45V Input Voltage, 2.5uA Ultra-low Iq, 300mA LDO in SOT23-5

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 is housed in a tiny SOT23-5 package.

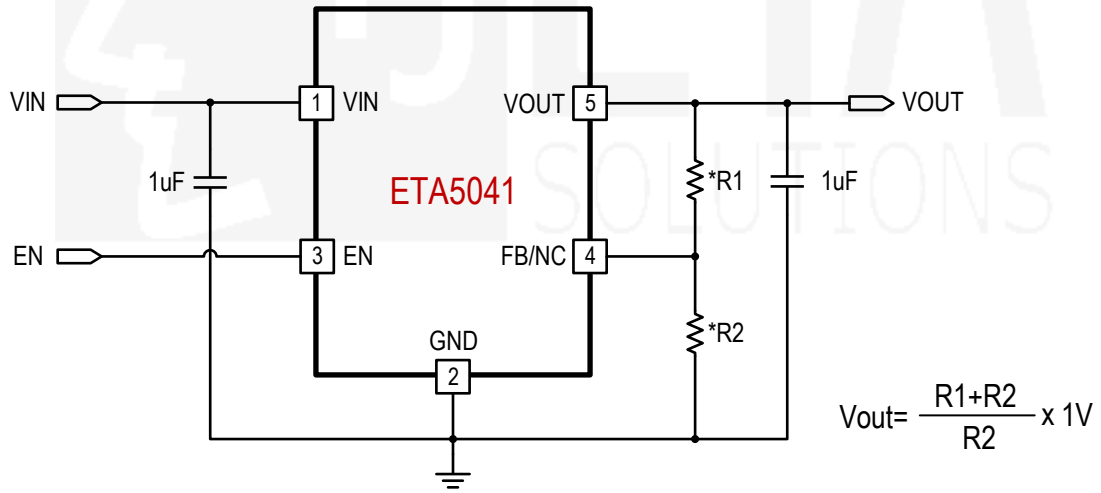
FEATURES

- 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
- RoHS Compliant

APPLICATIONS

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

TYPICAL APPLICATION

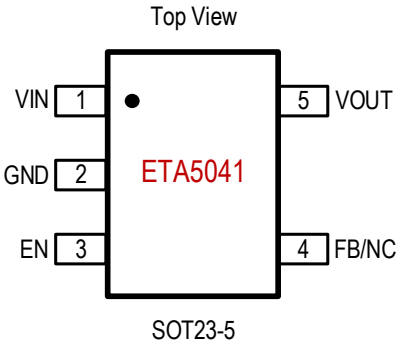


*R-Divider only for adjustable version

ORDERING INFORMATION

PART No.	PACKAGE	TOP MARK	Pcs/Reel
ETA5041VXXXOS2F	SOT23-5	PPYW	3000
XXX: Voltage Code e.g. 120=1.2V, 0=adj O=N: no discharge; O=D: discharge		PP: product code YW: 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.)

VIN, EN to GND Voltage ..... –0.3V to 48V

VOUT to GND Voltage.....–0.3V to 40V

FB Voltage.....–0.3V to 7V

Operating Temperature Range .....–40°C to 85°C

Storage Temperature Range .....–55°C to 150°C

Thermal Resistance	Θ_{JA}	Θ_{JC}	
SOT23-5	220	110	°C/W

Lead Temperature (Soldering 10sec) .....260°C

ELECTRICAL CHARACTERISTICS

(V_{IN} = V_{OUT}+1V, unless otherwise specified. Typical values are at T_A = 25°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≤V_{IN}≤45V			0.12	%/V
Load Regulation	1mA≤I_{OUT}≤100mA		20		mV
FB Voltage		0.98	1	1.02	V
Output Voltage Range	Available in 100mV steps	1.2		20	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 VIN is 3V or VOUT + VDROPOUT, whichever is greater.

