无锡市至诚微电子有限公司 ZCC8801

LOW Noise High PSRR 1 Ch500mA/1A Ultra LOW Dropout LDO

FUNCTIONAL DESCRIPTION

The ZCC8801 series is a CMOS-based positive low-dropout linear regulator (LDO) featuring 500 mA/ 1.0A that provides high PSRR, high output voltage accuracy, low-noise and low supply current

It consists of a voltage reference, an error amplifier, a resistor-ladder for output voltage setting. It also has under-voltage lockout (UVLO), over current/short circuit protection circuit and over temperature shutdown circuit.

The ZCC8801 typically has 95mV dropout voltage (DFN3030-8, Iout=1A, Vout=3.3V) and 156mA dropout voltage (DFN3030-8, Iout=1A, Vout=1.8V) and chip enable function (EN) for long battery life.

Excellent ripple rejection, load transient and line transient response make it ideal for the power sources of mobile communication devices or camera modules in low light condition. It can also turn on under full load condition, making it suitable for harsh system environment.

The ZCC8801 series LDOs have option for output current limit between 1.0A or 500mA by alternating the LCON pin between "H" or "L" for DFN3030-8 package version.

MAIN FEATURES

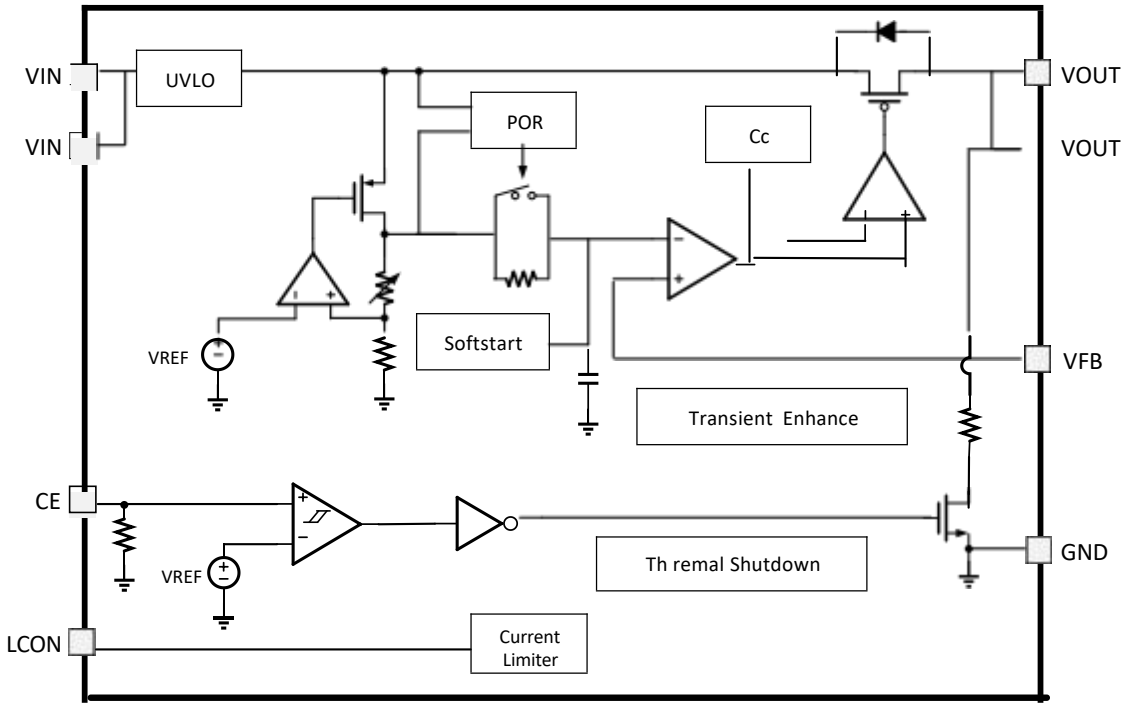
- Supply Current (no load): 85μA (typ.)
- Supply Current (Standby): 0.1μA (typ.)
- Dropout Voltage: 100mV (DFN3030-8, Iout=1A, Vout=2.5V, typ.)
- High-PSRR: 85dB @1kHz
- Output Noise: 10μVrms (10-100KHz, 0.85V output voltage settings, typ.)
- Line Regulation: 0.01%/V
- Fixed Mode Voltage Range: 0.85V to 2.5V with 0.05V step.
- Adjustable Mode Voltage Range: 0.85V to 4.3V.
- Built-in Short Current Protection Limit: 120mA (LCON='H', 1.0A, typ.)
- Bulit-in Peak Current Protection Limit: 1.7A (LCON='H', 1.0A, typ.)
- Over Temperature Protection and Auto Recover
- Built-in Soft-Start and Inrush Current Limit
- Fast Auto Discharge Function for Power Down

APPLICATIONS

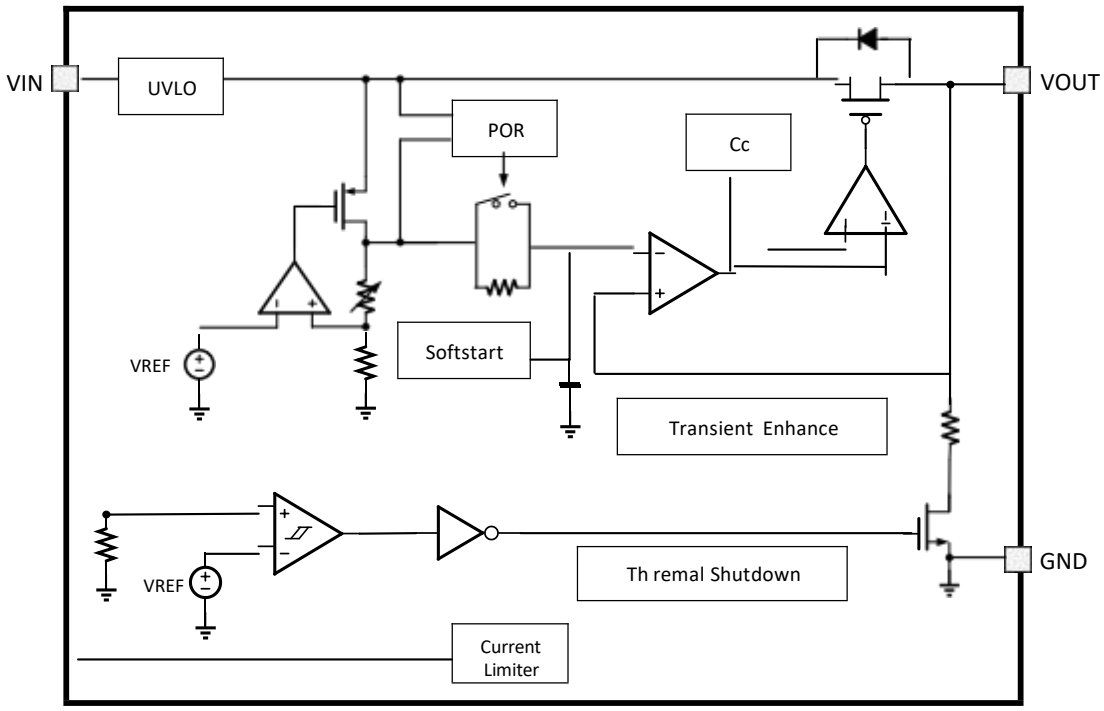
- Portable Device , Tablets and Smartphone
- Cameras, VCRs and Car Dash Cameras
- Low Light & Low Noise Cam Application
- Communications and Infrastructure
- AR or VR Application

BLOCK DIAGRAMS

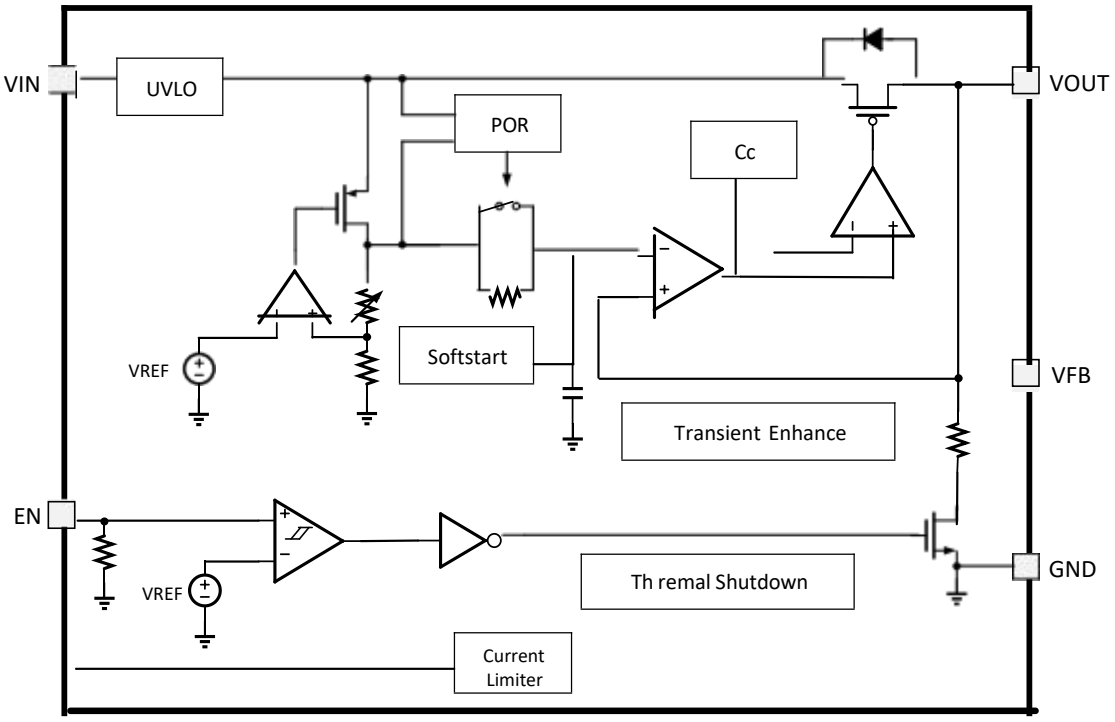
DFN3030-8 (8 PIN)



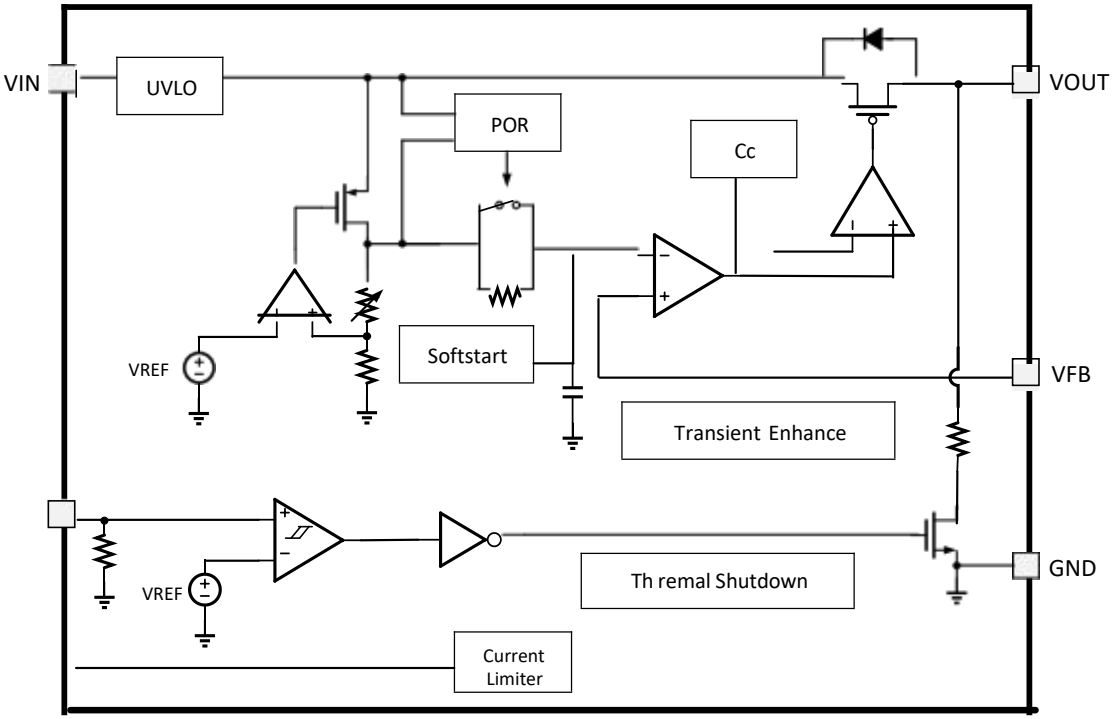
SOT-89-3 (3 PIN)



SOT-23-5 Fixed Mode (5 PIN)



SOT-23-5 ADJ Mode (5 PIN)



It is not recommended to use the 1A version of the SOT-23-5 package.

