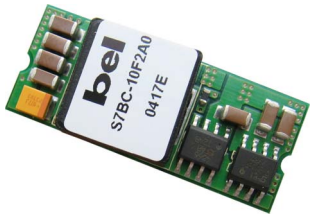
NON-ISOLATED DC/DC CONVERTERS

2.4V-5.5V Input 0.75V-3.63V/10A Output

S7BC-10F2Ax Series

- Non-Isolated
- High Efficiency
- High Power Density
- Fixed Frequency(300KHz)
- OCP/SCP
- Flexible Output Voltage Sequencing
- Remote Sense
- Under-Voltage Lockout (UVLO)
- Over Temperature Protection
- Wide Input Range
- Wide Trim Range
- Remote On/Off
- Converter Can Sink and Source Current
- Active Low/High (option)



Description

The Bel S7BC-10F2Ax modules are a series of non-isolated dc-dc converters that deliver up to 10A of output current with full load efficiency of 95% at 3.3V output. These modules provide precisely regulated voltage programmable via external resistor from 0.75V to 3.63V over a wide range of input voltage (2.4V-5.5V). These modules have a sequencing feature that enables designers to implement various types of output voltage sequencing when powering multiple voltages on a board. The open-frame construction and small footprint enable designers to develop cost and space-efficient solutions. Standard features include remote On/Off, remote sense, over current protection, short current protection, wide input, and programmable output voltage.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number Active Low	Model Number Active High
0.75V – 3.63V	2.4V – 5.5V	10A	36.3W	95%	S7BC-10F2AL	S7BC-10F2A0

Note: Add “G” suffix at the end of the model number to indicate “Tray Packaging”.

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3V	-	5.8V	
Output Enable Terminal Voltage	-0.3V	-	5.8V	
Sequencing Voltage [1]	-0.3V	-	Vin	
Ambient Temperature	-40°C	-	85°C	
Storage Temperature	-55°C	-	125°C	

Notes: All specifications are typical at 25°C unless otherwise stated.

1. S7BC-10F2Ax series of modules include a sequencing feature that enables users to implement various types of output voltage sequencing in their applications. This is accomplished via an additional sequencing pin. When the sequencing feature is not used, tie the SEQ pin to Vin.

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage				
Vo=3.3V	4.5V	-	5.5V	
Vo=1.8V~2.5V	3.0V	-	5.5V	
Vo ≤ 1.5V	2.4V	-	5.5V	
Input Current (full load)				
Vo=3.3V	-	7.0A	8.0A	
Vo=2.5V	-	5.5A	9.5A	
Vo=1.8V	-	4.0A	9.0A	
Vo=1.5V	-	3.5A	7.5A	
Vo=1.2V	-	3.0A	6.0A	
Vo=0.75V	-	2.0A	4.0A	
Input Current (no load)	-	80mA	-	
Remote Off Input Current	-	15mA	-	
Input Reflected Ripple Current (pk-pk)	-	140mA	-	Tested with two 100uF/10V tantalum input capacitors & simulated source impedance of 1uH, 5Hz to 20MHz.
Input Reflected Ripple Current (RMS)	-	40mA	-	
I^2t Inrush Current Transient	-	-	$0.2A^2s$	
Turn-on Voltage Threshold	-	2.2V	-	
Turn-off Voltage Threshold	-	2.0V	-	

Note: All specifications are typical at 25°C unless otherwise stated.

