

# NCP110

## Product Preview

# 200 mA, Low $V_{IN}$ , Low Noise and High PSRR LDO Regulator

The NCP110 is a linear regulator capable of supplying 200 mA output current from 1.1 V input voltage. The device provides wide output range from 0.6 V up to 4.0 V, very low noise and high PSRR. Due to low quiescent current the NCP110 is suitable for battery powered devices such as smartphones and tablets. The device is designed to work with a 1  $\mu$ F input and a 1  $\mu$ F output ceramic capacitor. It is available in ultra-small 0.35P, 0.65 mm x 0.65 mm Chip Scale Package (CSP) and XDFN4 0.65P, 1 mm x 1 mm.

### Features

- Operating Input Voltage Range: 1.1 V to 5.5 V
- Available in Fixed Voltage Option: 0.6 V to 4.0 V
- $\pm 2\%$  Accuracy Over Load/Temperature
- Ultra Low Quiescent Current Typ. 18  $\mu$ A
- Standby Current: Typ. 0.1  $\mu$ A
- Very Low Dropout: 70 mV for 1.05 V @ 100 mA
- High PSRR: Typ. 95 dB at 20 mA,  $f = 1$  kHz
- Ultra Low Noise: 8.8  $\mu$ V<sub>RMS</sub>
- Stable with a 1  $\mu$ F Small Case Size Ceramic Capacitors
- Available in –WLCSP4 0.65mm x 0.65mm x 0.33mm – Case 567JZ  
–XDFN4 1mm x 1mm x 0.4mm – Case 711AJ
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Typical Applications

- Battery-powered Equipment
- Wireless LAN Devices
- Smartphones, Tablets
- Cameras, DVRs, STB and Camcorders

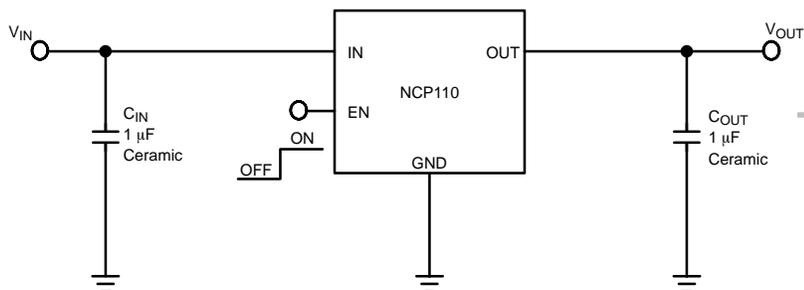


Figure 1. Typical Application Schematics

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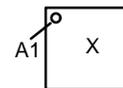


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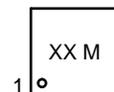
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### MARKING DIAGRAMS

  
WLCSP4  
CASE 567JZ

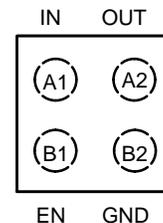


  
1  
XDFN4  
CASE 711AJ

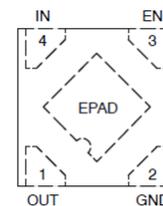


X or XX = Specific Device Code  
M = Date Code

### PIN CONNECTIONS



(Top View)



(Top View)

### ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 4 of this data sheet.

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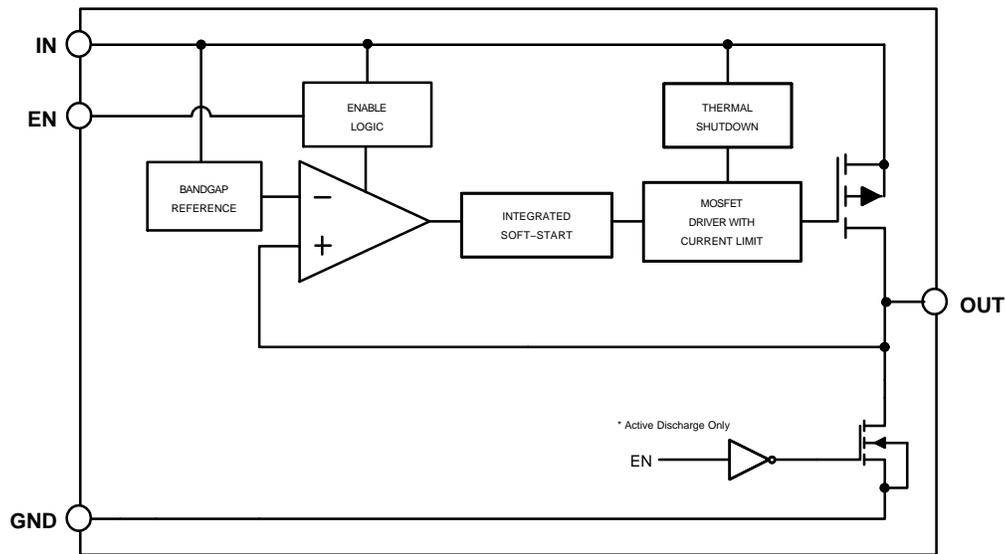


