

## General Description

The LTP3456 family is a 500 mA LDO linear regulator with auto discharge function. It uses an advanced CMOS process and a P-MOSFET pass device to achieve high power supply rejection ratio (PSRR), low noise, low dropout, low ground current, fast start-up, and excellent output accuracy.

The LTP3456 family is stable with a 1.0  $\mu\text{F}$  ceramic output capacitor. The device uses a precision voltage reference and feedback loop to achieve excellent Regulation and transient response.

The LTP3456 family is offered in a small SOT23-5L and DFN1 $\times$ 1-4L packages, which are ideal for small form factor portable equipment.

The LTP3456 family is available in standard fixed output voltages of 0.8 V, 1.2 V, 1.5 V, 1.8 V, 2.5 V, 2.8 V, 3.0 V, and 3.3 V.

## Features and Benefits

- Wide Input Voltage Range from 1.9 V to 5.5 V
- Up to 500 mA Load Current
- Standard Fixed Output Voltage Options: 0.8 V, 1.2 V, 1.5 V, 1.8V, 2.5 V, 2.8 V, 3.0 V and 3.3 V
- Very Low  $I_q$  of 45  $\mu\text{A}$  Typically
- Low Dropout of Typical 200 mV at 2.8 V Output and 300 mA Load
- High PSRR: 70 dB at 1 kHz
- Low Noise: 40  $\mu\text{V}_{\text{RMS}}$  at 1.2 V Output
- Excellent Load/Line Transient Response
- Packages: SOT23-5L, DFN1 $\times$ 1-4L

## Applications

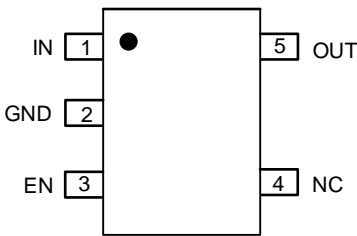
- Smart Phones and Tablets
- IP Cameras
- Portable instruments

Ordering Information

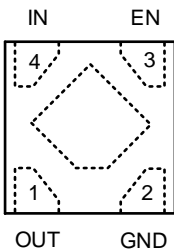
Model <sup>Note1</sup>	Package Name	Type Number <sup>Note1</sup>	Packing Quantity
LTP3456	SOT23-5L	LTP3456-xxNYT5	Tape and Reel, 3 000
	DFN1×1-4L	LTP3456-xxNYF4	Tape and Reel, 10 000

*Note1: xx stands for output voltage, e.g. if xx = 18, the output voltage is 1.8V; if xx = 30, the output voltage is 3.0V. The device with suffix "N" is shutdown version with enable control input.*

Pin Configurations (Top View)



