

45V Input Voltage, 2.5uA Ultra-low Iq, 300mA LDO

DESCRIPTION

ETA5041 is a low-dropout (LDO) linear voltage regulator that features ultra-low standby current as low as 2.5uA. It can withstand input voltage up to 48V and deliver 300mA output current.

ETA5041 can provide fixed or adjustable output voltages with wide input voltage range from 3V to 45V. The device also includes short circuit protection, UVLO and thermal shutdown.

Therefore, ETA5041 is an ideal power supply for low power applications such as IoT, portable and multi-cell battery-powered system, etc.

ETA5041 can be housed in SOT23-5 or ESOP8 package.

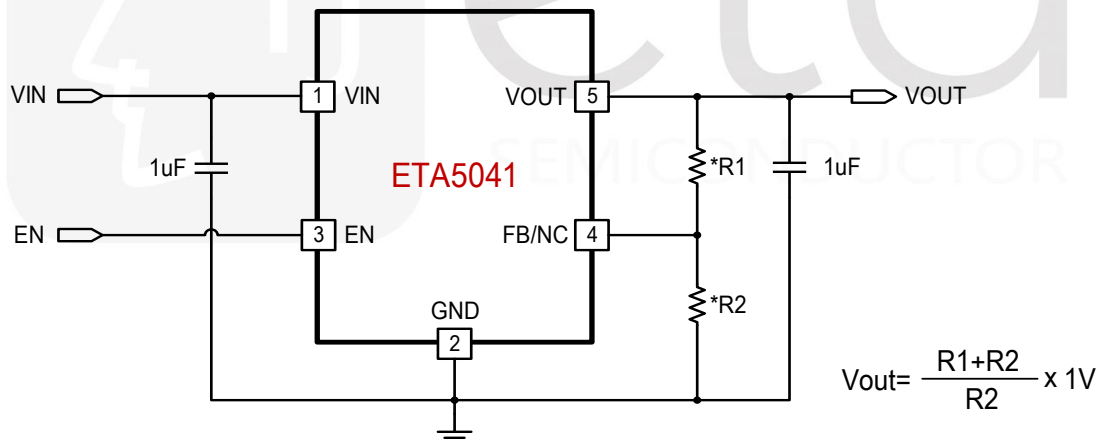
FEATURES

- ◆ Wide Input Voltage Range: from 3V to 45V
- ◆ Ultra-Low Quiescent Current: 2.5uA
- ◆ 300mA Output Current
- ◆ Stable with a Wide Range of Ceramic Capacitor, Larger than 1μF
- ◆ High PSRR, 70dB at 1KHz
- ◆ Integrated Thermal and Current Limit
- ◆ Pb Free, RoHS and REACH Compliant
- ◆ Halogen Free and “Green” Device

APPLICATIONS

- ◆ Portable Equipment
- ◆ Multi-cell Battery-Powered System
- ◆ NB-IoT Module

TYPICAL APPLICATION



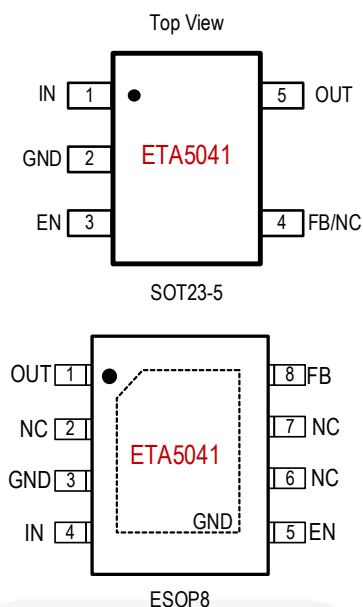
*R-Divider only for adjustable version

ORDERING

INFORMATION

PART No.	PACKAGE	TOP MARK	Pcs/Reel
ETA5041VXXXQS2F	SOT23-5	PPYW	3000
ETA5041V0NE8A	ESOP8	ETA5041 0000N YWWXL	4000
XXX: voltage code, e.g., 120=1.2V, 0=adj Q=N: no discharge, Q=D: discharge		PP: product code, YW/YWW: data code	

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.)

