CC6430

5V/12V/24V 350mA Single Coil Intelligent Fan Driver with Blocked Rotation Protection

FEATURES

- Built-in high sensitivity Hall sensor
- With blocking protection function, it will not destroy the IC or coil when blocking.
- Integrated power reverse protection
- Strong driving ability, can output up to 350mA continuous current
- Low power consumption, quiescent current 2mA
- Excellent temperature stability ensures that the IC can withstand extreme environments
- Resistant to mechanical stress, the magnetic sensitivity will not be offset by external pressure.
- ESD (HBM) 6kV, LU 200mA

APPLICATION

- Single Coil DC Brushless Fans
- Single Coil DC Brushless Motors

GENERAL DESCRIPTION

The CC6430 is a high performance, single coil, brushless DC motor (fan) driver. The chip is designed and manufactured with an innovative advanced high-voltage BiCMOS process that is optimised for Hall sensors and motor drives.

The chip contains a high sensitivity Hall sensor, chopper offset module, Hall temperature compensation unit, voltage regulator and low RDSON full-bridge driver, etc. The CC6430's low power consumption, with a quiescent current of only 2mA, is much lower than similar products in the market, which helps to improve fan efficiency as well as fan reliability.

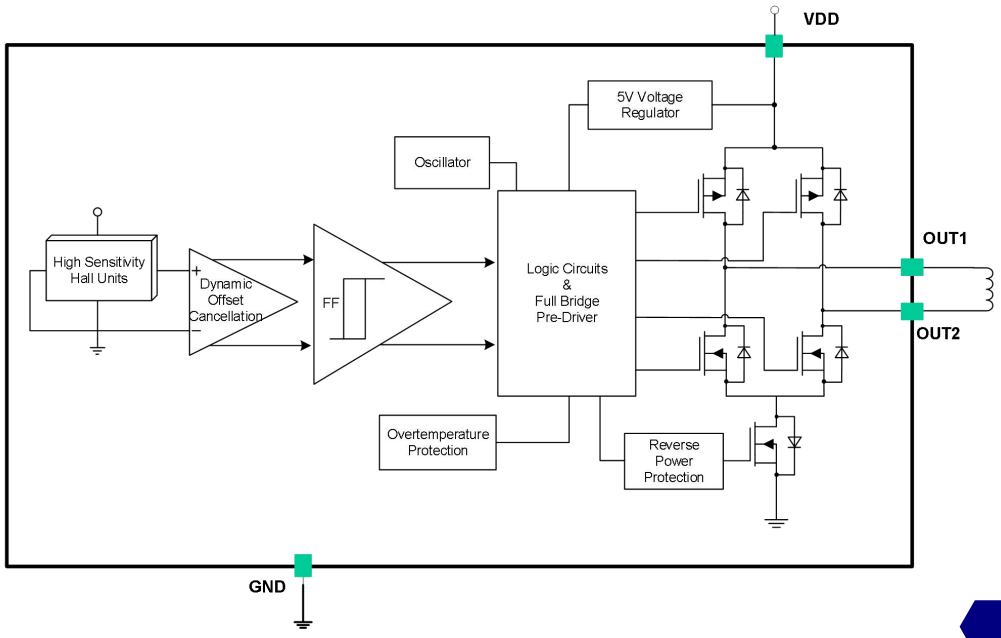
The CC6430 integrates an internal blocking protection function, which automatically stops supplying power to the coil and enters a self-starting state when the fan is blocked. This method can reduce the power consumption and ensure that the fan will not be damaged during the fan jamming, and greatly improves the reliability of the fan.

The CC6430 is capable of withstanding instantaneous high voltage of 40V, ensuring the reliability of the fan in a wide range of applications.

The CC6430 has an integrated reverse connection protection function, eliminating the need for external reverse protection diodes and saving costs for customers.

CC6430 is available in TO-94 and SOT335 package. It's operating ambient temperature range is -40~125°C. Comply with RoHS requirements.