SELECTION GUIDE

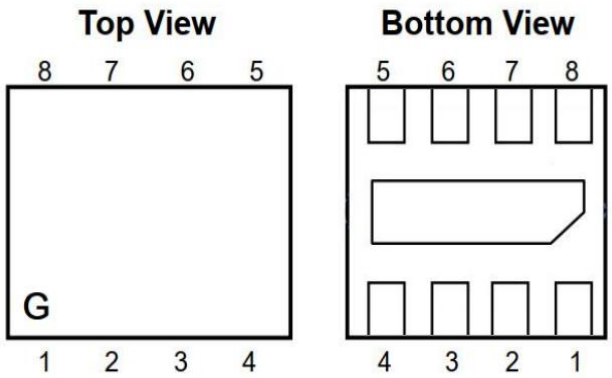
Product Name : ZCC8801*X-nnn-P*

- X=Revision
- nnn = Output Voltage ➔120=1.2V , 330=3.3V , 085=0.85V
- P: Package ➔ D=DFN3*3-8 ; S=SOT89-5

(ZCC8801 series LDOs offer VOUT voltage available in 0.85V~4.30V with 0.05V step)

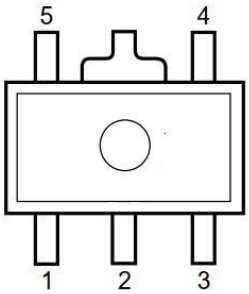
e.g. ZCC8801-120-D ➔ Original Version. Output voltage=1.2V, DFN3*3-8 package.

PIN DESCRIPTION



DFN3*3-8 Pin Configuration

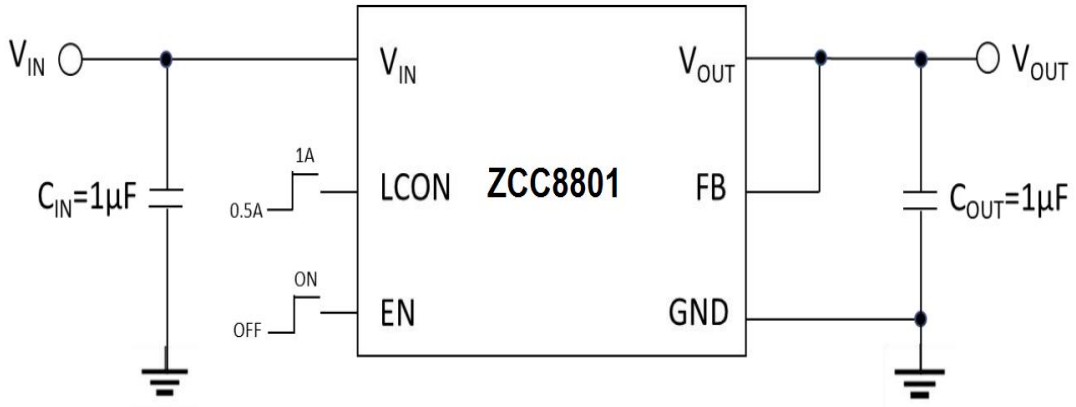
PIN No	Symbol	Pin Description
1	VOUT	Output Pin
2	VOUT	Output Pin
3	LCON	Output Current Limit Alternate Pin
4	VFB	Feedback Pin
5	GND	Ground Pin
6	CE	Chip Enable Pin
7	VDD	Input Pin
8	VDD	Input Pin
Exposed Pad	left open or connected to common ground	Connect to PCB metal area for heatsink purposes



SOT-89-5 Pin Configuration

PIN No	Symbol	Pin Description
1	VFB	Feedback Pin
2	GND	Ground Pin
3	CE	Chip Enable Pin
4	VDD	Input Pin
5	VOUT	Output Pin

TYPICAL APPLICATION CIRCUIT



* Recommended Ceramic Capacitors for Vin and Vout: 1uF

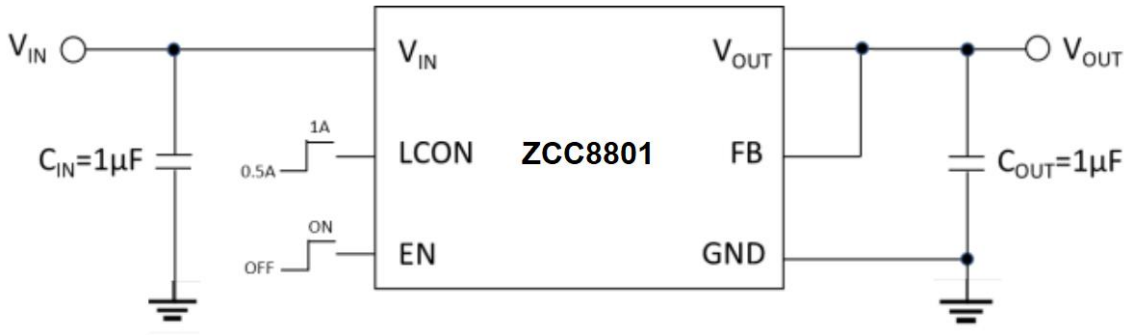
Pin Name	Pin Function	PIN No				
		DFN1216-8	DFN3030-8		DFN2020-6	
			Fixed	ADJ	Fixed	ADJ
VIN	Input of Supply Voltage.	7, 8	7, 8	7, 8	6	6
VOUT	LDO Output Voltage pin.	1, 2	1, 2	1, 2	1	1
GND	Ground.	5	4	4	3	3
EN	Enable pin.	6	5	5	4	4
NC	No internal connection.	NA	3, 6	6	2, 5	5
ADJ	ADJ pin.	4	NA	3	NA	2
LCON	Output Current Limit Alternate Pin.	3	NA	NA	NA	NA

Pin Name	Pin Function	PIN No					
		SOT-23-5		SOT-89-3			SOT-89-5
		Fixed	ADJ	A	B	C	ADJ
VIN	Input of Supply Voltage.	1	1	1	2	3	4
VOUT	LDO Output Voltage pin.	5	5	3	3	1	5
GND	Ground.	2	2	2	1	2	2
EN	Enable pin.	3	3	NA	NA	NA	3
NC	No internal connection.	4	NA	NA	NA	NA	NA
ADJ	ADJ pin.	NA	4	NA	NA	NA	1

***Note: Connect exposed pad (heat sink on the back) to GND.**

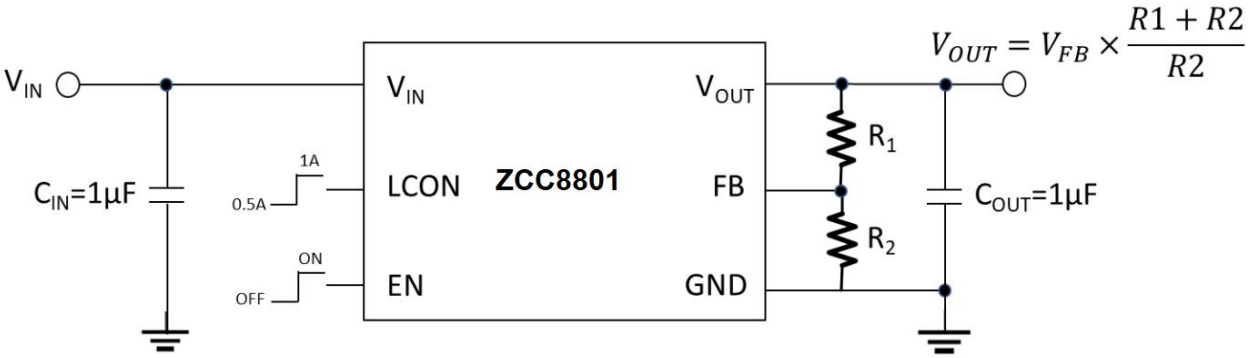
TYPICAL APPLICATION CIRCUIT

A. Fixed mode example



* Recommended Ceramic Capacitors for Vin and Vout: 1uF

B. Adjustable (ADJ) mode example



The adjustable-version device requires external feedback divider resistors to set the output voltage. V_{OUT} is set using the feedback divider resistors, R_1 and R_2, according to the following equation:

$$V_{OUT} = V_{FB} \times (1 + R_1 / R_2)$$

For this device, V_{FB} = 0.85 V.

To ignore the FB pin current error term in the V_{OUT} equation, set the feedback divider current to 100x the FB pin current listed in the *Electrical Characteristics* table. This setting provides the maximum feedback divider series resistance, as shown in the following equation:

$$R_1 + R_2 \leq V_{OUT} / (I_{FB} \times 100)$$

For this device, I_{FB} = 10 nA.