IN, EN to GND Voltage	−0.3V to 48V
OUT to GND Voltage	−0.3V to 40V
FB Voltage	−0.3V to 7V
Junction Temperature	150°C
Storage Temperature Range	−55°C to 150°C
Thermal Resistance	θ_{JA} θ_{JC}
SOT23-5	220 110 °C/W
ESOP8	50 10 °C/W
Lead Temperature (Soldering 10sec)	260°C

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

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

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage Range ⁽¹⁾		3		45	V
Ground Current	No Load		2.5		uA
Shutdown Current	$V_{EN}=0V$		1		uA
Dropout Voltage	$I_{OUT}=100mA, V_{OUT}=3.3V$		540		mV
Output Current Limit	$V_{OUT}=95\%$	300	400		mA
Output Foldback Current Limit	$V_{OUT}=0V$		200		mA
Line Regulation	$V_{OUT}+1V \leq V_{IN} \leq 45V$			0.12	%/V
Load Regulation	$1mA \leq I_{OUT} \leq 100mA$		20		mV
FB Voltage		0.98	1	1.02	V
Output Voltage Range	Available in 100mV steps	1.2		12	V
Output Voltage Accuracy	$I_{OUT}=30mA$	-2		2	%
Power Supply Rejection Ratio	Freq = 100Hz, $I_{OUT} = 10mA$		88		dB
	Freq = 1KHz, $I_{OUT} = 10mA$		70		dB
EN Logic High Threshold	Rising	1.2			V
EN Logic Low Threshold	Falling			0.4	V
Discharge Resistance ⁽²⁾	$V_{EN}=0$		60		Ω
EN Input Current	$V_{EN}=3V$		0		uA
Thermal Shutdown	Hysteresis=30°C		160		°C

(1): Minimum V_{IN} is 3V or $V_{OUT} + V_{DROPOUT}$, whichever is greater.

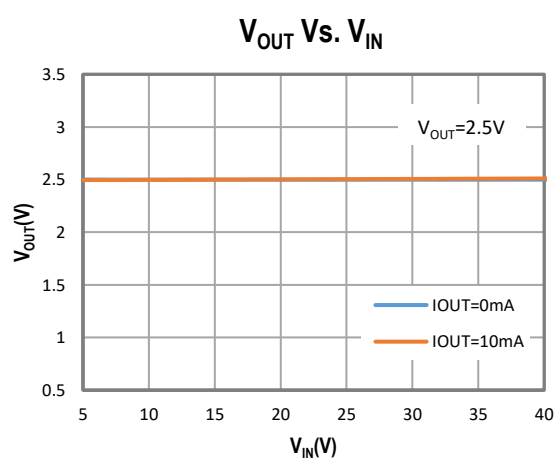
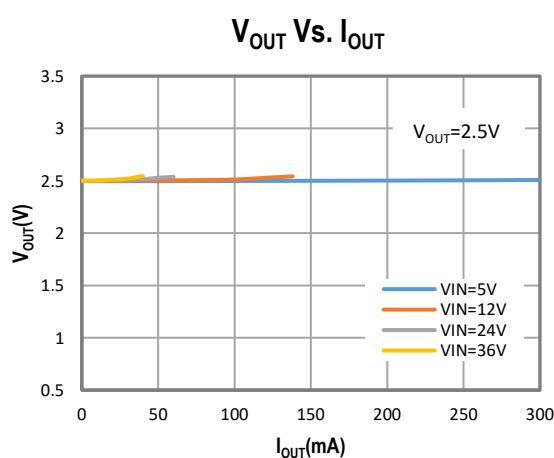
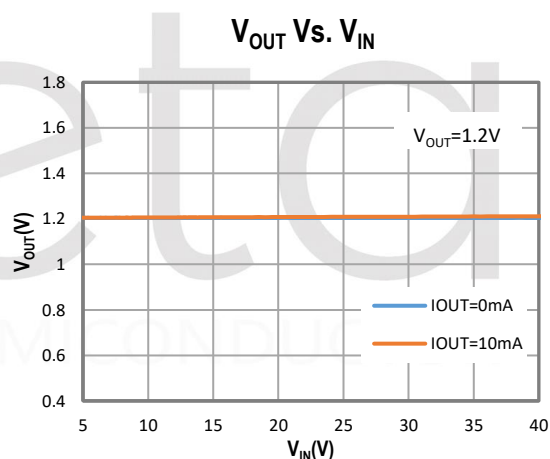
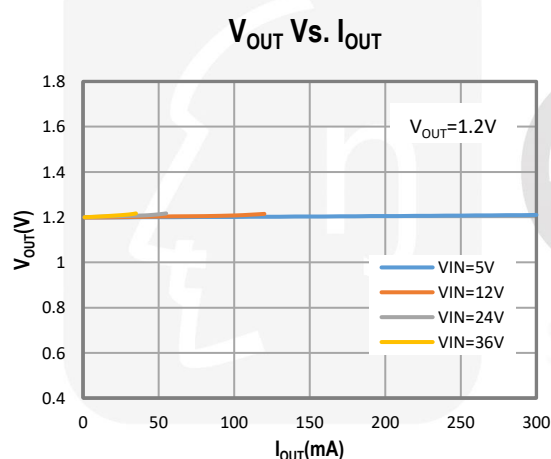
(2): This parameter is for output discharge version.

