



Low Power, High PSRR LDO Regulators

Description

FC6330 series is a low-power, high PSRR, low dropout linear regulator manufactured by CMOS process. The FC6330 series of regulators have built-in fixed voltage reference, temperature protection, current limiting circuit, phase compensation circuit and low internal resistance MOSFET to achieve low power consumption, high ripple suppression, and low dropout performance. The FC6330 series is compatible with ceramic capacitors with a smaller volume than tantalum capacitors, and does not require the use of 0.1uF By-pass capacitors, which can save space. The high-speed response characteristics of the FC6330 series cope with the fluctuation of load current, so it is especially suitable for handheld and radio frequency products. The output can be turned off by controlling the CE pin on the chip, and the power consumption after turning off is only 0uA.

Feature

- Maximum Output Current: 400mA
($V_{IN}=4.3V, V_{OUT}=3.3V$)
- Dropout Voltage: 117mV@ $I_{OUT}=100mA$
- Operating Voltage Range: 1.8V~5.5V
- Output Voltage Range: 1.5V~5.0V
- Highly Accuracy: $\pm 2\%$
- Low Power Consumption: 4uA(TYP.)
- Standby Current: 0uA(TYP.)
- High Ripple Rejection: 67dB@1KHz (FC6330C33)
- Built-in temperature protection and current limiting protection
- AEC-Q101 qualified
- ESD HBM : 3000V \uparrow

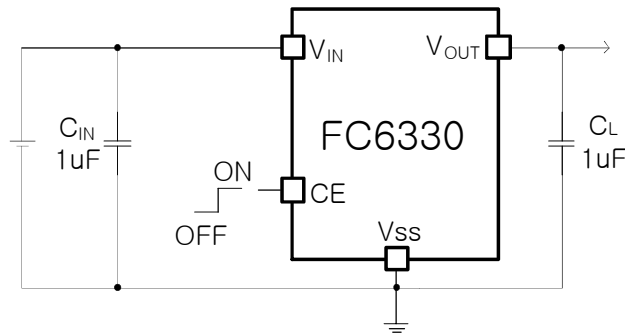
Applications

- Mobile phones
- Cordless telephone equipment
- Cameras, Video cameras
- Bluetooth and other radio frequency products
- Reference voltage sources

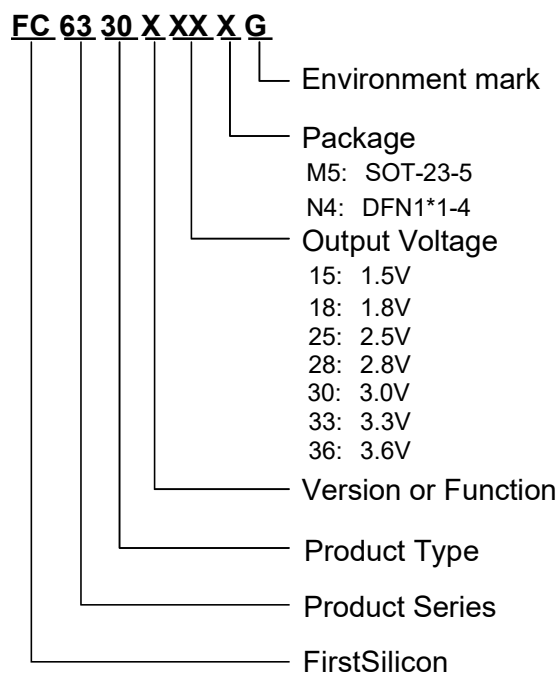
Package

- 4-pin DFN1*1-4
- 5-pin SOT-23-5

Typical Application Circuit

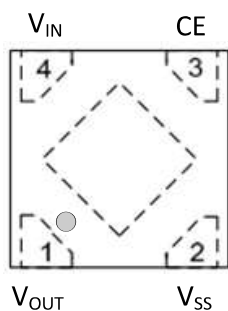


Selection Guide

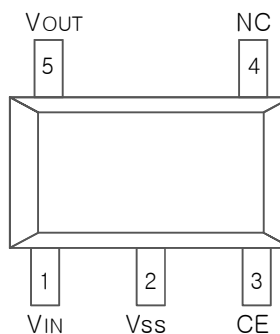


Product serie	Product Function
FC6330C15N4AG	V _{OUT} =1.5V; Package: DFN1*1-4
FC6330C15M5G	V _{OUT} =1.5V; Package: SOT-23-5
FC6330C18N4AG	V _{OUT} =1.8V; Package: DFN1*1-4
FC6330C18M5G	V _{OUT} =1.8V; Package: SOT-23-5
FC6330C25N4AG	V _{OUT} =2.5V; Package: DFN1*1-4
FC6330C25M5G	V _{OUT} =2.5V; Package: SOT-23-5
FC6330C28N4AG	V _{OUT} =2.8V; Package: DFN1*1-4
FC6330C28M5G	V _{OUT} =2.8V; Package: SOT-23-5
FC6330C30N4AG	V _{OUT} =3.0V; Package: DFN1*1-4
FC6330C30M5G	V _{OUT} =3.0V; Package: SOT-23-5
FC6330C33N4AG	V _{OUT} =3.3V; Package: DFN1*1-4
FC6330C33M5G	V _{OUT} =3.3V; Package: SOT-23-5
FC6330C36N4AG	V _{OUT} =3.6V; Package: DFN1*1-4
FC6330C36M5G	V _{OUT} =3.6V; Package: SOT-23-5

