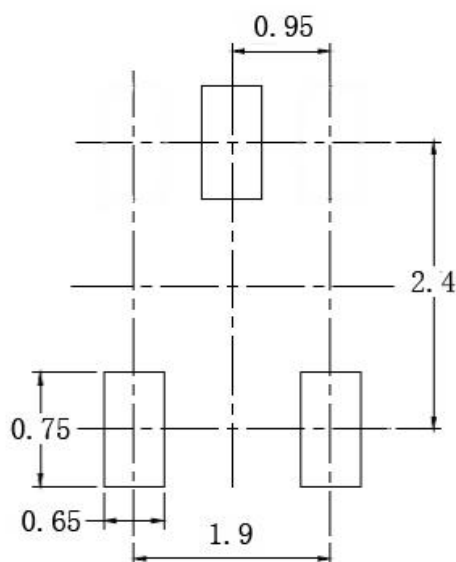
BOTTOM VIEW

Symbol	Dimensions In Millimeters		
	Min	Nom	Max
A	0.32	0.37	0.41
A1	0.00	0.02	0.05
A2	0.102 REF		
D	0.95	1.00	1.05
D2	0.43	0.48	0.53
e	0.65 BSC		
E	0.95	1.00	1.05
E2	0.43	0.48	0.53
L	0.20	0.25	0.30
L1	0.205 REF		

UTDFN1x1-4L Surface Mount Package

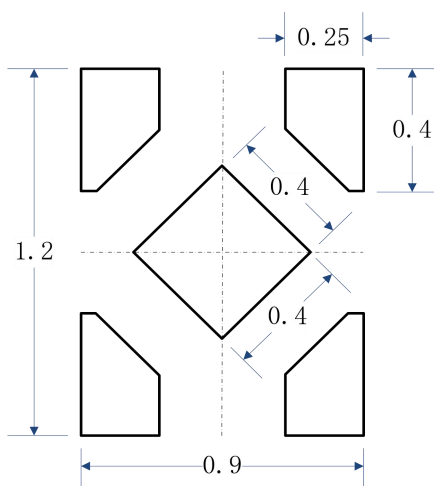
LAND PATTERN DATA

SOT23-3



RECOMMENDED PCB LAYOUT PATTERN (Unit: mm)

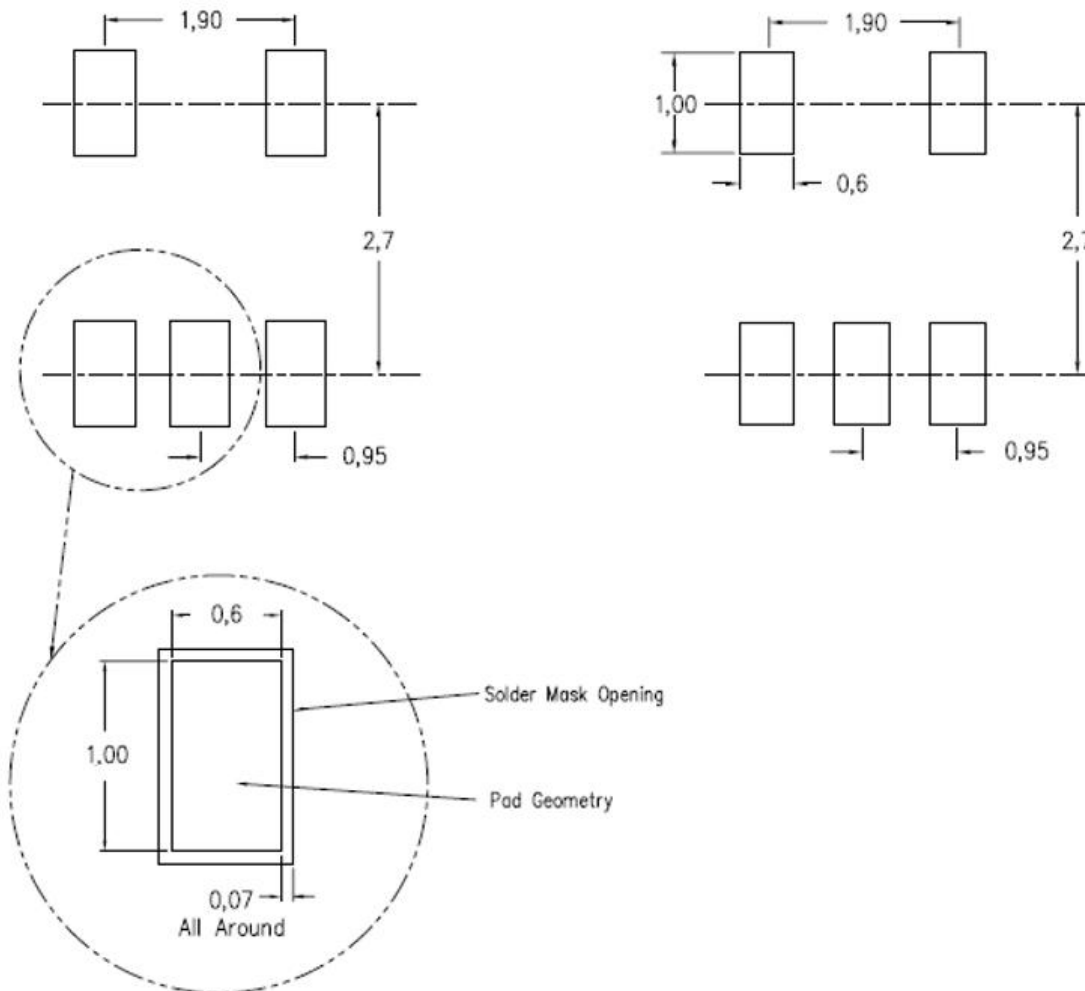
UTDFN1x1-4L



RECOMMENDED PCB LAYOUT PATTERN (Unit: mm)

LAND PATTERN DATA

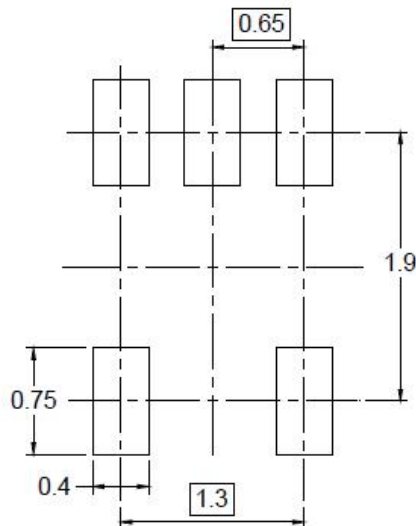
SOT23-5



RECOMMENDED PCB LAYOUT PATTERN (Unit: mm)

LAND PATTERN DATA

SC70-5



RECOMMENDED PCB LAYOUT PATTERN (Unit: mm)