40V/3A, Forced PWM Mode, Synchronous Step-Down Converter

DESCRIPTION

The ETA2892 is a high-efficiency and high-frequency DC-to-DC step-down switching regulator, capable of delivering up to 3A of output current. The device operates with input voltage from 3.6V to 40V, making the ETA2892 ideal for wide input voltage range power conversion. ETA2892 adopts adjustable frequency current mode, the high frequency allows the use of the small inductance value and low DCR inductors, thereby achieving higher space efficiencies.

ETA2892 is available in ESOP8 package.

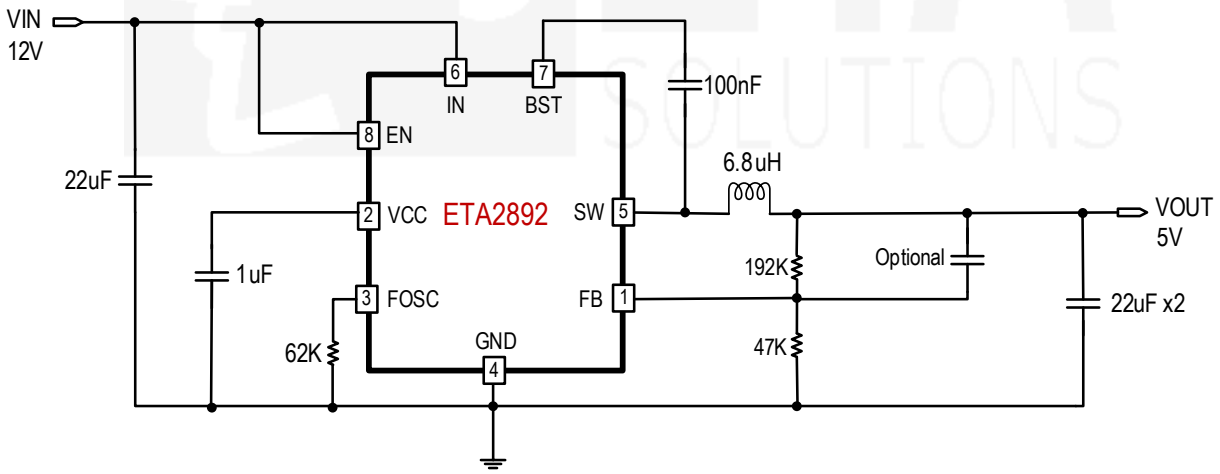
FEATURES

- Wide Input Voltage Range 3.6V-40V
- Capable of Delivering 3A Output
- Current Mode Control
- Programmable Switching Frequency
- Forced PWM Mode
- Low Rdson Internal Power FETs
- Thermal Shutdown and UVLO Protection
- Available in ESOP8 Package

APPLICATIONS

- Vehicle Electrical Devices
- Smart Home
- Surveillance

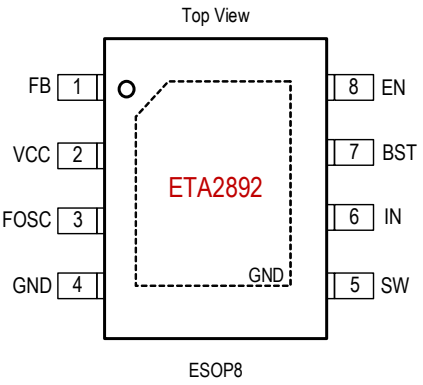
TYPICAL APPLICATION



ORDERING INFORMATION

PART No.	PACKAGE	TOP MARK	Pcs/Reel
ETA2892E8A	ESOP8	ETA2892 YWW2L	4000

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, SW, EN Voltage……..……–0.3V to 45V
BST Voltage ……..……–0.3V to SW+6V
FB,FOSC,VCC Voltage ……..…–0.3V to 6.5V
Operating Temperature Range ……–40°C to 85°C
Storage Temperature Range……–55°C to 150°C
Thermal Resistance θ_{JA} θ_{JC}
ESOP8 ……..……50……10……..°C/W
Lead Temperature (Soldering 10sec) ……..…260°C