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point	-2%Vo,set	-	2%Vo,set	Vin=5V, Io=Iomax full load
Output Voltage Set Point	-3%Vo,set	-	3%Vo,set	Over all operating input voltages, resistive loads and temperature conditions
Load Regulation	-	0.4%Vo,set	-	Io=Io, min to Io, max
Line Regulation	-	0.3%Vo,set	-	Vin=Vin, min to Vin, max
Regulation Over Temperature (-40°C to +85°C)	-	0.5%Vo,set	-	Tref=Ta, min to Ta, max
Output Current	0A	-	10A	
Current Limit Threshold	15A	-	27A	
Short Circuit Surge Transient	-	-	$1.5A^2s$	
Ripple and Noise (pk-pk)	-	25mV	50mV	Tested with 0-20MHz, 10uF/16V tantalum capacitor & 1uF/10V TDK ceramic capacitor at the output
Ripple and Noise (RMS)	-	8mV	15mV	
Turn on Time	-	4mS	8mS	
Overshoot at Turn on	-	0%Vo,set	3%Vo,set	
Output Capacitance				
ESR ≥ 1mohm	0uF	-	1000uF	
ESR ≥ 10mohm	0uF	-	4700uF	
Transient Response				
50% ~ 100% Max Load	Vo=3.3V	-	130mV	-	di/dt=2.5A/uS; Vin=5V; and with two 150uF/16V tantalum capacitors & 1uF/10V ceramic capacitor at the output
Settling Time		-	50uS	-	
100% ~ 50% Max Load		-	150mV	-	
Settling Time		-	50uS	-	

Output Specifications (continued)

Parameter		Min	Typ	Max	Notes
Transient Response					
50% ~ 100% Max Load	Vo=2.5V	-	130mV	-	di/dt=2.5A/uS; Vin=5V; and with two 150uF/16V tantalum capacitors & 1uF/10V ceramic capacitor at the output
Settling Time		-	50uS	-	
100% ~ 50% Max Load		-	130mV	-	
Settling Time		-	50uS	-	
50% ~ 100% Max Load	Vo=1.8V	-	120mV	-	
Settling Time		-	50uS	-	
100% ~ 50% Max Load		-	120mV	-	
Settling Time		-	50uS	-	
50% ~ 100% Max Load	Vo=1.5V	-	120mV	-	
Settling Time		-	50uS	-	
100% ~ 50% Max Load		-	120mV	-	
Settling Time		-	50uS	-	
50% ~ 100% Max Load	Vo=1.2V	-	130mV	-	
Settling Time		-	50uS	-	
100% ~ 50% Max Load		-	130mV	-	
Settling Time		-	50uS	-	
50% ~ 100% Max Load	Vo=0.75V	-	120mV	-	
Settling Time		-	50uS	-	
100% ~ 50% Max Load		-	140mV	-	
Settling Time		-	50uS	-	

Note: All specifications are typical at nominal input (Vin=5V), full load at 25°C unless otherwise stated.

General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				Measured at Vin=5V, full load
Vo=3.3V	92%	95%	-	
Vo=2.5V	90%	93%	-	
Vo=1.8V	88%	91%	-	
Vo=1.5V	87%	90%	-	
Vo=1.2V	85%	88%	-	
Vo=0.75V	79%	82%	-	
Switching Frequency	250KHz	300KHz	350KHz	
Over Temperature Shutdown	-	125°C	-	
Output Trim Range (Wide Trim)	0.7525V	-	3.63V	
Remote Sense Compensation	-	10%	-	
MTBF	6,643,156 hours			Calculated Per Bell Core TR-332 (Io = Nominal; Ta = 25°C)
Dimensions				
Inches (L × W × H)	1.30 x 0.53 x 0.315			
Millimeters (L × W × H)	33.02 x 13.46 x 8.00			
Weight	-	6.6g	-	

Note: All specifications are typical at 25°C unless otherwise stated.