Pin Configuration(Top View)



DFN1*1-4

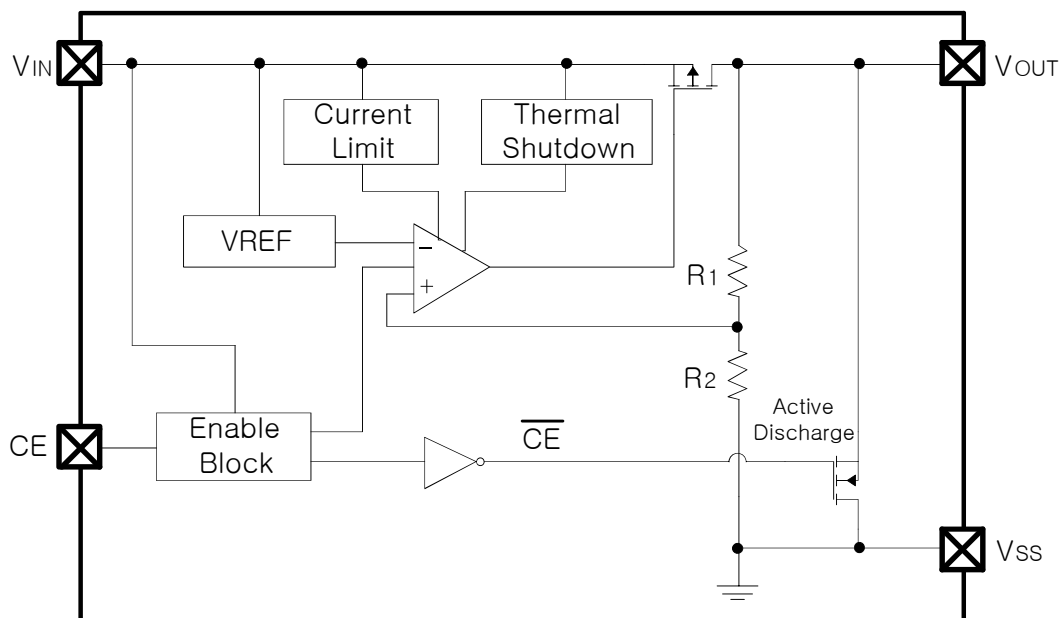


SOT-23-5

Pin Assignment

PIN Number DFN1*1-4	PIN Number SOT-23-5	Symbol	Function
1	5	V_{OUT}	Output
2	2	V_{SS}	Ground
3	3	CE	ON/OFF Control
4	1	V_{IN}	Power Input
-	4	NC	No Connect

Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Ratings	Units
Input Voltage	V_{IN}	-0.3~6.5	V
CE Pin Voltage	V_{CE}	$V_{IN} - 0.3 \sim V_{IN} + 0.3$	V
V_{OUT} Voltage	V_{OUT}	$V_{IN} - 0.3 \sim V_{IN} + 0.3$	V
V_{OUT} Current	I_{OUT}	600	mA
Internal Power Dissipation	DFN1*1-4	0.5	W
	SOT-23-5	0.6	
Thermal resistance (Junction to air)	DFN1*1-4	250	$^{\circ}\text{C}/\text{W}$
	SOT-23-5	210	
Operating Ambient Temperature Range	T_{Opr}	-40~+85	$^{\circ}\text{C}$
Storage Temperature Range	T_{stg}	-55~+150	$^{\circ}\text{C}$
Maximum junction temperature	T_J	-40~+150	$^{\circ}\text{C}$



FC6330

Electrical Characteristic

($V_{IN} = V_{OUT} + 1V$, $V_{CE} = V_{IN}$, $C_{IN} = C_L = 1\mu F$, $T_a = 25^\circ C$, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units	
Operating Input Voltage	V_{IN}		1.8	-	5.5	V	
Output Voltage	$V_{OUT(E)}$ (Note 2)	$I_{OUT} = 10mA, V_{IN} = V_{OUT} + 1V$	X 0.98	$V_{OUT(T)}$ (Note 1)	X 1.02	V	
Maximum Output Current	I_{OUTMAX}	$V_{IN} = V_{OUT} + 1V$	-	400	-	mA	
Load Regulation	ΔV_{OUT}	$V_{IN} = V_{OUT} + 1V$, $1mA \leq I_{OUT} \leq 100mA$	-	9	20	mV	
Dropout Voltage (Note 3) $I_{OUT} = 100mA$	VDIF	$V_{OUT} = 3.3V$	-	117	-	mV	
Dropout Voltage (Note 3) $I_{OUT} = 200mA$	VDIF	$V_{OUT} = 3.3V$	-	235	-	mV	
Supply Current	I_{SS}	$V_{IN} = V_{OUT} + 1V$	-	4	7	μA	
Stand-by Current	I_{CEL}	$V_{CE} = 0V$	-	0	0.2	μA	
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	$I_{OUT} = 30mA$, $V_{OUT} + 1V \leq V_{IN} \leq 6V$	-	0.02	-	%/V	
Output Current Limit	I_{LIM}	Peak Output Current	-	630	-	mA	
CE "High" Voltage	V_{CEH}	Start up	1.2	-	-	V	
CE "Low" Voltage	V_{CEL}	Shut down	-	-	0.4	V	
Ripple Rejection Rate (Note 4)	PSRR	$V_N = (V_{OUT} + 1)V + 0.2V_{ppAC}$, $I_{OUT} = 10mA$	f=1kHz f=10kHz	- -	67 55	- -	dB
Thermal Shutdown Temperature (Note 4)	T_{SD}	Temperature increasing, $I_{OUT} = 10mA$	-	150	-	$^\circ C$	
Thermal Shutdown Hysteresis (Note 4)	ΔT_{SD}	Temperature falling	-	25	-	$^\circ C$	
Output noise	V_N	f = 10Hz to 100kHz, $I_{OUT} = 10mA$	-	90	-	μV_{RMS}	