ELECTRICAL CHARACTERISTICS

(V_{IN} = 12V, V_{OUT} = 5V, unless otherwise specified. Typical values are at TA = 25°C.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage Range (1)		3.6		40	V
Input UVLO	Rising		3.9		V
	Falling		3.6		V
Input OVP (1)	Rising		40		V
	Falling		37.5		V
Input Supply Current	V_{IN}=12V,V_{OUT}=5V		10		mA
Input Shutdown Current			1.2		μA
VCC Internal Voltage		5	5.5	6	V
VCC Current Limit			30		mA
FB_ Voltage		0.985	1	1.015	V
FB_ Input Current (1)			0		μA
Switching Frequency	Ff, R_{OSC} open		130		KHz
	R_{OSC}=62K		456		KHz
	Fs, R_{OSC} =0		1.1		MHz
Switching Frequency Range		130		1100	KHz
Maximum Duty Cycle	F_{SW}=500KHz, C_{BST}=10nF, V_{IN}=4.9V, Voutset=5V		99		%
Short Circuit Hiccup Time (1)	On Time, F_{SW}=500KHz		2.5		mS
	Off Time, F_{SW}=500KHz		6.5		mS
FB_ Hiccup Falling Threshold			42		%VFB

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
FB_ Hiccup Rising			46		%VFB
FB_ OVP Rising			113		%VFB
FB_ OVP Falling			111		%VFB
Load Step	V_{IN} = 12V, V_{OUT} = 5V, C_{OUT}=44uF,I_{OUT}=0.1A to 3A		3		%/A
High Side Switch On Resistance (1)			131		mΩ
Low Side Switch On Resistance (1)			84		mΩ
High Side Current Limit (1)			6.5		A
	During Foldback		2.1		A
SW Leakage Current	V_{IN}=V_{SW}=12V		0		μA
FOSC Voltage			1		V
EN Rising Threshold	Rising		1		V
EN Falling Threshold	Falling		0.9		V
EN Pull Up Current	V_{EN}=0V		0.25		uA
Thermal Shutdown (2)	Rising		160		°C
Thermal Shutdown Hys (2)			40		°C

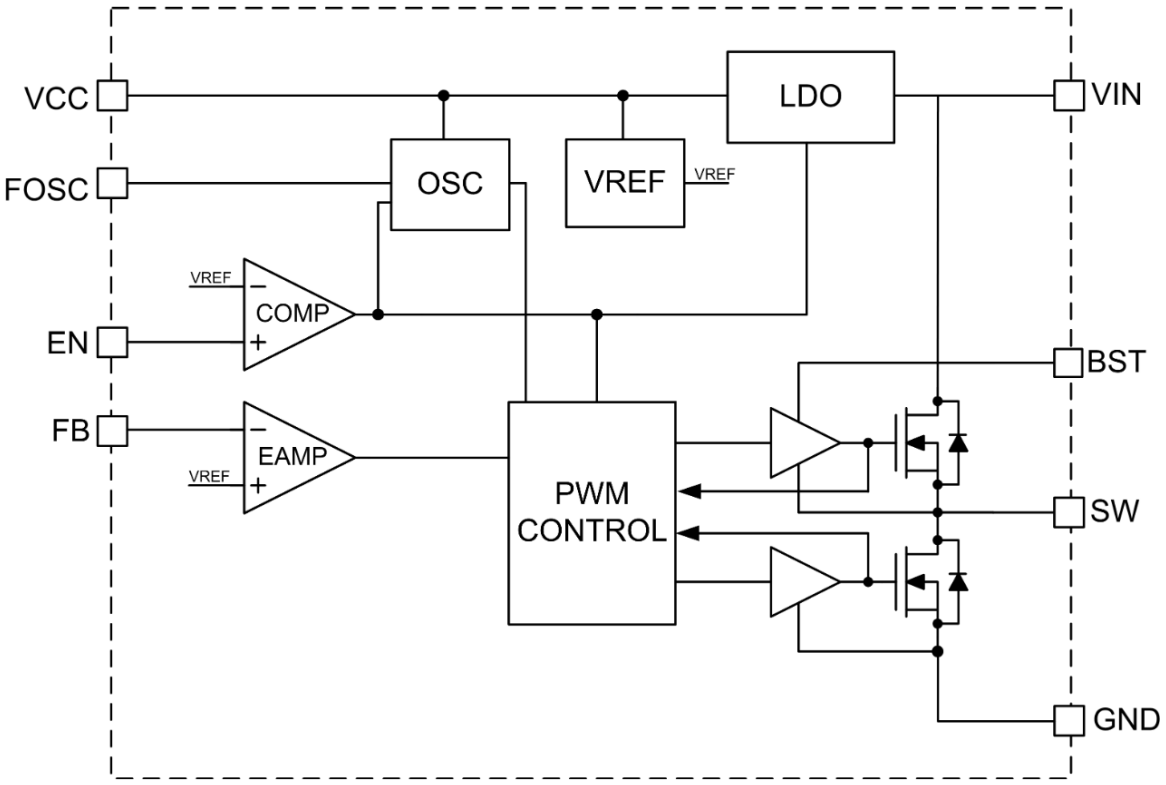
Notes:

1) Guaranteed by Design
2) Guaranteed by Engineering Characterization

PIN DESCRIPTION

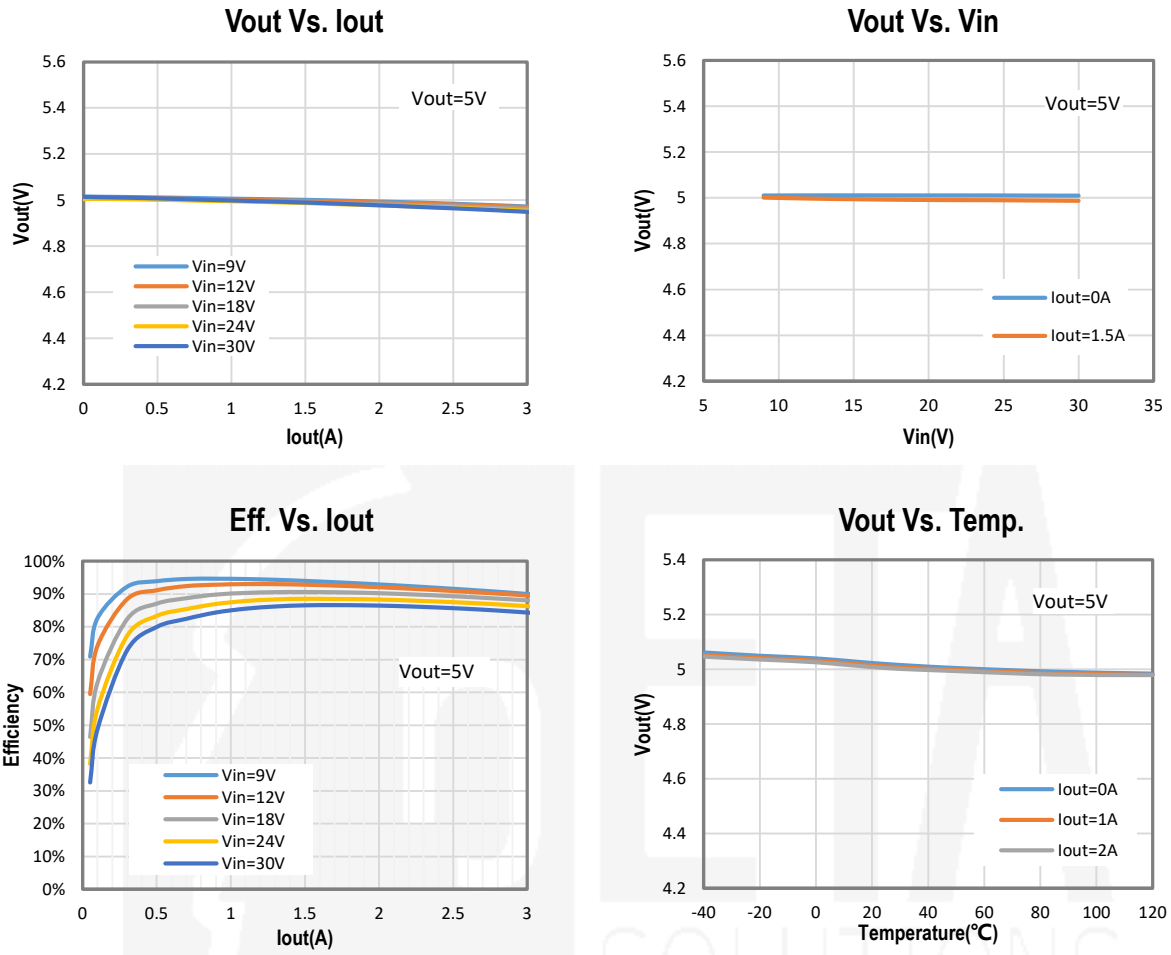
PIN #	NAME	DESCRIPTION
1	FB	Feedback Input. Connect an external resistor divider from the output to FB and GND to set V_{OUT}
2	VCC	Power supply pin for internal circuit. Bypass with a 1uF capacitor
3	FOSC	Frequency Setting pin. Connect a resistor from this pin to GND to set the switching frequency between 130KHz to 1.1MHz. The switching frequency equals to: $F_{SW}=28000/R_{OSC}$ KHz, where R_{OSC} is in KΩ
4	GND	Ground pin
5	SW	Inductor Connection. Connect an inductor between SW and the regulator output
6	IN	Input power pin. Bypass to GND with a minimum 10uF X7R or X5R capacitor
7	BST	Bootstrap pin . Connect a 10nF capacitor from this pin to SW
8	EN	Enable pin. Drive this pin high or floating to enable, low to disable.It has an accurate threshold for seting UVLO externally
Exposed Pad	GND	Ground pin