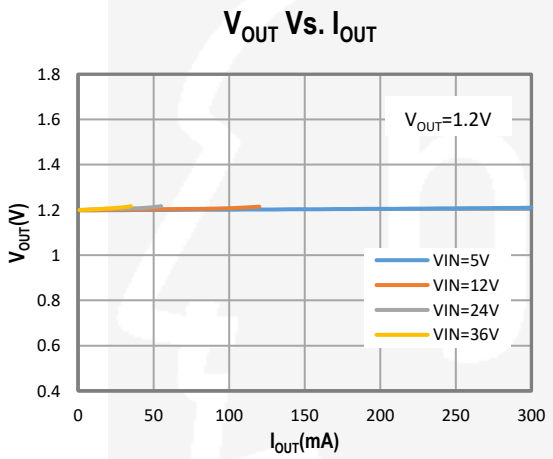
(2): This parameter is for output discharge version.

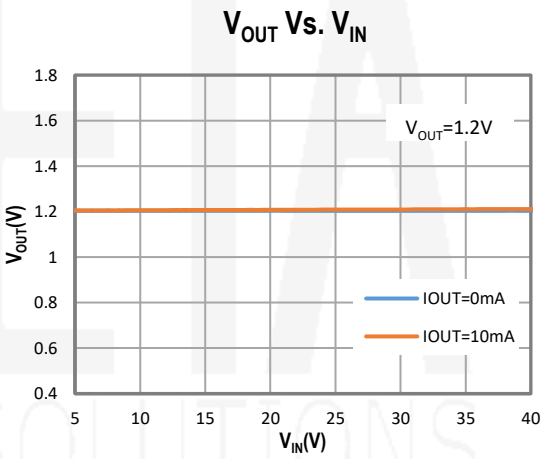
PIN DESCRIPTION

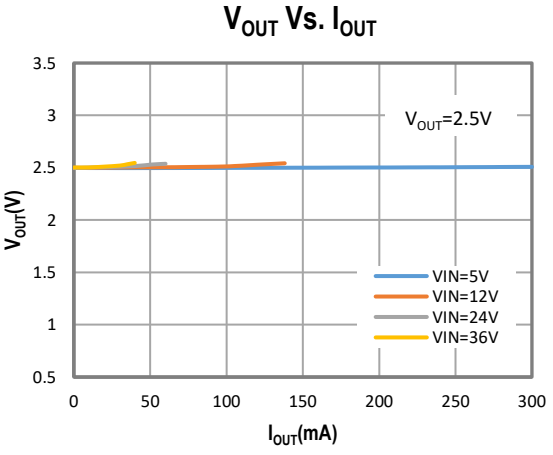
PIN #	NAME	DESCRIPTION
1	VIN	Supply voltage pin. Bypass with a 1μF ceramic capacitor to GND
2	GND	Ground
3	EN	Enable pin for the IC. Drive this pin high to enable the IC, low to disable. Default high when floating.
4	FB/NC	Feedback pin for output voltage configuration. FB only for adjustable voltage version, none connection for fixed voltage version
5	VOUT	Output voltage pin. Bypass with a 1μF ceramic capacitor to GND

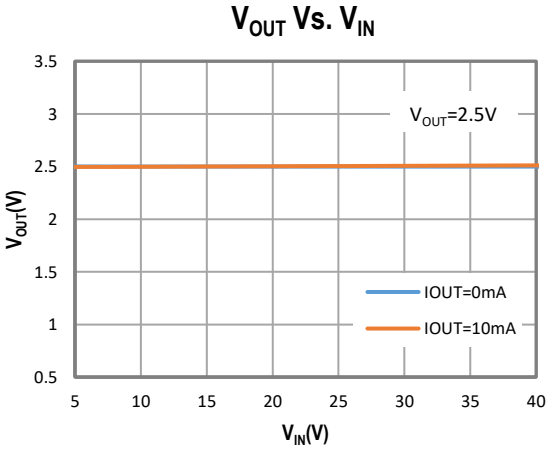
TYPICAL CHARACTERISTICS

(Typical values are at T_A = 25°C unless otherwise specified.)





