

500mA Low Noise, High PSRR Fast Transient Response LDO with Fixed Output Voltage

DESCRIPTION

ETA5050 is a fixed output, 500mA low noise and fast transient response low-dropout (LDO) linear voltage regulator with high power-supply rejection ratio (PSRR). Its PSRR can be as high as 70dB with quiescent current is about 37 μ A. Therefore, ETA5050 is an ideal power supply for noise-sensitive applications such as RF transmissions, cellphones, CMOS sensors and audios etc.

ETA5050 is consists of a precise voltage reference, an error amplifier, a compensation network, and a low ON-resistance power P-MOSFET. It also integrates many protection circuitries, like current limit and over-temperature protection module.

ETA5050 is in a tiny SOT23-5 package.

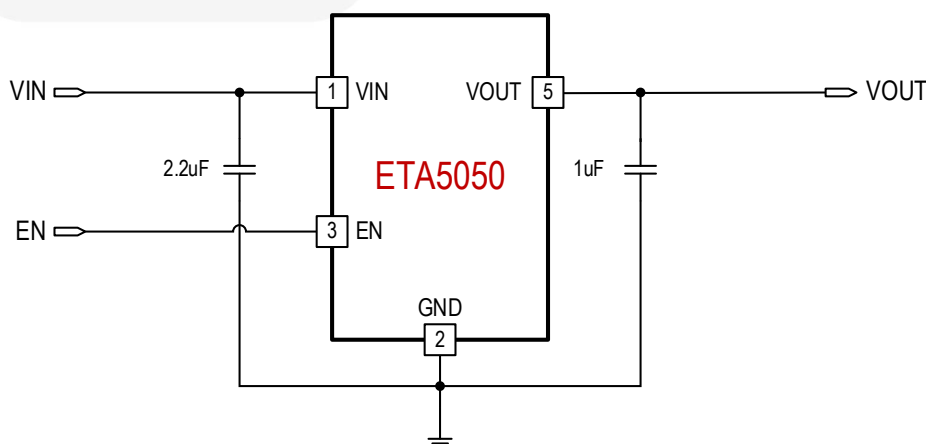
FEATURES

- ◆ 500mA Output Current
- ◆ Minimum Output Voltage as Low as 1.0V
- ◆ 0.24V Dropout Voltage for 200mA at $V_{OUT}=3.3V$
- ◆ Low Quiescent Current 37 μ A
- ◆ <1 μ A Shutdown Current
- ◆ Excellent Load and Line Transient Response
- ◆ High PSRR, 70dB
- ◆ Stable with a Wide Range of Ceramic Capacitor
- ◆ Moisture Sensitivity Level (MSL)
SOT23-5: Level 3
- ◆ Pb Free, RoHS and REACH Compliant
- ◆ Halogen Free and "Green" Device

APPLICATIONS

- ◆ Set-Top Box
- ◆ Cellphone
- ◆ Security Camera

TYPICAL APPLICATION



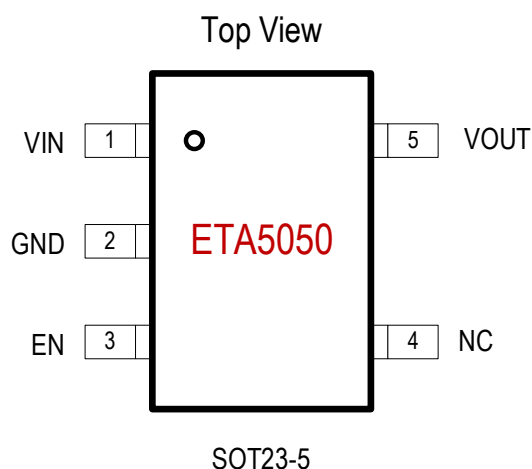
ORDERING

INFORMATION

PART No.	PACKAGE	TOP MARK	Pcs/Reel
ETA5050VXXS2F	SOT23-5	PPYW	3000
XX: voltage code	e.g., 12 =1.2V	PP: product code	YW: date code

Please check the table at bottom of this document for available part numbers.

PIN CONFIGURATION



ABSOLUTE MAXIMUM RATINGS

(Note: Exceeding these limits may damage the device. Exposure to absolute maximum rating conditions for long periods may affect device reliability.)

VIN, EN, VOUT Voltage		-0.3V to 6V
Junction Temperature		150°C
Storage Temperature Range		-55°C to 150°C
Thermal Resistance	θ_{JA} θ_{JC}	
SOT23-5	163.....55.....	°C/W
Lead Temperature (Soldering 10ssec)		260°C
ESD HBM (Human Body Mode)		2KV
ESD CDM (Charge Device Mode)		1KV

Recommended Operating Conditions

(Note: The device is not guaranteed to function outside its operating conditions.)

