

# 80dB PSRR, Low Noise, RF, 300mA LDO in SOT23-6

# DESCRIPTION

ETA5052 is a low-dropout (LDD) low-power linear voltage regulator features high power-supply rejection ratio (PSRR), ultralow-noise, fast start-up, and excellent line and load transient responses. Its PSRR can be as high as 80dB and its noise level can be as low as 30µVRMS of output voltage noise at 2.8V output with a 0.1µF bypass capacitor. Therefore, ETA5052 is an ideal power supply for noise-sensitive applications such as RF transmissions, cellphones, CMOS sensors and audios etc.

ETA5052's output voltage is adjustable through external feedback resistors and is housed in S0T23-6 package.

# FEATURES

- High PSRR, 80 dB at 10Hz,70dB at 10Kz
- Low Noise, 30µVRMS
- Stable With a Wide Range of Ceramic Capacitor larger than 1µF
- Excellent Load and Line Transient Response
- Very Low Dropout Voltage
- 300mA output current

# APPLICATIONS

- RF power
- Sensors
- Audio



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# PIN CONFIGURATION



# ABSOLUTEMAXIMUM RATINGS

# ELECTRICAL CHACRACTERISTICS

PARAMETER	CONDITIONS	MIN	ТҮР	MAX	UNIT	
Input Voltage Range <sup>(1)</sup>		2.7		5.5	V	
Under Input Voltage Lock Out	Rising, Hysteresis=100mV		2.6		V	
Ground Current	0µA ≤ IOUT ≤ 200mA		170		μA	
Shutdown Current	VEN = □V, 2.7V ≤ VIN ≤ 5.5V			1	μA	
Dropout Voltage <sup>(2)</sup>	10UT = 200mA		135		тV	
Continuous Output Current				300	mA	
Output Current Limit	VOUT = 95%	350	600		mA	
Output Foldback Current Limit	$V \Box U T = \Box V$		300		mA	
Line Regulation	V0UT + 1V ≤ VIN ≤ 5.5V			0.12	%/V	
Load Regulation	0µA ≤ 10UT ≤ 200mA		0		тV	
FB Feedback Voltage	DULU	1.178	1.200	1.222	V	
FB Pin Current	VFB = 1.8V			1	μA	
REFBP Voltage		1.188	1.200	1.212	٧	
	Freq = 100Hz, IOUT = 10mA		80 80 70 60		dB	
Power Supply Rejection Ratio	Freq = 1KHz, IOUT = 100mA					
	Freq = 10kHz, 10UT = 100mA					
	Freq = 100kHz, 10UT = 100mA					
Output Noise Voltage			30		µVRMS	
	Floating REFBP, lout=D		95			
<b>P</b> 1 1 1	$C_{REFBP} = 4.7 nF$ , lout=0		105 110		μs	
Start-up time,	C <sub>REFBP</sub> = 10nF, lout=0					
	CREFBP = 33nF, lout=0		128		1	
EN pin input Logic Low	2.7V ≤ VIN ≤ 5.5V			0.5	V	
EN pin input Logic High	2.7V ≤ VIN ≤ 5.5V	1.2			V	
Thermal Shutdown	Rising, Hysteresis =30°C		150		0C	

(V\_{IN} = 3.8V, V\_{OUT} = 2.8V, unless otherwise specified. Typical values are at TA = 25°C.)

(1): Minimum VIN is 2.7 V or VOUT + VOROPOUT, whichever is greater.

(2): Only measure for options of VOUT higher than 2.7V because minimum of VIN be 2.7V.



# PIN DESCRIPTION

PIN #	NAME	DESCRIPTION
1	VIN	Input Supply Pin
2	GND	Ground Pin
3	EN	Enable Pin. Drive it high to enable IC, drive it low to disable. EN can be connected to IN if not used.
4	REFBP	Reference Voltage Bypass pin. Bypass this pin to GND by an external capacitor to improve PSRR performance at high frequency.
5	FB	Feedback pin for setting up output voltage.
6	VOUT	Output of regulator

# TYPICAL CHARACTERISTICS













# TYPICAL CHARACTERISTICS Cont'

(Typical values are at  $T_A = 25^{\circ}C$  unless otherwise specified.)