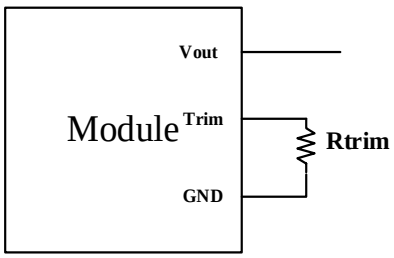
Control Specifications

Parameter	Min	Typ	Max	Notes
Signal Low (Unit Off)	-0.3V	-	0.3V	S7BC-10F2A0; Remote On/Off pin open, Unit on.
Signal High (Unit On)	1.5V	-	5.8V	
Signal Low (Unit On)	-0.3V	-	0.3V	S7BC-10F2AL; Remote On/Off pin open, Unit on.
Signal High (Unit Off)	1.5V	-	5.8V	
Sequencing Voltage	0.05V	-	Vin	Sequencing Voltage should be higher than output voltage.
Sequencing Slew Rate Capability	-	-	2V/mS	
Sequencing Delay Time	10mS	-	-	Delay from Vin, min to application of voltage on SEQ pin
Tracking Accuracy Power-Up Power-Down	 - -	 100mV 200mV	 200mV 400mV	

Output Trim Equations

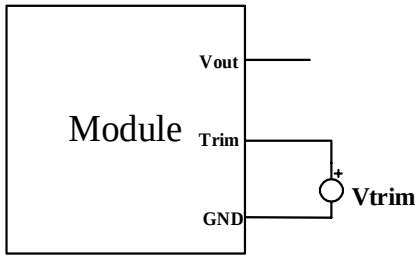
Equation for calculating the trim resistor (in kΩ) given the desired adjusted voltage (Vadj) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground.

$$R_{trim} = \frac{21.07}{V_{adj} - 0.7525} - 5.11$$

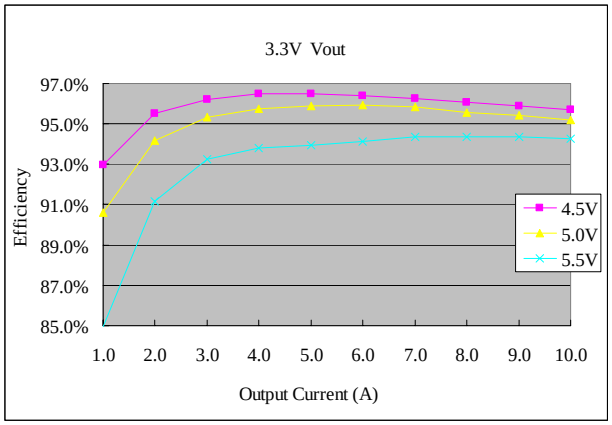


Equation for calculating the trim voltage (in V) given the desired adjusted voltage (Vadj) is shown below. The Trim Up voltage should be connected between the Trim pin and Ground.

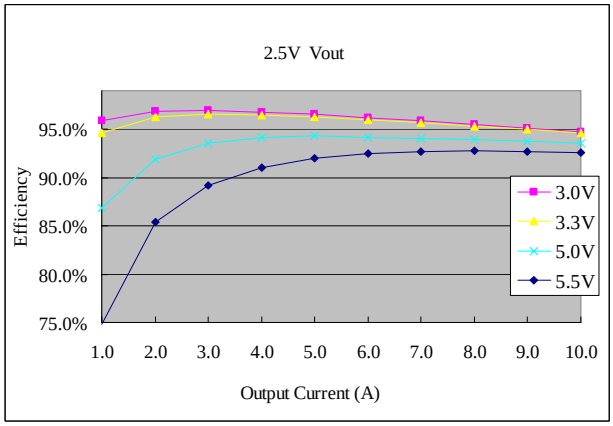
$$V_{trim} = 0.7 - 0.1698 \times (V_{adj} - 0.7525)$$