Ambient Temperature Range		-40°C to 85°C
Junction Temperature Range		-40°C to 125°C

ELECTRICAL CHARACTERISTICS

($V_{IN} = V_{OUT} + 1.5V$, $C_{IN} = 2.2\mu F$, $C_{OUT} = 1\mu F$, unless otherwise specified. Typical values are at $T_A = 25^\circ C$.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage Range ⁽¹⁾		1.6		6.0	V
Ground Current	No Load		37	60	μA
Shutdown Current	$V_{EN} = 0V$		0	1	μA
Dropout Voltage	$I_{OUT} = 300mA$, $V_{OUT} = 1.2V$		850	1000	mV
	$I_{OUT} = 300mA$, $V_{OUT} = 1.8V$		550	700	mV
	$I_{OUT} = 300mA$, $V_{OUT} = 3.0V$		350	500	mV
	$I_{OUT} = 300mA$, $V_{OUT} = 3.3V$		330	450	mV
Continuous Output Current	If not limited by heat dissipation of package and dropout		500		mA
Output Current Limit	$V_{OUT} = 95\%$		500		mA
Output Foldback Current Limit	$V_{OUT} = 0V$		250		mA
Line Regulation	$V_{OUT} + 1V \leq V_{IN} \leq 6V$			0.12	%/V
Load Regulation	$0\mu A \leq I_{OUT} \leq 200mA$		20		mV
Output Voltage Range	Available in 50mV steps	1.0		3.95	V
Vout Voltage accuracy	$I_{OUT} = 30mA$	-2		+2	%
Power Supply Rejection Ratio	Freq = 100Hz, $I_{OUT} = 30mA$		73		dB
	Freq = 1kHz, $I_{OUT} = 30mA$		70		
Start-up time,			50		μs
EN pin input Logic Low	$1.8V \leq V_{IN} \leq 6V$			0.4	V
EN pin input Logic High	$1.8V \leq V_{IN} \leq 6V$	1.4			V

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Input current at EN pin ⁽²⁾	$V_{EN}=3V$		1		μA
Thermal Shutdown	Rising, Hysteresis =30°C		150		°C
Output Noise Voltage	BW=10Hz to 100KHz		50		μV_{RMS}

(1): Minimum V_{IN} is 2.0V or $V_{OUT} + V_{DROPOUT}$, whichever is greater.

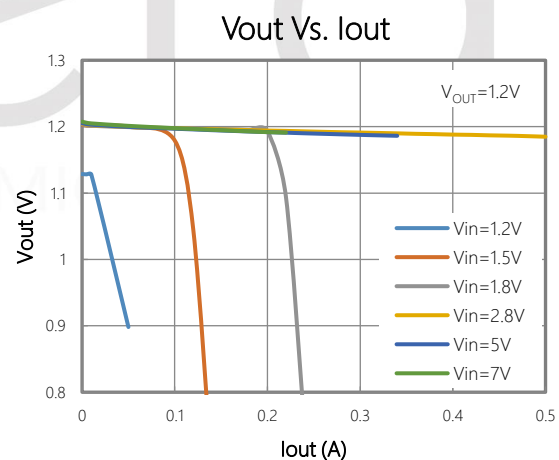
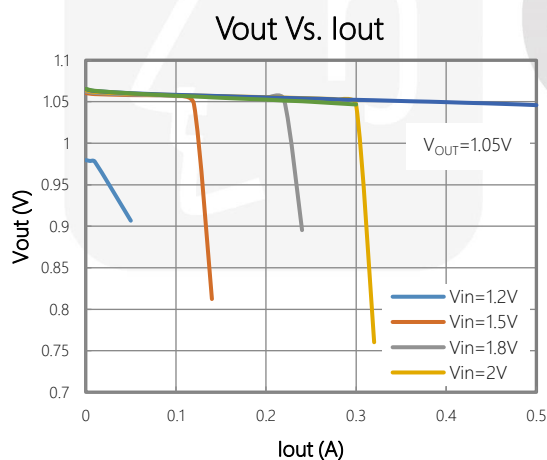
(2): There is a 3M Ω resistor between EN and ground on the device.