ABSOLUTE MAXIMUM RATINGS

Symbol	Item	Rating		Unit
V_{IN}	Input Voltage	6.0		V
V_{CE}	Input Voltage (CE Pin)	-0.3 to 6.0		V
V_{LCON}	Input Voltage (LCON Pin)	-0.3 to 6.0		V
V_{OUT}	Output Voltage	-0.3 to 6.0		V
P_D	Power Dissipation (Standard Land Pattern)	DFN1216-8	1400	mW
T_{OP}	Junction Temperature Range	−40 to 125		˚C
T_{STG}	Storage Temperature Range	−55 to 125		˚C

RECOMMENDED OPERATING CONDITIONS

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage	1.32 to 5.5	V
V_{OUT}	Output Voltage	0.85 to 4.3	V
Ta	Operating Temperature Range	-40 to 85	℃
C_{IN}/C_{OUT}	Input/Output Capacitance	1/1	uF

ELECTROSTATIC DISCHARGE

Symbol	Parameter	Value	Unit
ESD	Human Body Mode	±4	kV
	Machine Mode	±250	V
	Charge Device Mode	±1000	V

THERMAL DATA

Symbol	Parameter	Value		Unit
θ_{JA}	Thermal resistance junction-ambient	DFN1216	80	°C/W
		SOT23-5	260	

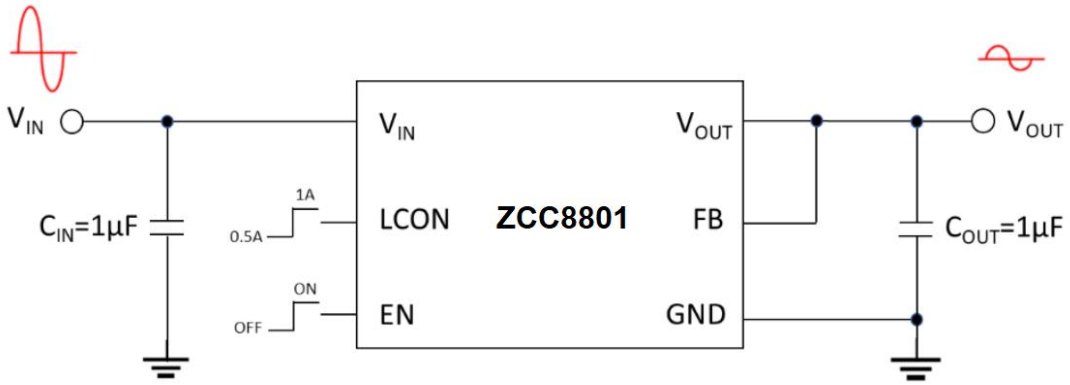
ELECTRICAL CHARACTERISTICS

V_{IN} = V_{OUT} + 1.0 V, I_{OUT} = 1 mA, C_{IN} = C_{OUT} = 1.0 µF, typical values are at T_J = 25 °C; unless otherwise noted.

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Unit
V_{IN}	Operating input voltage			1.32		5.50	V
V_{OUT}	V_{OUT} accuracy	V_{OUT} + 0.5 V ≤ V_{IN} ≤ 5.5 V	V_{OUT} ≥ 1.75V	-1.0		+1.0	%
			V_{OUT} < 1.75V	-20		+20	mV
V_{FB}	V_{FB} accuracy	V_{IN} = 2.0 V, I_{LOAD} = 1mA		0.8415	0.85	0.8585	V
ΔV_{OUT}	Static line regulation				0.01		%/V
ΔV_{OUT}	Static load regulation	I_{OUT} = 10 mA to 500 mA			1	20	mV
		I_{OUT} = 10 mA to 1000 mA				40	
V_{DROP}	Dropout voltage	I_{OUT} = 1 A	V_{OUT}=1.2V		245	340	mV
			V_{OUT}=1.8V		140	235	
			V_{OUT}=2.5V		105	175	
		I_{OUT} = 500 mA For SOT-23-5	V_{OUT}=1.2V		150	210	
			V_{OUT}=1.8V		80	135	
			V_{OUT}=2.5V		60	100	
			V_{OUT}=3.3V		50	105	
			V_{OUT}=4.3V		40	85	
I_Q	Quiescent current	IOUT = 0 mA			85	140	µA
$I_{Standby}$	Standby current	VIN input current in OFF MODE: VEN = GND			0.1	3	µA
I_{LIM}	Output current limit	I_{OUT} = 500 mA		0.6	0.78		A
		I_{OUT} = 1 A			1.7		
I_{SC}	Short-circuit current	V_{OUT} = 0 V	I_{OUT} = 500 mA			186	mA
			I_{OUT} = 1 A			150	
I_{FB}	Feedback pin current				0.01	0.1	µA

ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
e_N	Output noise voltage			10		μVrms
PSRR	Power Supply Rejection Ratio			85		dB
T_{TSD}	Thermal shutdown	Shutdown, temperature increasing		165		°C
		Reset, temperature decreasing		135		°C
CE	Enable input logic low	V_{IN} = 1.32 V to 5.5 V			0.4	V
	Enable input logic high	V_{IN} = 1.32 V to 5.5 V	1			
LCON	LCON input logic low	V_{IN} = 1.32 V to 5.5 V			0.4	V
	LCON input logic low	V_{IN} = 1.32 V to 5.5 V	1			



$$PSRR = 20 * \log\left(\frac{V_{IN_{RIPPLE}}}{V_{OUT_{RIPPLE}}}\right)(dB)$$

*This is ZCC8801-330-D measurement data. Other PSRR information please contact Gutschsemi.

FUNCTION DESCRIPTION

A. Short-Circuit Protect and Current Limitation

ZCC8801 series LDOs can protect internal circuit under short-circuit condition on the output. When the load current increases above 1.55 A, the current limit and current foldback mechanism starts to restrict the I_{LIM} value. If the load resistance decreases even more then the foldback, circuit starts limiting the current to 0.2 A when V_{OUT} = 0.

B. Over Temperature Protection and Auto Recover

In order to prevent over thermal condition from damaging the device, ZCC8801 series LDOs have internal thermal limiting functions designed to protect the device. It will rapidly shut off PMOS pass element during over temperature condition.

C. Current Foldback

The current limiting/ current foldback circuit plays an important role by controlling any excessive output current. Our ZCC8801 series LDOs provide a current foldback circuit that can detect accurately when an over-current condition occurs.

D. Very Fast Transient Response

In addition to the main feedback loop, ZCC8801 series LDOs contain a fast-transient loop that allows the LDO to respond faster to large-output transients. ZCC8801 series LDOs that contain this loop are better able to minimize the effects of a load transient even the output capacitance is small. The recommended output capacitance value is 1μF. It's small size greatly reduce the cost and save PCB area.

E. Ultra High PSRR and Extreme Low Noise

ZCC-China's ZCC8801 series high-performanceLDO regulatorsfeature remarkable power supply rejection ratio characteristics (up to 104 dB at 10 kHz) and extreme-low noise operation (as low as 6.3 μVRMS with A-wt) resulting in cleaner and stable output voltages. Our LDO is very suitable for ultra-sensitive loads like camera module and security monitor, especially in low light condition.

F. Start-Up at Full Load

ZCC8801 series LDOs can start-up at full load, make it very suitable for heavy load start up condition and severe system timing constraint.

G. Auto Discharge Function

ZCC8801 series LDOs have an auto discharge function to quickly force the output voltage to zero. When the LDO is disabled, the auto discharge function quickly discharge the output capacitor, thereby reducing the output voltage to nearly zero. This function is very useful for quickly ON/OFF application.

H. Low Quiescent Current

ZCC8801 series LDOs consume only 85μA (typical) while operating with no load condition. By reducing the quiescent current, your application can stay in standby/sleep mode much longer than leading low quiescent current LDOs in the market.

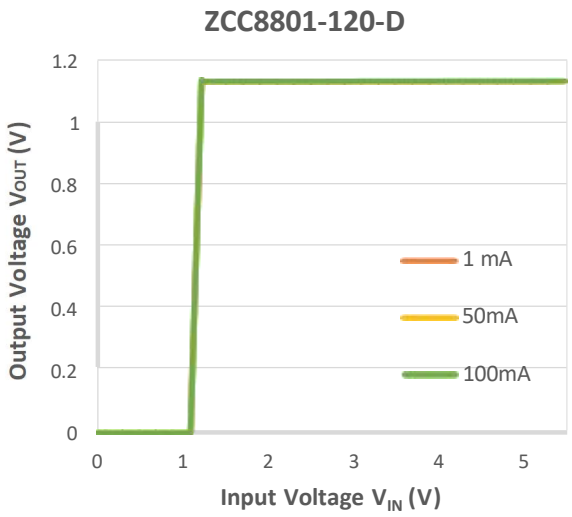
I. Uuder Voltage Lock OUT (UVLO)

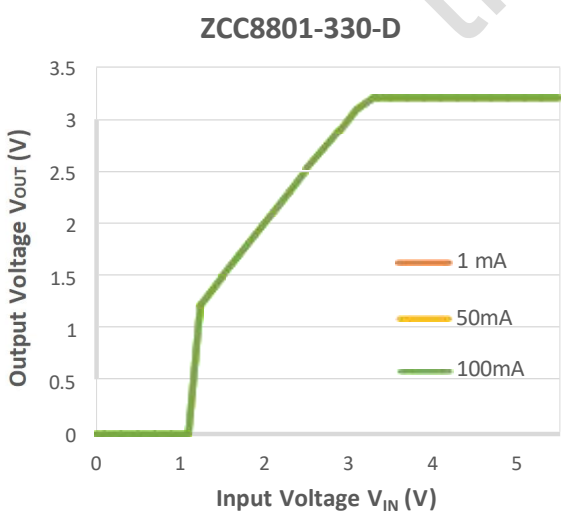
ZCC8801 has an undervoltage lockout (UVLO) function to make sure that whole circuit does nothing until the power supply voltage is high enough. When power supply voltage is high enough, reference circuit can generate right voltage ; logic function can generate correct control signals. This UVLO function can guarantee robust system performance.

TYPICAL CHARACTERISTICS

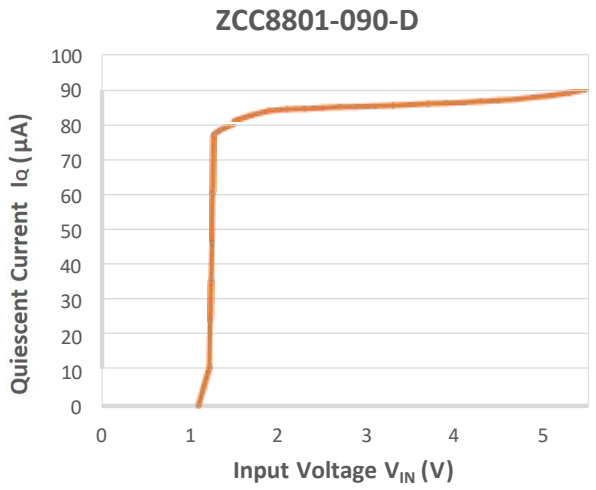
V_{IN} = $V_{SET(1)}$ + 1.0 V, I_{OUT} = 1 mA, C_{IN} = C_{OUT} = 1.0 μF, LCON='H', typical values are at T_J = 25 °C; unless otherwise noted.