PIN DESCRIPTION

SOT23-5 PIN #	ESOP8 PIN #	NAME	DESCRIPTION
1	4	IN	Supply voltage pin. Bypass with a 1 μ F ceramic capacitor to GND
2	3	GND	Ground
3	5	EN	Enable pin for the IC. Drive this pin high to enable the IC, low to disable. Default high when floating.
4	8	FB/NC	Feedback pin for output voltage configuration. FB only for adjustable voltage version, none connection for fixed voltage version
5	1	OUT	Output voltage pin. Bypass with a 1 μ F ceramic capacitor to GND
NA	2, 6, 7	NC	Not connect

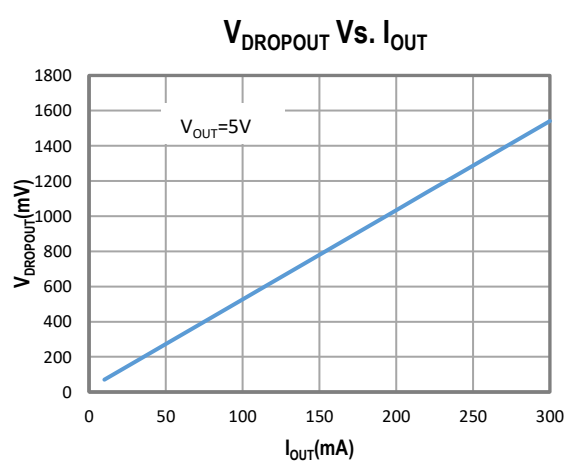
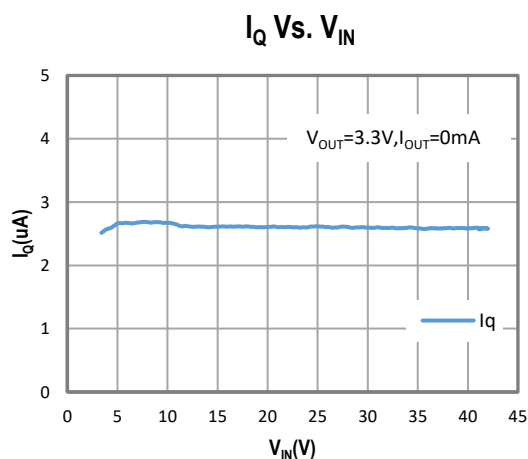
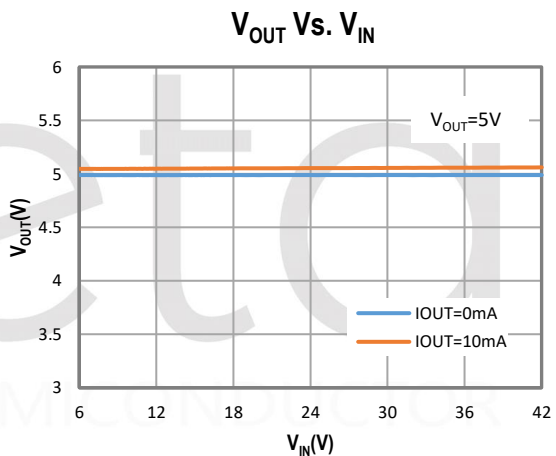
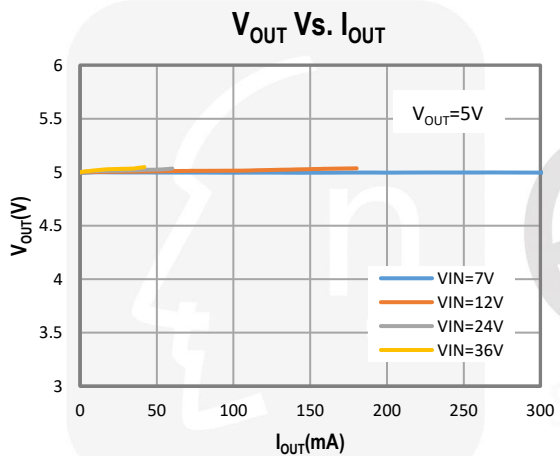
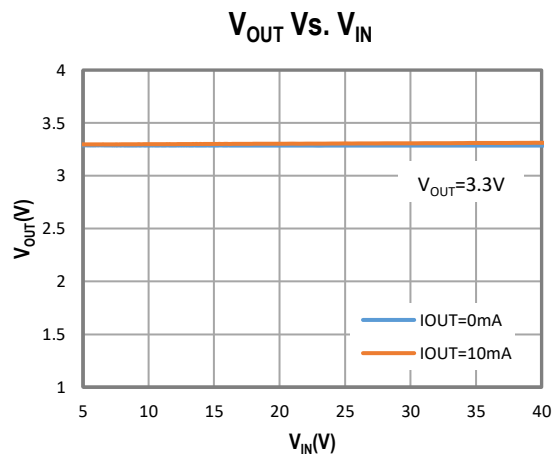
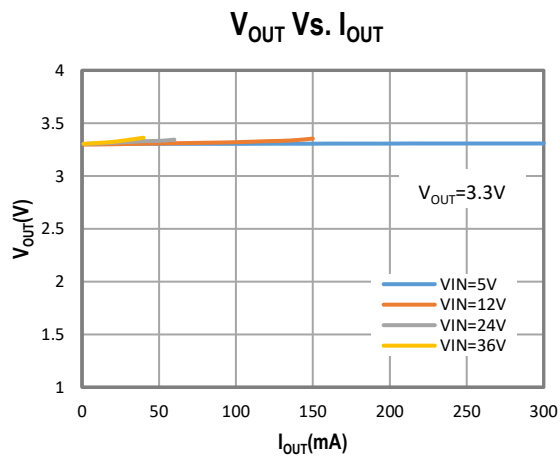
TYPICAL CHARACTERISTICS

