1 Description

The LDO is a high-precision low dropout linear regulator with current limiting function, output current up to 300mA, low power consumption, high PSRR, as well as short-circuit protection and over-temperature protection, available in SOT89-3, DFN2X2-6L, SOT-23-5, SOT23-3 and other package forms.

2 Features

- Ultra-low quiescent current：1.2μA
- High accurate：±2%
- Low dropout voltage：200mV@I_{OUT}=100mA, V_{OUT} =5V
- Maximum output current：300mA
- Input Voltage Range：Max 36V
- Output short circuit protection
- Thermal shutdown

3 Applications

- Cell phone
- Battery-powered equipment
- Wireless telephones, wireless telephones, wireless communication equipment
- Camera Recorder
- Portable audio-visual equipment
- Palmtop computer

4 Ordering information

Product Number	Package	Quantity/Tape
CN86LXXXDSR	DFN2x2-6	4000/Type
CN86LXXXTCR	SOT23-5	3000/Type
CN86LXXXATCR	SOT23-5	3000/Type
CN86LXXXTGR	SOT23-3	3000/Type
CN86LXXXOGR	SOT89-3	1000/Type
CN86LXXXAOGR	SOT89-3	1000/Type

Product Number	Output voltage
CN86L028	V_{OUT}=2.8V
CN86L030	V_{OUT}=3.0V
CN86L033	V_{OUT}=3.3V
CN86L036	V_{OUT}=3.6V
CN86L040	V_{OUT}=4.0V
CN86L050	V_{OUT}=5.0V
CN86L056	V_{OUT}=5.6V
CN86L120	V_{OUT}=12.0V

5 Marking

Product Number	Marking*
CN86LXXXDSR	CN86XX YYWW
CN86LXXXTCR	6XXYW
CN86LXXXATCR	86LXXXA YYWW
CN86LXXXTGR	6XXYW
CN86LXXXOGR	CN86LXXX YYWW
CN86LXXXAOGR	CN86LXXXA YYWW

Note: YY=Year WW=Week.

Green (RoHS & HF): CHIPNORTH defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your CHIPNORTH representative directly.