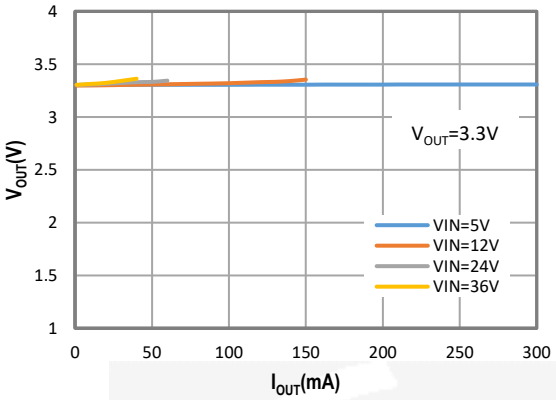




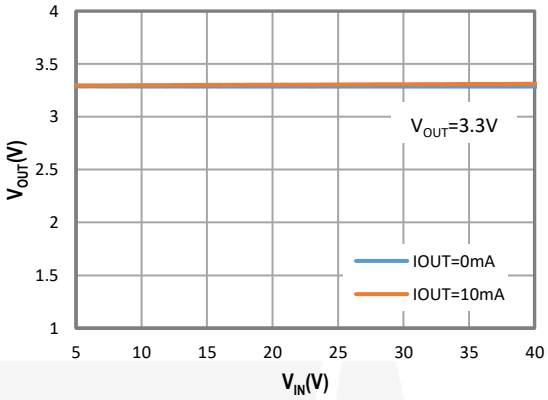
TYPICAL CHARACTERISTICS (cont')

(Typical values are at T_A = 25°C unless otherwise specified.)