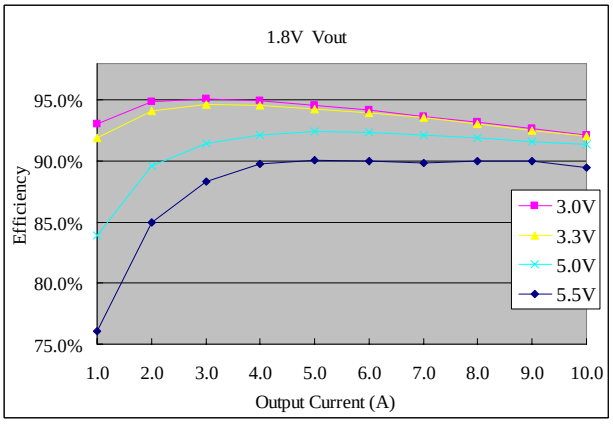
Efficiency Data



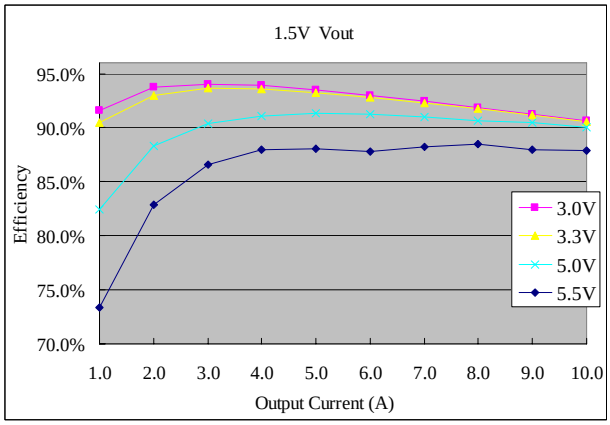
Vo=3.3V



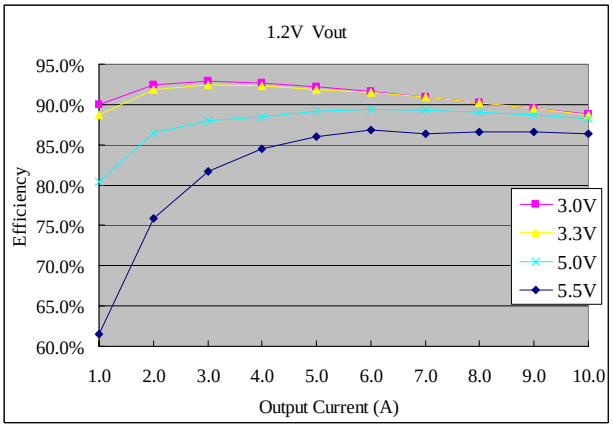
Vo=2.5V



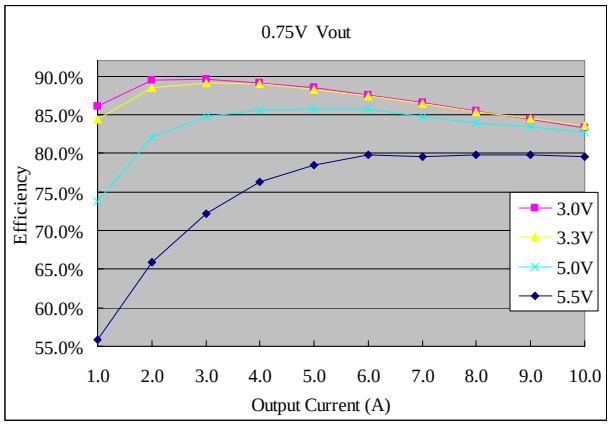
Vo=1.8V



Vo=1.5V

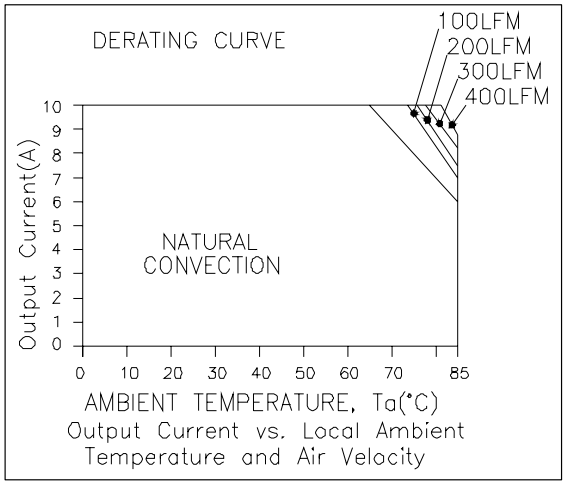