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	NC	Not Connected
5	VOUT	Output of regulator

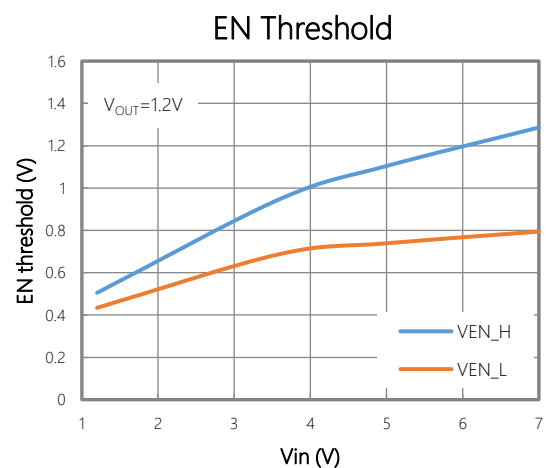
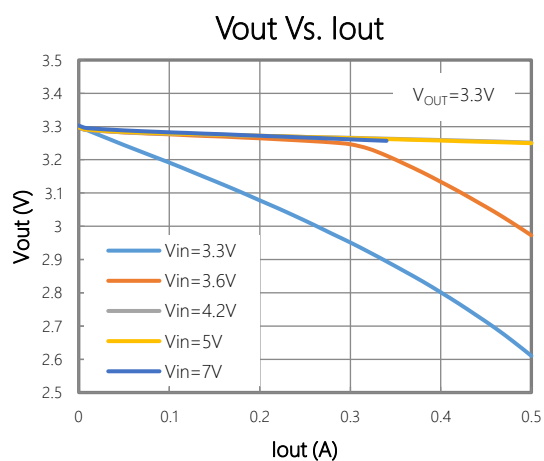
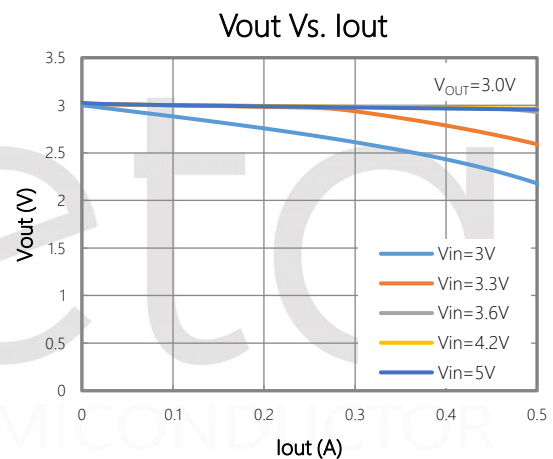
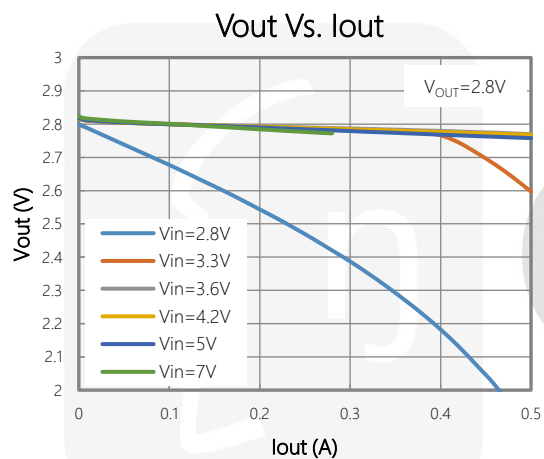
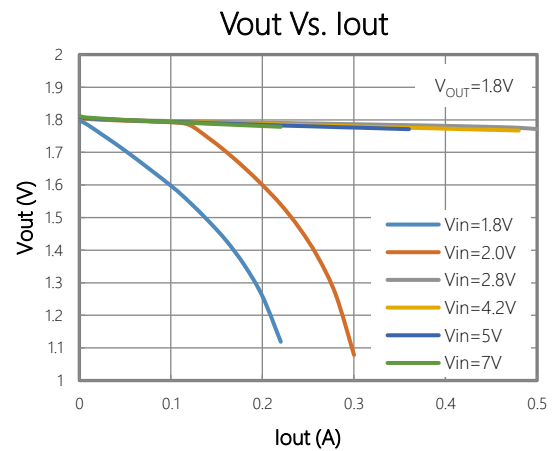
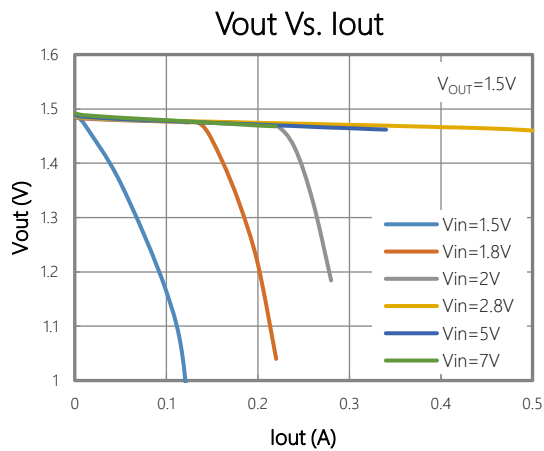
TYPICAL CHARACTERISTICS