Moisture sensitivity level(MSL):3

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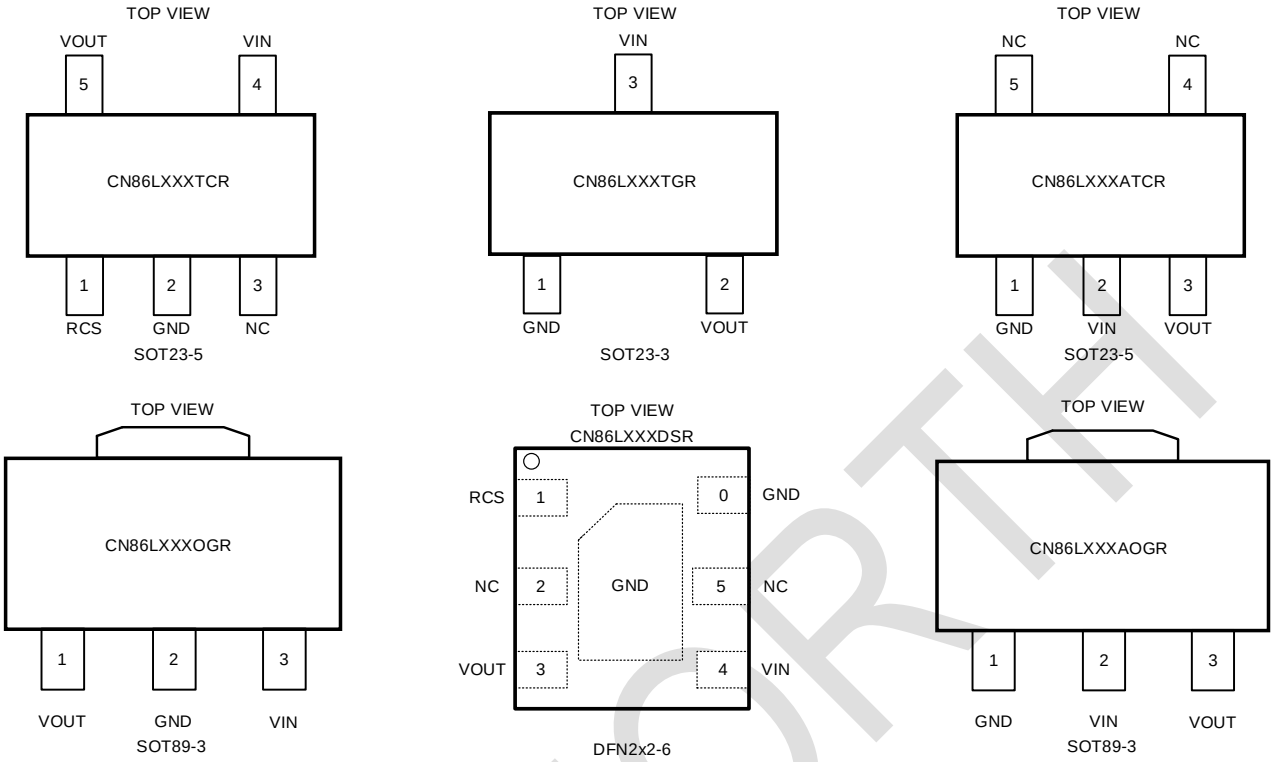
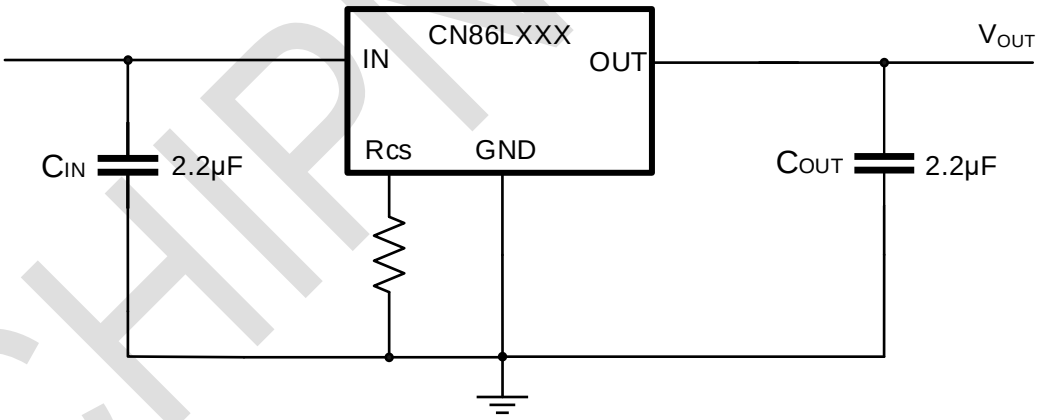
6 Pinout



7 Typical Application



Note：General application circuits are recommended input capacitance C_{IN} = 2.2μF, near the chip input; output capacitance C_{OUT} = 2.2μF, near the chip output.

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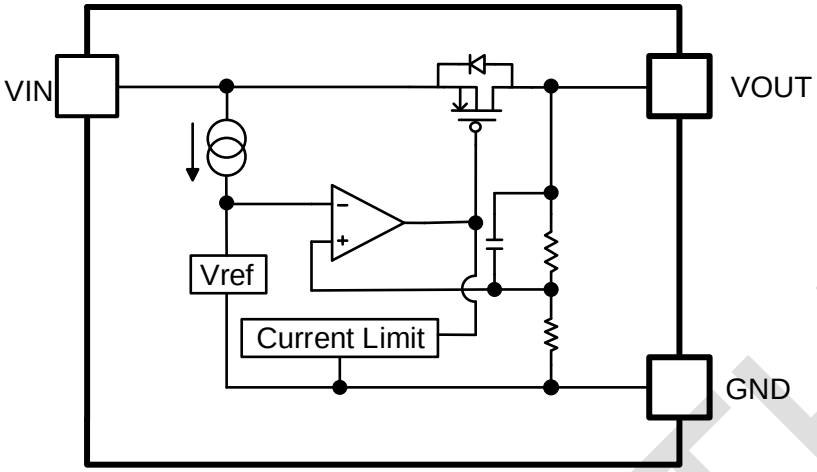
8 Block Diagram