SOT23-5

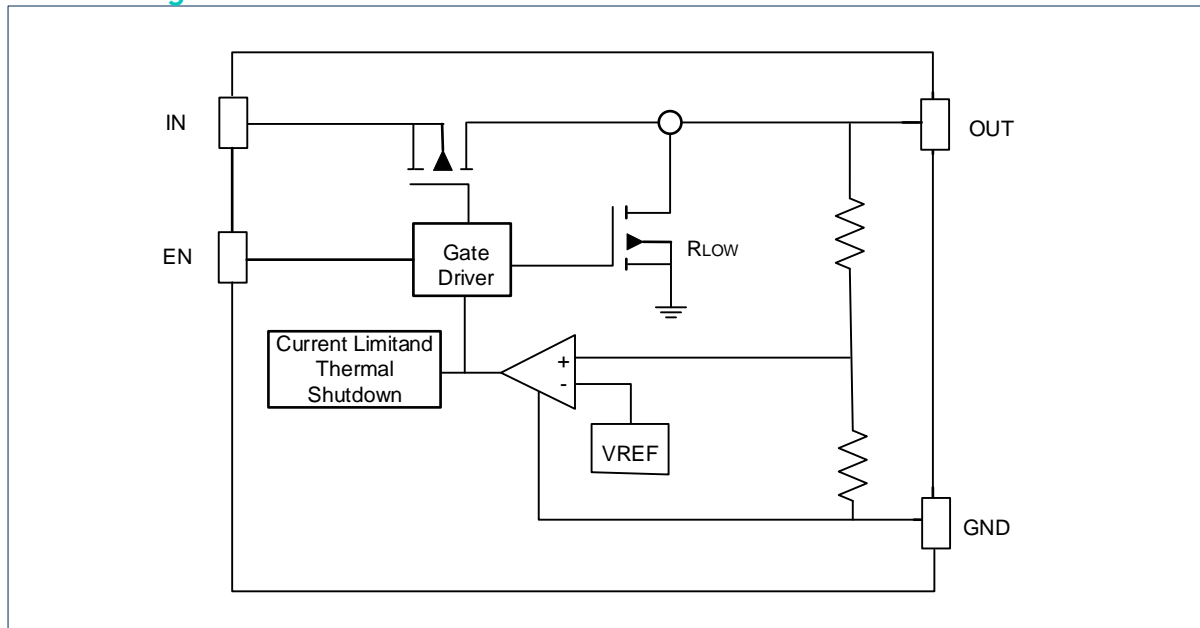


DFN1.0×1.0-4L

Pin Function

Package		Symbol	Function
SOT23-5L	DFN1×1-4L		
1	4	IN	Supply input pin.
2	2	GND	Ground.
3	3	EN	Enable control input, active high.
4	/	NC	No Connection.
5	1	OUT	Output pin.

## Block Diagram



## Functional Description

### INPUT CAPACITOR

A 1  $\mu\text{F}$  ceramic capacitor is recommended to connect between VIN and GND pins to decouple input power supply glitch and noise. The amount of the capacitance may be increased without limit. This input capacitor must be located as close as possible to the device to assure input stability and less noise. For PCB layout, a wide copper trace is required for both VIN and GND.

### OUTPUT CAPACITOR

An output capacitor is required for the stability of the LDO. The recommended output capacitance is from 0.47  $\mu\text{F}$  to 4.7  $\mu\text{F}$ , Equivalent Series Resistance (ESR) is from 5 m $\Omega$  to 100 m $\Omega$ , and temperature characteristics is X7R or X5R. Higher capacitance values help to improve load/line transient response. The output capacitance may be increased to keep low undershoot/overshoot. Place output capacitor as close as possible to OUT and GND pins.

### ON/OFF INPUT OPERATION

The LTP3456 is turned on by setting the EN pin high, and is turned off by pulling it low. If this feature is not used, the EN pin should be tied to IN pin to keep the regulator output on at all time.

### ULTRA FAST START-UP

After enabled, the LTP3456 is able to provide full power in as little as tens of microseconds, typically 80  $\mu\text{s}$ . This feature will help load circuitry move in and out of standby mode in real time, eventually extend battery life for mobile phones and other portable devices.

### CURRENT LIMIT PROTECTION

When output current at the OUT pin is higher than current limit threshold or the OUT pin is short-circuit to GND, the current limit protection will be triggered and clamp the output current to approximately 500 mA to prevent over-current and to protect the regulator from damage due to overheating.

### THERMAL SHUTDOWN PROTECTION

Thermal protection disables the output when the junction temperature rises to approximately +155°C, allowing the device to cool down. When the junction temperature reduces to approximately +130°C the output circuitry is enabled again. Depending on power dissipation, thermal resistance, and ambient temperature, the thermal protection circuit may cycle on and off. This cycling limits the heat dissipation of the regulator, protecting it from damage due to overheating.

## Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
IN Voltage	$V_{IN}$	-0.3	7	V
Other Pin Voltage		-0.3	$V_{IN} + 0.3$	V
Maximum Load Current			500	mA
Package Thermal Resistance	DFN1×1-4L		180	°C/W
	SOT23-5		260	°C/W
Junction Temperature	$T_J$		150	°C
Storage Temperature	$T_{STG}$	-65	150	°C
Lead Temperature(Soldering, 10 sec)	$T_L$		300	°C

**NOTE:** Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Unit
IN Voltage	$V_{IN}$	1.9	5.5	V
Output Current	$I_{OUT}$	0	500	mA
Operating Ambient Temperature	$T_A$	-40	85	°C
Effective Input Ceramic Capacitor Value	$C_{IN}$	0.47	4.7	μF
Effective Output Ceramic Capacitor Value	$C_{OUT}$	0.47	4.7	μF
Input and Output Capacitor Equivalent Series Resistance (ESR)	ESR	5	100	mΩ

## Caution:

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. LINEARIN recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

LINEARIN reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact LINEARIN sales office to get the latest datasheet.

