NCP156

Product Preview

Dual 500 mA / 250 mA LDO for Camera Modules, Low Iq, Very Low Dropout, Ultra Low Noise

The NCP156 is Dual Output Linear Voltage Regulator optimized for camera module application. The device offers unique combination of High Current Low Voltage Bias Rail Topology for supplying digital block and very precise second output for powering analog sensor block. This combination allows achieving the best performance and power efficiency.

Features

- High Current Bias Rail Topology for OUT1
- High PSRR, Ultra Low Noise LDO for OUT2
- Output voltage range: OUT1 – 0.8 V to 1.8 V
  (Factory trimmed) OUT2 – 1.8 V to 3.6 V
- Low I_Q of typ. 100 μA
- Slow V_{OUT} Slew Rate for Camera Modules (Optional)
  typ. ≤30 mV/ms
- Ultra−Low Dropout: OUT1 typ. 140 mV @ 1.1 V/500 mA
  OUT2 typ. 95 mV @ 2.8 V/250 mA
- ±1% Typical Accuracy
- High PSRR: OUT1 typ. 70 dB at 1 kHz
  OUT2 typ. 92 dB at 1 kHz
- Thermal Shutdown and Current Limit Protections
- Stable with a Small Ceramic Capacitor
- Available WLCSP−6 1.2x0.8 mm Package
- Active Output Discharge for Fast Output Turn−Off
- These are Pb−free Devices

Typical Applications

- Camera Modules
- Smartphones, Tablets

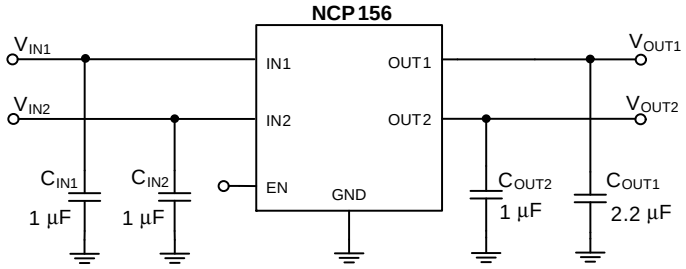

Figure 1. Typical Application Schematic

This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.

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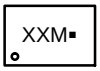
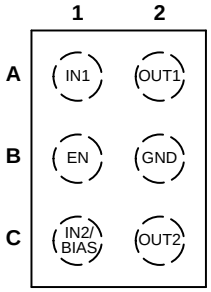
WLCSP6, 1.2x0.8
CASE 567MV

MARKING DIAGRAM



XX = Specific Device Code
M = Month Code
▪ = Pb−Free Package

PIN CONNECTIONS



(Top View)