FUNCTIONAL BLOCK DIAGRAM



TYPICAL CHARACTERISTICS

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



FUNCTIONAL DESCRIPTION

ETA2892 is a wide input range, high-efficiency and high-frequency DC-to-DC step-down switching regulator. It is capable of delivering up to 3A of output current.

Forced PWM Mode

A forced PWM DC-DC regulator always switches at a fixed frequency when the output heavy load or light load. This is to ensure a minimum output voltage ripple over the full load range.

Enable

EN is a digital control pin that turns the ETA2892 on and off. Drive EN High or floating to turn on the regulator, drive it Low to turn it off. An internal 0.25uA pull-up current from VIN to EN allows EN float to turn on the chip.

Over Current Protection and Hiccup

ETA2892 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 (42%Vfb), the ETA2892 will enter hiccup mode. It will turn off the chip immediately for 6.5mS. After that, it will try to re-starts as normal for 2.5mS. After 2.5mS, 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 160°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 Output Voltage Setting

In external Output Voltage Setting Version selected, the ETA2892 regulator is programmed using an external resistor divider. The output voltage is calculated using below equation.

$$V_{OUT} = V_{FB} \times \ (1 + \frac{R_1}{R_2})$$

Where: V_{FB} =1V typically

Resistors R2 has to be between 10KΩ to 100KΩ and thus R1 is calculated by following equation.