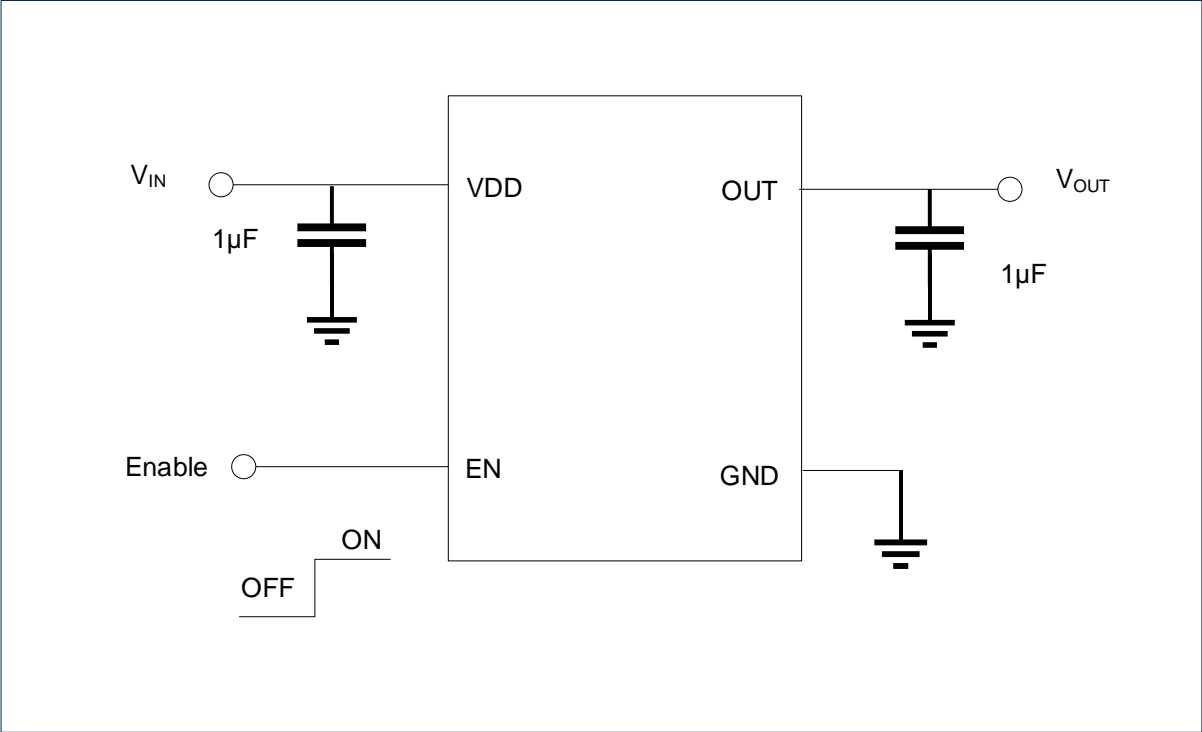
## Electrical Characteristics

$T_A = +25^{\circ}\text{C}$ ,  $V_{IN} = V_{EN} = V_{OUT} + 1\text{ V}$  unless otherwise noted.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{IN}$	Input Voltage Range		1.9		5.5	V
$\Delta V_{OUT}$	Regulated Output Voltage	$I_{OUT} = 1\text{ mA}$ , $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$	-2		2	$\%V_{OUT}$
	Line Regulation	$V_{IN} = V_{OUT} + 1\text{ V}$ to $5.5\text{ V}$ , $I_{OUT} = 10\text{ mA}$		0.03	0.2	$\%V_{OUT}$
	Load Regulation	$I_{OUT} = 0\text{ mA}$ to $300\text{ mA}$		20	40	mA
$T_S$	Soft-start Time	From enable to power on		80		$\mu\text{s}$
$I_{SHORT}$	Short Current limit	$V_{OUT} = 0\text{ V}$		70		mA
$I_{Q-ON}$	DC Supply Quiescent Current	Active mode: $V_{EN} = V_{IN}$		45	70	$\mu\text{A}$
$I_{Q-OFF}$	DC Supply Shutdown Current	$V_{EN} = 0\text{ V}$		0.01	1	$\mu\text{A}$
$V_{DROP}$	Dropout Voltage	$V_{OUT} = 1.2\text{ V}$ , $I_{OUT} = 300\text{ mA}$		380	480	mV
		$V_{OUT} = 1.5\text{ V}$ , $I_{OUT} = 300\text{ mA}$		300	400	mV
		$V_{OUT} = 1.8\text{ V}$ , $I_{OUT} = 300\text{ mA}$		220	340	mV
		$V_{OUT} = 2.5\text{ V}$ , $I_{OUT} = 300\text{ mA}$		210	330	mV
		$V_{OUT} = 2.8\text{ V}$ , $I_{OUT} = 300\text{ mA}$		200	320	mV