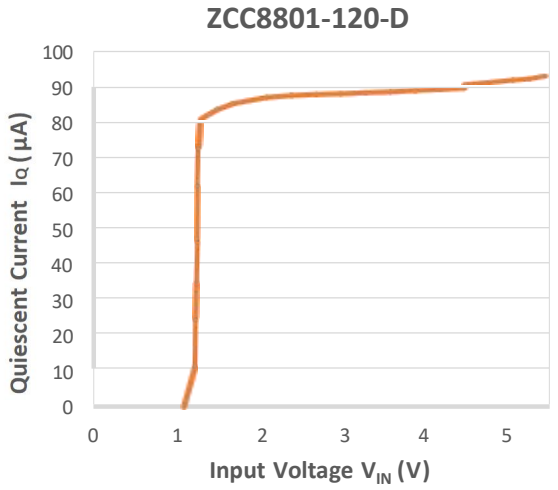
Output Voltage vs. Input Voltage (C_{IN} = C_{OUT}=1.0μF, T_a= 25 °C)

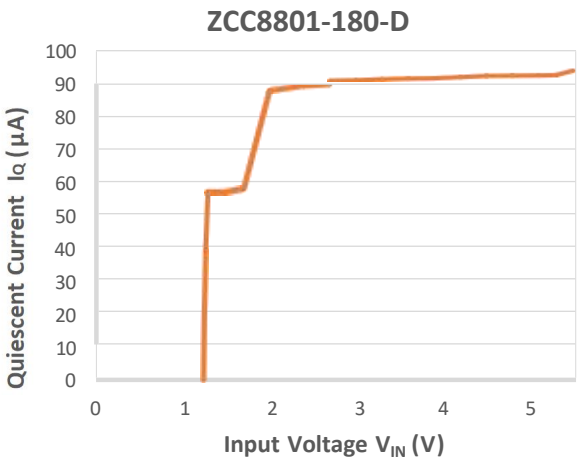


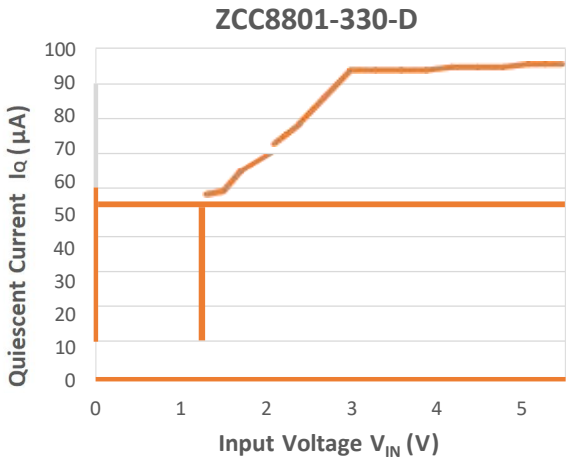


Supply Current vs. Input Voltage (C_{IN} = C_{OUT} = 1.0μF, T_a= 25 °C)

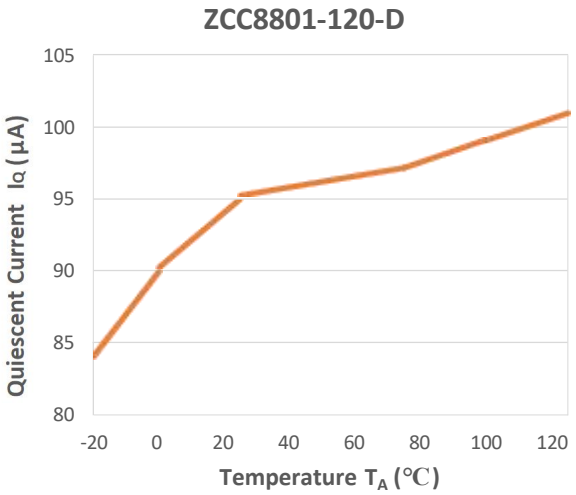






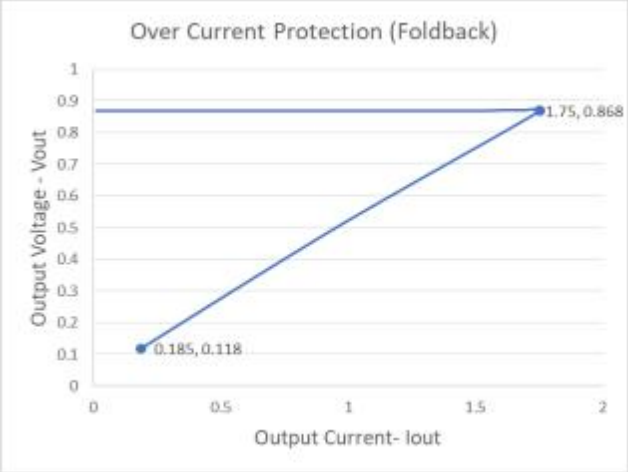


Supply Current vs. Temperature (CIN = COUT = 1.0μF, IOUT= 0 mA)

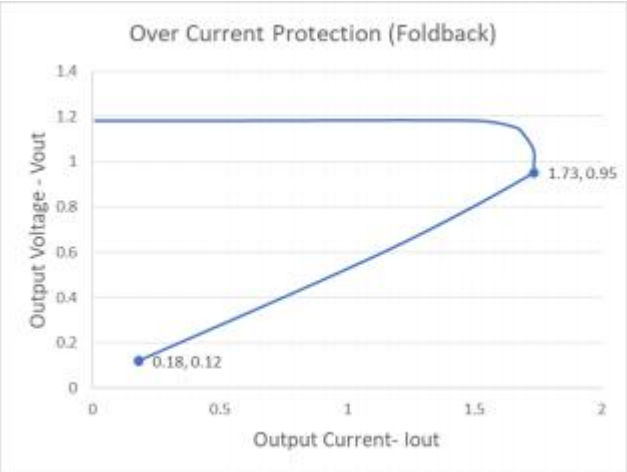


Over Current Protect Foldback Characteristic (LCON = V_{IN}, C_{IN} = C_{OUT} = 1.0 μF, Ta = 25°C)

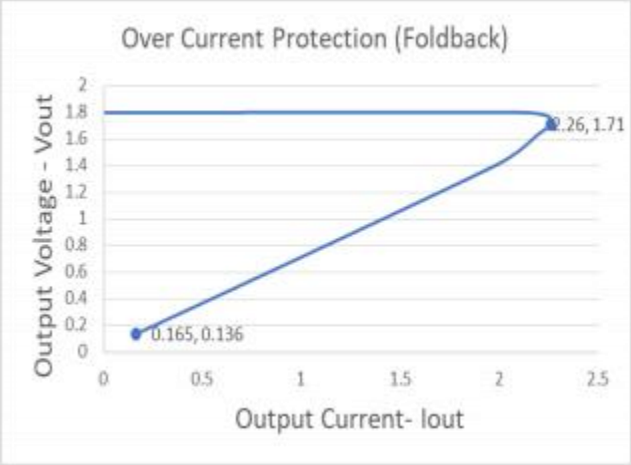
ZCC8801-090-D



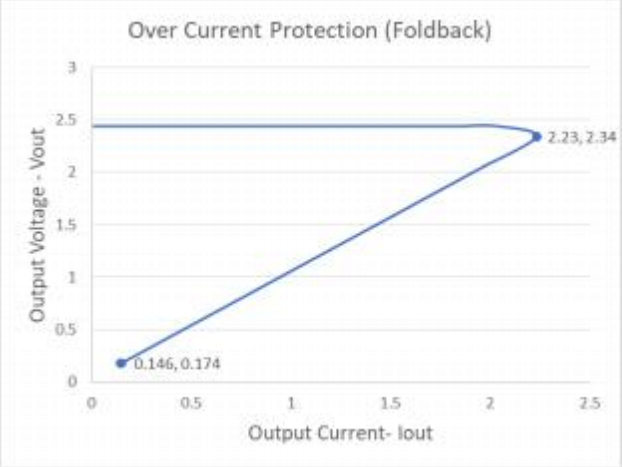
ZCC8801-120-D



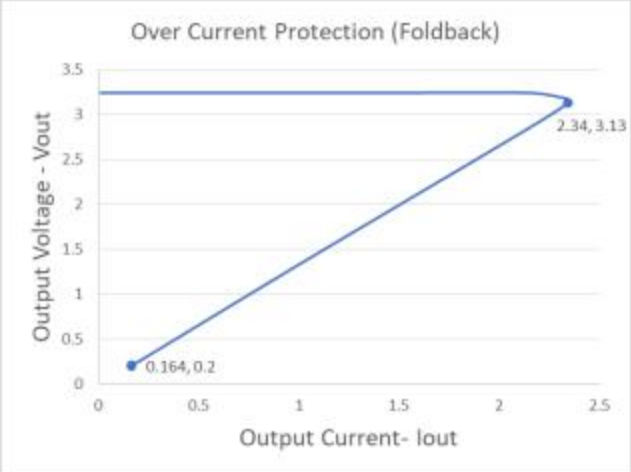
ZCC8801-180-D



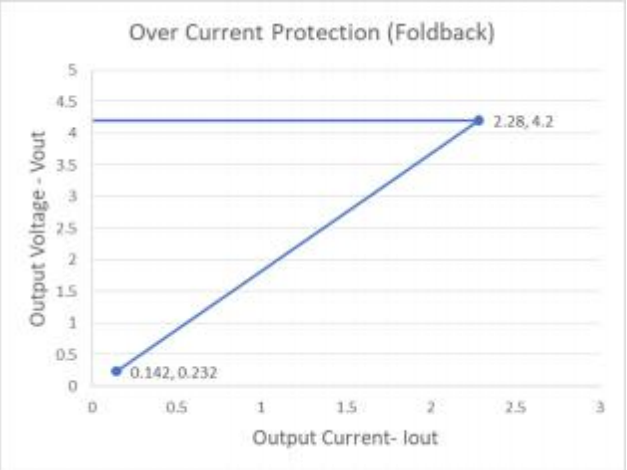
ZCC8801-250-D



ZCC8801-330-D



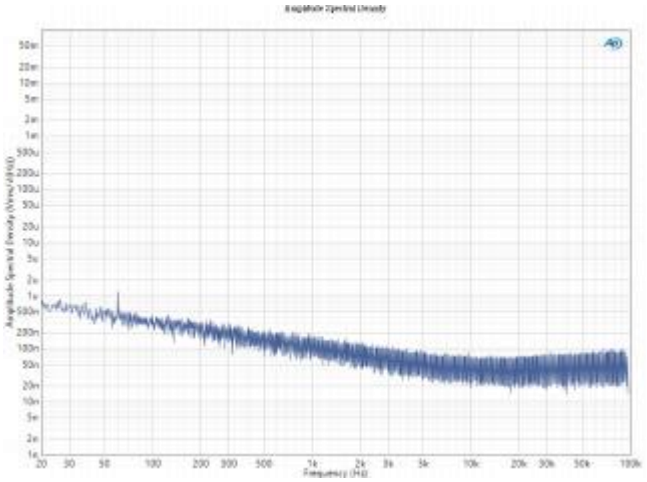
ZCC8801-430-D



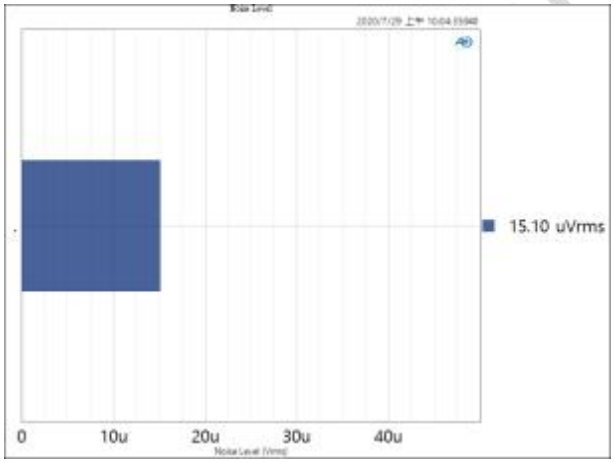
Output Noise Voltage (10 Hz to 100 kHz, C_{IN} = C_{OUT} = 1.0 µF, Ta = 25°C)