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



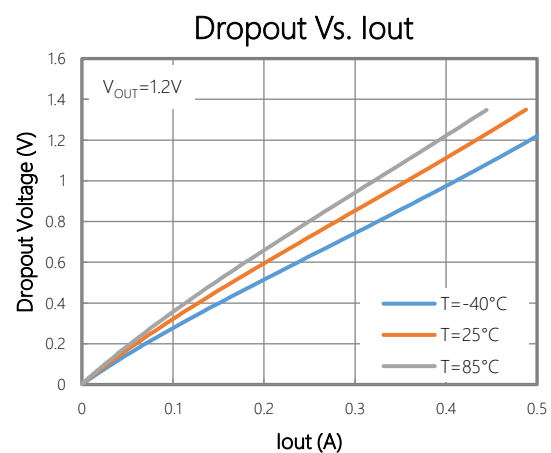
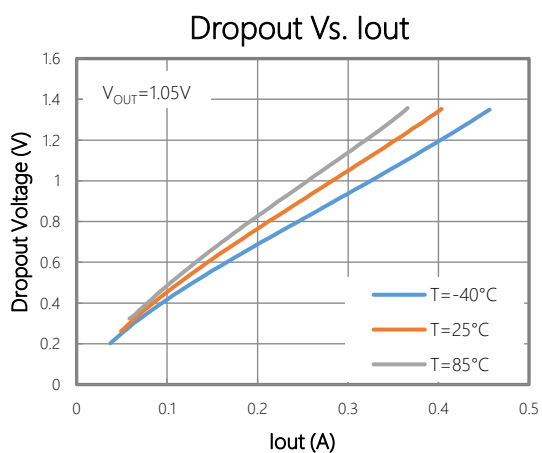
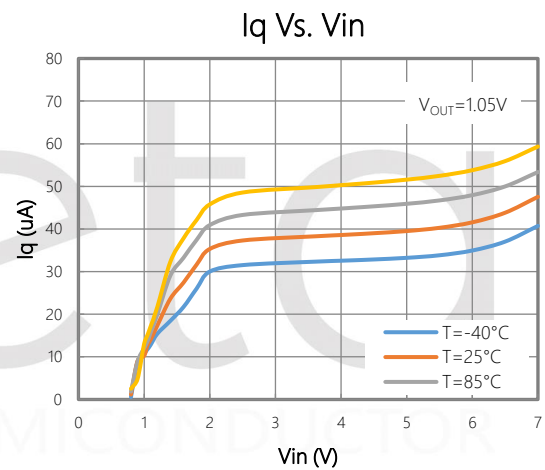
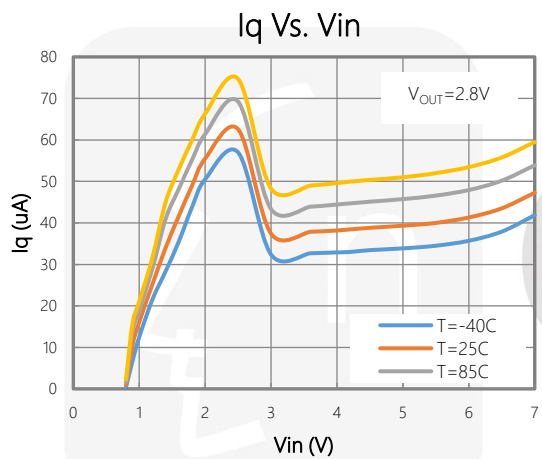
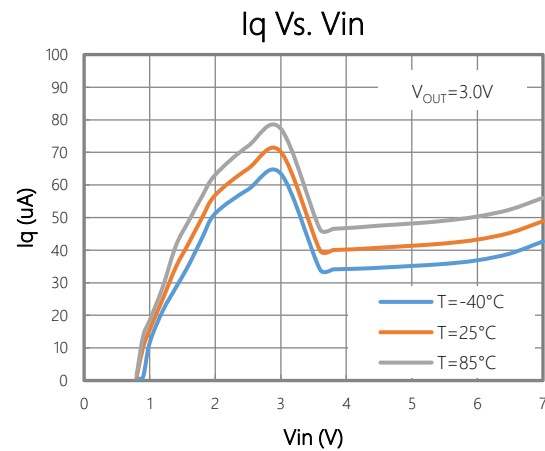
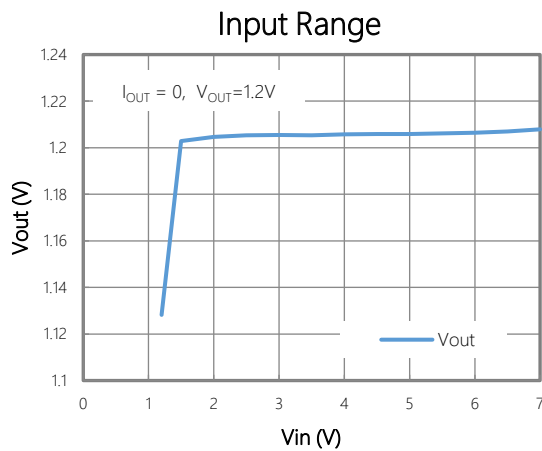
TYPICAL CHARACTERISTICS Cont'd

