

35V/3A Synchronous Step-Down Converter in FCTSOT23-6

DESCRIPTION

The ETA2807 is a high-efficiency DC-to-DC step-down switching regulator that is capable of delivering up to 3A of output current. The device operates with wide input voltage range from 4.6V to 35V, making it ideal for high voltage USB charging applications.

The ETA2807 uses a constant current mode architecture. It includes constant current(CC)/constant voltage(CV) output regulation and output cord compensation, making it a perfect solution for car charger application.

ETA2807 is available in FCTSOT23-6 package.

FEATURES

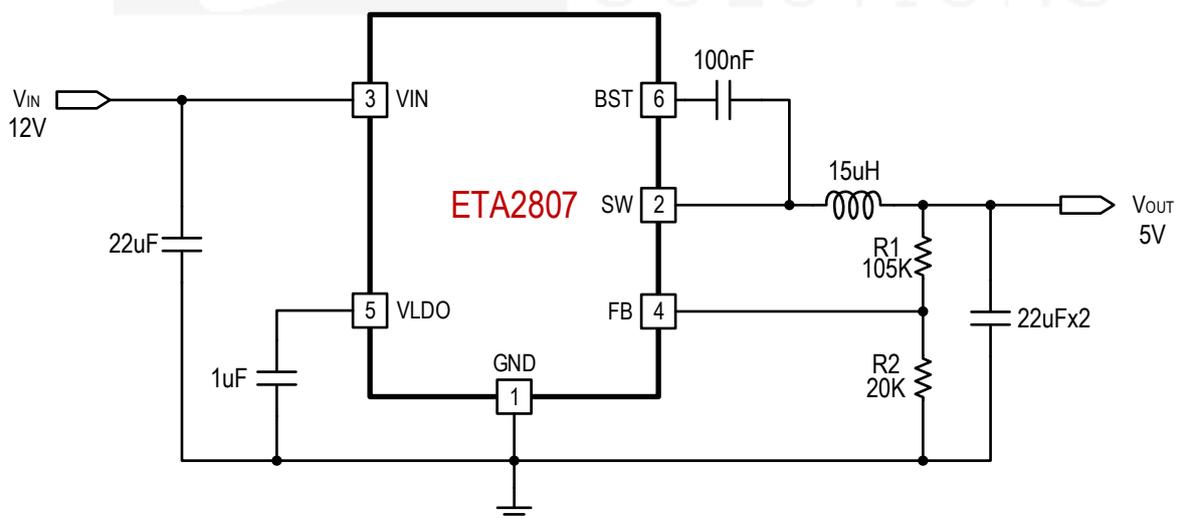
- ◆ Wide Input Voltage Range: 4.6V-35V
- ◆ 40V Input Standoff Voltage
- ◆ High Efficiency PFM Mode at Light Load
- ◆ Capable of Delivering 3A Output Current
- ◆ 100% Duty Cycle
- ◆ Support CC/CV Output
- ◆ Cord Compensation Function
- ◆ Current Mode Control
- ◆ Thermal Shutdown and UVLO
- ◆ Available in FCTSOT23-6 Package

APPLICATIONS

- ◆ Car Chargers
- ◆ Industrial Applications
- ◆ Automotive Applications

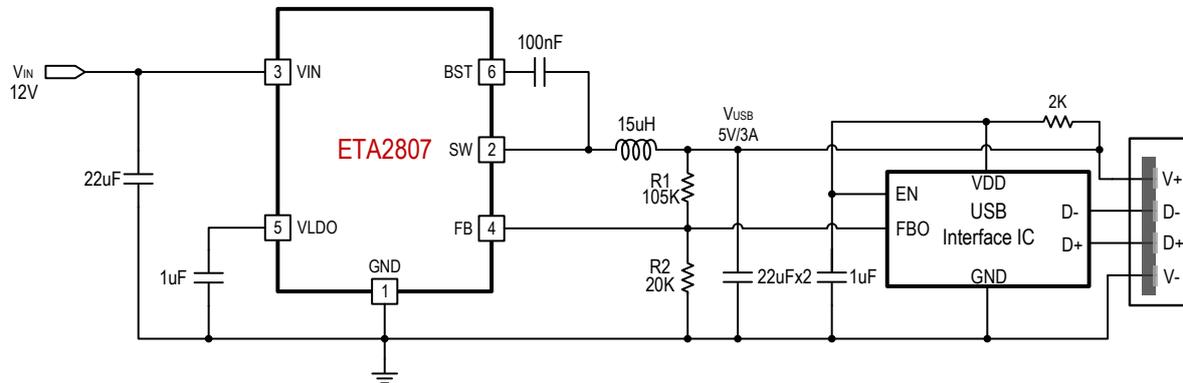
ORDERING INFORMATION	PART No.	PACKAGE	TOP MARK	Pcs/Reel
	ETA2807FT2G	FCTSOT23-6	AeYW	3000