NOTES:

- $V_{OUT(T)}$: Specified Output Voltage
- $V_{OUT(E)}$: Effective Output Voltage (i.e. The output voltage when " $V_{OUT(T)} + 1.0V$ " is provided at the Vin pin while maintaining a certain Iout value.)
- $V_{DIF} = V_{IN1} - V_{OUT(E)}$
 V_{IN1} : The input voltage when $V_{OUT(E)}$ appears as input voltage is gradually decreased.
 $V_{OUT(E)}$ = A voltage equal to 98% of the output voltage whenever an amply stabilized Iout { $V_{OUT(T)} + 1.0V$ } is input.
- guaranteed by design.

Typical Performance Characteristics

FC6330C33M5G ($V_{CE} = V_{IN} = 4.3V$, $T_a = 25^\circ C$, unless otherwise noted.)

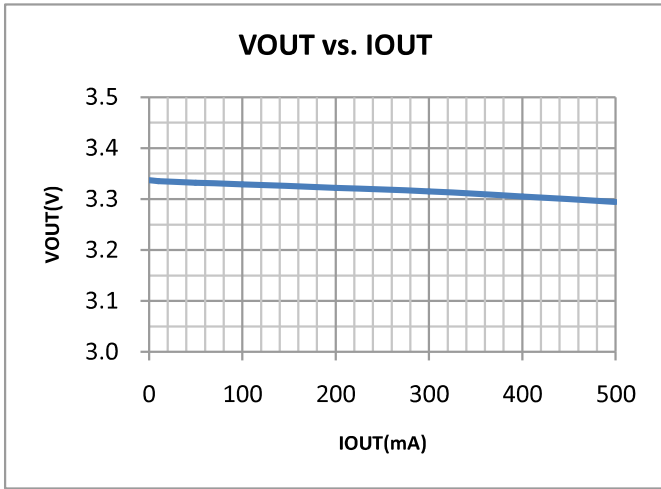


Figure 1. Output Voltage vs. Output Current

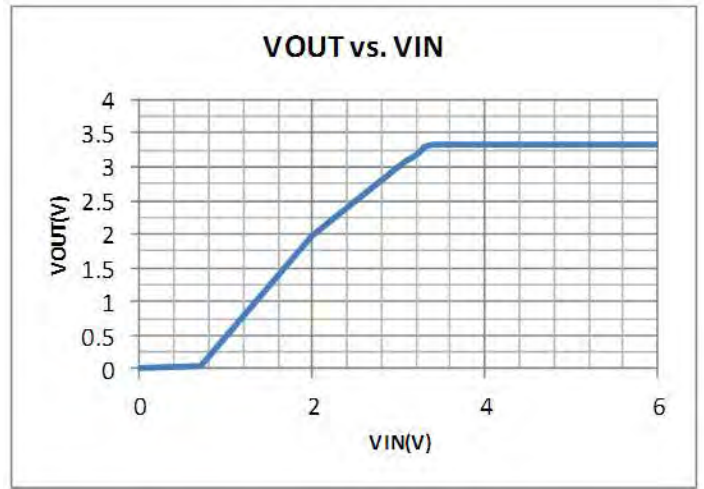


Figure 2. Output Voltage vs. Input Voltage

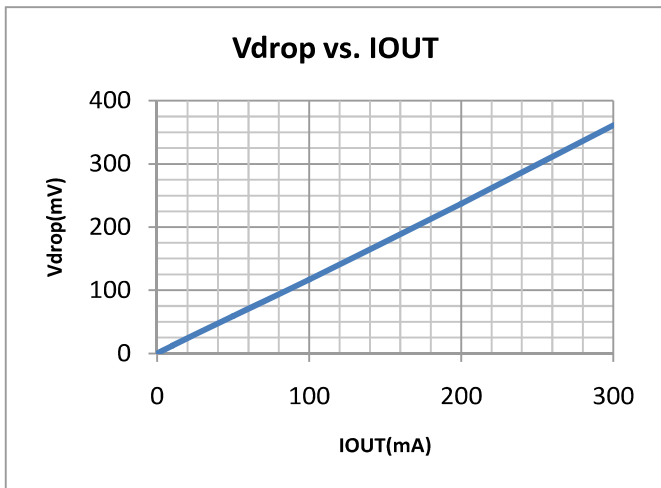


Figure 3. Dropout Voltage vs. Output Current

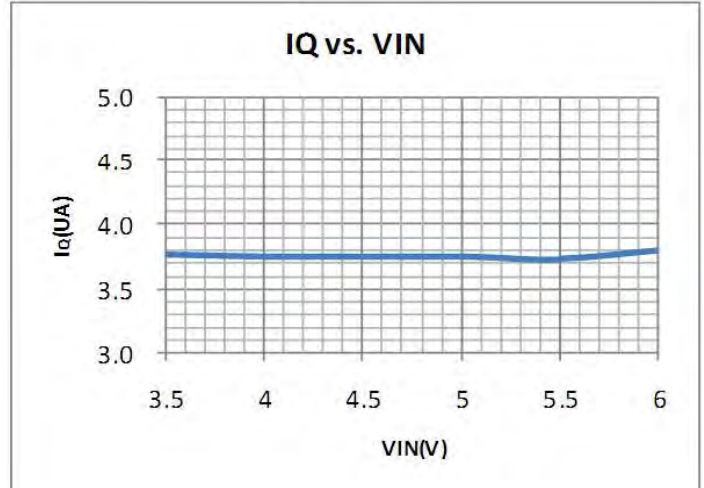


Figure 4. Quiescent Current vs. Input Voltage

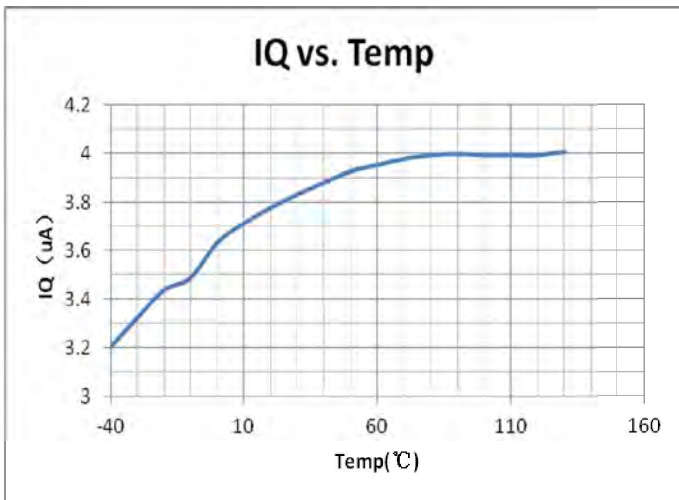


Figure 5. Quiescent Current vs. Temperature

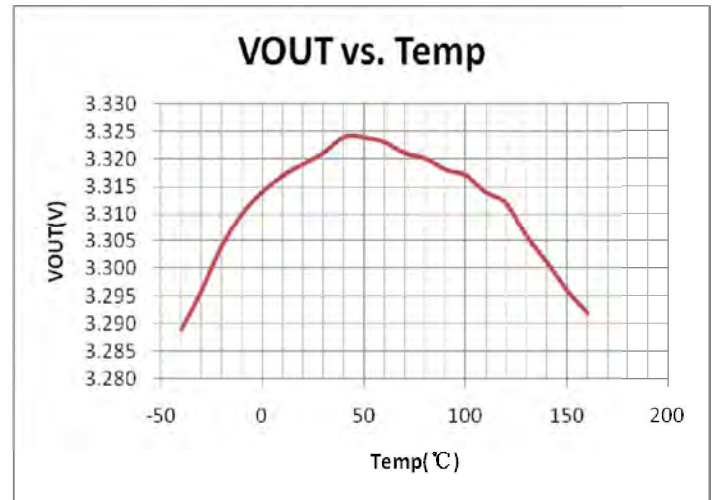


Figure 6. Output Voltage vs. Temperature

Typical Performance Characteristics(Con.)