9 Pin Descriptions

Pin No.				Descriptions
Pin Name	CN86LXXX OGR	CN86LXXX AOGR	CN86LXXX ATCR	
GND	2	1	1	GND
VIN	3	2	2	Input
VOUT	1	3	3	Output
NC			4	No Connect
NC			5	No Connect

Pin No.				Descriptions
Pin Name	CN86LXXX TCR	CN86LXXX TGR	CN86LXXX DSR	
GND	2	1	6	GND
VIN	4	3	4	Input
VOUT	5	2	3	Output
NC	3		2	No Connect
NC			5	No Connect
RCS	1		1	Current limiting regulation

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10 Specifications

10.1 Absolute Maximum Ratings

Parameter	Symbol	Value	Units
Maximum Input Voltage	V_{IN}	-0.3 ~ 40	V
Maximum Output Voltage	V_{OUT}	-0.3 ~ 40	V
Ambient Temperature (T_A)	T_A	125	°C
Storage temperature range	T_{STG}	-55 ~ 150	°C
Output Current	I_{OUT}	300	mA
Welding temperature	T_{LEAD}	260（Soldering,10s）	°C

(1) Stresses exceeding the values listed under Absolute Maximum Ratings may cause permanent damage to the device. These listed values are stress ratings only and do not imply that the device will operate properly under these conditions or any other conditions other than the recommended operating conditions. Prolonged operation at maximum absolute rating conditions can affect device reliability.

(2) All voltage values are based on the ground terminal.

10.2 ESD Ratings

Discharge mode	Standardize	Value	Units
HBM	ESDA/JEDEC JS-001-2017	±4000	V
CDM	ESDA/JEDEC JS-002-2018	±2000	V

10.3 Recommended Operating Ran

Parameter	Symbol	Min.	Max.	Units
Input Voltage Range	V_{IN}	V_{OUT}+1	36	V
Working environment temperature	T_A	-40	105	°C

10.4 Thermal Information

Parameter	Package	Value	Units
Junction to ambient thermal resistance ($R_{\theta JA}$)	SOT23-3	220	°C/W
	SOT23-5	188	°C/W
	DFN2x2-6	140	°C/W
	SOT89-3（OGR）	100	°C/W
	SOT89-3（AOGR）	165	°C/W

(1) Thermal resistance is not a fixed constant; its value is influenced by the following factors: PCB heat dissipation capacity, number and thickness of copper layers, ambient temperature, airflow velocity, etc.

(2) The thermal resistance values listed in the datasheet are provided solely for customers to compare the thermal performance of different packages. Since the heat dissipation conditions of the PCB in actual customer applications differ from those of our test boards, the actual measured thermal resistance values may vary from the nominal values in the datasheet. Customers should conduct verification on their own system boards to ensure that the thermal design meets the requirements of the product application.

10.5 Electrical Characteristics

Test conditions：V_{IN}=V_{OUT}+1V, C_{IN}=2.2μF, C_{OUT}=2.2μF, T_A=25℃, unless otherwise specified.

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Input voltage range	V_{IN}	I_{OUT}=10mA	V_{OUT}+0.1V		36	V
Output voltage	V_{OUT}	V_{IN}=V_{OUT}+2V, I_{OUT}=10mA	V_{OUT} x0.98	V_{OUT}	V_{OUT} x1.02	V
Output voltage accuracy	V_{OUT}%	V_{IN}=V_{OUT}+2V, I_{OUT}=10mA	98%		102%	
Line regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	V_{IN}=V_{SET}+1V~12V I_{OUT}=3mA（V_{OUT} =5V）		0.011	0.067	%/V
Load regulation	ΔV_{OUT}	V_{IN}=V_{SET}+1V I_{OUT}=3~300mA		52	100	mV
Quiescent current	I_Q	V_{IN}=12V, I_{OUT} =0mA	0.2	1.2	3	μA
Dropout voltage*1	V_{DROP}	I_{OUT}=100mA@V_{OUT}=5V	0.1	0.2	0.3	V
Maximum output current	I_{OUT_MAX}	V_{OUT}=0.95*$V_{OUT(S)}$	300			mA
Current limit	I_{LIMIT}		300	500	700	mA
OTP threshold		95% rated V_{OUT}		160		°C
OTP hysteresis				30		°C
PSRR		100Hz, I_{OUT}=50mA		50		dB