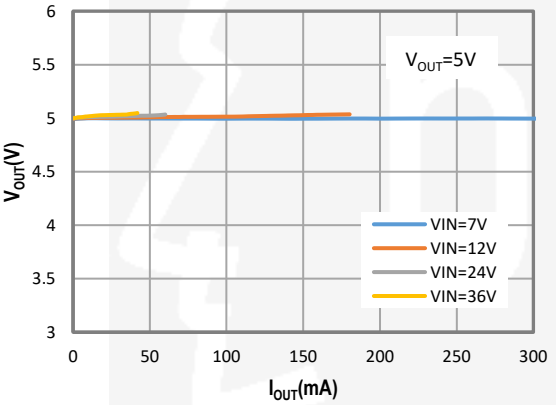
V_{OUT} Vs. I_{OUT}



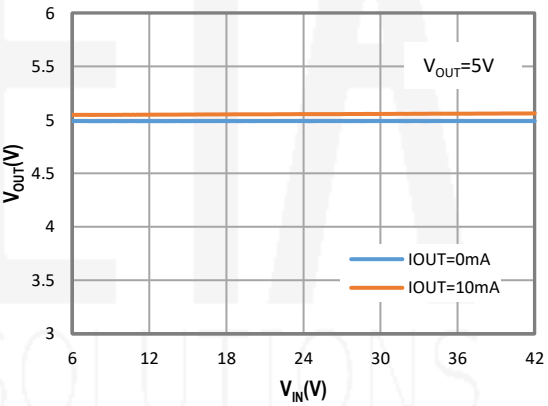
V_{OUT} Vs. V_{IN}



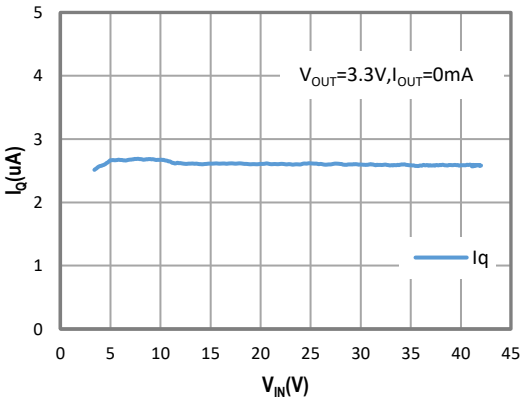
V_{OUT} Vs. I_{OUT}



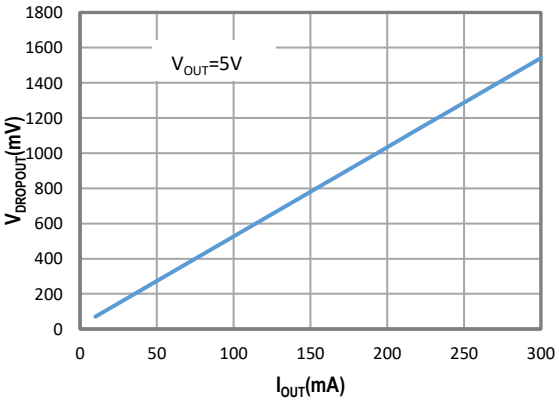
V_{OUT} Vs. V_{IN}



I_Q Vs. V_{IN}



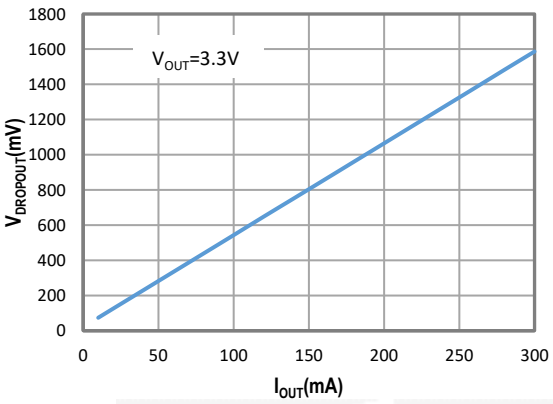
$V_{DROPOUT}$ Vs. I_{OUT}



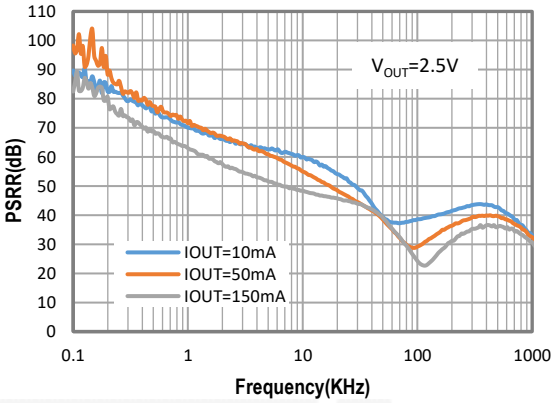
TYPICAL CHARACTERISTICS (cont')

(Typical values are at T_A = 25°C unless otherwise specified.)

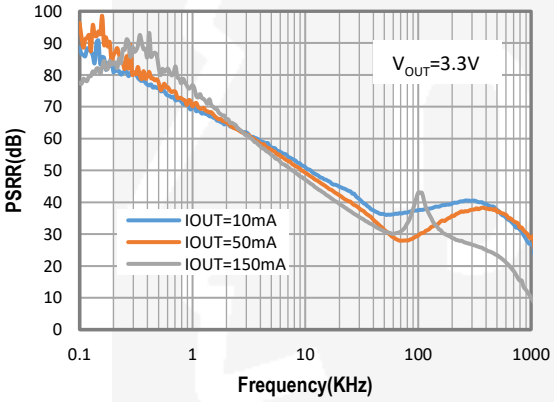
$V_{DROPOUT}$ Vs. I_{OUT}



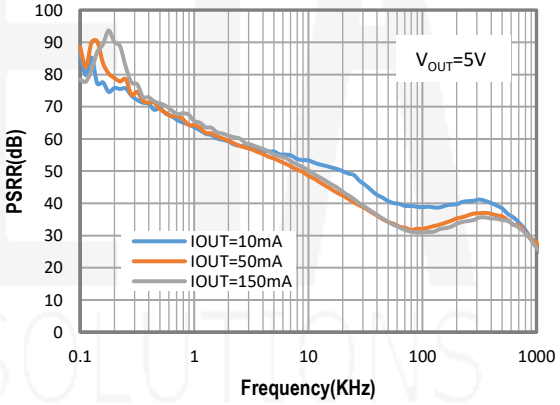
PSRR Vs. Freq.



PSRR Vs. Freq.