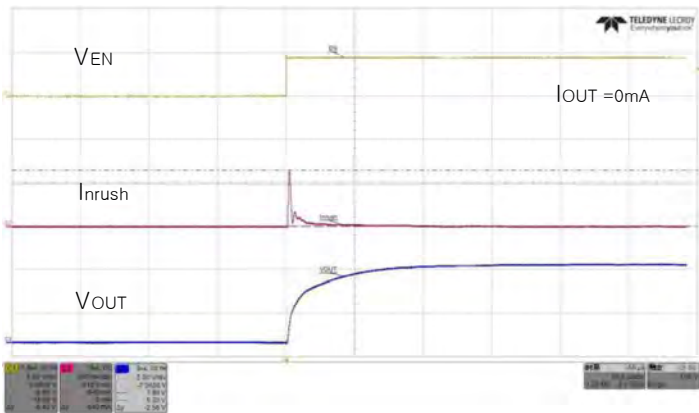


Figure 7. Enable Turn-on Response

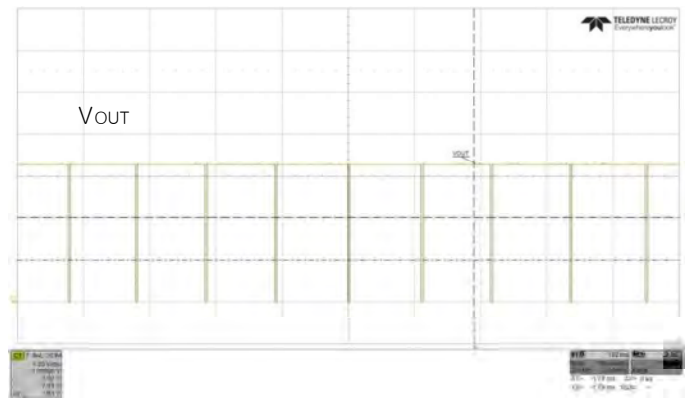


Figure 8. Thermal Shutdown

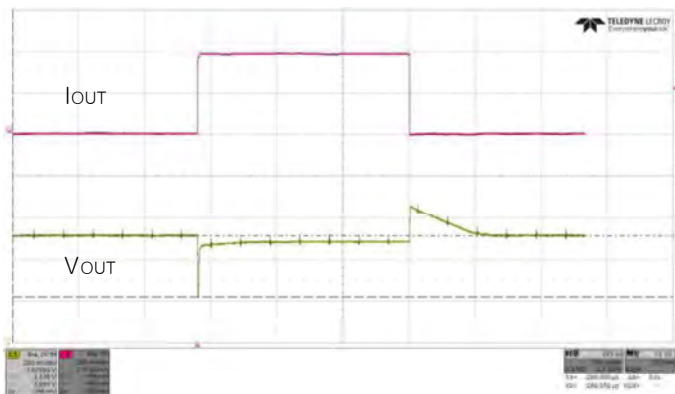


Figure 9. Load Transient Response
I_{OUT}=1mA to 400mA