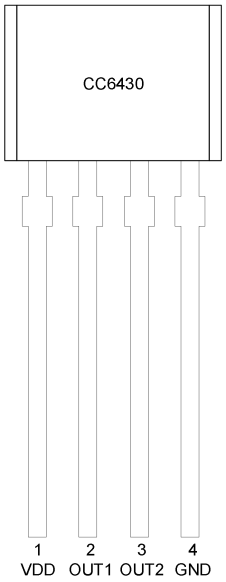
FUNCTION BLOCK DIAGRAM



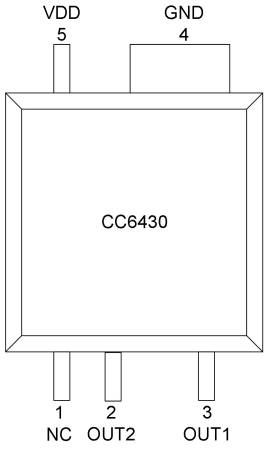
ORDERING INFORMATION

Part No.	Packing Code	Package Form
CC6430TO	TO-94	bulk，1000 pcs/bulk
CC6430SS	SOT335	tape reel, 10000 pcs/reel

PIN CONFIGURATIONS



TO-94 Package



SOT335 Package

Pin Name	Pin NO.		Function
	TO-94封装	SOT335封装	
VDD	1	5	Supply Voltage
OUT1	2	3	Full Bridge Output 1
OUT2	3	2	Full Bridge Output 2
GND	4	4	GND
NC	-	1	NC

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol		Value	Unit
Fan Supply Voltage	V_{DD}		40	V
Reverse Voltage	V_{REV}		-40	V
Peak Output Current	I_{PEAK}		1000	mA
Continuous Output Current	I_{CONT}		350	mA
Ambient Temperature	T_A		-40~125	°C
Junction Temperature	T_J		160	°C
Thermal Resistance Junction - Ambient	R_{thJA}	TO-94	227	°C/W
		SOT335	195	°C/W
Storage Temperature	T_S		-55~150	°C
Magnetic Flux Density	B		Unlimited	mT
Electrostatic Discharge	ESD(HBM)		6	kV
Latch-Up	LU		200	mA

Note: Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute-maximum rated conditions for extended periods may degrade device reliability.

RECOMMENDED OPERATION CONDITIONS

Parameter	Symbol	Min.	Max.	Unit
Fan Supply Voltage	V_{DD}	3	32	V
Fan Continuous Current	I_{OUTC}	-	300	mA
Ambient Temperature	T_A	-40	125	°C

ELECTRICAL CHARACTERISTICS (V_{DD}=18V @ T_A=25°C, unless specified otherwise)

Parameter	Symbol	Condition	Min	Typ.	Max	Unit
Fan Supply Voltage	V_{DD}	-	3	-	36	V
Quiescent Current	I_{DD}	-	-	2	4	mA
Output Saturation Voltage Drop	V_{SAT_SINK}	I_{OUT}=200mA	-	0.28	-	V
	V_{SAT_SOURCE}	I_{OUT}=200mA	-	0.28	-	V
Output Rising Time	t_r	R_L=820Ω，C_L=20pF	-	30	-	ns
Output Falling Time	t_f	R_L=820Ω，C_L=20pF	-	30	-	ns
Dead Time	t_{DEAD}	R_L=820Ω，C_L=20pF	-	10	-	us
Locked Rotor ON Time	T_{ON}	V_{DD}>7V	-	0.45	-	s
Locked Rotor OFF Time	T_{OFF}	V_{DD}>7V	-	2.85	-	s
Reverse Current	I_{REV}	V_{DD} = -36V	-	-	100	uA
Over Temperature Protection[1]	T_{SD}			160		°C
OTP Hysteresis	$\triangle T_{SD}$			50		°C

Note: [1] Design values, not actual test values.

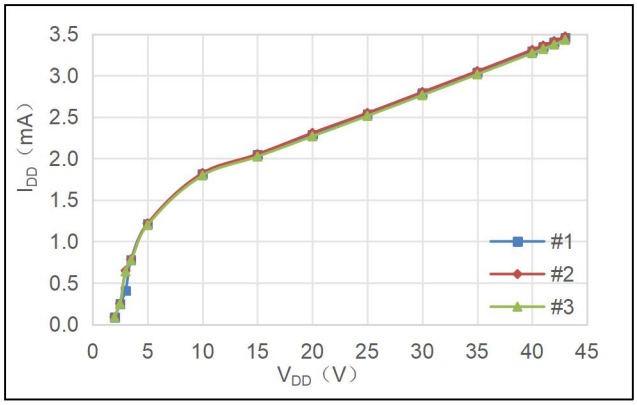
MAGNETIC PARAMETER

Parameter	Symbol	Min	Typ.	Max.	Unit
Operate Point	B_{OP}	5	25	45	Gauss
Release Point	B_{RP}	-45	-25	-5	Gauss
Hysteresis	B_{HYS}	20	50	80	Gauss