Figure 2. Simplified Schematic Block Diagram

## PIN FUNCTION DESCRIPTION

Pin No. CSP4	Pin No. XDFN4	Pin Name	Description
A1	4	IN	Input voltage supply pin
A2	1	OUT	Regulated output voltage. The output should be bypassed with small 1 $\mu$ F ceramic capacitor.
B1	3	EN	Chip enable: Applying $V_{EN} < 0.2$ V disables the regulator, Pulling $V_{EN} > 0.7$ V enables the LDO.
B2	2	GND	Common ground connection
-	EPAD	EPAD	Expose pad can be tied to ground plane for better power dissipation

## ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Input Voltage (Note 1)	$V_{IN}$	-0.3 V to 6	V
Output Voltage	$V_{OUT}$	-0.3 to $V_{IN} + 0.3$ , max. 6 V	V
Chip Enable Input	$V_{CE}$	-0.3 to $V_{IN} + 0.3$ , max. 6 V	V
Output Short Circuit Duration	$t_{SC}$	unlimited	s
Maximum Junction Temperature	$T_J$	150	$^{\circ}$ C
Storage Temperature	$T_{STG}$	-55 to 150	$^{\circ}$ C
ESD Capability, Human Body Model (Note 2)	$ESD_{HBM}$	2000	V
ESD Capability, Machine Model (Note 2)	$ESD_{MM}$	200	V

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Refer to ELECTRICAL CHARACTERISTICS and APPLICATION INFORMATION for Safe Operating Area.

2. This device series incorporates ESD protection and is tested by the following methods:

ESD Human Body Model tested per EIA/JESD22-A114

ESD Machine Model tested per EIA/JESD22-A115

Latchup Current Maximum Rating tested per JEDEC standard: JESD78.

## THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Thermal Characteristics, CSP4 (Note 3) Thermal Resistance, Junction-to-Air	$R_{\theta JA}$	108	$^{\circ}$ C/W
Thermal Characteristics, XDFN4 (Note 3) Thermal Resistance, Junction-to-Air		198.1	

3. Measured according to JEDEC board specification. Detailed description of the board can be found in JESD51-7

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**ELECTRICAL CHARACTERISTICS**  $-40^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$ ;  $V_{\text{IN}} = V_{\text{OUT(NOM)}} + 0.3 \text{ V}$  or  $1.1 \text{ V}$ , whichever is greater;  $I_{\text{OUT}} = 1 \text{ mA}$ ,  $C_{\text{IN}} = C_{\text{OUT}} = 1 \mu\text{F}$ , unless otherwise noted.  $V_{\text{EN}} = 1.0 \text{ V}$ . Typical values are at  $T_J = +25^{\circ}\text{C}$  (Note 4).