Note*:

V_{DROP}=V_{IN}-(V_{OUT_REG}*0.98), V_{OUT_REG} is the output voltage when V_{IN} = V_{OUT} + 1.0V and I_{OUT} = 100mA.V_{IN} is the input voltage, and when the input voltage decreases gradually, the output voltage becomes 98% of V_{OUT_REG}.

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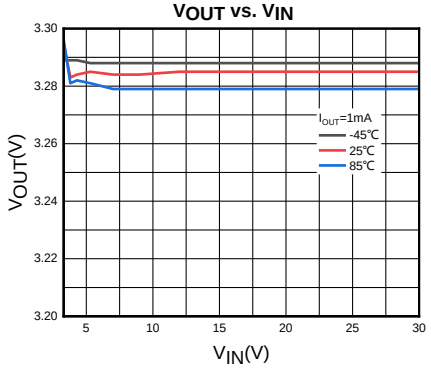
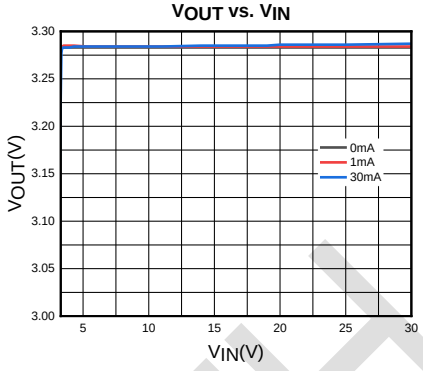
10.6 Characteristics Curve（CN86L033OGR）

Test conditions: V_{IN}=V_{OUT}+1V, C_{IN}=2.2μF, C_{OUT}=2.2μF, T_A=25℃, unless otherwise specified.