TYPICAL APPLICATION

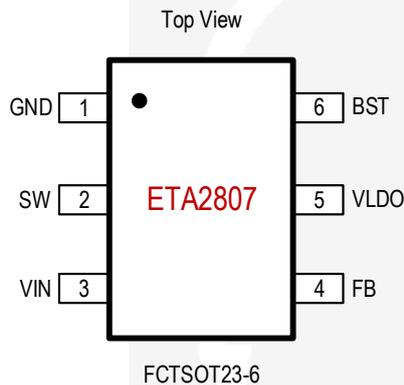


*R2 has to be between 1KOhm to 100KOhm

TYPICAL APPLICATION OF USB INTERFACE



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 Voltage.....	-0.3V to 40V
SW Voltage.....	-0.3V to VIN+0.3V
BST Voltage.....	-0.3V to SW+6V
FB, VLDO Voltage.....	-0.3V to 6V
SW to ground current.....	Internally limited
Operating Temperature Range	-40°C to 85°C
Storage Temperature Range	-55°C to 150°C
Thermal Resistance	θ_{JC} θ_{JA}
FCTSOT23-6.....	55.....100
Lead Temperature (Soldering, 10sec)	260°C

ELECTRICAL CHARACTERISTICS

(VIN = 12V, unless otherwise specified. Typical values are at TA = 25°C.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage Range (1)		4.6		35	V
Input UVLO	Rising, Hysteresis=320mV		4.57		V
Input Supply Current	VFB=0.9V,no switching		460		μ A
Input Shutdown Current			8		μ A
VLDO Internal Voltage			5.3		V
FB Voltage			0.8		V
FB Cord Compensation Current(1)	IOUT=2A, ICORD(A)=IOUT(A)/2000000		1		μ A
Switching Frequency			250		KHz
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT

Maximum Duty Cycle			100	%
Soft Start Time			300	μ s
Short Circuit Hiccup Time ⁽¹⁾	On Time		6	ms
	Off Time		300	ms
FB_Hiccup Falling Threshold			32	%V _{FB}
FB_Hiccup Rising Threshold			40	%V _{FB}
FB_OVP Falling Threshold			107	%V _{FB}
FB_OVP Rising Threshold			109	%V _{FB}
Foldback Frequency	V _{OUT} =0		62.5	KHz
CC Current Limit Threshold			3.5	A
High Side Switch On Resistance ⁽¹⁾	I _{SW} =500mA		56	m Ω
Low Side Switch On Resistance ⁽¹⁾	I _{SW} =500mA		29	m Ω
High Side Current Limit ⁽¹⁾			6	A
Low Side Zero Crossing Current ⁽¹⁾			120	mA
Thermal Shutdown ⁽²⁾			150	$^{\circ}$ C
Thermal Shutdown Hysteresis ⁽²⁾			20	$^{\circ}$ C

Notes:

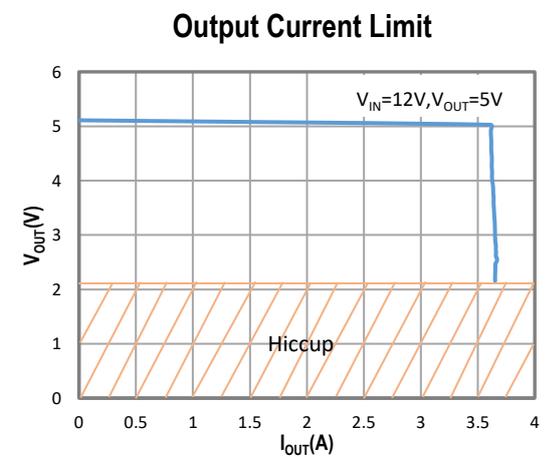
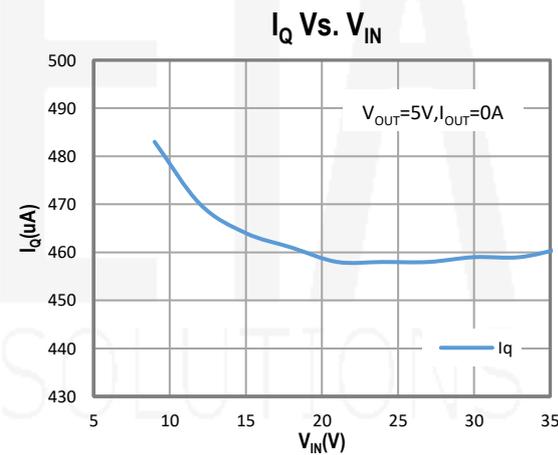
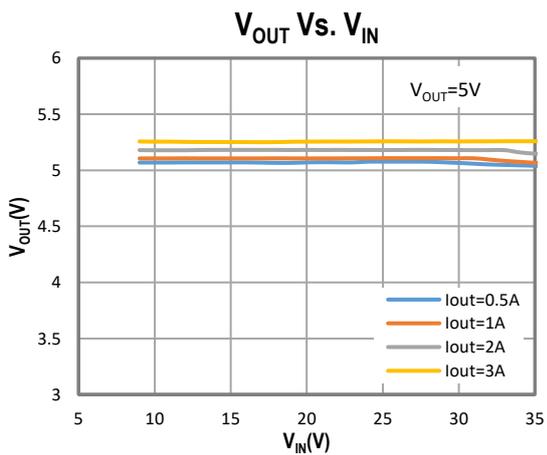
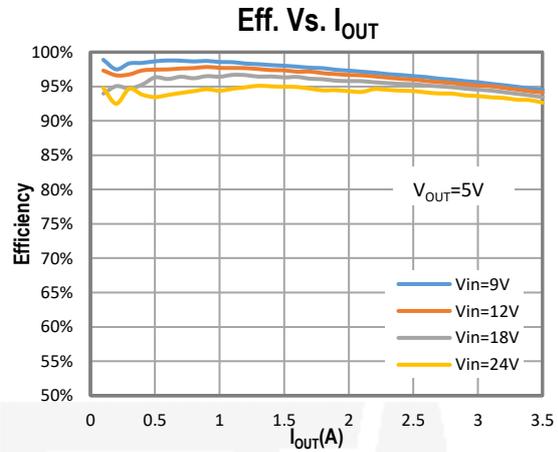
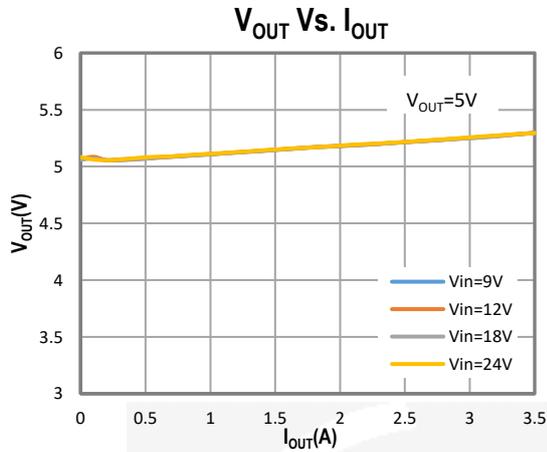
- 1) Guaranteed by Design
- 2) Guaranteed by Engineering Characterization