		$V_{OUT} = 3.0\text{ V}$ , $I_{OUT} = 300\text{ mA}$		190	310	mV
		$V_{OUT} = 3.3\text{ V}$ , $I_{OUT} = 300\text{ mA}$		180	300	mV
$I_{LMT}$	Current Limit	$R_{LOAD} = 1\ \Omega$	300			mA
PSRR	Power supply rejection ration	$f = 1\text{ kHz}$ , $C_{OUT} = 1\ \mu\text{F}$ , $I_{OUT} = 20\text{ mA}$		70		dB
		$f = 10\text{ kHz}$ , $C_{OUT} = 1\ \mu\text{F}$ , $I_{OUT} = 30\text{ mA}$		65		dB
$e_N$	Output Noise Voltage	$BW = 10\text{ Hz}$ to $100\text{ kHz}$ , $I_{OUT} = 200\text{ mA}$ , $V_{OUT} = 2.8\text{ V}$ , $C_{OUT} = 1\ \mu\text{F}$		60		$\mu\text{V}_{RMS}$
		$BW = 10\text{ Hz}$ to $100\text{ kHz}$ , $I_{OUT} = 200\text{ mA}$ , $V_{OUT} = 1.2\text{ V}$ , $C_{OUT} = 1\ \mu\text{F}$		40		$\mu\text{V}_{RMS}$
$V_{IL}$	EN Low Threshold			0.3		V
$V_{IH}$	EN High Threshold		1.2			V
$I_{EN}$	EN Pin Input current	$V_{EN} = 0\text{ V}$		0	0.1	$\mu\text{A}$
$R_{PD}$	EN pull-down resistance		0.8	1	1.3	M $\Omega$
$R_{LOW}$	Output resistance of auto discharge at off state	$E_N = 0\text{ V}$ , $V_{IN} = 4\text{ V}$		90		$\Omega$
$T_{TSD}$	Thermal shutdown threshold	$T_J$ rising		150		$^{\circ}\text{C}$
$T_{HYS}$	Thermal shutdown hysteresis	$T_J$ falling from shutdown		20		$^{\circ}\text{C}$