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

External Frequency Setting

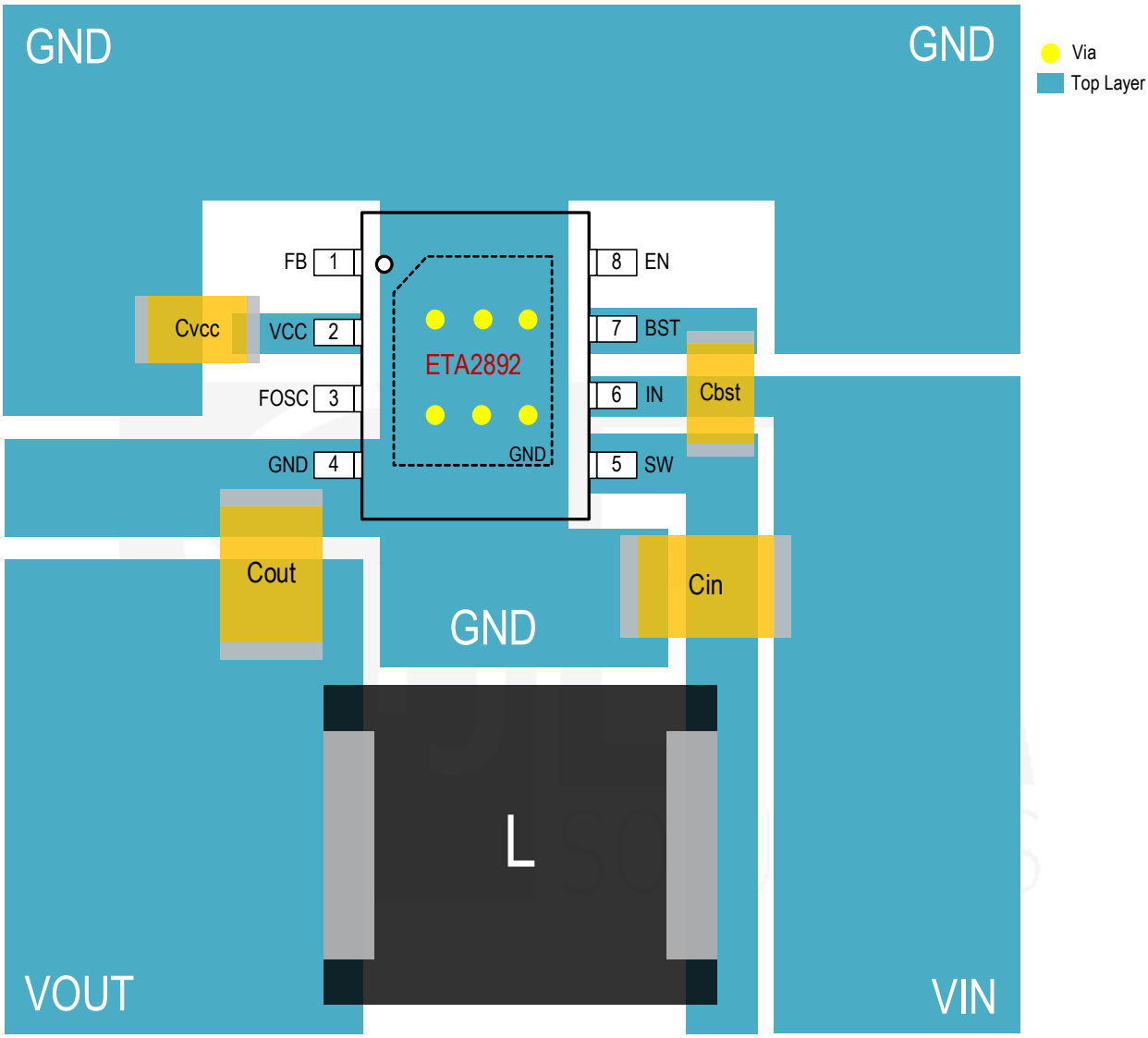
Use a resistor from FOSC pin to GND to setting the switching frequency.

$$F_{sw} = \frac{28000}{R_{osc}} \quad (KHz)$$

With R_{OSC} in KΩ.
If R_{OSC} > 300KΩ the frequency will be fix is F_{sw} =130KHz (Ff), incase R_{OSC} < 30KΩ the frequency will be fix is F_{sw}= 1.1MHz (Fs).