ZCC8801-090-D, I_{OUT} = 100 mA

Amplitude Spectral Density

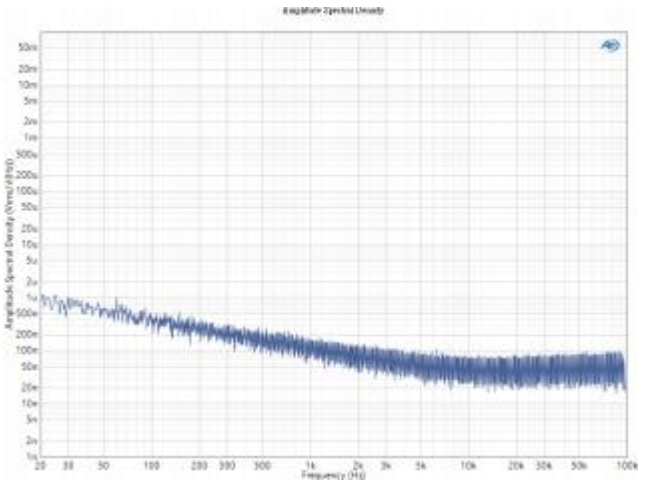


V_{RMS} from 10 Hz to 100 kHz

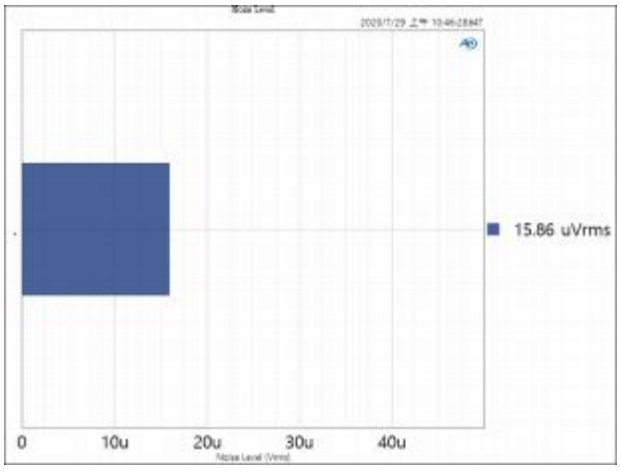


ZCC8801-120-D, I_{OUT} = 100 mA

Amplitude Spectral Density

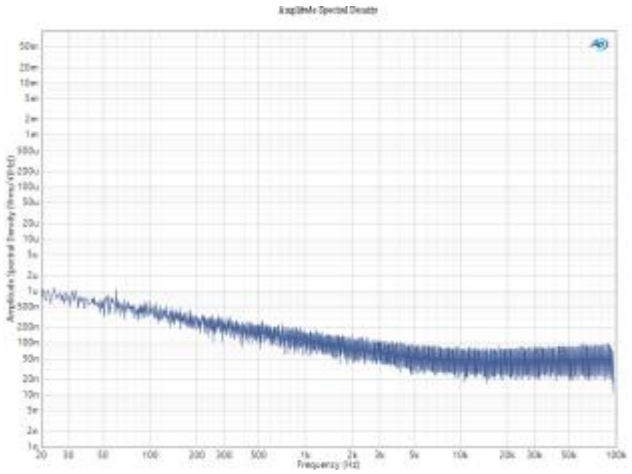


V_{RMS} from 10 Hz to 100 kHz

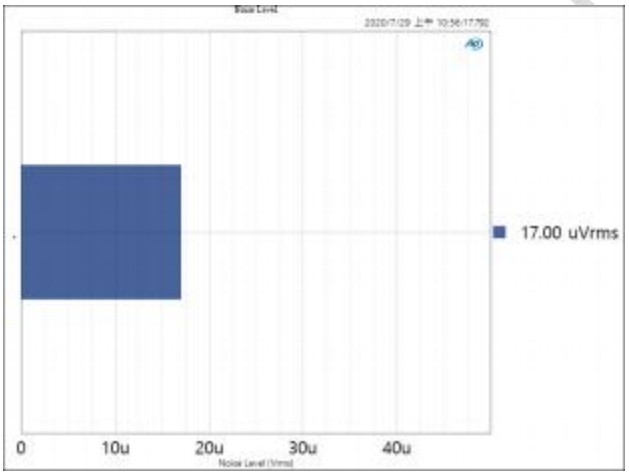


ZCC8801-330-D, I_{OUT} = 100 mA

Amplitude Spectral Density



V_{RMS} from 10 Hz to 100 kHz

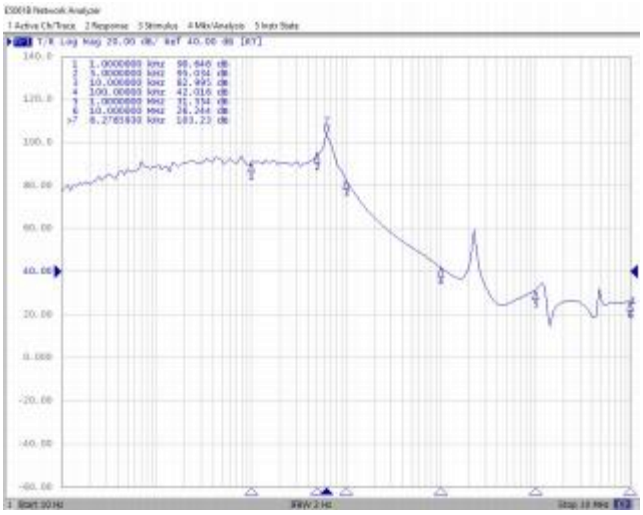


Power Supply Ripple Rejection vs. Frequency (V_{IN}=V_{OUT}+1V , C_{IN} = C_{OUT} = 1.0 μF, Ripple = 0.2 Vp-p, Ta = 25°C)