Vo=1.2V

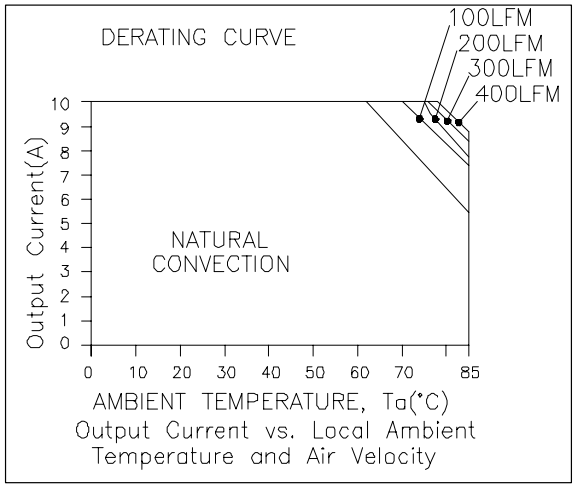


Vo=0.7525V

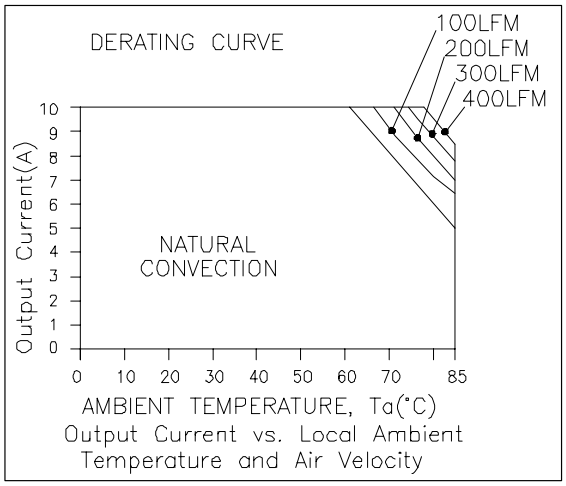
Thermal Derating Curves



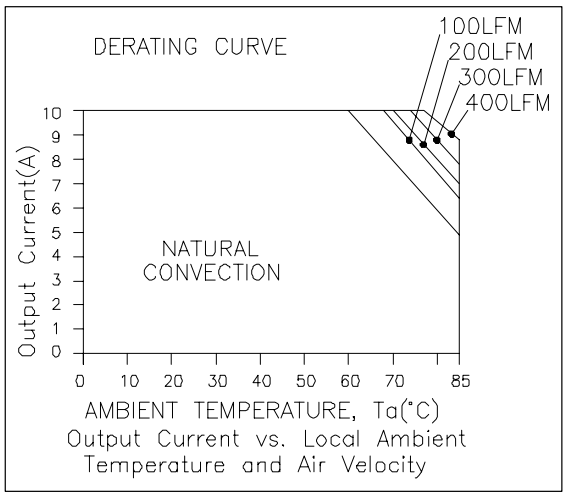
Vin=5.0V, Vo=0.75V



Vin=5.0V, Vo=1.5V

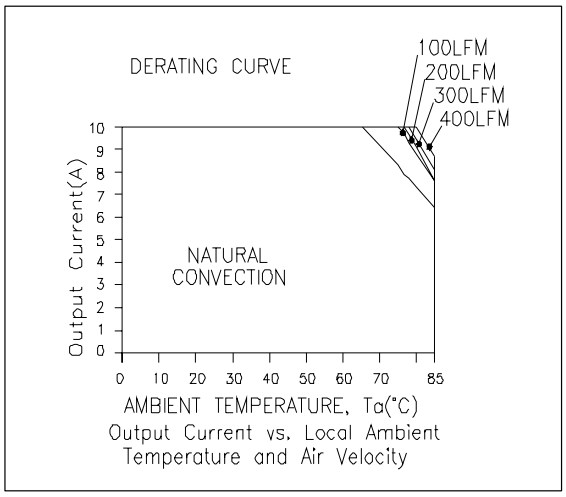