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# FUNCTIONAL BLOCK DIAGRAM



# FUNCTIONAL DESCRIPTION

The ETA5052 family of LDO regulators has been optimized for application in noise-sensitive equipment. The device features extremely low dropout voltages, high PSRR, ultralow output noise, low quiescent current, and enable-input to reduce supply currents to less than 1µA when the regulator is turned off.

## Enable Sequence

ETA5052 is enabled when all below conditions happen. Otherwise, ETA5052 is in standby mode.

- EN pin voltage above Logic High level
- VIN is higher than Under-Voltage-Lock-Out Level.
- Junction Temperature is not at Over-Temperature Protection level.

Once all above conditions happen, ETA5052 first enable BANDGAP, and Pre-charge REFBP before enable internal 2.64V regulator and BIAS. Finally, when internal bias ready, ETA5052 enable LDO core.

ETA5052 is completed forced in shutdown mode when EN pin is at below LOGIC\_LOW that supply current is less than 1µA. Otherwise, part only shutdown the VOUT while other circuit still in operation. Once ETA5052 is in shutdown conditions, Output is discharged by 1kΩ resistor.

## **Dutput Current Limit and Foldback Current Limit**

ETA5052 family features an internal current limit. In normal operation, the ETA5052 limits output current to approximately 600mA. When current limiting engages, the output voltage scales back linearly until the over current condition ends.

In case output is in hard short conditions, ETA5052 also features an internal foldback limit that reduces the output current limit to a lower level, 300mA, then reduce power dissipation ratings of the package.

# ETA5052



## Reference Bypass

ETA5052 provides a pin that bypass internal reference voltage with an external capacitor. This improves PSRR at high frequency and also help reduces output noise.

#### **Over-Temperature Protection**

Thermal protection disables the output when the junction temperature rises to approximately 150°C, allowing the device to cool down. When the junction temperature cools to approximately 120°C, the output circuitry is again enabled. Depending on power dissipation, thermal resistance, and ambient temperature, the thermal protection circuit may cycle on and off. This cycling limits regulator dissipation, protecting the device from damage as a result of overheating.

## **APPLICATION INFORMATION**

### External Dutput Voltage Setting

In external Output Voltage Setting Version selected, the ETA5052regulator is programmed using an external resistor divider. The output voltage is calculated using below equation.

$$V_{OUT} = V_{REF} x \left(1 + \frac{R_u}{R_d}\right)$$

Where VREF = 1.200V typically (the internal reference voltage)

Resistors Ru and Rd should be chosen for approximately  $40\mu$ A divider current. Lower value resistors can be used for improved noise performance, but the solution consumes more power. Higher resistors values can cause accuracy issues. The recommended design procedure is to choose R2 =  $30k\Omega$  to set the divider current at  $40\mu$ A, then R1 is calculated using below equation.

$$R_1 = \left(\frac{V_{OUT}}{V_{REF}} - 1\right) x R_2$$

## PACKAGE DUTLINE

Package: SOT23-6





Symbol	Dimensions In Millimeters		Dimensions In Inches		
	Min	Max	Min	Max	
A	1.050	1.250	0.041	0.049	
A1	0.000	0.100	0.000	0.004	
A2	1.050	1.150	0.041	0.045	
b	0.300	0.500	0.012	0.020	
с	0.100	0.200	0.004	0.008	
D	2.820	3.020	0.111	0.119	
E	1.500	1.700	0.059	0.067	
E1	2.650	2.950	0.104	0.116	
е	0.950(BSC)		0.037(BSC)		
e1	1.800	2.000	0.071	0.079	
L	0.300	0.600	0.012	0.024	
θ	0°	8°	0°	8°	