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



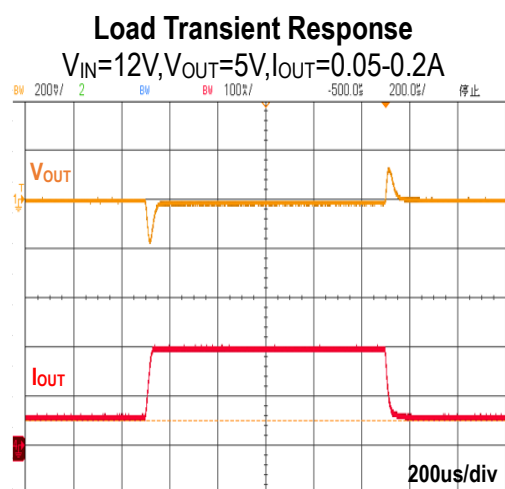
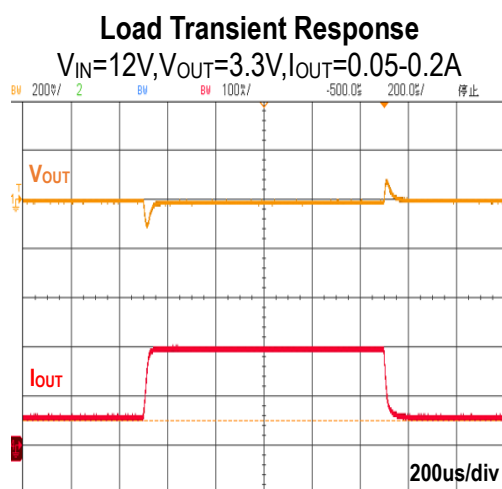
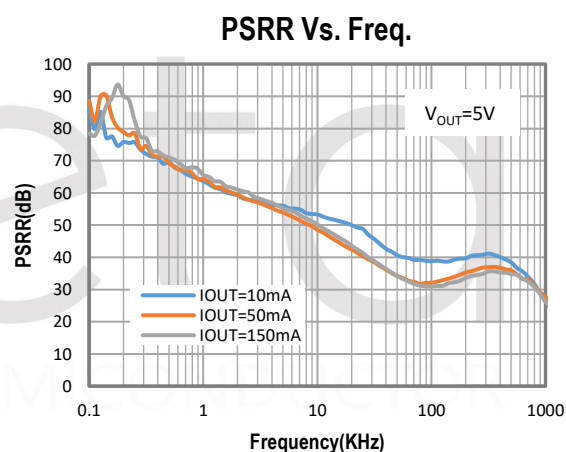
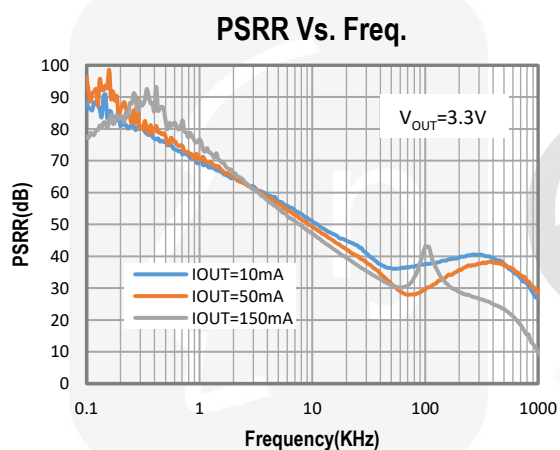
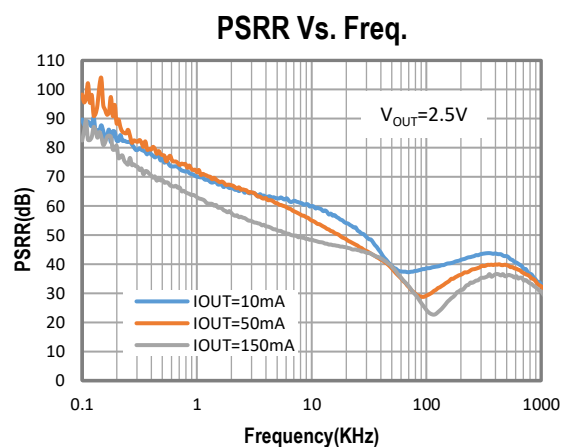
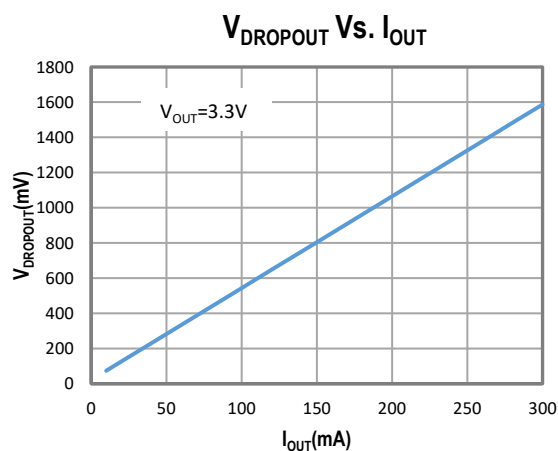
TYPICAL CHARACTERISTICS (cont')