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit	
Operating Input Voltage		$V_{\text{IN}}$	1.1		5.5	V	
Output Voltage Accuracy	$V_{\text{IN}} = V_{\text{OUT(NOM)}} + 0.3 \text{ V}$ ( $V_{\text{IN}} \geq 1.1 \text{ V}$ )	$V_{\text{OUT(NOM)}} \leq 1.5 \text{ V}$	$V_{\text{OUT}}$	-30		+30	mV
		$V_{\text{OUT(NOM)}} > 1.5 \text{ V}$		-2		+2	%
Line Regulation	$V_{\text{OUT(NOM)}} + 0.5 \text{ V} \leq V_{\text{IN}} \leq 5.5 \text{ V}$ , ( $V_{\text{IN}} \geq 1.1 \text{ V}$ )	LineReg		0.02		%/V	
Load Regulation	$I_{\text{OUT}} = 1 \text{ mA}$ to $200 \text{ mA}$	LoadReg		0.001		%/mA	
Dropout Voltage (Note 5)	$V_{\text{OUT(NOM)}} = 1.05 \text{ V}$	$I_{\text{OUT}} = 50 \text{ mA}$	$V_{\text{DO}}$		40	70	mV
		$I_{\text{OUT}} = 100 \text{ mA}$			70	130	
	$V_{\text{OUT(NOM)}} = 1.20 \text{ V}$	$I_{\text{OUT}} = 110 \text{ mA}$			60	140	
		$I_{\text{OUT}} = 200 \text{ mA}$			110	190	
Output Current Limit	$V_{\text{OUT}} = 90\% V_{\text{OUT(NOM)}}$	$I_{\text{CL}}$	225	300		mA	
Short Circuit Current	$V_{\text{OUT}} = 0 \text{ V}$	$I_{\text{SC}}$		300			
Quiescent Current	$I_{\text{OUT}} = 0 \text{ mA}$	$I_{\text{Q}}$		20	25	$\mu\text{A}$	
Shutdown Current	$V_{\text{EN}} \leq 0.2 \text{ V}$ , $V_{\text{IN}} = 1.1 \text{ V}$	$I_{\text{DIS}}$		0.01	1.0	$\mu\text{A}$	
EN Pin Threshold Voltage	EN Input Voltage "H"	$V_{\text{ENH}}$	0.7			V	
	EN Input Voltage "L"	$V_{\text{ENL}}$			0.2		
EN Pull Down Current	$V_{\text{EN}} = 1.1 \text{ V}$	$I_{\text{EN}}$		0.2	0.5	$\mu\text{A}$	
Turn-On Time	$C_{\text{OUT}} = 1 \mu\text{F}$ , From assertion of $V_{\text{EN}}$ to $V_{\text{OUT}} = 95\% V_{\text{OUT(NOM)}}$	$t_{\text{ON}}$		120		$\mu\text{s}$	
Power Supply Rejection Ratio	$I_{\text{OUT}} = 20 \text{ mA}$ , $V_{\text{IN}} = V_{\text{OUT}} + 0.3 \text{ V}$	PSRR		90		dB	
				$f = 100 \text{ Hz}$			95
				$f = 1 \text{ kHz}$			85
				$f = 10 \text{ kHz}$			55
	$f = 100 \text{ kHz}$						
Output Voltage Noise	$f = 10 \text{ Hz}$ to $100 \text{ kHz}$	$V_{\text{N}}$		8.8		$\mu\text{V}_{\text{RMS}}$	
Thermal Shutdown Threshold	Temperature rising	$T_{\text{SDH}}$		160		$^{\circ}\text{C}$	
	Temperature falling	$T_{\text{SDL}}$		140		$^{\circ}\text{C}$	
Active Output Discharge Resistance	$V_{\text{EN}} < 0.2 \text{ V}$ , Version A only	$R_{\text{DIS}}$		280		$\Omega$	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Performance guaranteed over the indicated operating temperature range by design and/or characterization. Production tested at  $T_A = 25^{\circ}\text{C}$ .

Low duty cycle pulse techniques are used during the testing to maintain the junction temperature as close to ambient as possible.

5. Dropout voltage is characterized when  $V_{\text{OUT}}$  falls  $0.02 \times V_{\text{OUT(NOM)}}$  below  $V_{\text{OUT(NOM)}}$ .

6. Guaranteed by design.

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## ORDERING INFORMATION

Device	Nominal Output Voltage	Marking	Description	Rotation	Package	Shipping†
NCP110AFCT060T2G	0.60 V	C	200 mA, Active Discharge	0°	WLCSP4 CASE 567JZ (Pb-Free)	5000 / Tape & Reel
NCP110AFCT105T2G	1.05 V	A		0°		
NCP110AFCT120T2G	1.20 V	F		0°		
NCP110AFCT180T2G	1.80 V	D		0°		