PIN DESCRIPTION

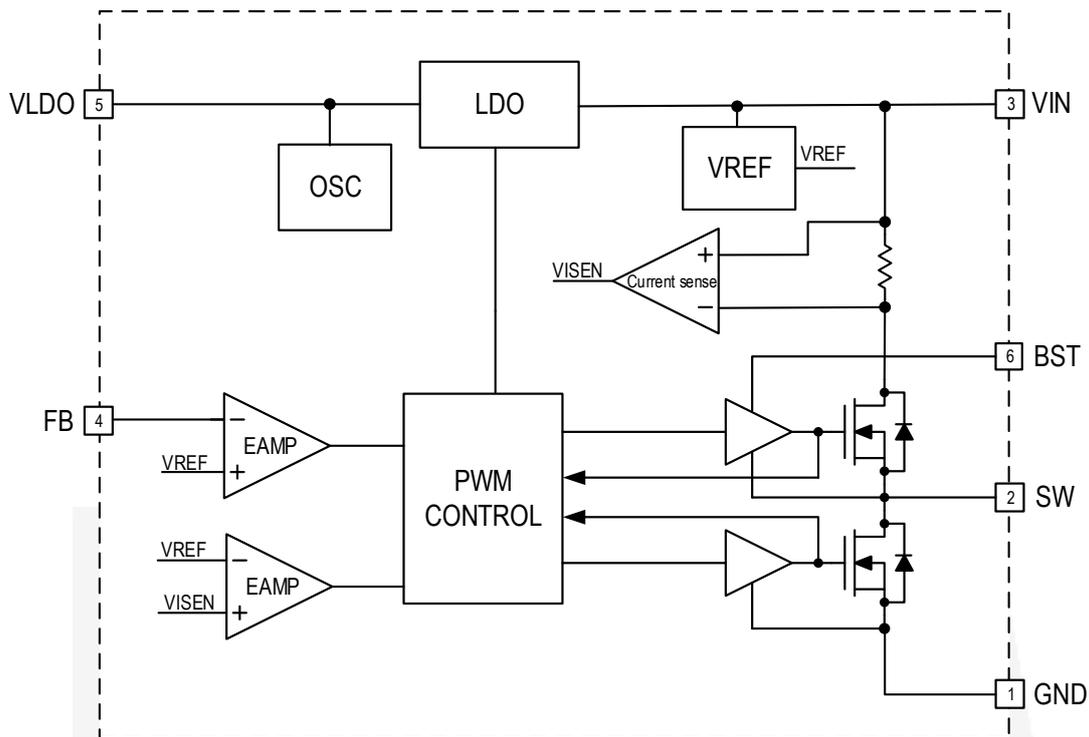
PIN #	NAME	DESCRIPTION
1	GND	Ground
2	SW	Inductor connection. Connect an inductor between SW and the regulator output.
3	VIN	Supply voltage. Bypass with a 22 μ F ceramic capacitor to GND.
4	FB	Feedback Input. Connect an external resistor divider from the output to FB and GND to set V _{OUT} .
5	VLDO	Power supply pin for internal circuit. Bypass with a 1 μ F ceramic capacitor to GND.
6	BST	Bootstrap pin. Connect a 100nF capacitor from this pin to SW.

TYPICAL CHARACTERISTICS

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



FUNCTIONAL BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

The 2807 is a wide input range, high-efficiency, DC-to-DC step-down switching regulator, capable of delivering up to 3A of output current, integrated with a 56mΩ high side MOSFET. It uses a PWM current-mode control scheme. An error amplifier integrates the error between the FB signal and the internal reference voltage. The output of the integrator is then compared to the sum of a current-sense signal and the slope compensation ramp. This operation generates a PWM signal that modulates the duty cycle of the power MOSFETs to achieve regulation for output voltage.

Light Load Operation

Traditionally, a fixed constant frequency PWM DC-DC regulator always switches even when the output load is small. When energy is shuffling back and forth through the power MOSFET, power is lost due to the finite $R_{ds(on)}$ of the MOSFET and parasitic capacitances. At light load, this loss is prominent and efficiency is therefore very low. ETA2807 goes into a power save mode during light load, thereby extending the range of high efficiency operation.

External Output Voltage Setting

The output voltage of the ETA2807 regulator can be programmed by using an external resistor divider. The output voltage is calculated by the equation below.

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

Where: $V_{REF} = 0.8V$ typically (the internal reference voltage)

R_2 has to be between $1K\Omega$ to $100K\Omega$ and thus R_1 is calculated by the following equation.

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

Cord Compensation Function

ETA2807 has a cord compensation feature to compensate the voltage drop due to cord resistance. The sink current at FB pin for cord compensation is I_{CORD} when output current is I_{OUT} .