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

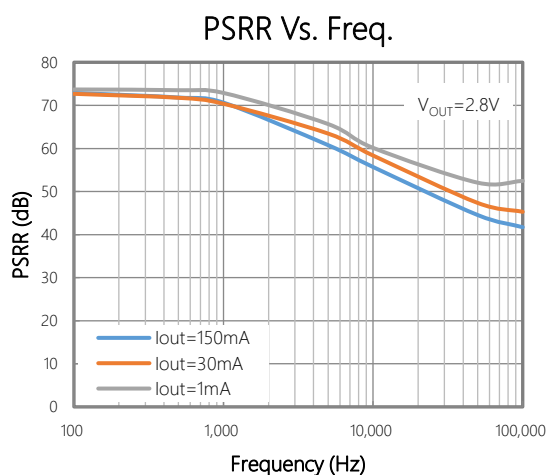
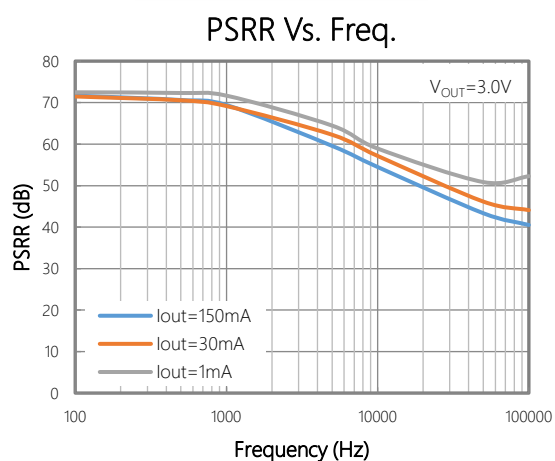
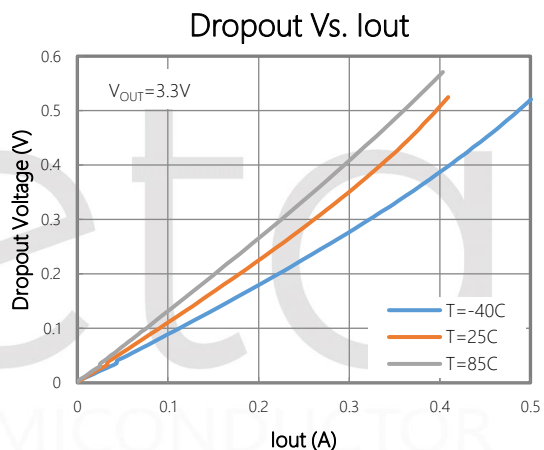
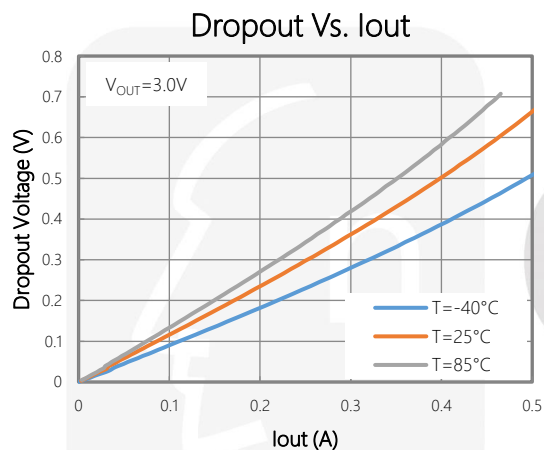
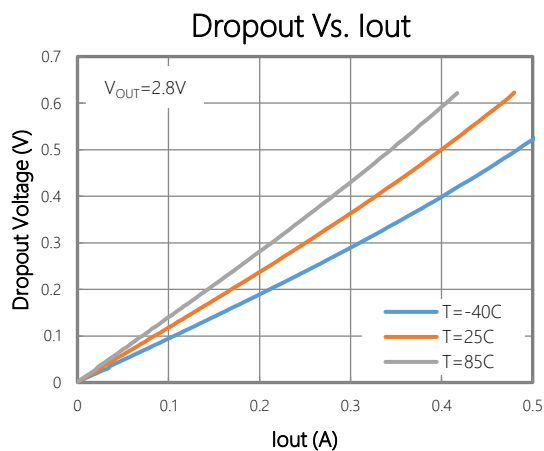
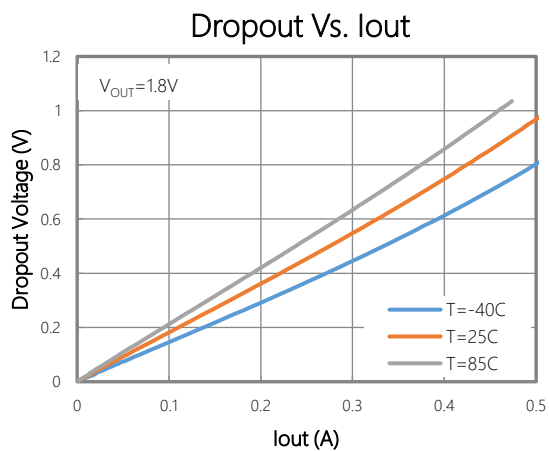