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

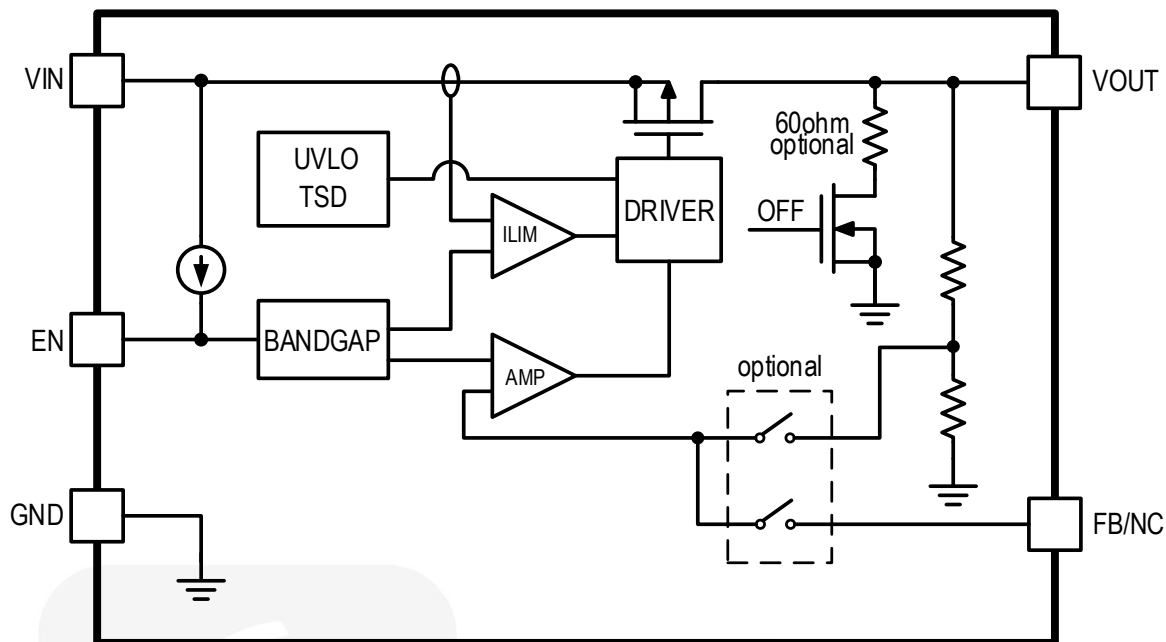


TYPICAL CHARACTERISTICS (cont')

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



FUNCTIONAL BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

The ETA5041 family of LDO regulators has been optimized for application in low standby power equipments. The device features 2.5uA ultra-low quiescent current, 45V input voltage and 300mA output current capability.

Enable Sequence

ETA5041 is enabled when all below conditions happen. Otherwise, ETA5041 is in standby mode.

- ◆ EN pin voltage is 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, ETA5041 first enables BANDGAP and BIAS. When internal bias is ready, ETA5041 enables LDO core.

ETA5041 is completed forced in shutdown mode when EN pin is below LOGIC_LOW. Otherwise, part only shutdown the VOUT, other circuit is still in operation. Once ETA5041 is in shutdown conditions, Output is discharged by 60Ω resistor (optional).

Output Current Limit and Foldback Current Limit

ETA5041 family features an internal current limit. In normal operation, the ETA5041 limits output current to approximately 400mA. When current limiting engages, the output voltage scales back linearly until the over current condition ends.

In case output is in hard short conditions, ETA5041 also features an internal foldback limit that reduces the output current limit to a lower level, 200mA, then reduce power dissipation ratings of the package.