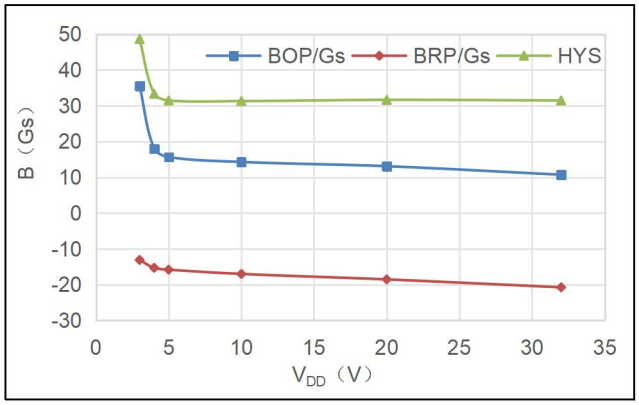
DRIVER OUTPUT VS. MAGNETIC POLE

Parameter	Test Condition	OUT1	OUT2
North Pole	$B<B_{RP}$	High	Low
South Pole	$B>B_{OP}$	Low	High

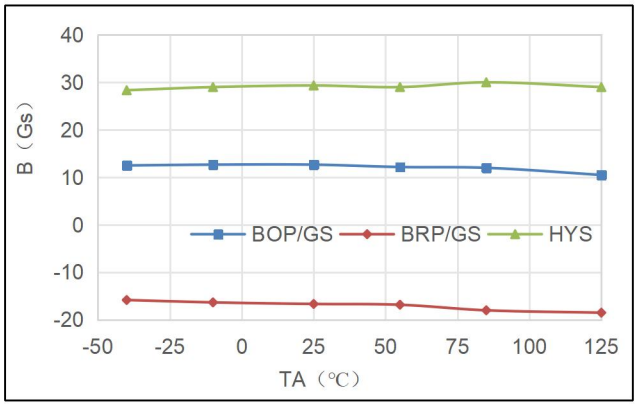
CURVE & WAVEFORM (V_{DD}=18V @ T_A=25°C, unless specified otherwise)