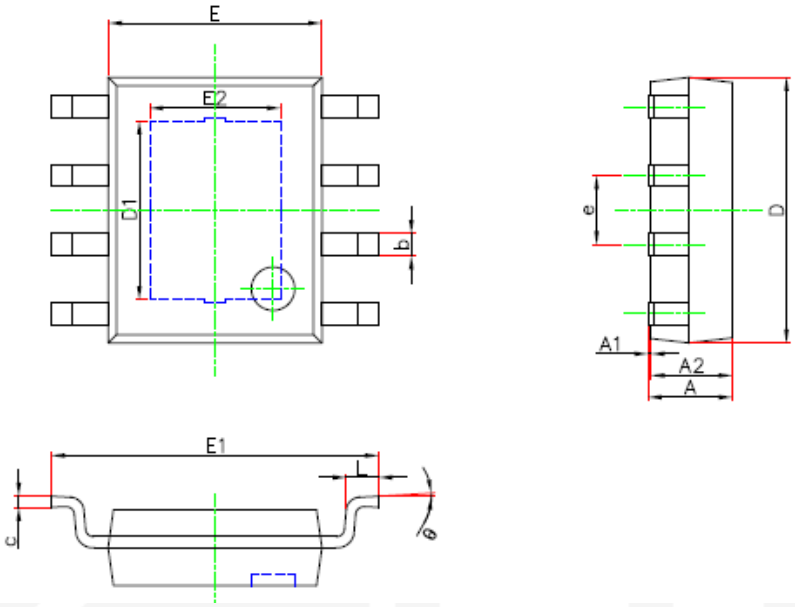
PCB LAYOUT GUIDE

Keep the power devices as close to the chip as possible to achieve the smallest power loop area, which leads to the best EMI performance; Cin is always placed nearest to Vin and GND



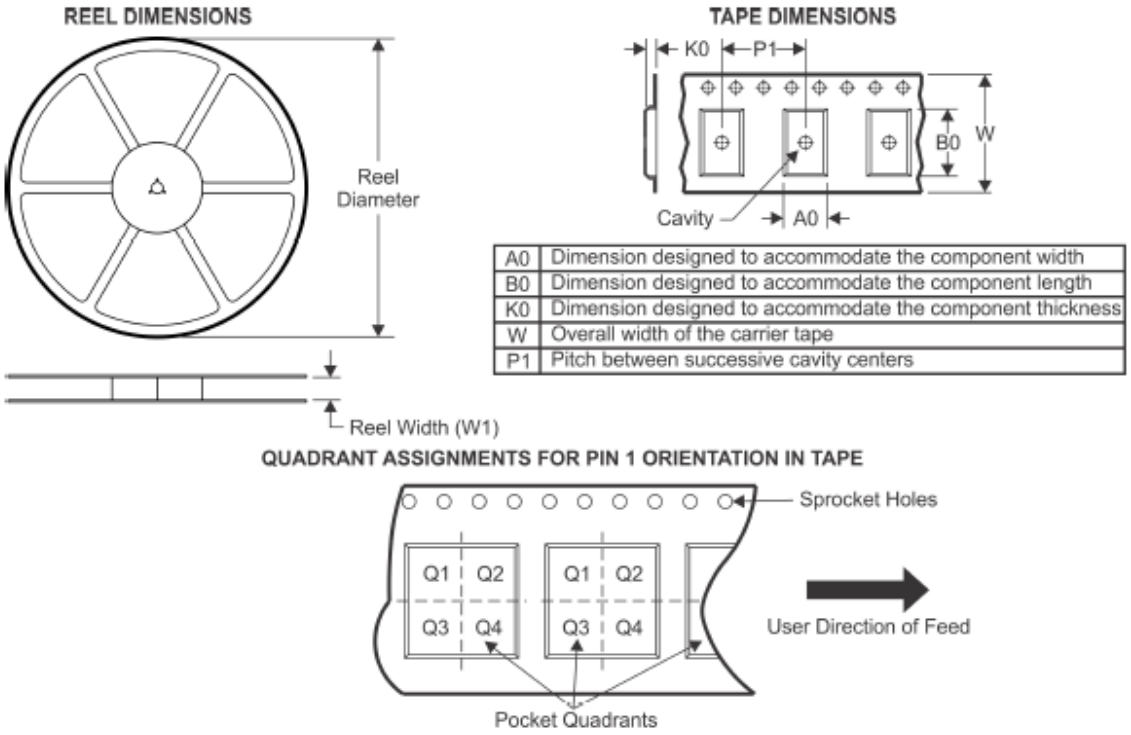
PACKAGE OUTLINE

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°

TAPE AND REEL INFORMATION



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

Device	Package Type	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
ETA2892E8A	ESOP8	8	4000	330	12.7	6.6	5.4	2.05	8	12	Q1