TYPICAL CHARACTERISTICS Cont'd

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

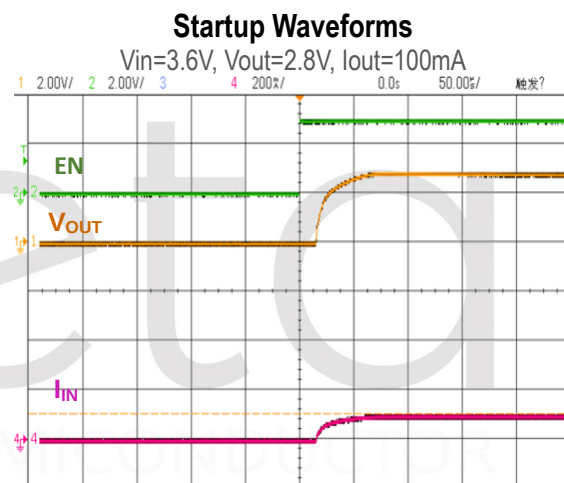
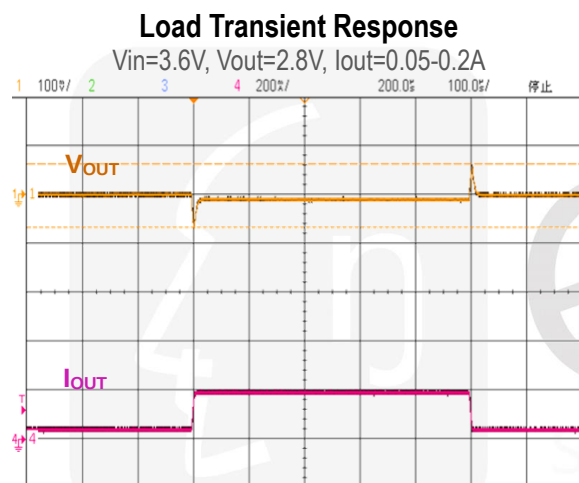
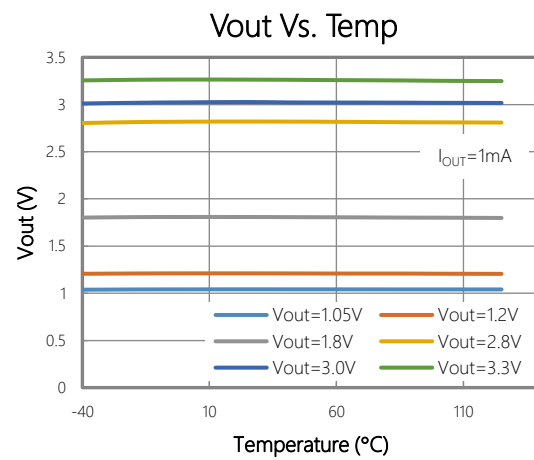
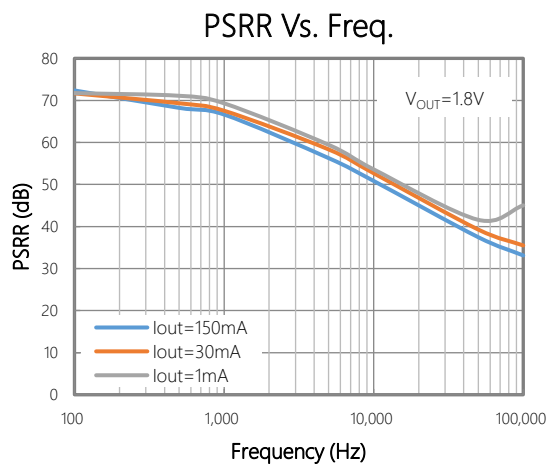