Over-Temperature Protection

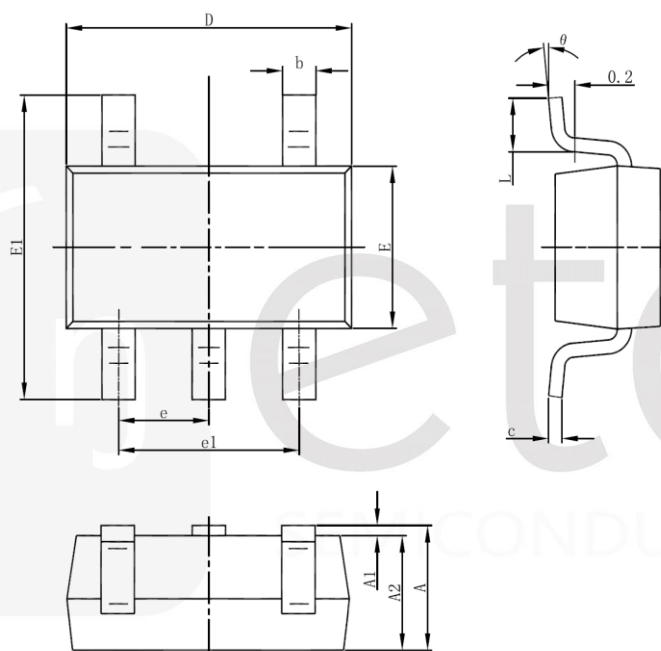
Thermal protection disables the output when the junction temperature rises to approximately 160°C, allowing the device to cool down. When the junction temperature cools to approximately 130°C, the output circuitry is again enabled. Depending on power dissipation, thermal resistance, and ambient temperature, 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 ETA5041 can handle is calculated by following equation:

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

PACKAGE OUTLINE

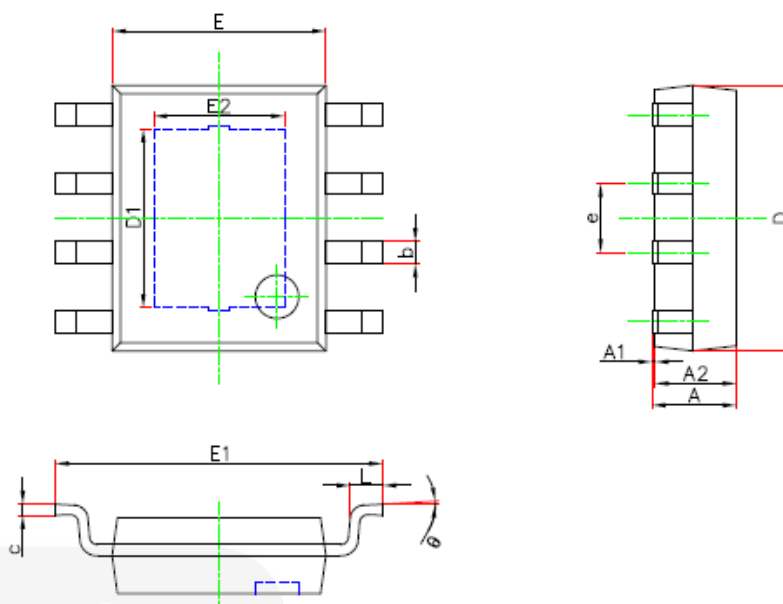
Package: SOT23-5



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
c	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
e	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°