## ORDERING INFORMATION

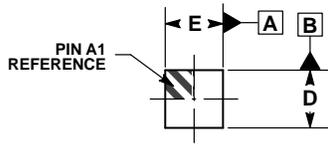
Device	Nominal Output Voltage	Marking	Description	Package	Shipping
NCP110AMX060TBG	0.60 V	FC	200 mA, Active Discharge	XDFN4 (Pb-Free)	3000 / Tape & Reel
NCP110AMX105TBG	1.05 V	FA			
NCP110AMX120TBG	1.20 V	FF			
NCP110AMX180TBG	1.80 V	FD			
NCP110AMX280TBG	2.80 V	FE			

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

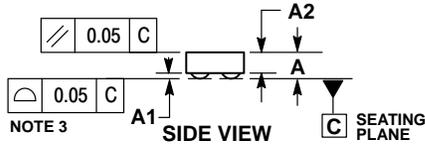
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## PACKAGE DIMENSIONS

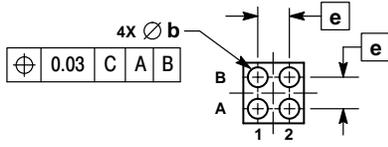
WLCSP4, 0.64x0.64  
CASE 567JZ  
ISSUE A



TOP VIEW



SIDE VIEW



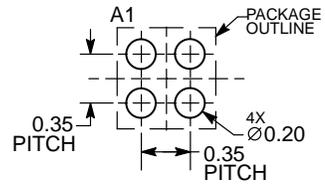
BOTTOM VIEW

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. COPLANARITY APPLIES TO SPHERICAL CROWNS OF SOLDER BALLS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	---	---	0.33
A1	0.04	0.06	0.08
A2	0.23 REF		
b	0.195	0.210	0.225
D	0.610	0.640	0.670
E	0.610	0.640	0.670
e	0.35 BSC		

### RECOMMENDED SOLDERING FOOTPRINT\*



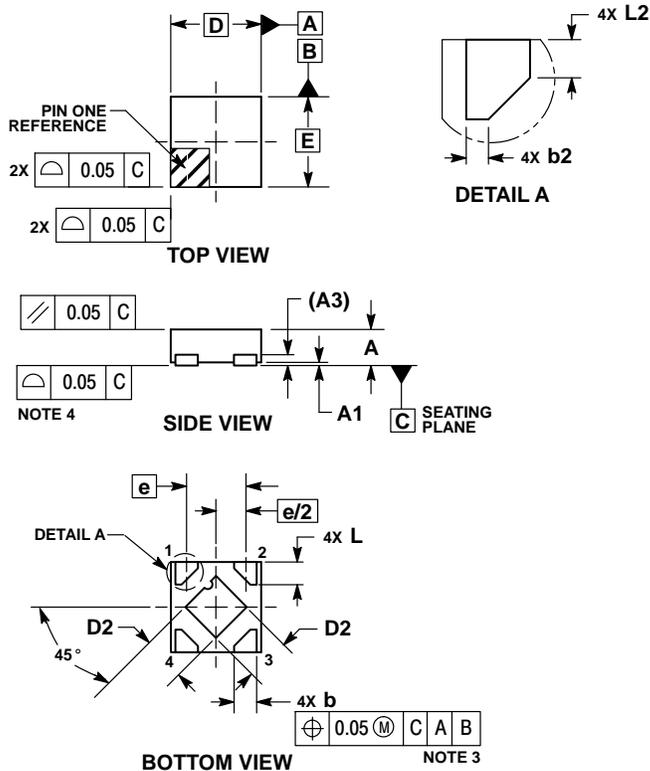
DIMENSIONS: MILLIMETERS

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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## PACKAGE DIMENSIONS

**XDFN4 1.0x1.0, 0.65P**  
CASE 711AJ  
ISSUE A

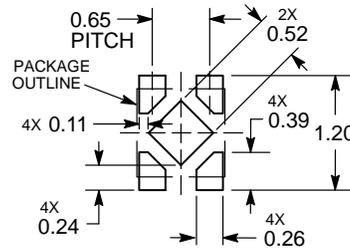


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.20 mm FROM THE TERMINAL TIPS.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

MILLIMETERS		
DIM	MIN	MAX
A	0.33	0.43
A1	0.00	0.05
A3	0.10	REF
b	0.15	0.25
b2	0.02	0.12
D	1.00	BSC
D2	0.43	0.53
E	1.00	BSC
e	0.65	BSC
L	0.20	0.30
L2	0.07	0.17

**RECOMMENDED MOUNTING FOOTPRINT\***



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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