ORDERING INFORMATION

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

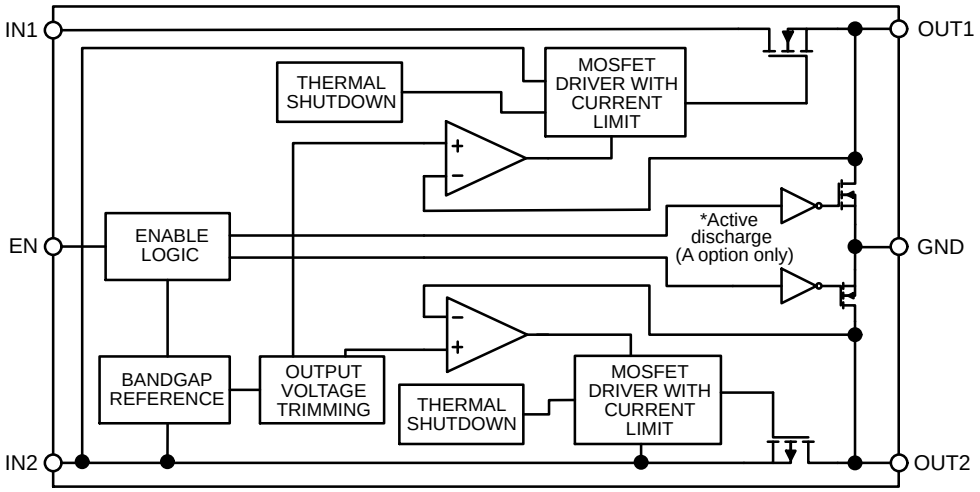


Figure 2. Simplified Schematic Block Diagram

Table 1. PIN FUNCTION DESCRIPTION

Pin No.	Pin Name	Description
A1	IN1	Output 1 – Power Supply pin
A2	OUT1	Regulated Output 1 Voltage pin
B1	EN	Applying V_{EN} < 0.4 V disables the regulator; Pulling V_{EN} > 0.9 V enables both voltage outputs.
B2	GND	Common ground connection
C1	IN2	Output 2 – Power Supply pin, Output 1 – Control Supply pin
C2	OUT2	Regulated Output 2 Voltage pin

Table 2. THERMAL CHARACTERISTICS (Note 1)

Rating	Symbol	Value	Unit
Thermal Characteristics, WLCSP6 1.2x0.8mm, Thermal Resistance, Junction−to−Air Thermal Characterization Parameter, Junction−to−Board	 θ_{JA} ψ_{JB}	 TBD TBD	°C/W

1. Single component mounted on 1 oz, FR4 PCB with 645mm2 Cu area

Table 3. ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Input Voltage 1 (Note 2)	V_{IN1}	−0.3 to 6	V
Input Voltage 2 (Note 2)	V_{IN2}	−0.3 to 6	V
Output Voltage 1	V_{OUT1}	−0.3 to V_{IN1} + 0.3	V
Output Voltage 2	V_{OUT2}	−0.3 to V_{IN2} + 0.3	V
Enable Input	V_{EN}	−0.3 to 6	V
Output Short Circuit Duration	t_{SC}	Indefinite	s
Maximum Junction Temperature	$T_{J(MAX)}$	150	°C
Storage Temperature	T_{STG}	−55 to 125	°C
ESD Capability, Human Body Model (Note 3)	ESD_{HBM}	2000	V
ESD Capability, Machine Model (Note 3)	ESD_{MM}	200	V
ESD Capability, Charged Device Model (Note 3)	ESD_{CDM}	1000	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.

2. Refer to ELECTRICAL CHARACTERISTICS and APPLICATION INFORMATION for Safe Operating Area.
3. This device series incorporates ESD protection and is tested by the following methods:
   ESD Human Body Model tested per AEC−Q100−002 (EIA/JESD22−A114)
   ESD Machine Model tested per AEC−Q100−003 (EIA/JESD22−A115)
   ESD Charged Device Model tested per EIA/JESD22−C101, Field Induced Charge Model
   Latchup Current Maximum Rating tested per JEDEC standard: JESD78.

Table 4. ELECTRICAL CHARACTERISTICS $-40°C \le T_J \le 125°C$; V_{IN1} = $V_{OUT1(NOM)}$ +0.3 V, V_{IN2} = 2.7 V or (V_{OUT1} + 1.6 V) or $V_{OUT2(NOM)}$ + 0.3 V whichever is greater, I_{OUT1} = I_{OUT2} = 1 mA, V_{EN} = 1 V, unless otherwise noted. C_{IN1} = C_{IN2} = 1 μF, C_{OUT1} = 2.2 μF, C_{OUT2} = 1 μF. Typical values are at T_J = +25°C. Min/Max values are for $-40°C \le T_J \le 125°C$ unless otherwise noted.