PACKAGE OUTLINE

Package: ESOP8



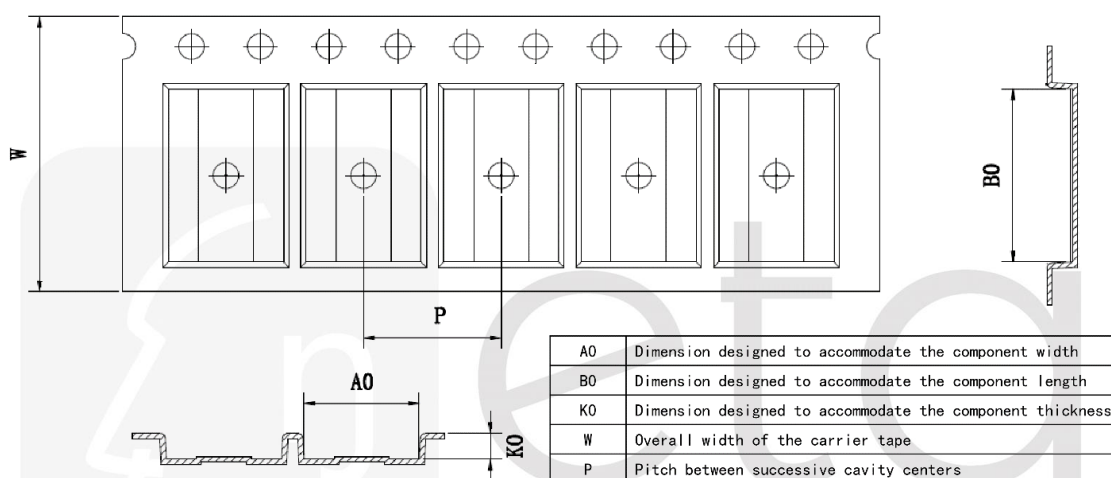
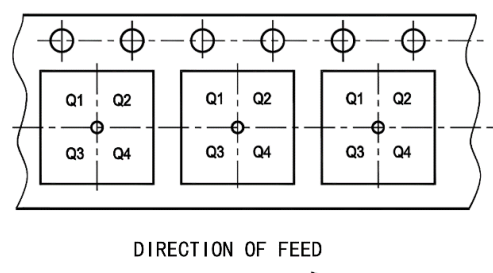
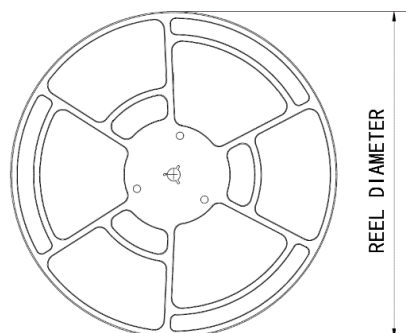
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.300	1.700	0.051	0.067
A1	0.000	0.100	0.000	0.004
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.201
D1	3.202	3.402	0.126	0.134
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
E2	2.313	2.513	0.091	0.099
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

AVAILABLE PART NUMBER

Part Description	Part Number	Package	Mark	Pcs/Reel
VOUT Adjustable No Discharge SOT23-5	ETA5041V0NS2F	SOT23-5	YLYW	3000
VOUT Adjustable with Discharge SOT23-5	ETA5041V0DS2F	SOT23-5	Y9YW	3000
1.2V No Discharge SOT23-5	ETA5041V120NS2F	SOT23-5	flYW	3000
1.2V with Discharge SOT23-5	ETA5041V120DS2F	SOT23-5	emYW	3000
2.5V No Discharge SOT23-5	ETA5041V250NS2F	SOT23-5	fmYW	3000
2.5V with Discharge SOT23-5	ETA5041V250DS2F	SOT23-5	enYW	3000
3.3V No Discharge SOT23-5	ETA5041V330NS2F	SOT23-5	fnYW	3000
3.3V with Discharge SOT23-5	ETA5041V330DS2F	SOT23-5	eoYW	3000
5V No Discharge SOT23-5	ETA5041V500NS2F	SOT23-5	foYW	3000
5V with Discharge SOT23-5	ETA5041V500DS2F	SOT23-5	epYW	3000
VOUT Adjustable No Discharge ESOP8	ETA5041V0NE8A	ESOP8	ETA5041 0000N YWWXL	4000



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
ETA5041VXXXQS2F	SOT23-5	5	3000	180	9.5	3.17	3.23	1.37	4	8	Q3
ETA5041VXXXQE8A	ESOP8	8	4000	330	12.7	6.6	5.4	2.05	8	12	Q1