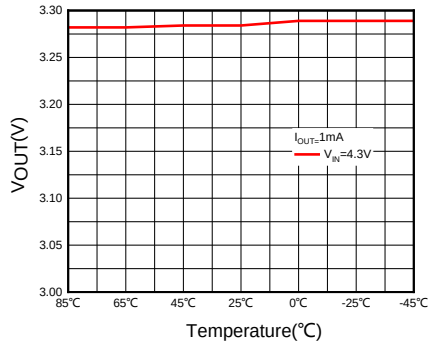
VOUT vs. VIN



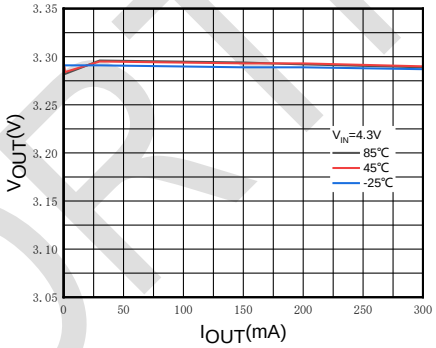
VOUT vs. VIN



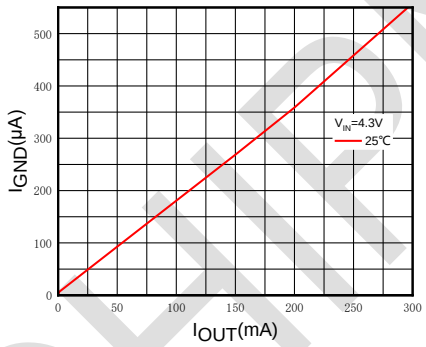
VOUT vs. Temperature



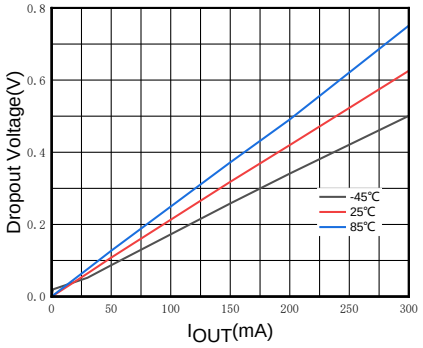
VOUT vs. IOUT



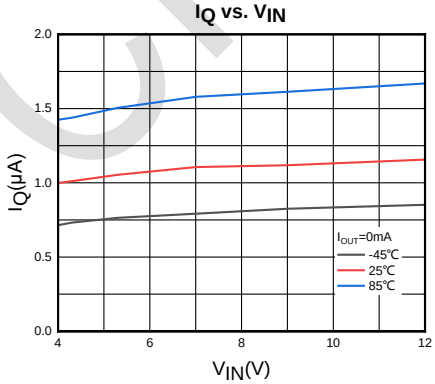
IGND vs. IOUT



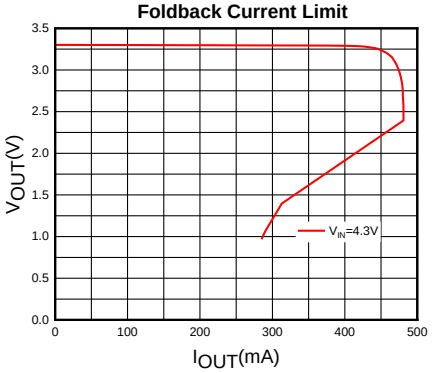
Dropout Voltage vs. IOUT



IQ vs. VIN



Foldback Current Limit



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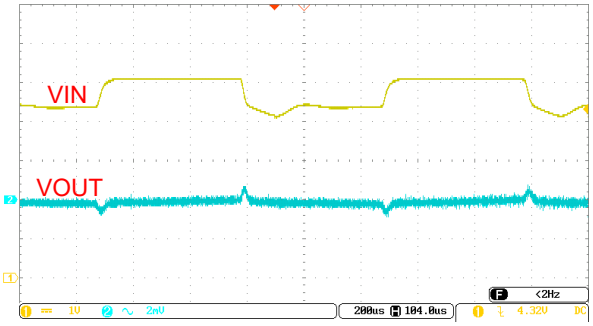

Figure 1 Line Transient

(V_{IN}=from 4.3V to 5V to 4.3V, I_{OUT}=0mA)

Figure 2 Line Transient

(V_{IN}=from 4.3V to 5V to 4.3V, I_{OUT}=300mA)

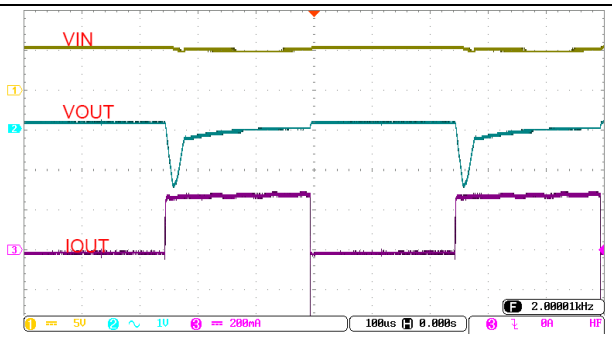

Figure 3 Load Transient

(V_{IN}=5.3V, I_{OUT}=0mA-300mA-0mA)

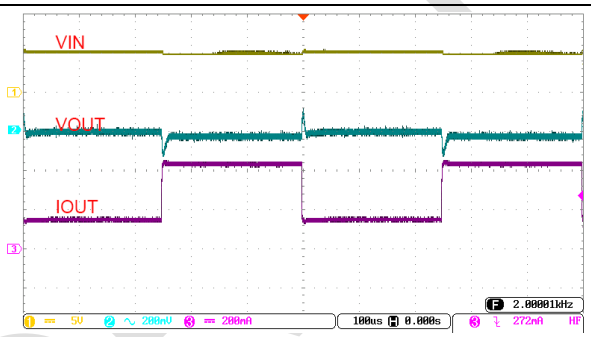

Figure 4 Load Transient

(V_{IN}=5.3V, I_{OUT}=150mA-300mA-150mA)

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11 Functional Description

11.1 Current Folding

CN86L has a current foldback function, after triggering the current limit protection, the output current remains constant and the output voltage decreases as the load impedance decreases, this function can be used as both current limit protection and short circuit protection.。

11.2 RCS Pin Function

The RCS pin is used to control the chip current limit. The details are as follows：

1、When the RCS pin is floating, the current limit is 500mA.