The output voltage is calculated by the equation below.

$$V_{OUT} = V_{REF} \times \left(1 + \frac{R_1}{R_2}\right) + V_{CORD_COMP}$$

The V_{CORD_COMP} can be calculated by the equation below.

$$I_{CORD} = \frac{I_{OUT(A)}}{2000000} (A), \quad V_{CORD_COMP} = I_{CORD} \times R_1 (Ohm)$$

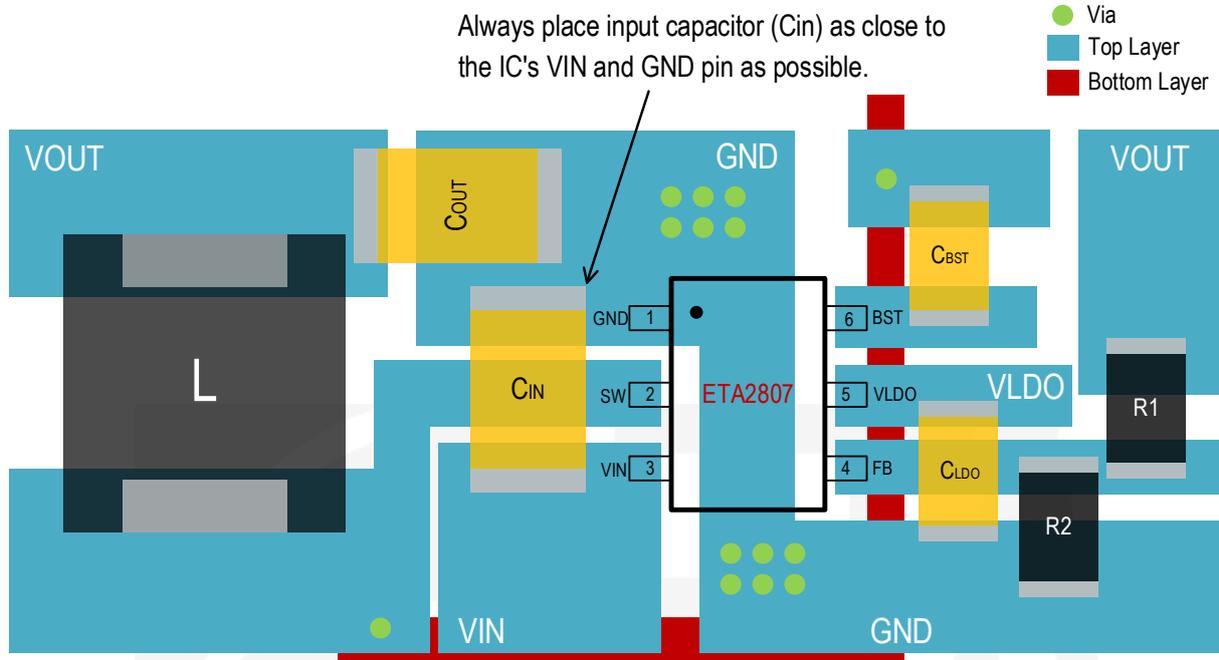
Over Current Protection and Hiccup

ETA2807 has a cycle-by-cycle over current limit for when the inductor current peak value is over the set current limit threshold. When the output voltage drop until FB falls below UV threshold ($0.3V$), the ETA2807 will enter hiccup mode. It will turn off the chip immediately for $300mS$. After that, it will try to re-starts as normal for $6mS$. After $6mS$, if FB is still below UV threshold, then the chip enters hiccup mode again. If FB is higher than UV threshold, it will enter the normal mode.