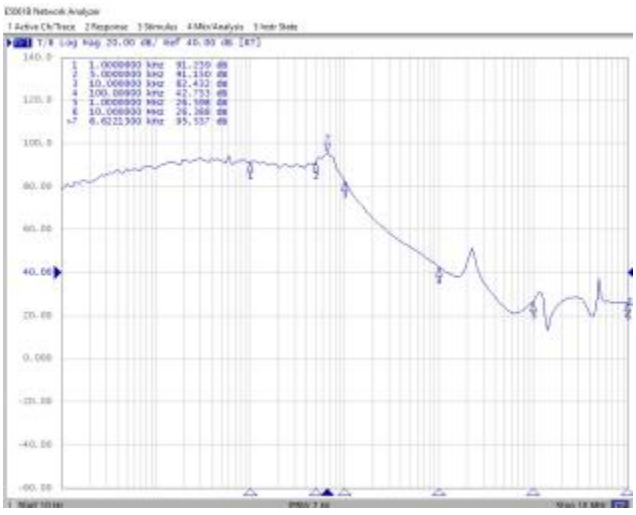
ZCC8801-180-D

I_{Load}=1mA

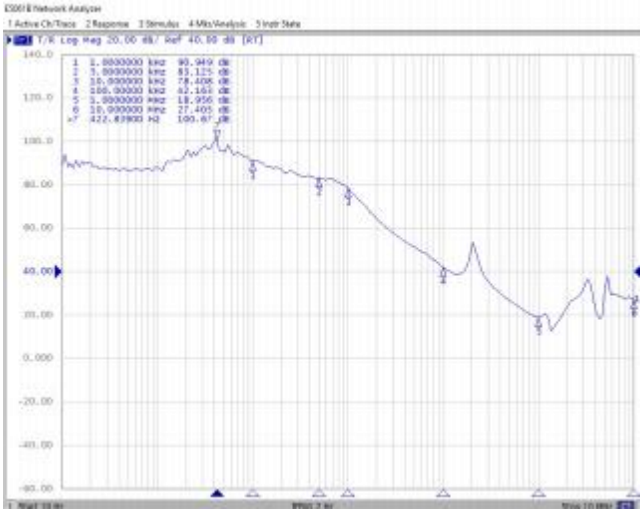
I_{Load}=10mA



I_{Load}=30mA

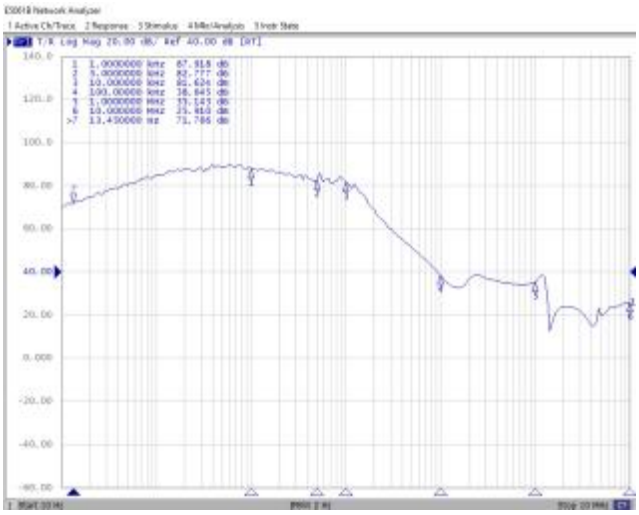


I_{Load}=150mA

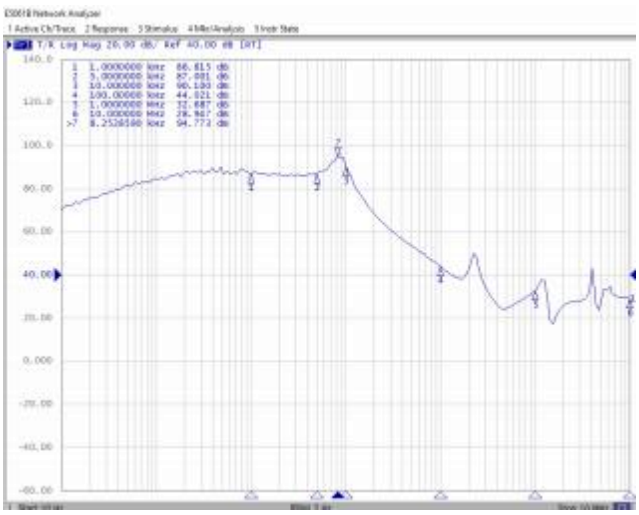


ZCC8801-330-D

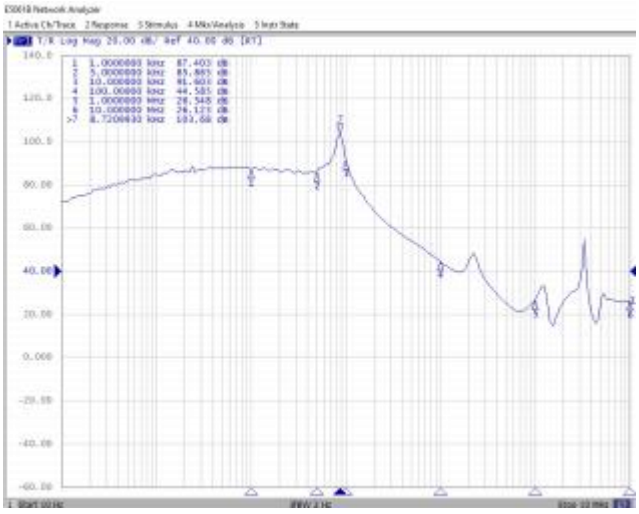
I_{Load}=1mA



I_{Load}=10mA



I_{Load}=30mA

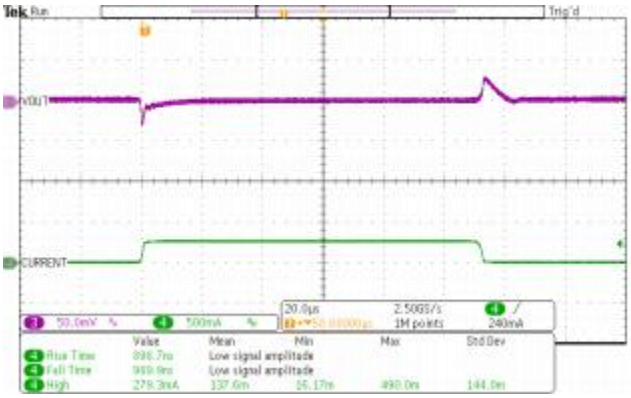


I_{Load}=150mA

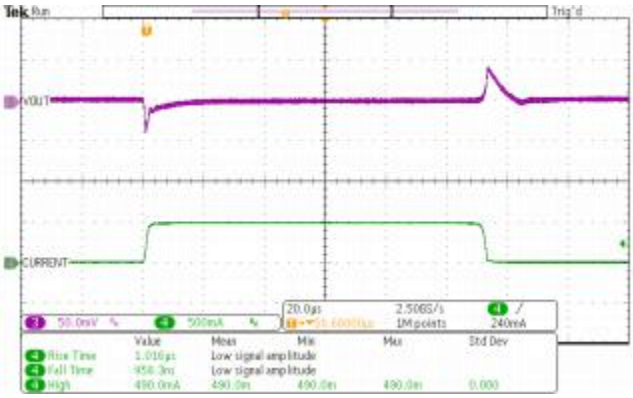
Load Transient Response (V_{IN}=V_{OUT}+1V, C_{IN} = C_{OUT} = 1.0 μF, tr = tf = 1 μs, Ta = 25°C)

ZCC8801-180-D

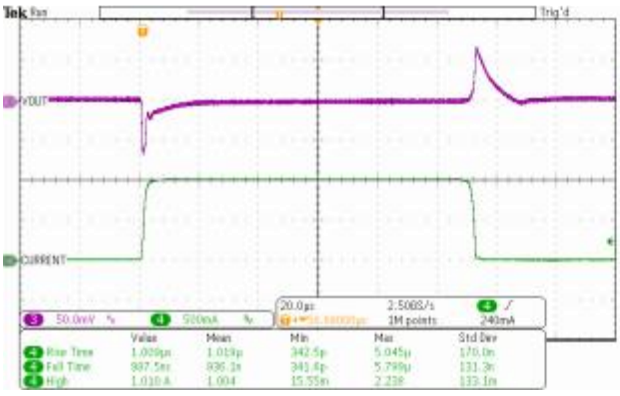
1mA -> 250mA



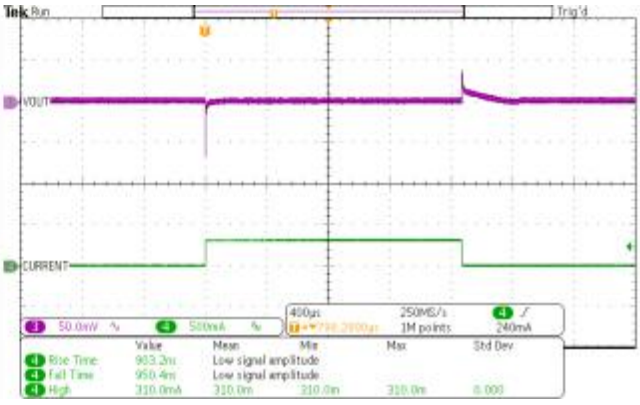
1mA -> 500mA



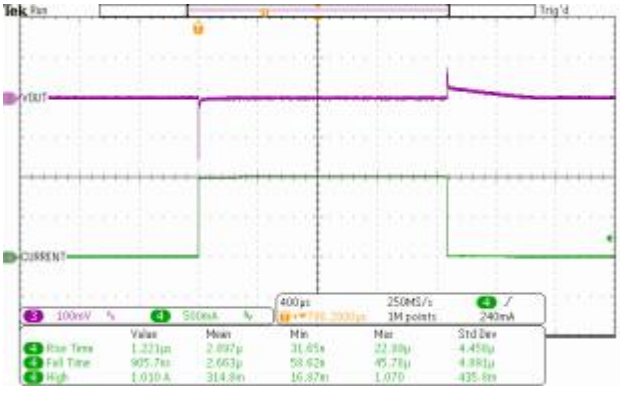
1mA -> 1000mA



0mA -> 300mA

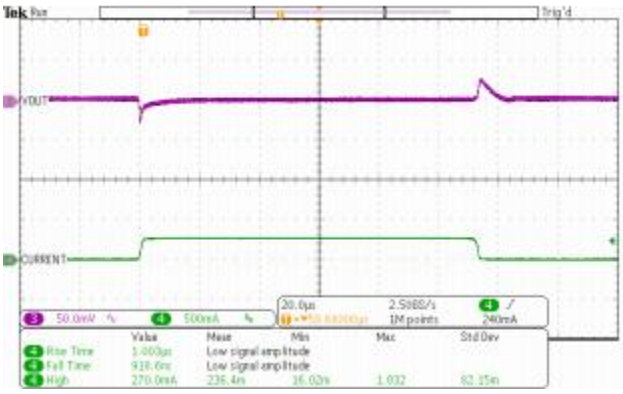


0mA -> 1000mA

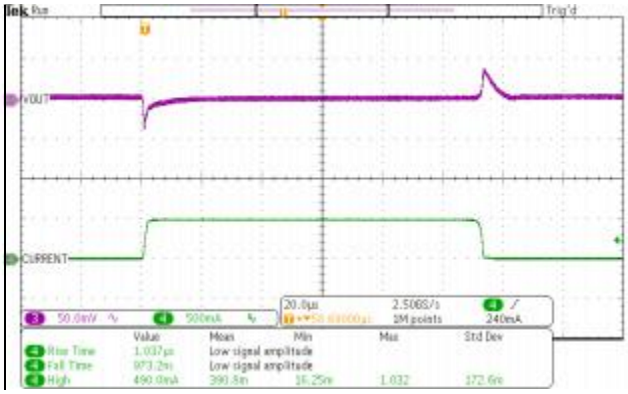


ZCC8801-330-D

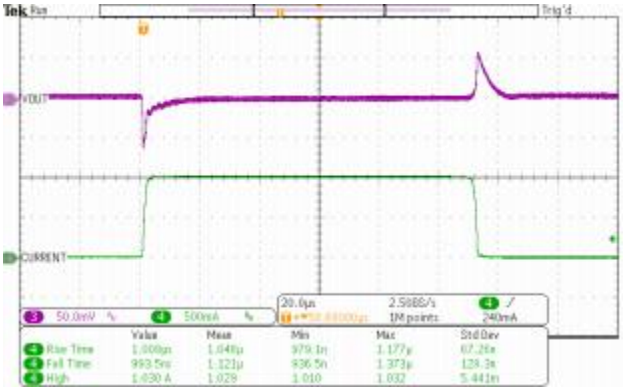
1mA -> 250mA



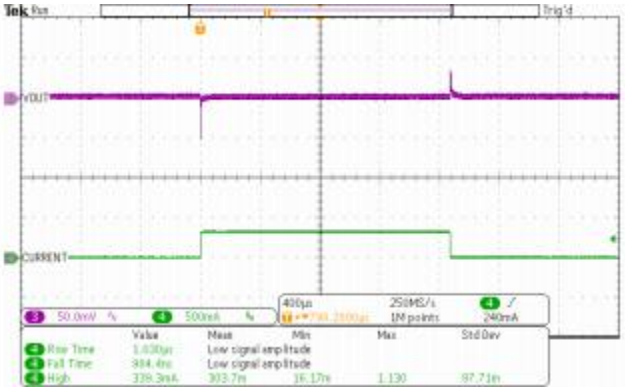
1mA -> 500mA



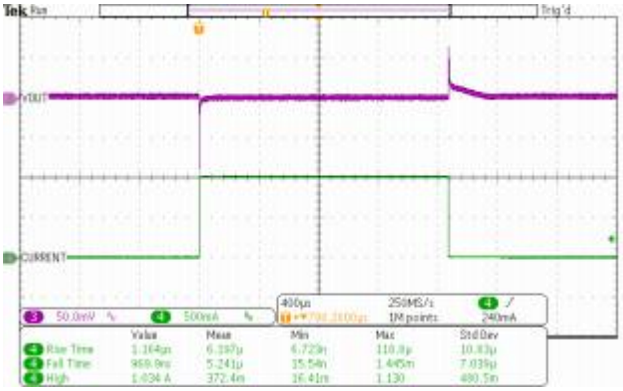
1mA -> 1000mA



0mA -> 300mA

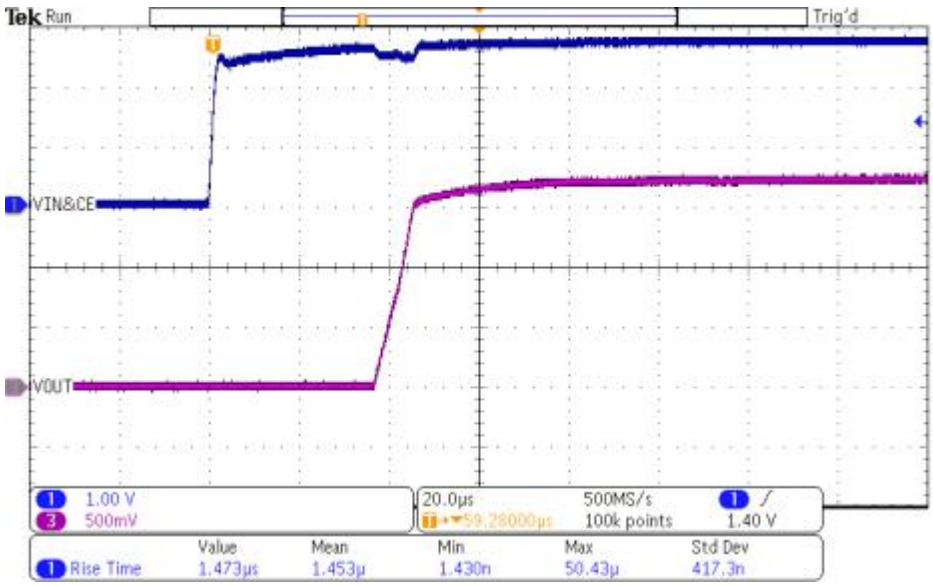


0mA -> 1000mA

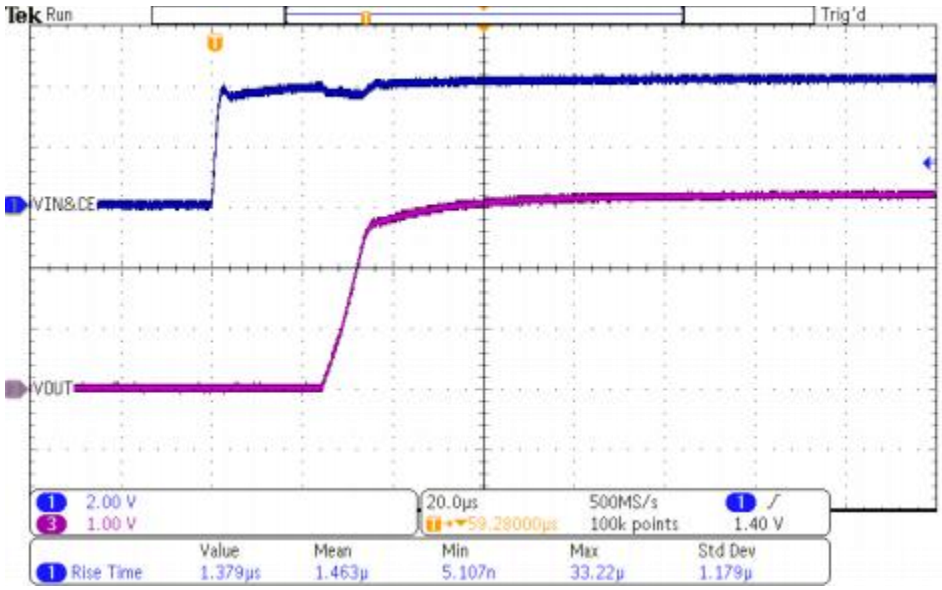


Turn-on waveform by V_{IN} & CE @ light load (V_{IN} = CE = 0 V to V_{OUT}+1V, C_{IN} = C_{OUT} = 1.0 μF, Ta = 25°C, I_{OUT} = 1 mA)