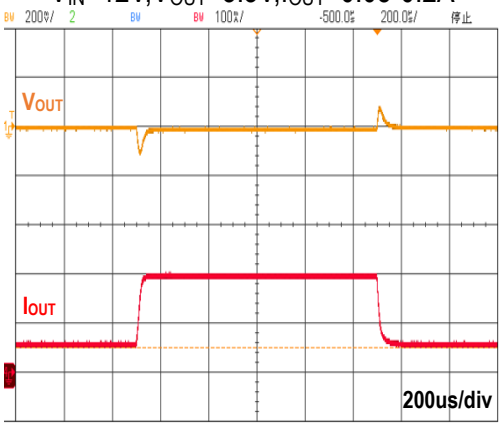


PSRR Vs. Freq.



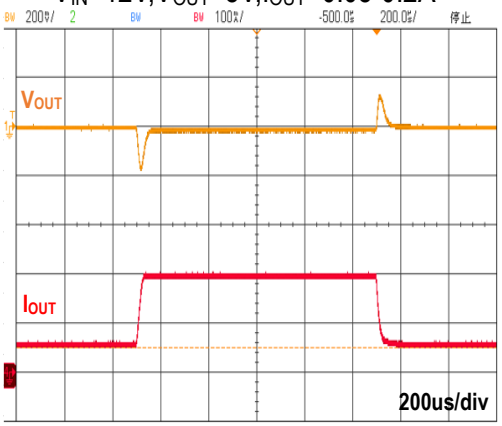
Load Transient Response

V_{IN}=12V,V_{OUT}=3.3V,I_{OUT}=0.05-0.2A

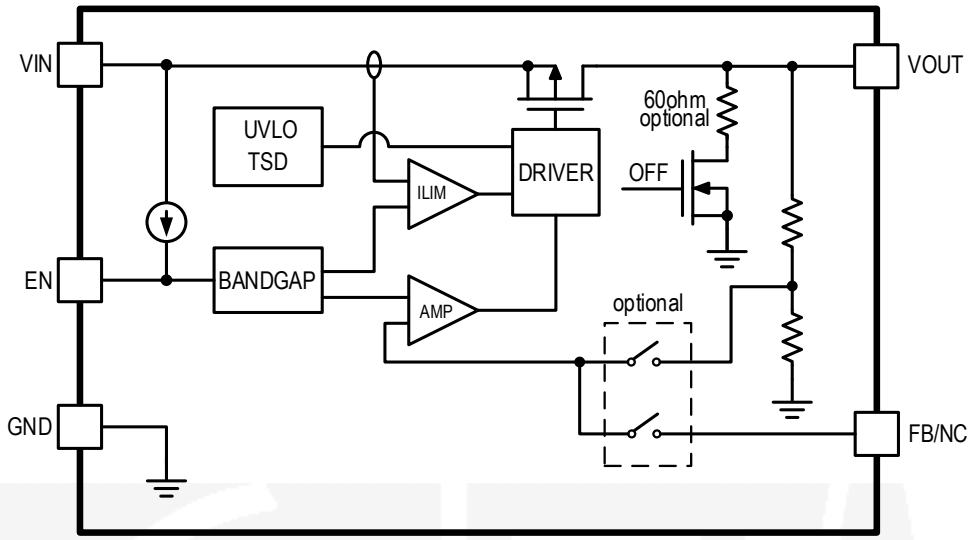


Load Transient Response

V_{IN}=12V,V_{OUT}=5V,I_{OUT}=0.05-0.2A



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

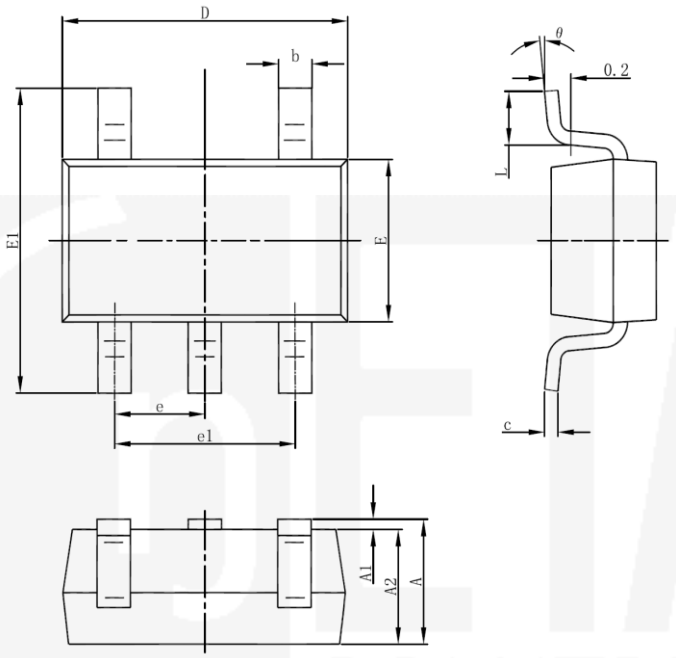
ETA5041 family features an internal current limit. In normal operation, the ETA5041 limits output current to approximately 400mA. When current limiting