Over-Temperature Protection

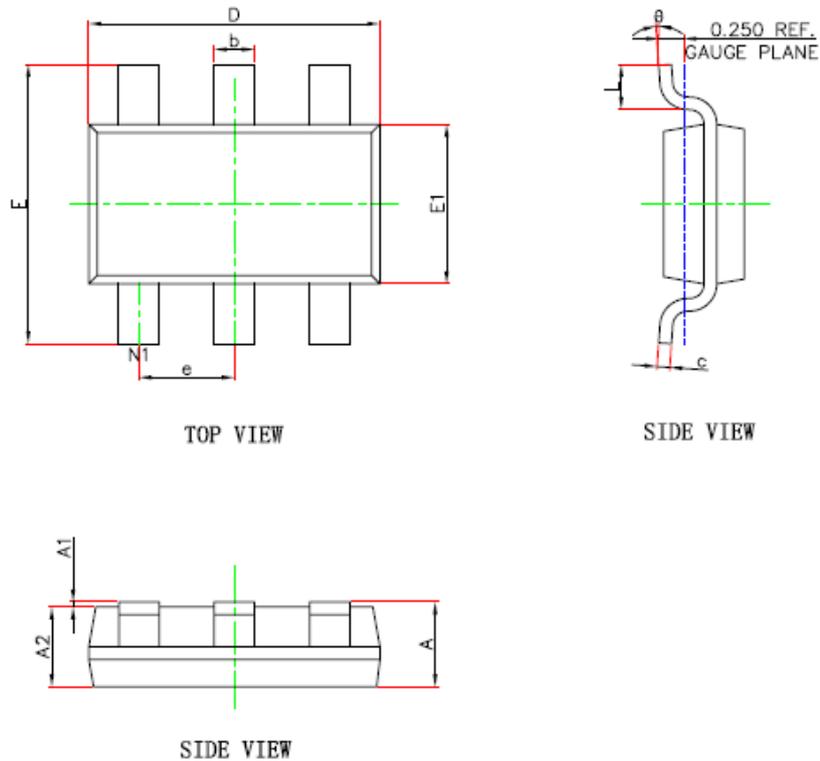
Thermal protection disables the output when the junction temperature rises to approximately $150^{\circ}C$, allowing the device to cool down. When the junction temperature cools to approximately $130^{\circ}C$, the output circuitry is again enabled. Depending on power dissipation, thermal resistance, 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.

PCB GUIDELINES



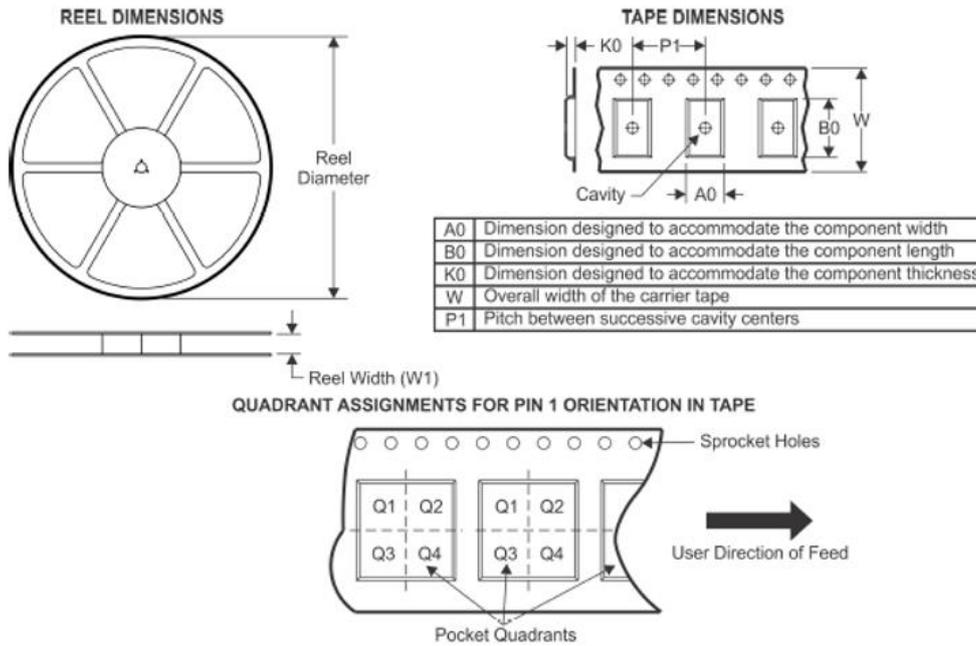
PACKAGE OUTLINE

Package: FCTSOT23-6



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	-----	1.100	-----	0.043
A1	0.000	0.100	0.000	0.004
A2	0.700	1.000	0.028	0.039
D	2.850	2.950	0.112	0.116
E	2.650	2.950	0.104	0.116
E1	1.550	1.650	0.061	0.065
b	0.300	0.500	0.012	0.020
c	0.080	0.200	0.003	0.008
e	0.950(BSC)		0.037(BSC)	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

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
ETA2807FT2G	FCTSOT23-6	6	3000	178	8.4	3.1	3.1	1.3	4	8	Q3