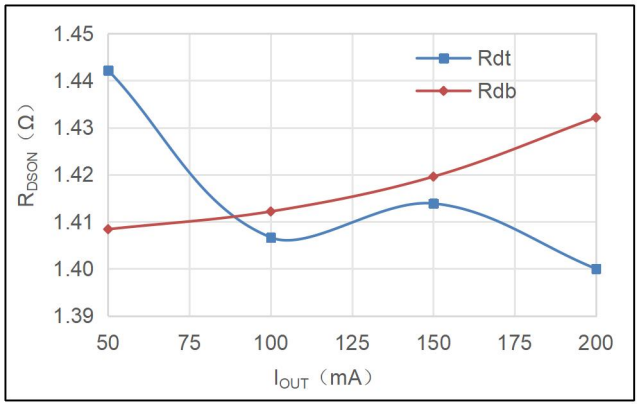
I_{DD} vs. V_{DD}



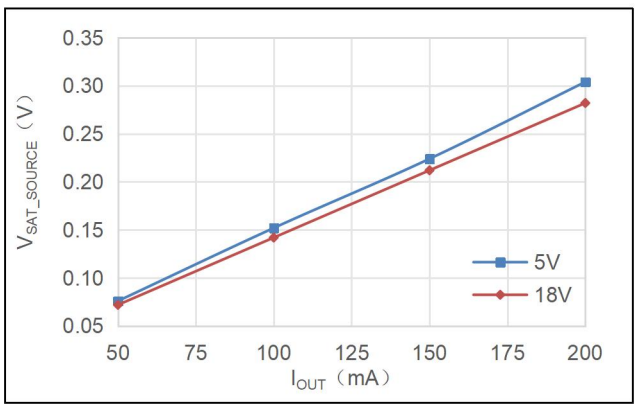
B_{OP} & B_{RP} & B_{HYS} vs. V_{DD}



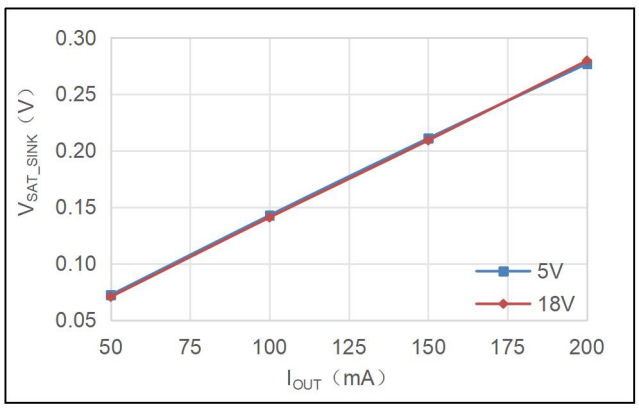
B_{OP} & B_{RP} vs. TA



R_{DSON} vs. I_{OUT}

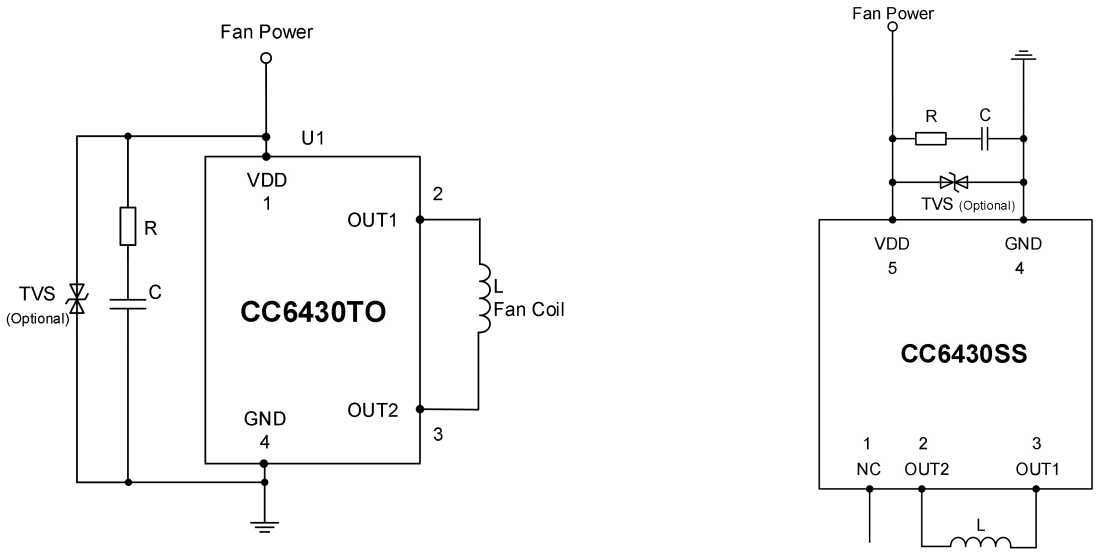


V_{SAT_SOURCE} vs. I_{OUT}



V_{SAT_SINK} vs. I_{OUT}

TYPICAL APPLICATION CIRCUIT



CC6430 typical application circuit

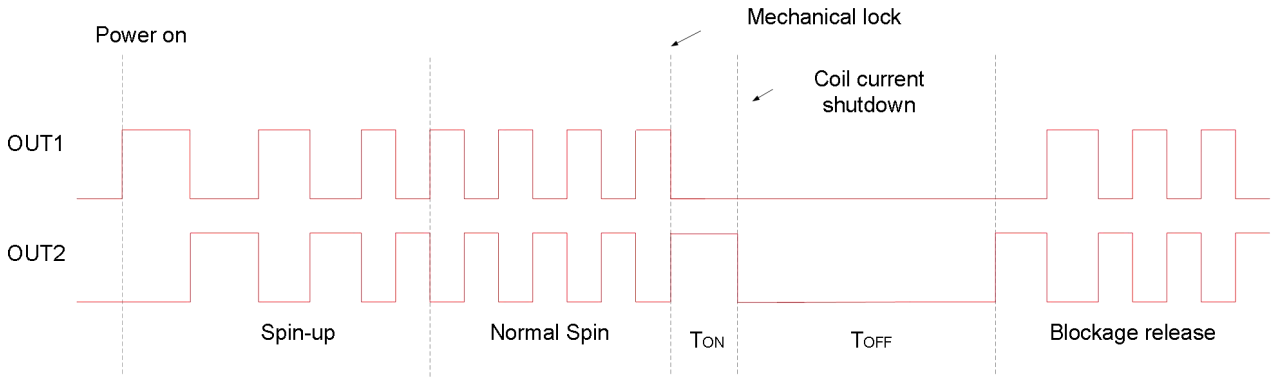
Note:

a) Bypass RC circuit (recommended) can absorb the fan coil current and improve the reliability of the fan, the specific parameters are related to the actual model, rotation current, start-up current and so on.

b) Bidirectional TVS is optional and can enhance the ability to absorb external abnormalities. Unidirectional TVS can be used when there are additional terminals for physical anti-reverse connection.