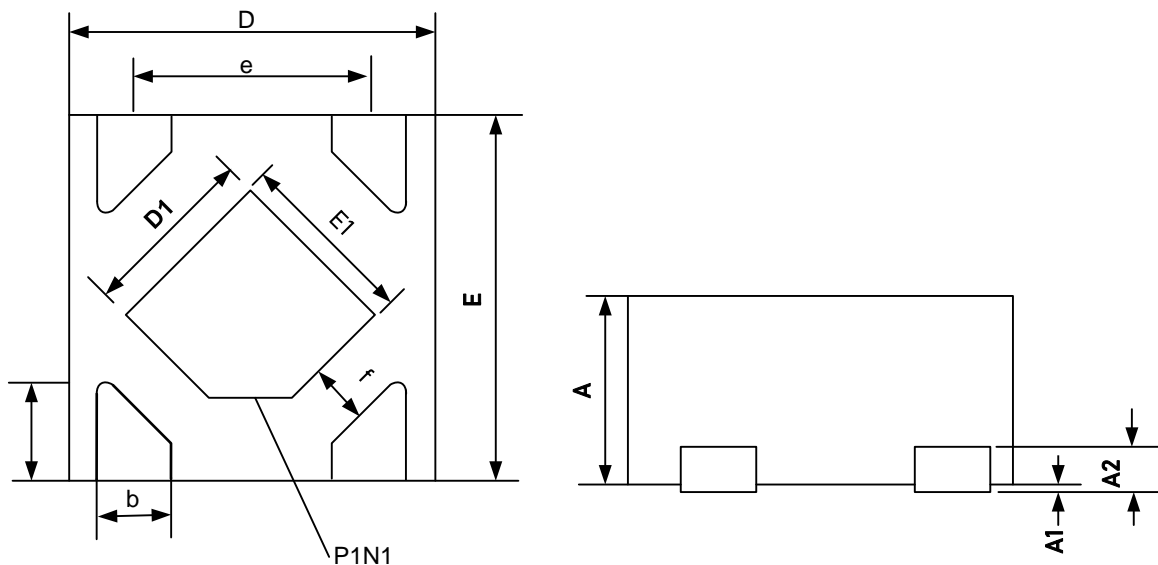
Note: Production test at  $+25^{\circ}\text{C}$ . Specifications over the temperature range are guaranteed by design and characterization.

Application Circuits



## Package Dimension

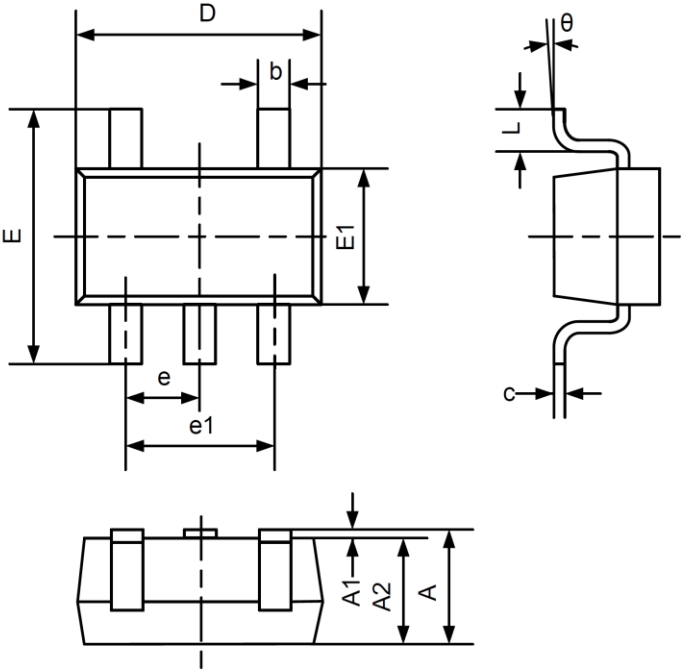
DFN1×1-4L



Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.450	0.500	0.550
A1	0.000	0.025	0.050
A2	0.125REF		
D	0.950	1.000	1.050
D1	0.380	0.480	0.580
E	0.950	1.000	1.050
E1	0.380	0.480	0.580
b	0.150	0.200	0.250
e	0.650BSC		
f	0.190	0.195	0.200
L	0.150	0.250	0.350

Package Dimension

SOT23-5L



Unit: mm

Symbol	Dimensions In Millimeters	
	MIN	MAX
A	0.700	1.250
A1	0.000	0.100
A2	0.700	1.150
b	0.350	0.500
c	0.080	0.200
D	2.820	3.020
E	2.650	2.950
E1	1.600	1.700
e	0.950BSC	
e1	1.800	2.000
L	0.300	0.600
θ	0°	8°