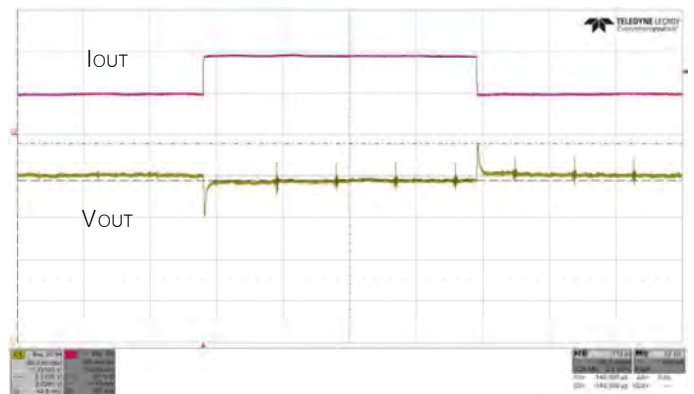


Figure 10. Load Transient Response
I_{OUT}=100mA to 200mA

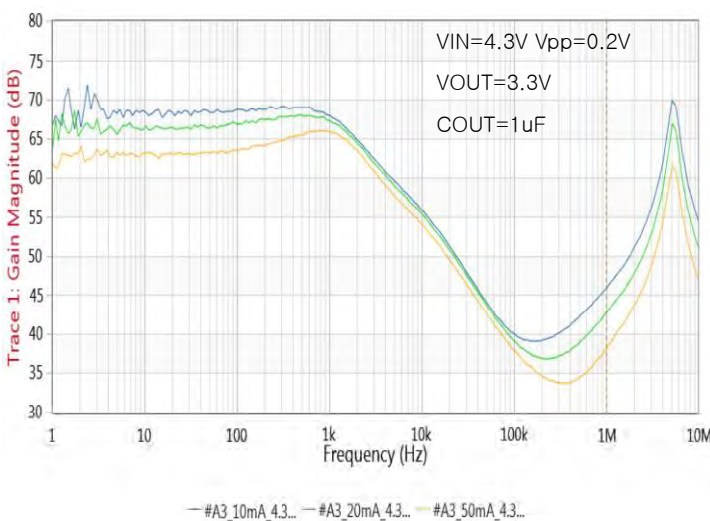


Figure 11. PSRR vs. Frequency

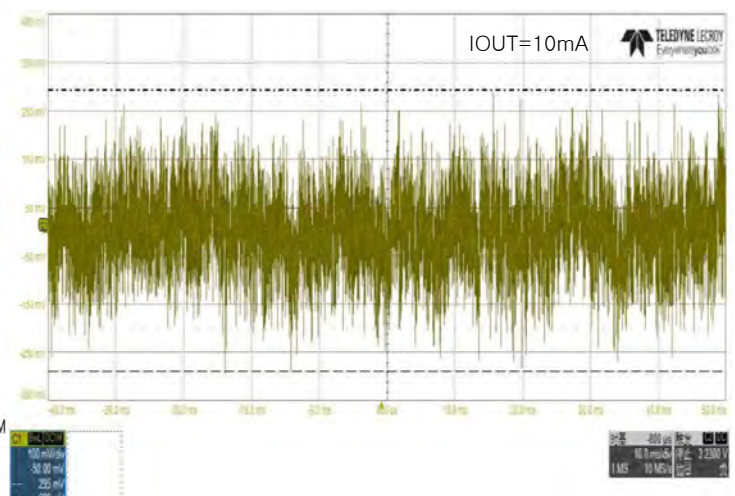
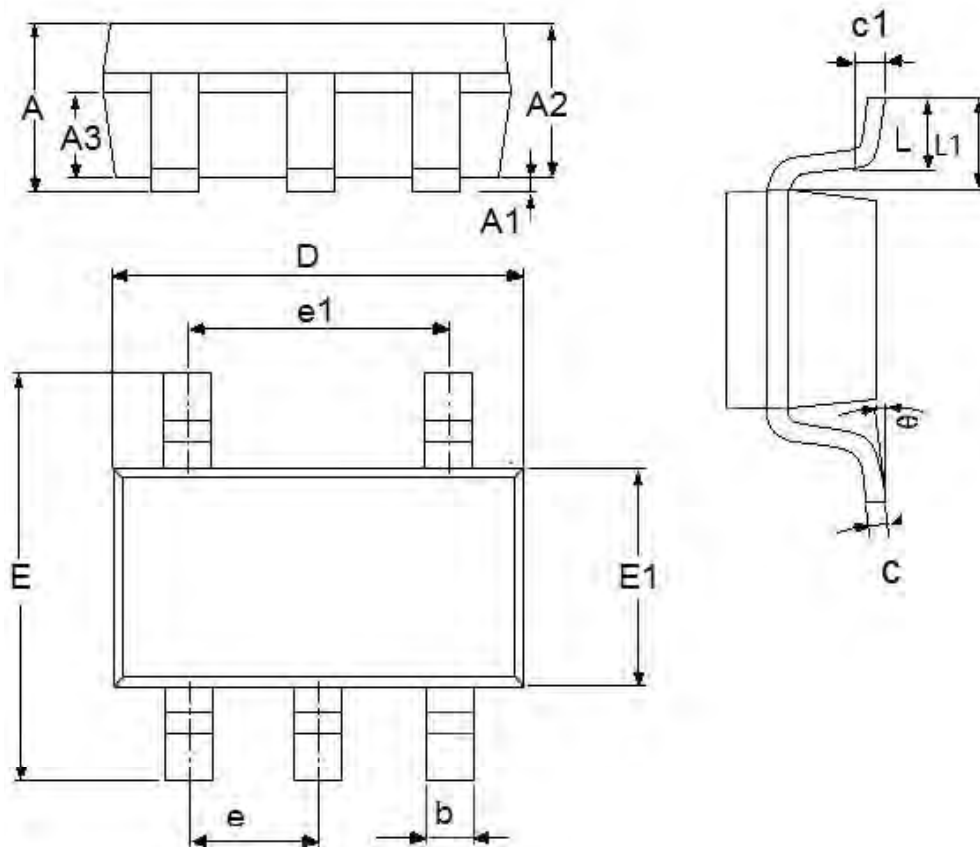