FEATURES

This product has built-in card blocking protection. When the fan is blocked, the blocking protection shuts off the fan coil current and then tries to restart it every 2 seconds. The cycling of the switch reduces the average current to 1/7th of normal card blocking, enough to protect the fan from damage due to overheating



MAXIMUM DRIVE CURRENT

The maximum heat dissipation power of the CC6430 package is determined by the following equation (Note: K is the recommended coefficient):

$$P_{D(MAX)} = \frac{T_J - T_A}{R_{thJA}} \times K$$

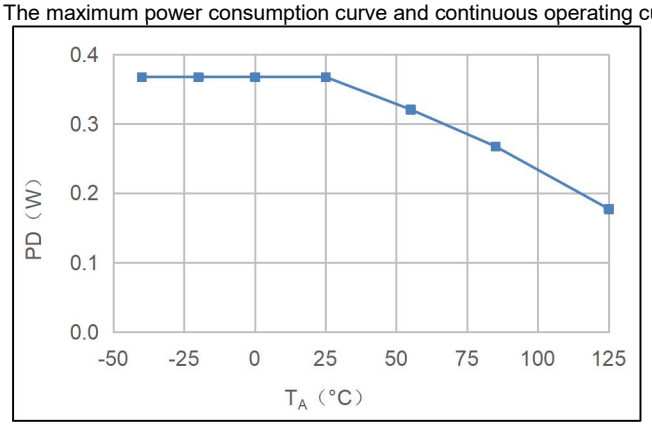
While normal operation, the power dissipated in CC6430:

$$P = I_{OUT}^2 \times R_{ON} + V_{DD} \times I_{DD}$$

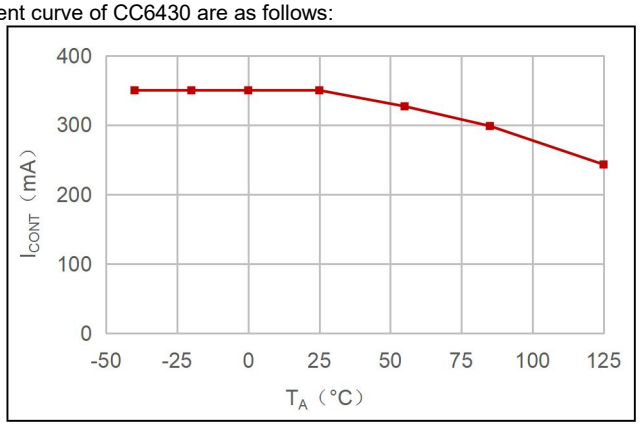
The maximum output current I_{MAX}:

$$I_{MAX} = \sqrt{\frac{(P_{D(MAX)} - V_{DD} \times I_{DD})}{R_{ON}}}$$

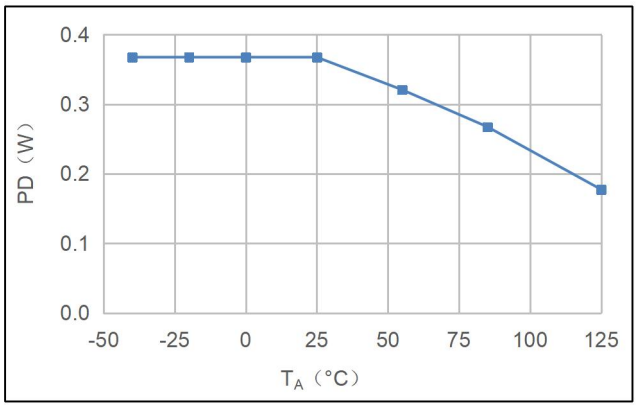
The maximum power consumption curve and continuous operating current curve of CC6430 are as follows:



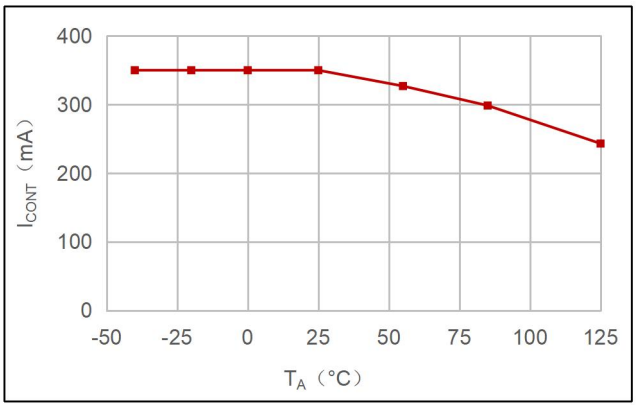
maximum power consumption curve (TO-94)



continuous operating current curve (TO-94)