ZCC8801-180-D

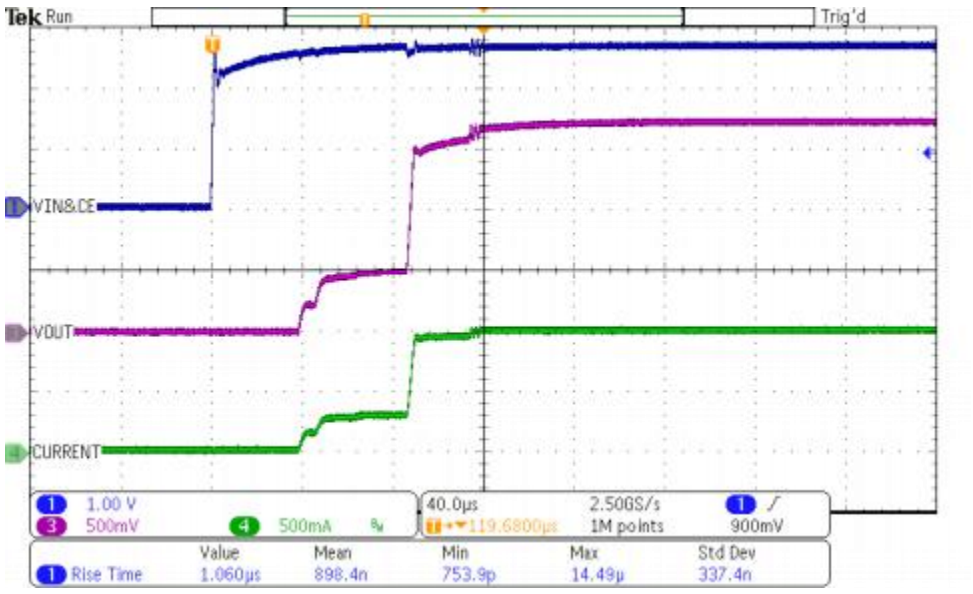


ZCC8801-330-D

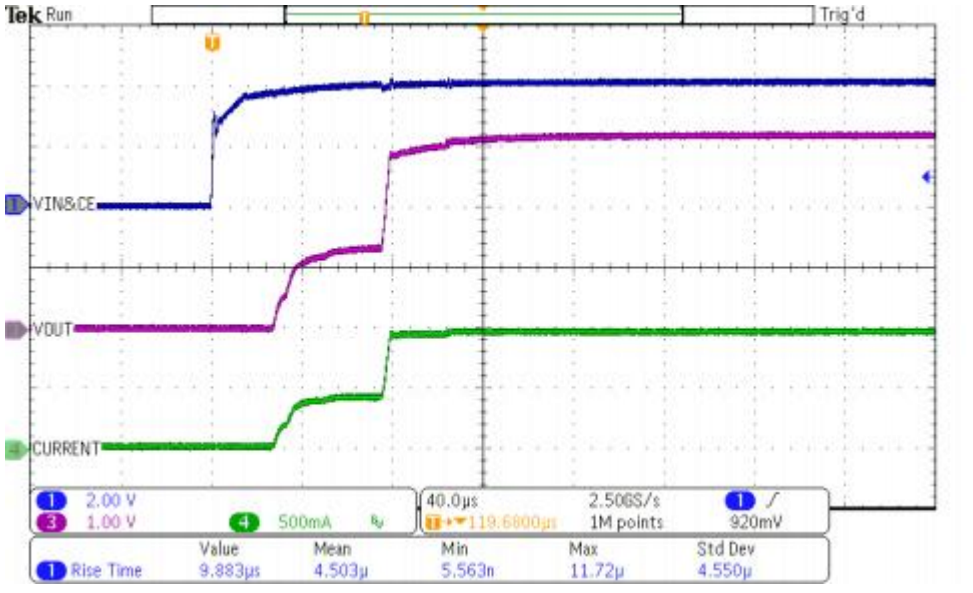


Turn-on waveform by V_{IN} & CE @ full load (V_{IN} = CE = 0 V to V_{OUT}+1V, C_{IN} = C_{OUT} = 1.0 μF, Ta = 25°C, I_{OUT}=1A)

ZCC8801-180-D

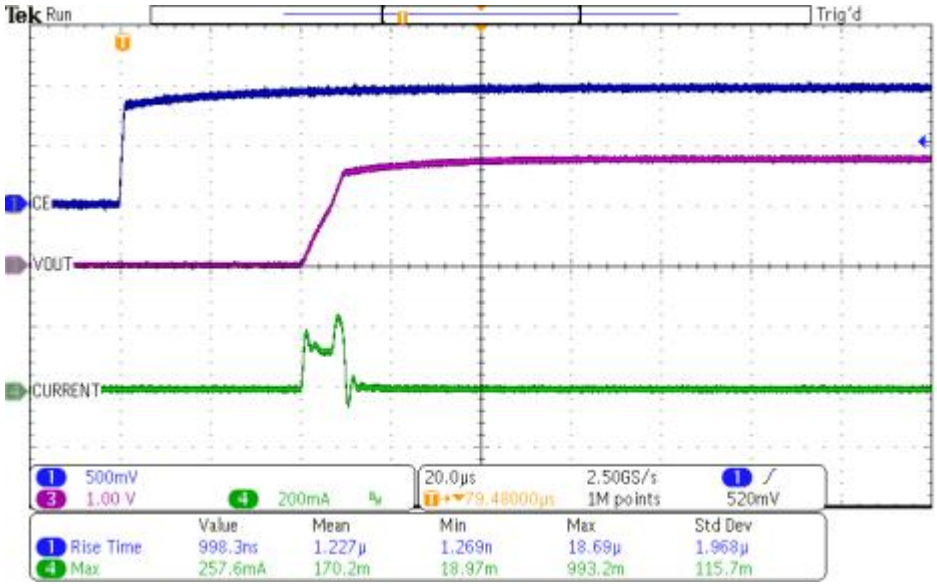


ZCC8801-330-D

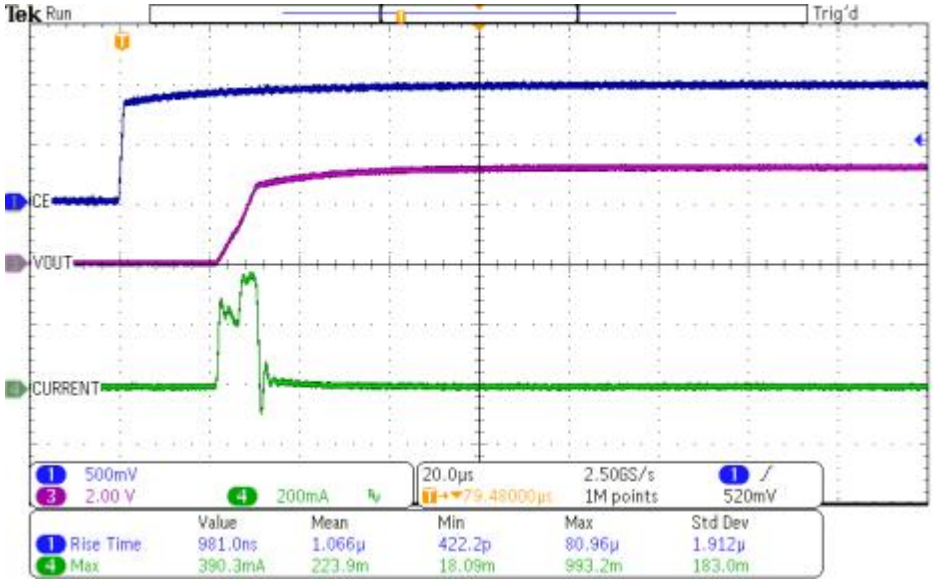


Turn-on by CE pin & Inrush current @ no load (V_{IN} = V_{OUT}+1V, CE = 0V to 1V, C_{IN} = C_{OUT} = 1.0 µF, Ta = 25°C, I_{OUT}=0 mA)