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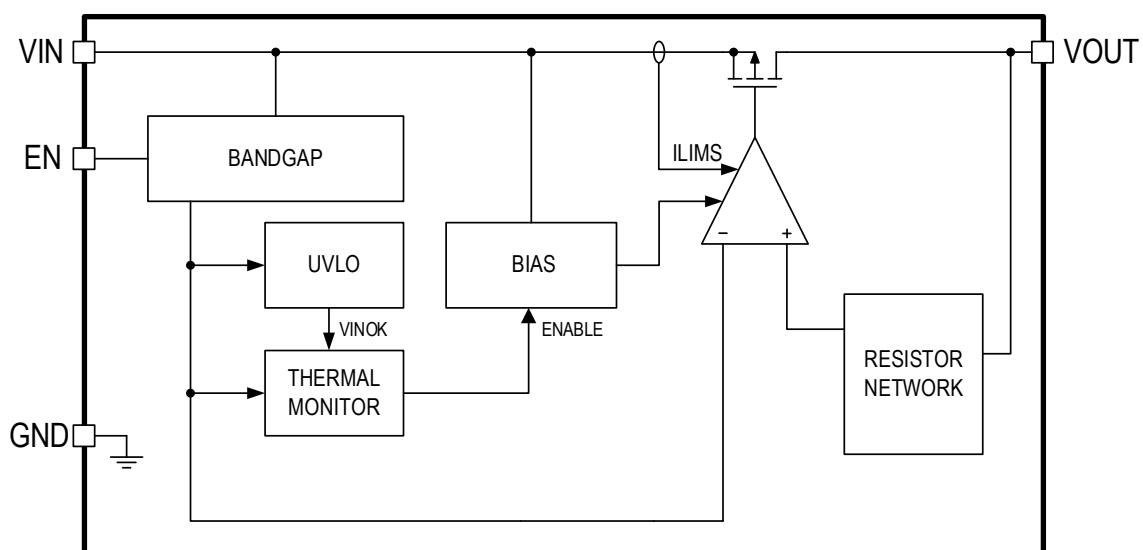
(Typical values are at $T_A = 25^\circ\text{C}$ unless otherwise specified.)

TYPICAL CHARACTERISTICS Cont'd

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



FUNCTIONAL BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

The ETA5050 family of LDO regulators has been optimized for application in noise-sensitive equipment. The device features low dropout voltages, high PSRR, low quiescent current, and enable-input to reduce supply currents to less than 1µA when the regulator is turned off.

Enable Sequence

ETA5050 is enabled when all below conditions happen. Otherwise, ETA5050 is in standby mode.

- ◆ EN pin voltage above Logic High level
- ◆ Junction Temperature is not at Over-Temperature Protection level.

Once all above conditions happen, ETA5050 first enables BANDGAP and BIAS then enables LDO core.

ETA5050 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 ETA5050 is in shutdown conditions, Output is discharged by 1kΩ resistor (optional).

Output Current Limit and Foldback Current Limit

ETA5050 family features an internal current limit. In normal operation, the ETA5050 limits output current to approximately 500mA. When current limiting engages, the output voltage scales back linearly until the over current condition ends.

In case output is in hard short conditions, ETA5050 also features an internal foldback limit that reduces the output current limit to a lower level, 250mA, then reduce power dissipation ratings of the package.

Over-Temperature Protection

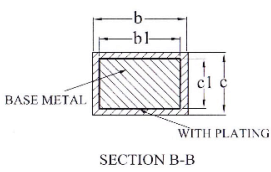
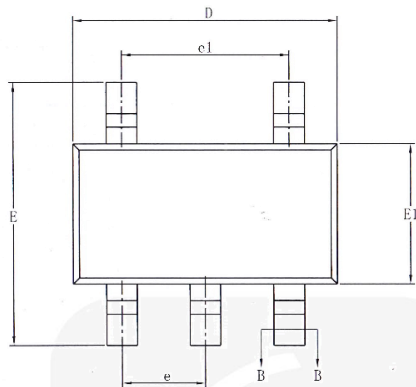
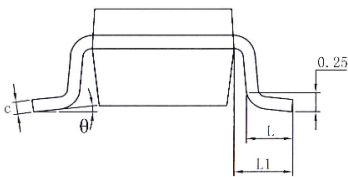
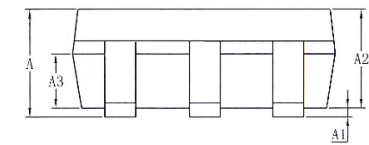
Thermal protection disables the output when the junction temperature rises to approximately 150°C, allowing the device to cool down. When the junction temperature cools to approximately 120°C, the output circuitry is again enabled. Depending on power dissipation, thermal resistance, and ambient temperature,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