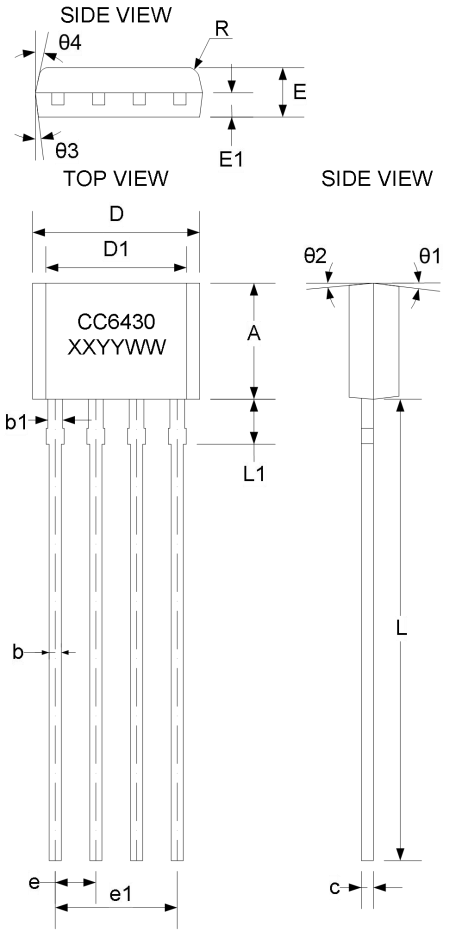
maximum power consumption curve (SOT335)



continuous operating current curve (SOT335)

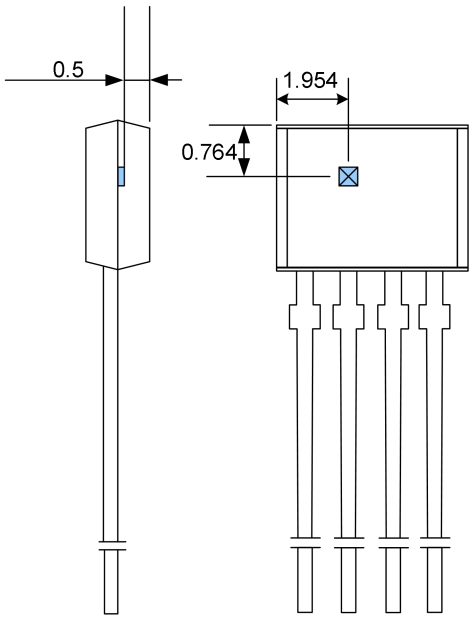
PACKAGE INFORMATIONS

1）TO-94 Package



Symbol	Size（mm）		
	Min.	Typ.	Max.
A	3.55	3.65	3.75
b	0.36	0.43	0.50
b1	0.38	0.465	0.55
c	0.36	0.38	0.51
D	5.12	5.22	5.32
D1	4.50	4.60	4.70
E	1.46	1.56	1.66
E1	0.71	0.76	0.81
R	-	0.3	-
e	1.27		
e1	3.81		
L	14.00	14.50	15.00
L1	1.312	1.412	1.512
θ1	5.19°	-	7°
θ2	3°	-	5°
θ3	5°	-	7°
θ4	10°	-	12°

Hall Location



Note:

1. All Dimensions are in millimeters.
2. To maintain reliability, it is recommended that the pin length be greater than 2.5mm.

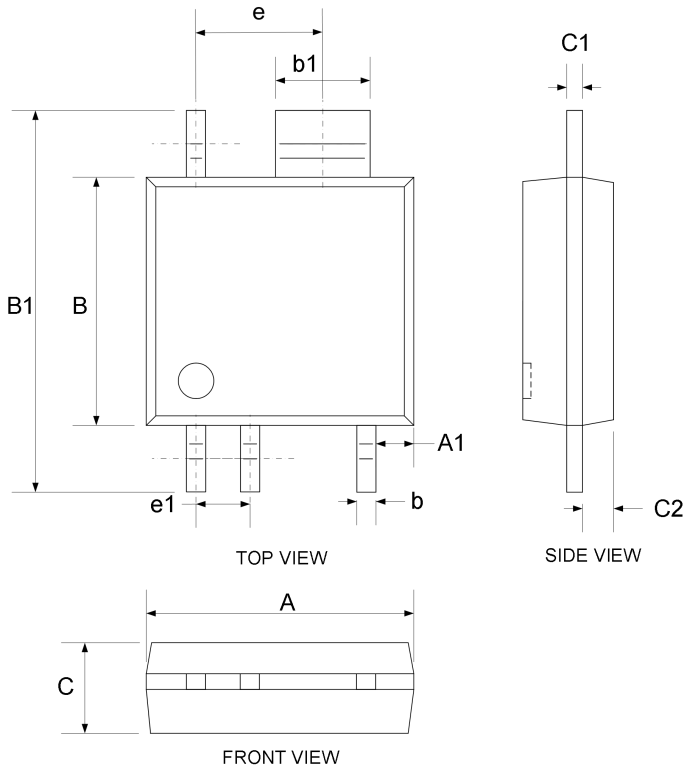
Marking:

1st Line: CC6430 –Device Name

2nd Line: XXYYWW – Batch No.

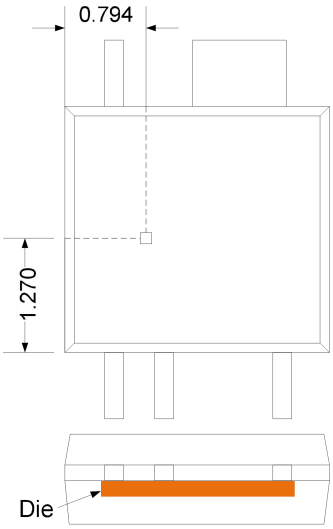
- XX – code
- YY – assembly year (last 2 digits)
- WW – assembly week number

2）SOT335 Package



Symbol	Size（mm）		
	Min.	Typ.	Max.
A	2.60	-	2.90
A1	0.35	0.40	0.45
e	1.20（BSC）		
e1	0.53（BSC）		
B	2.50	2.60	2.70
B1	3.90	4.00	4.10
b	0.16	0.21	0.26
b1	0.94	0.99	1.04
C	0.85	0.95	1.05
C1	0.15	0.152	0.18
C2	0.35	0.40	0.45

Hall Location



Back Marking:

1st Line: CC6430 – Device Name

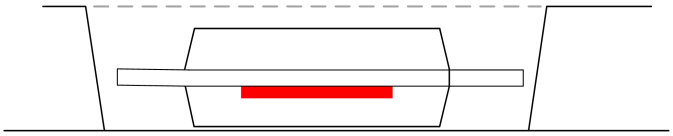
2nd Line: XXYYWW – Batch No.

- XX – code
- YY – assembly year (last 2 digits)
- WW – assembly week number

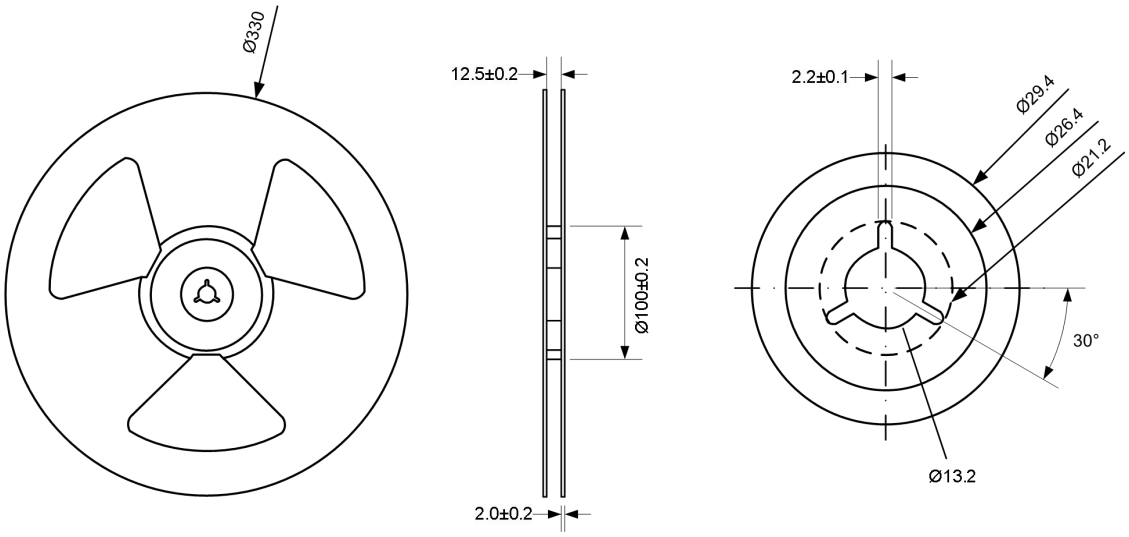
Note：

1.All Dimensions are in millimeters.