engages, the output voltage scales back linearly until the over current condition ends.

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.

PACKAGE OUTLINE

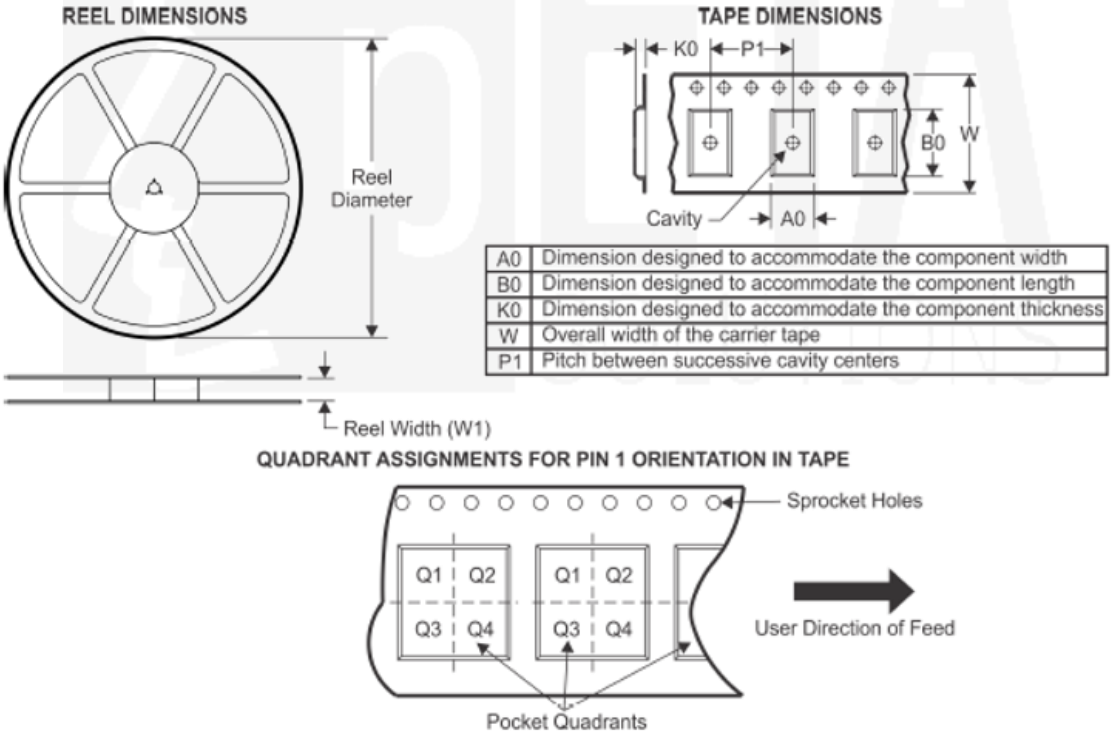


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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

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

TAPE AND REEL INFORMATION



Device	Package Type	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
ETA5041VXXXQS2F	SOT23-5	5	3000	180	9.5	3.17	3.23	1.37	4	8	Q3