Parameter	Test Conditions			Symbol	Min	Typ	Max	Unit
Operating Input Voltage Range				V_{IN1}	V_{OUT1} + V_{DO}		5.5	V
				V_{IN2}	(V_{OUT1} + 1.5) ≥ 2.4		5.5	
Output Voltage Accuracy	T_J = 25°C			V_{OUT1}		±1		%
				V_{OUT2}				
Output Voltage Accuracy	$V_{OUT1(NOM)}$ + 0.3 V ≤ V_{IN1} ≤ $V_{OUT1(NOM)}$ + 1.0 V, V_{OUT2} = 2.7 V or ($V_{OUT1(NOM)}$) + 1.6 V), whichever is greater, 1 mA < I_{OUT1} < 500 mA			V_{OUT1}	−1.5		+1.5	%
	V_{IN2} = ($V_{OUT2(NOM)}$ + 1 V) to 5.5 V 0 mA ≤ I_{OUT2} ≤ 250 mA			V_{OUT2}	−2		+2	
Line Regulation	V_{OUT1}	$V_{OUT1(NOM)}$ + 0.3 V ≤ V_{IN1} ≤ 5.5 V		$Line_{REG}$		0.01		%/V
	V_{OUT2}	$V_{OUT2(NOM)}$ + 0.3 V ≤ V_{IN2} ≤ 5.5 V				0.02		
	V_{IN2} to V_{OUT1}	(2.7 V or ($V_{OUT1(NOM)}$ + 1.6 V), whichever is greater) < V_{IN2} < 5.5 V				0.01		
Load Regulation	OUT1	I_{OUT1} = 1 mA to 500 mA		$Load_{REG}$		1.5		mV
	OUT2	I_{OUT2} = 1 mA to 250 mA				1.5		
Dropout Voltage (Note 5)	OUT1	I_{OUT1} = 500 mA		V_{DO}		140	270	mV
	OUT2	I_{OUT2} = 250 mA	$V_{OUT2(NOM)}$ = 2.8 V			95	160	
			$V_{OUT2(NOM)}$ = 3.3 V			80	145	
V_{IN2} to V_{OUT1} Dropout Voltage	I_{OUT1} = 500 mA, V_{IN2} = V_{IN2} (Notes 5, 6)			$V_{DO(IN2)}$		1.1	1.5	V
Output Current Limit	OUT1	V_{OUT} = 90% $V_{OUT(NOM)}$		I_{CL}	550	800	1100	mA
	OUT2				250	700		
Quiescent Current IN1	I_{OUT1} = 0 mA			I_{Q1}		10	20	μA
Quiescent Current IN2	I_{OUT2} = 0 mA			I_{Q2}		90	130	
Disable Current	V_{IN1} Pin	V_{EN1} ≤ 0.4 V		$I_{VIN1(DIS)}$		0.5	1	μA
	V_{IN2} Pin			$I_{VIN2(DIS)}$		0.5	1	
EN Pin Threshold Voltage	EN Input Voltage “H”			$V_{EN(H)}$	0.9			V
	EN Input Voltage “L”			$V_{EN(L)}$			0.4	
EN Pull Down Current	V_{EN} = 5.5 V			I_{EN}		0.3	2	μA
Turn−On Delay	OUT1	From assertion of V_{EN} to raising V_{OUT}		t_{DELAY}		200		μs
	OUT2					130		
V_{OUT} Slew Rate (Note 7)	Normal			V_{OUT1}		100		mV/μs
				V_{OUT2}		200		
	Slow			V_{OUT1}		15		
				V_{OUT2}		30		
Power Supply Rejection Ratio	V_{IN1} to V_{OUT1}, f = 1 kHz, I_{OUT1} = 150 mA, V_{IN1} ≥ V_{OUT} +0.5 V			PSRR(V_{IN1})		70		dB
	V_{IN2} to V_{OUT2}, f = 1 kHz, I_{OUT2} = 10 mA, V_{IN2} ≥ V_{OUT} +0.5 V			PSRR(V_{IN2})		92		
	V_{IN2} to V_{OUT1}, f = 1 kHz, I_{OUT1} = 150 mA, V_{IN1} ≥ V_{OUT1} +0.5 V			$PSRR_{(IN2\ to\ OUT1)}$		80		

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°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_{OUT} falls 3% below $V_{OUT(NOM)}$.
6. For output 1 voltages below 0.9 V, V_{IN2} to V_{OUT1} dropout voltage does not apply due to a minimum V_{IN2} operating voltage of 2.4 V.
7. Refer to Table 6 for output slew rate configuration.