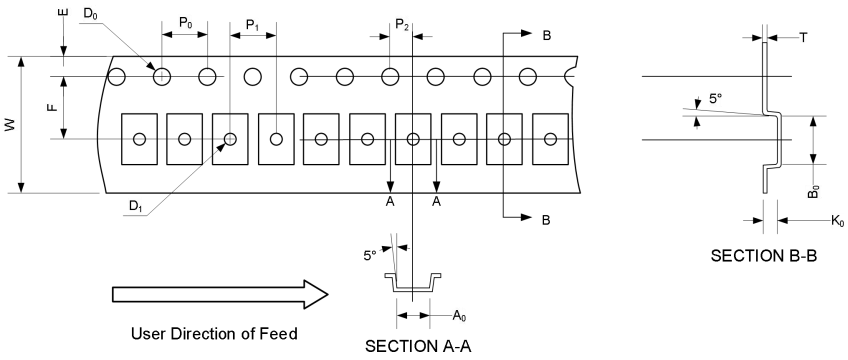
Information of carrier tape



Packaging & Tape reel (SOT335)



Information of Reel size

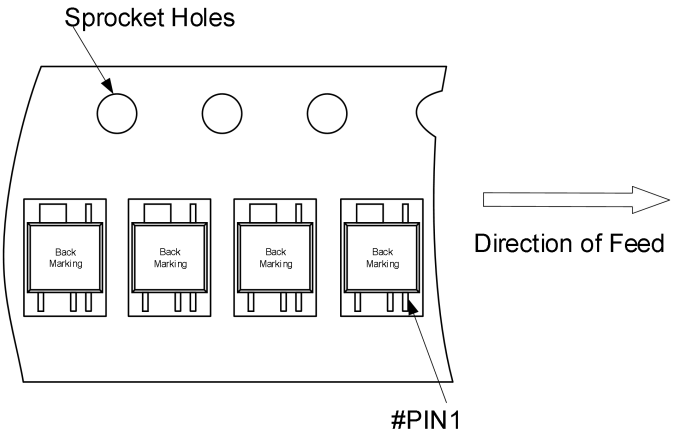


Information of Carrier Tape Size

Note: Each plate has 100 ± 5 grids in front of the tape and 100 ± 5 in the tail

Symbol	Size（mm）		
	Min.	Typ.	Max,
W	11.90	12.00	12.05
A0	2.90	2.95	3.00
B0	4.30	4.35	4.40
K0	1.30	1.35	1.40
E	1.65	1.75	1.85
F	5.40	5.50	5.60
D1	-	1.00	1.10
D0	-	1.50	1.60
P0	3.90	4.00	4.10
P1	3.90	4.00	4.10
P2	1.95	2.00	2.05
T	0.20	0.25	0.30

QUADRANT ASSIGNMENTS FOR PIN1 ORIENTATION IN TAPE



Note: All dimensions are millimeters.

REVISION HISTORY

Revision Date	Description of Revision	Revision
2024.01.24	Newly issued.	rev1.0
2024.01.25	Modified the T_{A_MIN} = -40°C——Page3 in ***RECOMMENDED OPERATION CONDITIONS*** form.	rev1.1
2024.02.28	ESD (HBM) changed from “4kV” to “6kV”.	rev1.2
2024.03.27	Delete the FPWM parameter from the ***RECOMMENDED OPERATION CONDITIONS*** form.	rev1.3
2024.06.24	Correct the electrical symbols of MOS devices in the ***FUNCTION BLOCK DIAGRAM.***	rev1.4
2024.06.28	Corrected silkscreen marking for SOT335 package to backside; Correcting the location of the chip in the carrier tape information.	rev1.5
2024.08.20	Supplementary maximum power curves and continuous current curves for TO-94 packages and SOT335 packages.	rev1.6

CrossChip

CrossChip Microsystems Inc. was founded in 2013, is a national high-tech enterprise, engaged in integrated circuit design and sales. The company has strong technical strength, has more than 60 kinds of patents, mainly used in Hall sensor signal processing, with the following product lines:

- ✓ High precision linear Hall sensor
- ✓ All kinds of Hall switches
- ✓ Single phase motor drive
- ✓ Single chip current sensor
- ✓ AMR Magnetoresistance sensor
- ✓ Isolation drive class chip

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