ZCC8801-180-D

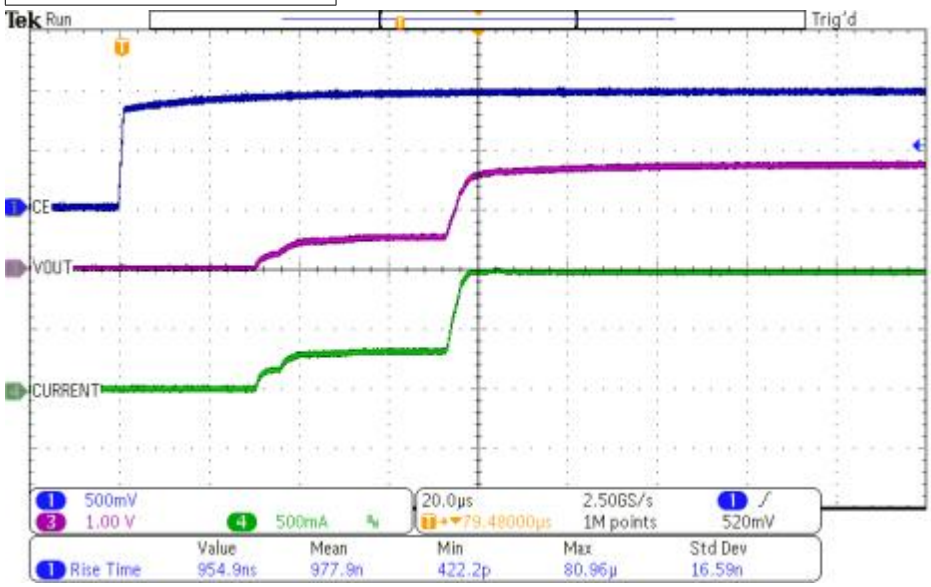


ZCC8801-330-D

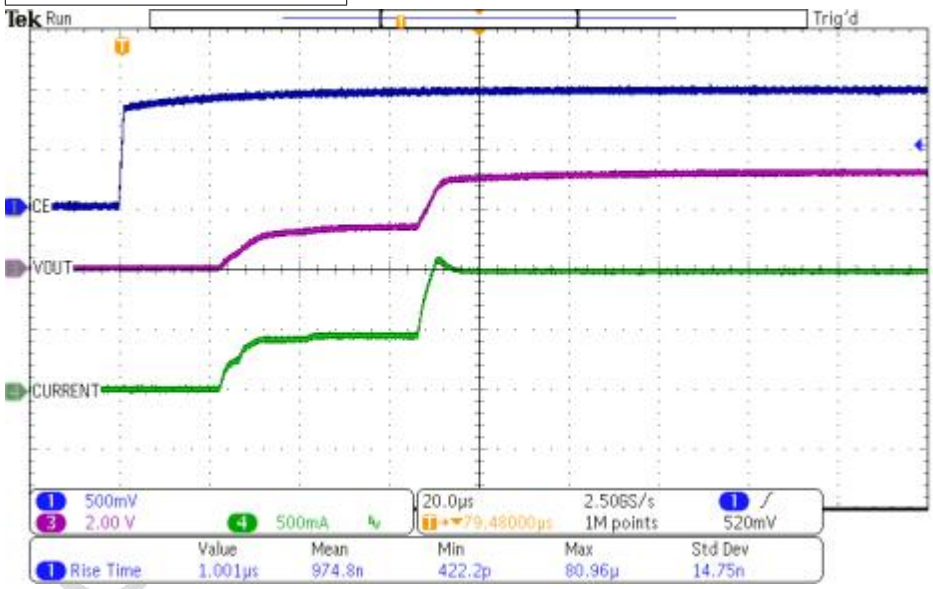


Turn-on by CE pin @ full load (V_{IN} = V_{OUT}+1V , CE = 0V to 1V, C_{IN} = C_{OUT} = 1.0 μF, Ta = 25°C, I_{OUT}=1A)

ZCC8801-180-D

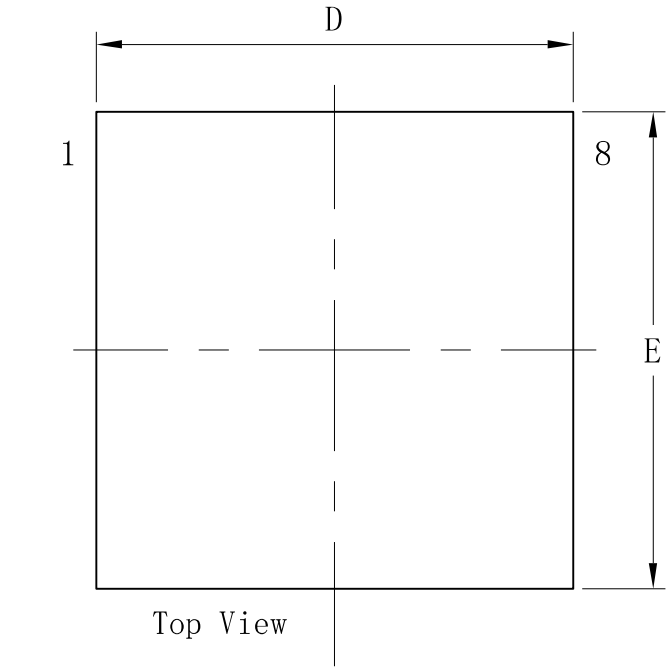


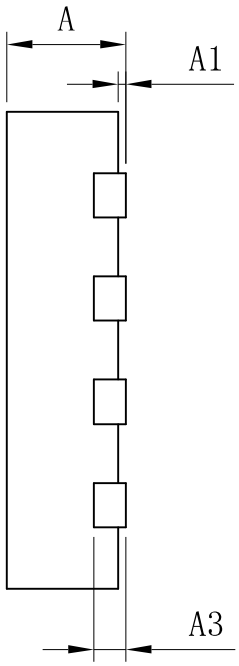
ZCC8801-330-D

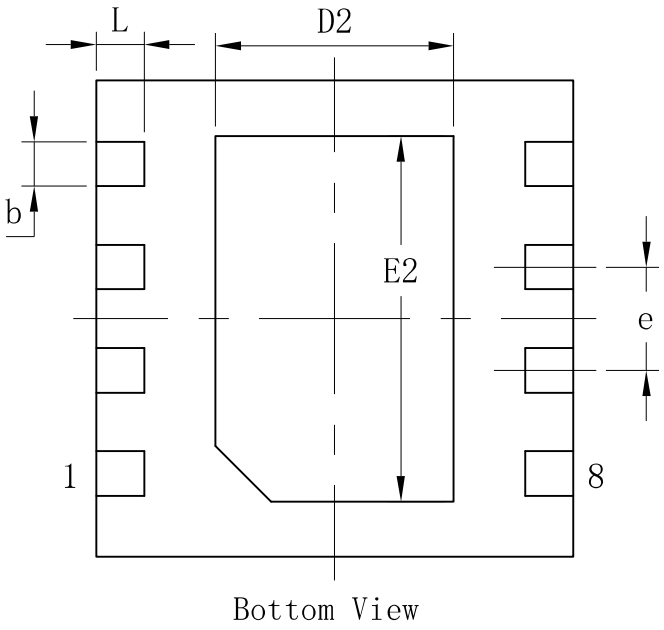


DFN3030-8 Package Information

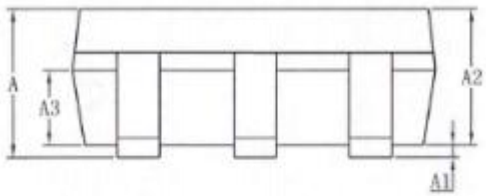
尺寸 / 标注	最小(mm)	标准(mm)	最大(mm)	尺寸 / 标注	最小(mm)	标准(mm)	最大(mm)
A	0.70	0.75	0.80	E	2.90	3.00	3.10
A1	-	-	0.05	D2	1.40	1.50	1.60
A3	0.203 REF			E2	2.20	2.30	2.40
b	0.23	0.28	0.33	e	0.65 TYP		
D	2.90	3.00	3.10	L	0.25	0.30	0.35

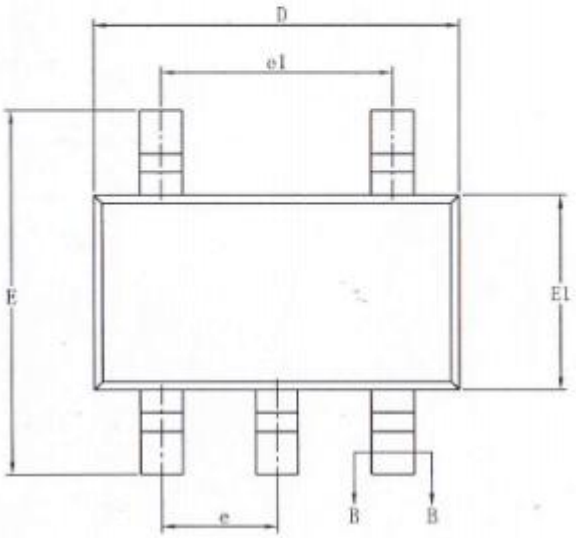




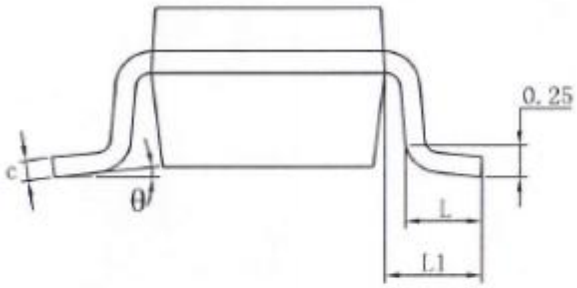


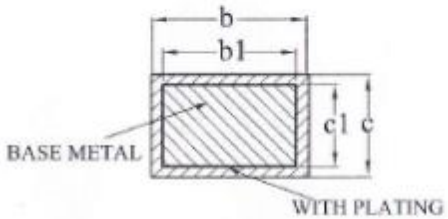
SOT-23-5 Package Information





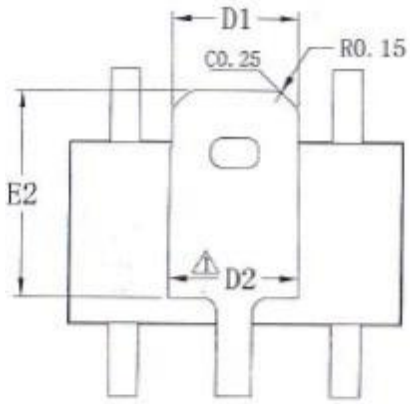
SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.25
A1	0.04	—	0.10
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.33	—	0.41
b1	0.32	0.35	0.38
c	0.15	—	0.19
c1	0.14	0.15	0.16
D	2.82	2.92	3.02
E	2.60	2.80	3.00
E1	1.50	1.60	1.70
e	0.95BSC		
e1	1.90BSC		
L	0.30	—	0.60
L1	0.60REF		
θ	0	—	8°

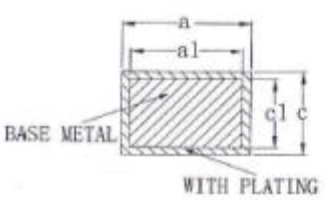




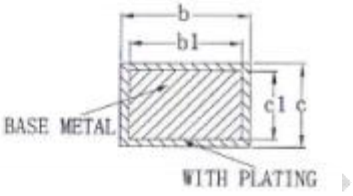
SECTION B-B

SOT-89-5 Package Information

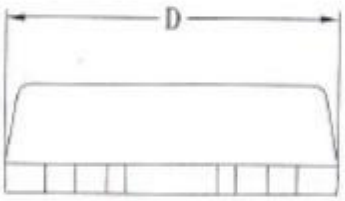


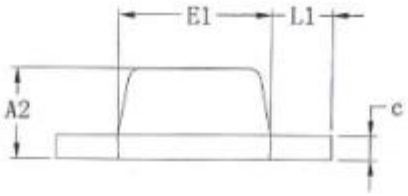


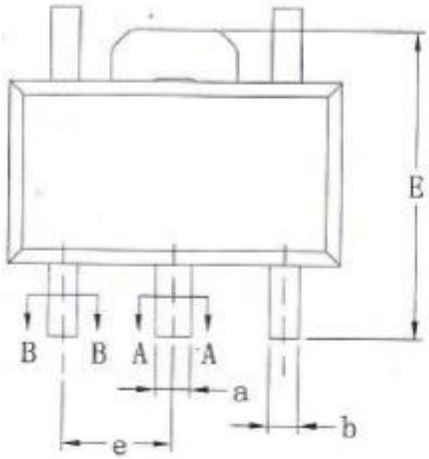
SECTION A-A



SECTION B-B







SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A2	1.40	1.50	1.60
b	0.38	—	0.46
b1	0.37	0.40	0.43
c	0.38	—	0.42
c1	0.37	0.38	0.39
a	0.46	—	0.56
a1	0.45	0.48	0.51
D	4.40	4.50	4.60
D1	1.62	—	1.83
E	3.95	—	4.25
E1	2.40	2.50	2.60
e	1.50BSC		
L1	0.89	—	1.20

L/F Size (mil) \ Size(mm)	⚠1 D2	⚠1 E2
85*70	1.75REF	2.84REF