2、When RCS pin is short-circuited, the current limit is 500mA.

3、When RCS is connected to a resistor, the current limit is determined by the resistor, when RCS<2.63K, the current limit is 500mA. when RCS>2.63K, the current limit is determined by the following formula:

$$I_{Limit}\ （mA）= \frac{1460}{R_{CS}(k\Omega）}$$

11.3 Thermal shutdown

The CN86L has an internal thermal shutdown function. When the internal junction temperature of the chip exceeds 160°C, the upper and lower tubes will stop switching to reduce the junction temperature, and the chip will restart softly when the junction temperature is reduced to 130°C or below.

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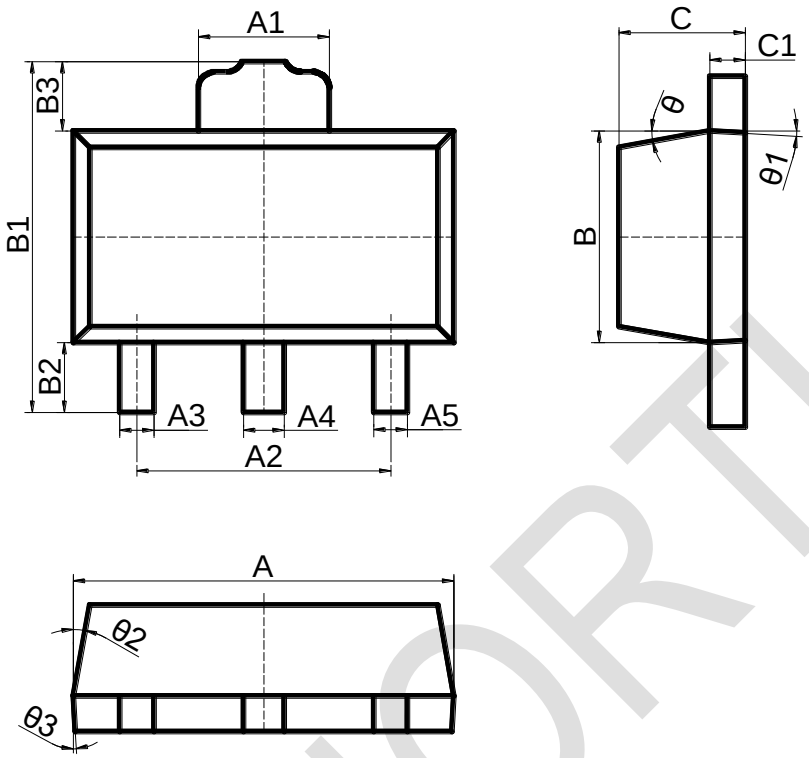
12 Package Information

SOT89-3



Dimension / Symbol	Min (mm)	Nom (mm)	Max (mm)
A	4.4	4.5	4.6
A1	1.4	1.6	1.8
A2	2.8	3.0	3.2
A4	0.37	0.47	0.57
A5	0.22	0.42	0.62
B	2.4	2.5	2.6
B1	-	-	4.25
B2	0.8	-	-
C	1.4	1.5	1.6
C1	0.3	0.4	0.5