Table 4. ELECTRICAL CHARACTERISTICS $-40°C \le T_J \le 125°C$; $V_{IN1} = V_{OUT1(NOM)} +0.3$ V, $V_{IN2} = 2.7$ V or ($V_{OUT1} + 1.6$ V) or $V_{OUT2(NOM)} + 0.3$ V whichever is greater, $I_{OUT1} = I_{OUT2} = 1$ mA, $V_{EN} = 1$ V, unless otherwise noted. $C_{IN1} = C_{IN2} = 1$ μF, $C_{OUT1} = 2.2$ μF, $C_{OUT2} = 1$ μF. Typical values are at $T_J = +25°C$. Min/Max values are for $-40°C \le T_J \le 125°C$ unless otherwise noted.

Parameter	Test Conditions		Symbol	Min	Typ	Max	Unit
Output Noise Voltage	OUT1	$V_{IN} = V_{OUT} +0.5$ V f = 10 Hz to 100 kHz	V_N		40		μVRMS
	OUT2				8.5		
Thermal Shutdown Threshold	Temperature increasing		T_{SDL}		160		°C
	Temperature decreasing		T_{SDH}		140		
Output Discharge Pull−Down	$V_{EN} \le 0.4$ V		R_{DISCH}		150		Ω

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°C. Low duty cycle pulse techniques are used during the testing to maintain the junction temperature as close to ambient as possible.
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7. Refer to Table 6 for output slew rate configuration.

APPLICATIONS INFORMATION

The NCP156 device offers various combinations of active discharge feature and V_{OUT} slew rate speed for each output channel. The OPN contains two letters behind product name which are dedicated for Active discharge and Slew rate speed. Possible combinations with corresponding letters are explained below.

Table 5. ACTIVE DISCHARGE

Act. Discharge (x = ON)	OUT1	OUT2
A	x	x
B		
C	x	
D		x

Table 6. V_{OUT} SLEW RATE SPEED

Slew rate (x = Slower)	OUT1	OUT2
A	x	x
B		
C	x	
D		x

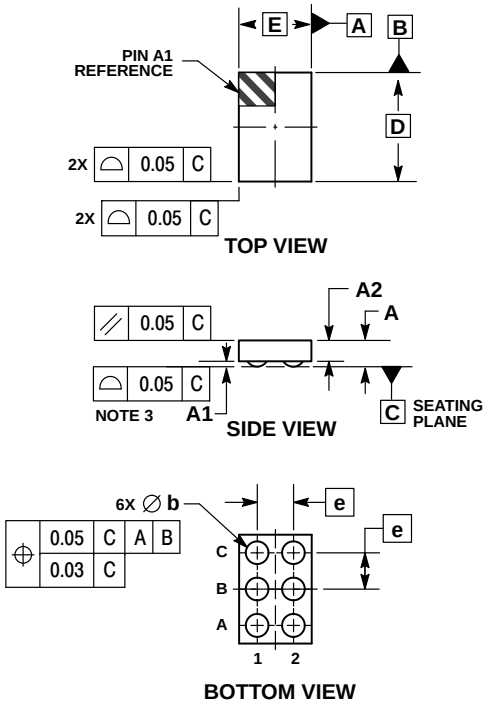
ORDERING INFORMATION

Device	Marking	Voltage Option OUT1 / OUT2	Active Discharge OUT1 / OUT2	Vout Slew Rate OUT1 / OUT2	Package	Shipping†
NCP156AAFCT120180T2G	DA	1.2 V / 2.8 V	Yes / Yes	Slow / Slow	WLCSP6 (Pb−Free)	TBD
NCP156BBFCT120180T2G	TBD	1.2 V / 2.8 V	No / No	Normal / Normal		

†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.

PACKAGE DIMENSIONS

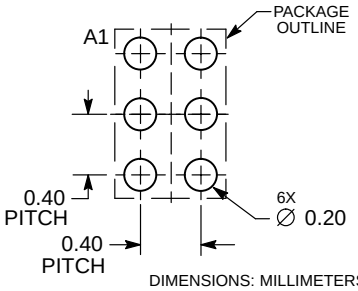
WLCSP6, 1.20x0.80
CASE 567MV
ISSUE A



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

	MILLIMETERS	
DIM	MIN	MAX
A	−−−	0.33
A1	0.04	0.08
A2	0.23 REF	
b	0.24	0.30
D	1.20 BSC	
E	0.80 BSC	
e	0.40 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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