The max power dissipation ($P_{D(MAX)}$) that ETA5050 can handle is calculated by following equation:

$$P_{D(MAX)} = [T_{J(MAX)} - T_A] / \theta_{JA}$$

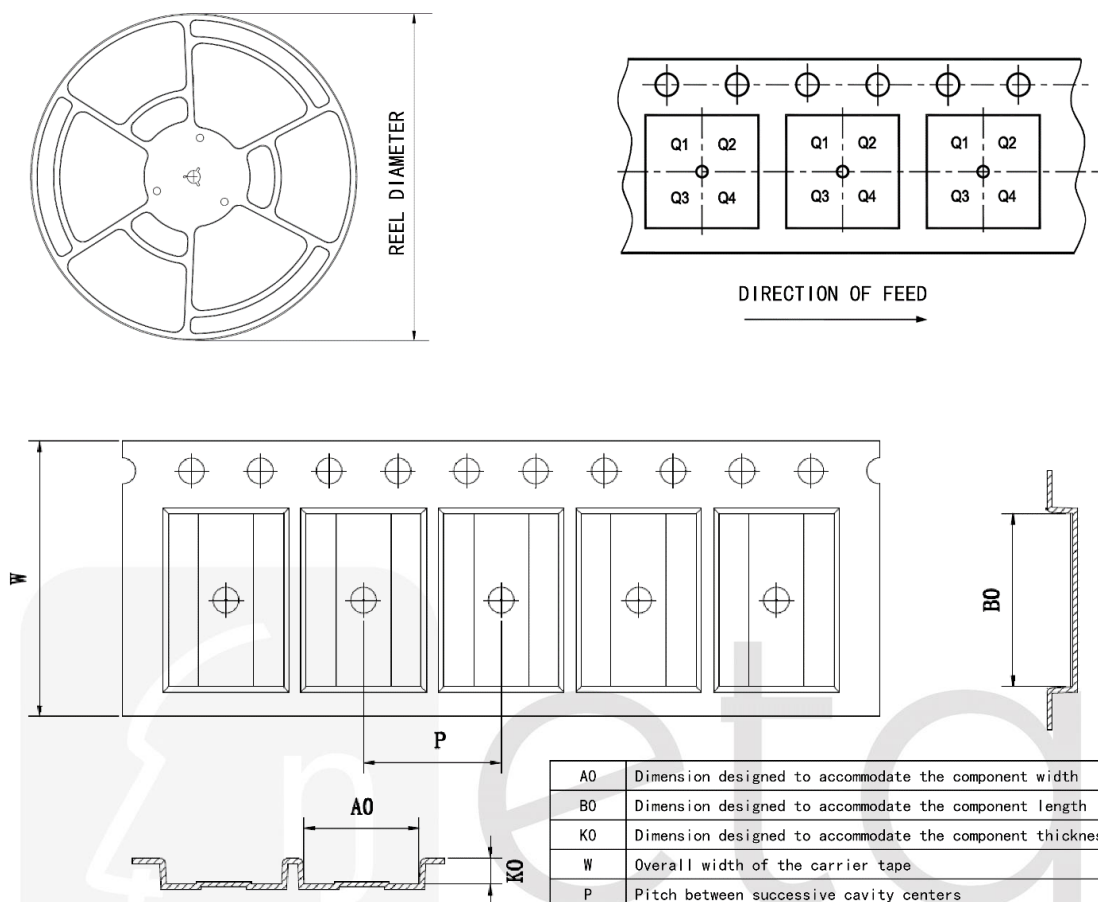
PACKAGE OUTLINE

Package: SOT23-5



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
c	0.95BSC		
c1	1.90BSC		
L	0.30	—	0.60
L1	0.60REF		
θ	0	—	8°

TAPE AND REEL INFORMATION



Device	Package Type	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P (mm)	W (mm)	Pin1 Quadrant
ETA5050VXXS2F	SOT23-5	5	3000	180	9.5	3.17	3.23	1.37	4	8	Q3

AVAILABLE PART NUMBER

Part Description	Part Number	Package	Mark	Pcs/Reel
1.0V No Discharge	ETA5050V10S2F	SOT23-5	10YW	3000
1.2V No Discharge	ETA5050V12S2F	SOT23-5	12YW	3000
1.5V No Discharge	ETA5050V15S2F	SOT23-5	15YW	3000
1.8V No Discharge	ETA5050V18S2F	SOT23-5	18YW	3000
2.5V No Discharge	ETA5050V25S2F	SOT23-5	25YW	3000
2.7V No Discharge	ETA5050V27S2F	SOT23-5	27YW	3000
2.8V No Discharge	ETA5050V28S2F	SOT23-5	28YW	3000
3.0V No Discharge	ETA5050V30S2F	SOT23-5	30YW	3000
3.3V No Discharge	ETA5050V33S2F	SOT23-5	33YW	3000