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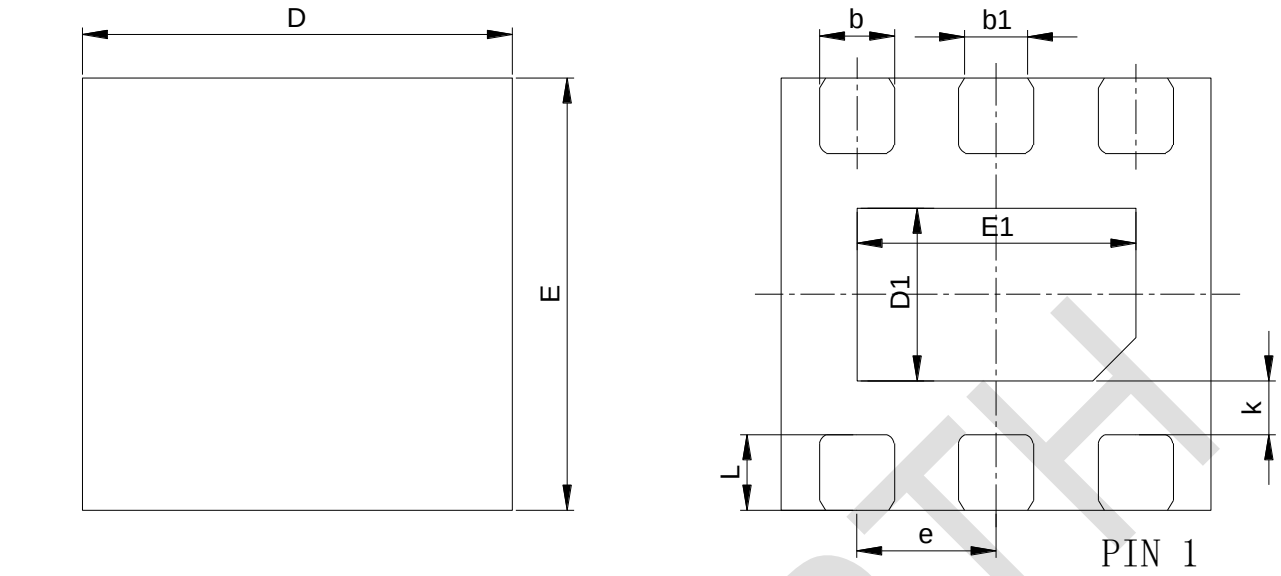
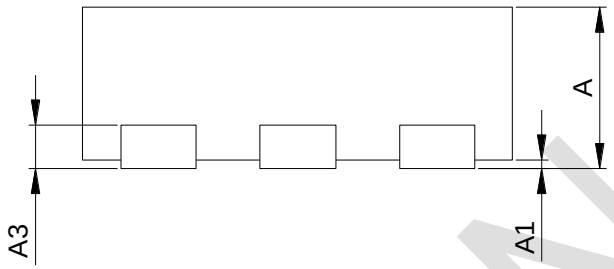
DFN2x2-6





Dimension / Symbol	Min (mm)	Nom (mm)	Max (mm)	Dimension / Symbol	Min (mm)	Nom (mm)	Max (mm)
A	0.7	0.75	0.8	E1	1.5	1.6	1.7
A1	0	0.025	0.05	k		0.25REF	
A3		0.203REF		b	0.25	0.3	0.35
D	1.9	2.0	2.1	b1		0.22REF	
E	1.9	2.0	2.1	e		0.65REF	
D1	0.9	1.0	1.1	L	0.2	0.25	0.3