Figure 12. 10Hz-100kHz noise

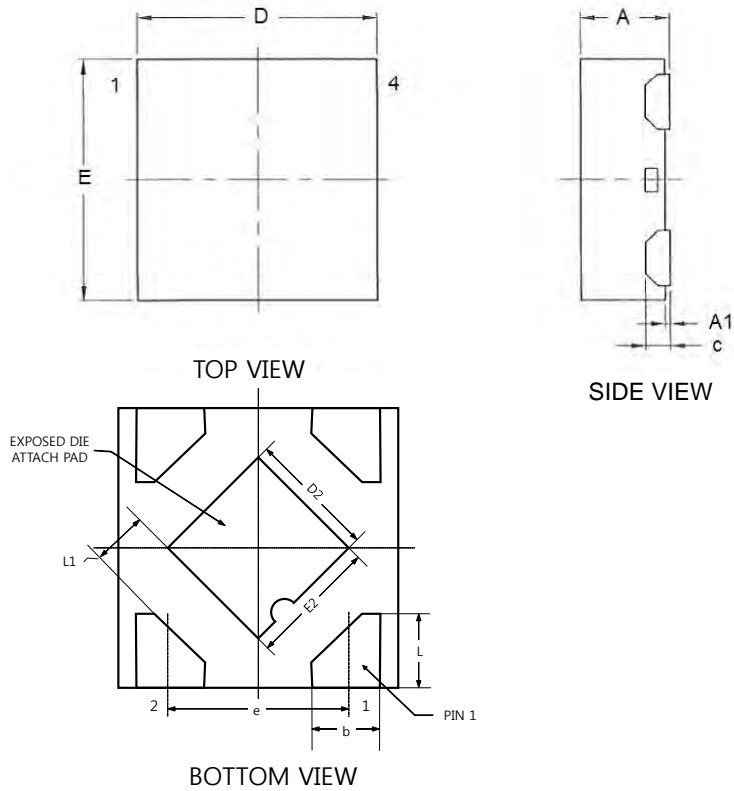
Packaging Information

- Package Type:SOT-23-5



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	1.05	1.45	0.0413	0.0571
A1	0	0.15	0.0000	0.0059
A2	0.9	1.3	0.0354	0.0512
A3	0.6	0.7	0.0236	0.0276
b	0.25	0.5	0.0098	0.0197
c	0.1	0.23	0.0039	0.0091
D	2.82	3.05	0.1110	0.1201
e1	1.9(TYP)		0.0748(TYP)	
E	2.6	3.05	0.1024	0.1201
E1	1.5	1.75	0.0512	0.0689
e	0.95(TYP)		0.0374(TYP)	
L	0.3	0.6	0.0118	0.0236
L1	0.59(TYP)		0.0232(TYP)	
θ	0	8°	0.0000	8°
c1	0.2(TYP)		0.0079(TYP)	