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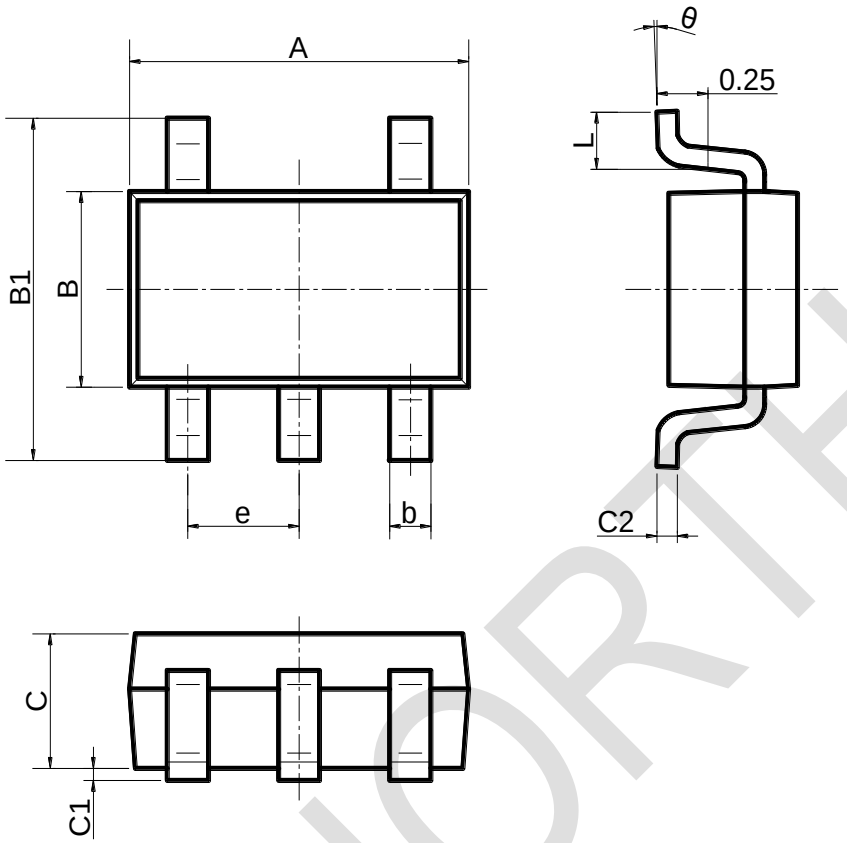
SOT23-5



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

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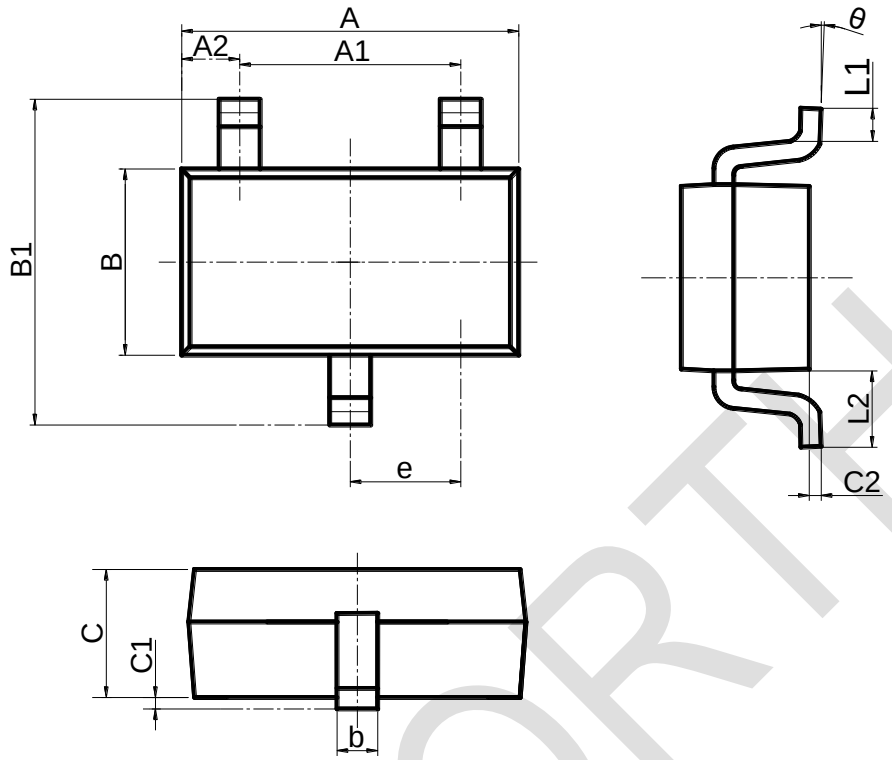
SOT23-3L



Dimension / Symbol	Min (mm)	Max (mm)	Min (inch)	Max (inch)
A	2.820	3.020	0.111	0.119
A1	1.800	2.000	0.071	0.079
B	1.500	1.700	0.059	0.067
B1	2.650	2.950	0.104	0.116
b	0.300	0.500	0.012	0.020
e	0.950(BSC)		0.037(BSC)	
C	1.050	1.250	0.041	0.049
C1	0.000	0.100	0.000	0.004
C2	0.100	0.200	0.004	0.008
L1	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

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13 Important Statement

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