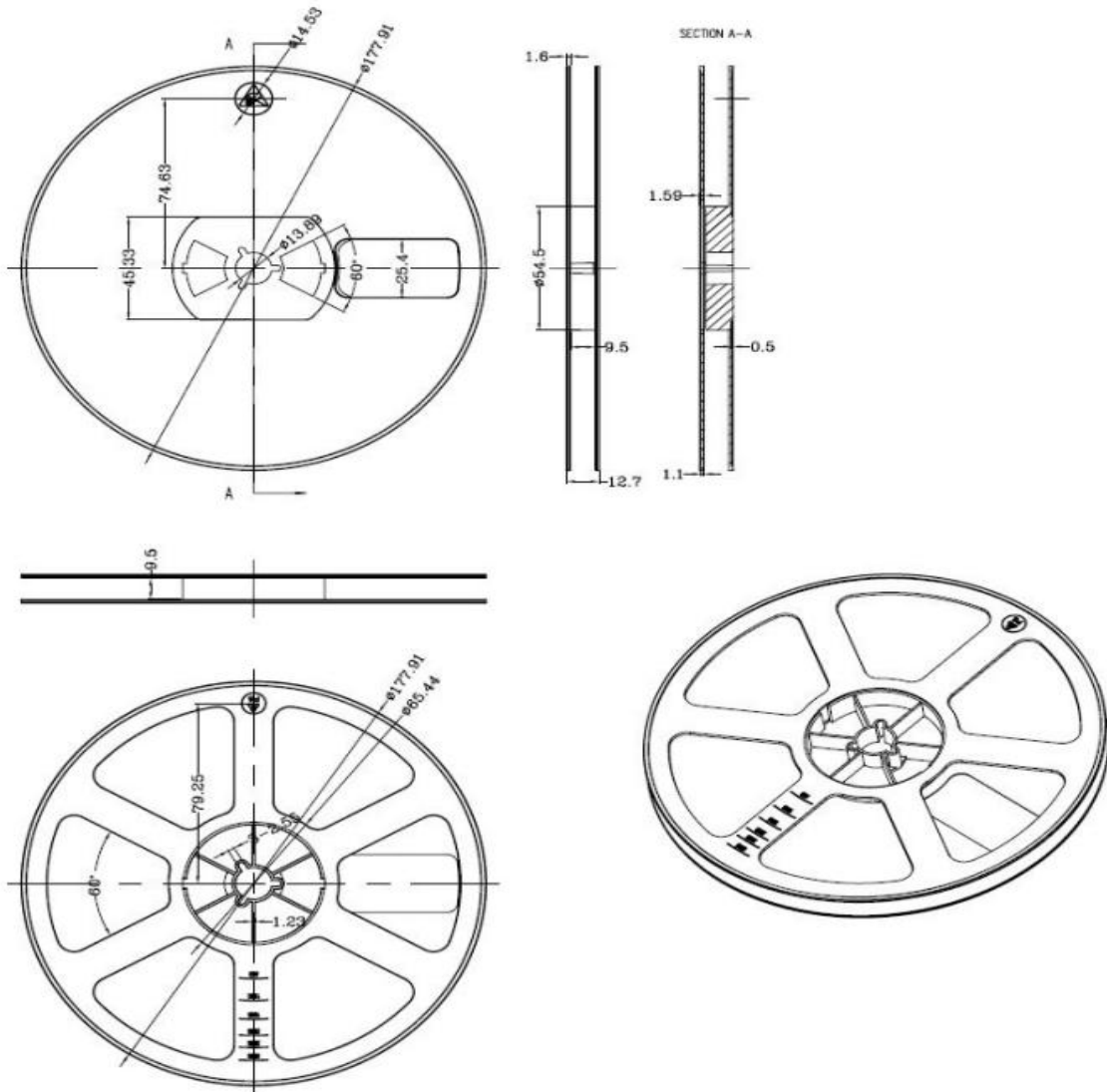
- Package Type: DFN1* 1- 4

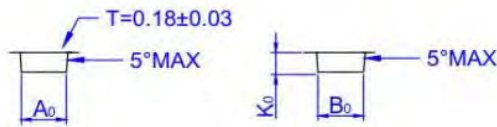
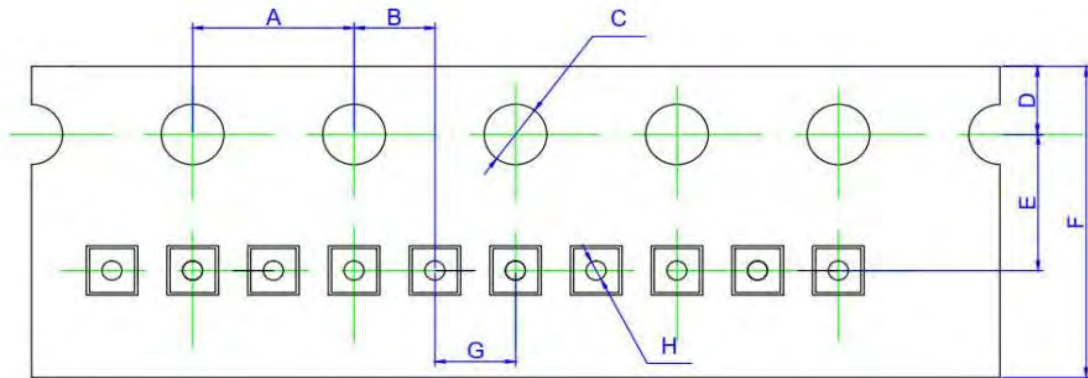


DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	0.32	0.4	0.0126	0.0157
A1	0	0.05	0	0.0020
b	0.18	0.28	0.0071	0.0110
c	0.102		0.0040	
D	0.95	1.05	0.0374	0.0413
D2	0.43	0.53	0.0169	0.0209
e	0.65 (TYP)		0.0256 (TYP)	
E	0.95	1.05	0.0374	0.0413
E2	0.43	0.53	0.0169	0.0209
L	0.2	0.3	0.0079	0.0118
L1	0.205 (TYP)		0.0081 (TYP)	

Tape and Reel Information

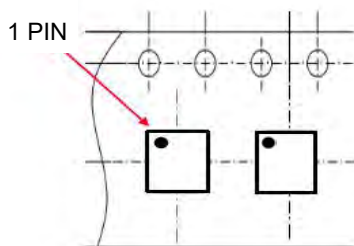
- Package Type : DFN1*1-4



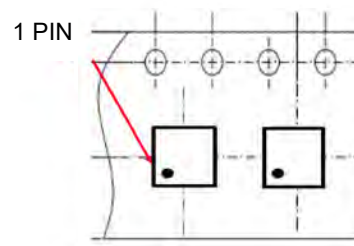


Item	Typ	Low Tolerance	High Tolerance	Min	Max
A ₀	1.12	-0.05	0.05	1.07	1.17
B ₀	1.13	-0.05	0.05	1.08	1.18
K ₀	0.5	-0.05	0.05	0.45	0.55
A	4.00	-0.10	0.10	3.9	4.1
B	2.00	-0.05	0.05	1.95	2.05
C	1.55	-0.05	0.05	1.5	1.6
D	1.75	-0.10	0.10	1.65	1.85
E	3.5	-0.05	0.05	3.45	3.55
F	8.0	-0.1	0.3	7.9	8.3
G	2.00	-0.05	0.05	1.95	2.05
H	0.5	-0.1	0.1	0.4	0.6

● 1PIN Orientation



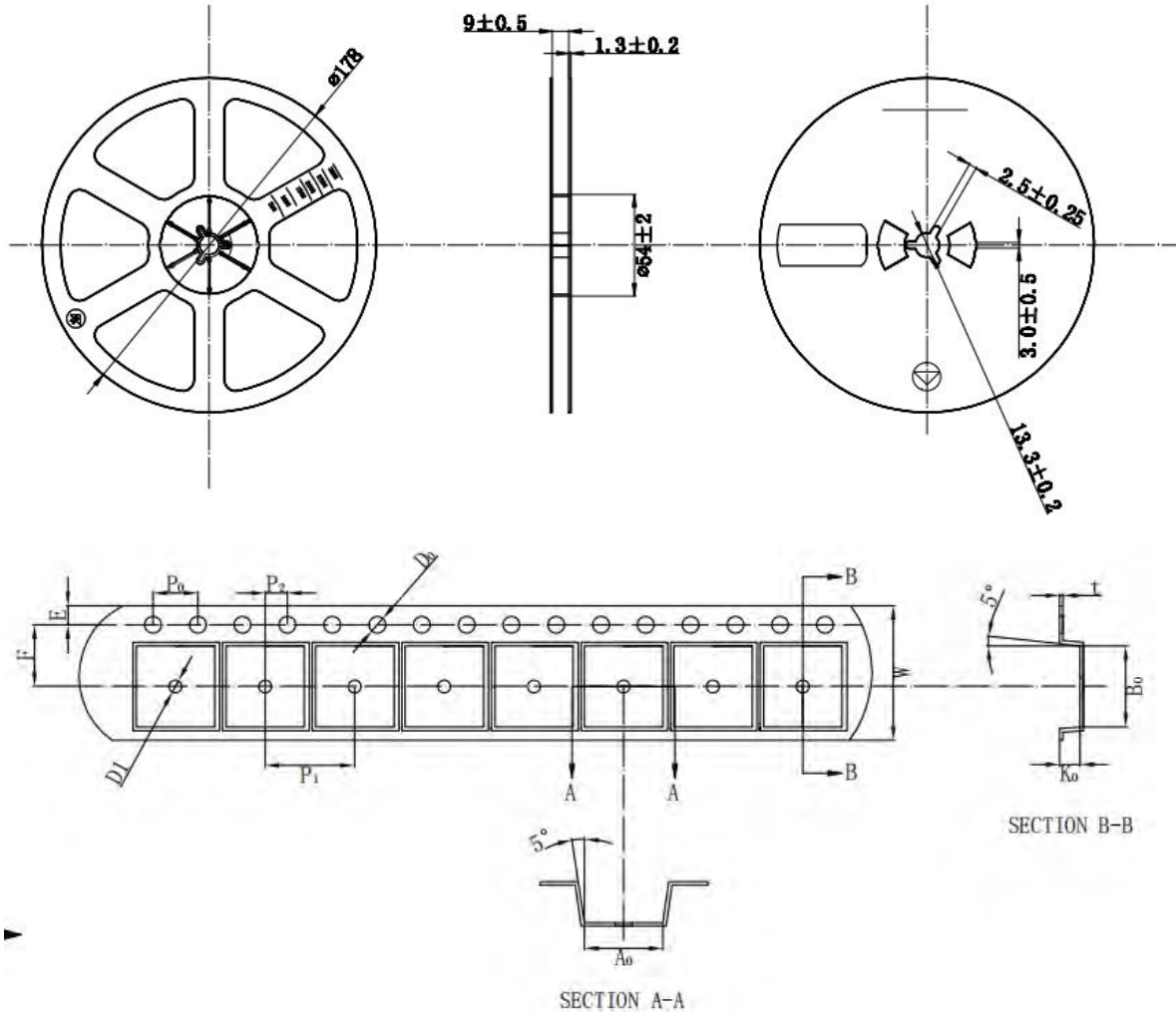
FC6330C30N4AG



FC6330CxxN4AG ⁽¹⁾

(1) Out put voltage value, xx = 15 to 36, e.g., 36 means 3.6 V output voltage. **NOTE: 30 IS NOT INCLUDED.**

- Package Type : SOT-23-5



ITEM	W	A ₀	B ₀	K ₀	E	F	D ₁	D ₀	P ₀	P ₁	P ₂	t
MIN	7.80	3.15	3.25	1.28	1.65	3.45	—	—	3.90	3.90	1.95	0.20
NOM	8.00	3.25	3.30	1.38	1.75	3.50	1.00	1.50	4.00	4.00	2.00	0.25
MAX	8.20	3.35	3.40	1.48	1.85	3.55	1.10	1.60	4.10	4.10	2.05	0.30

- 1PIN Orientation