Vin=5.0V, Vo=2.5V

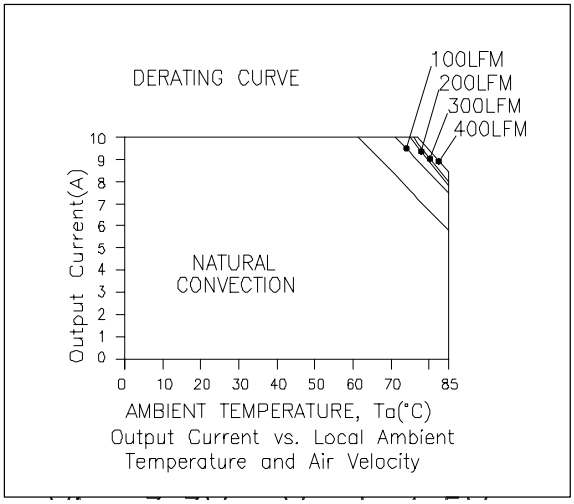


Vin=5.0V, Vo=3.3V

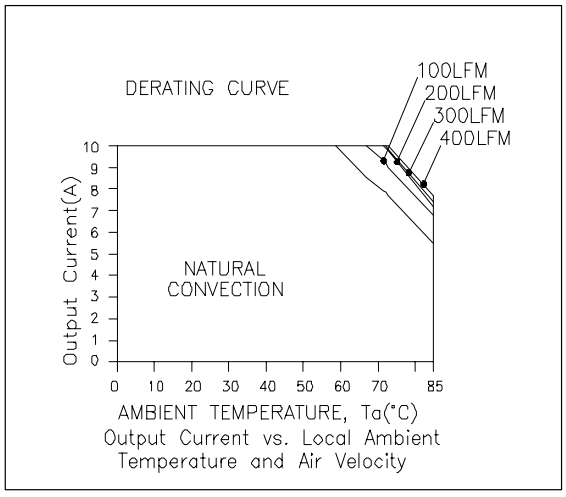
Thermal Derating Curves (continued)



Vin=3.3V, Vo=0.75V



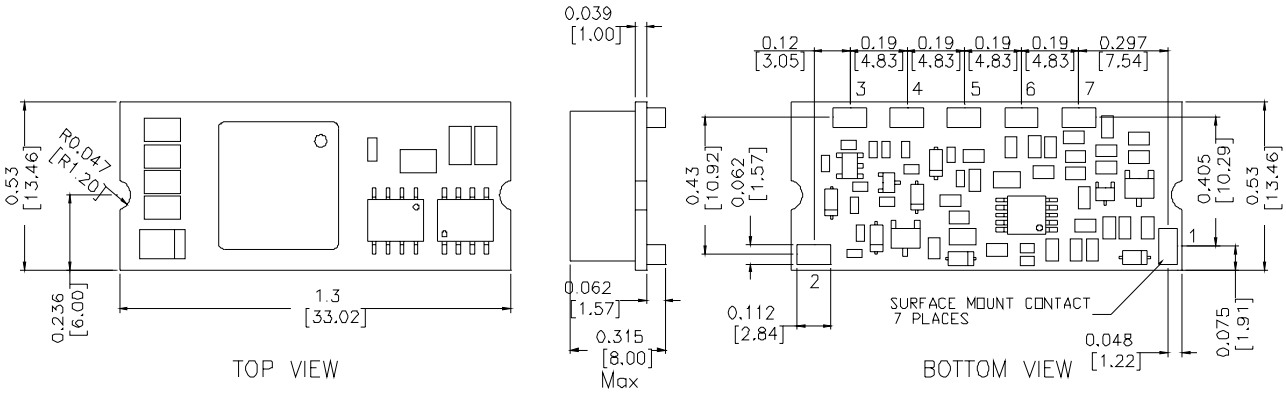
Vin=3.3V, Vo=1.5V

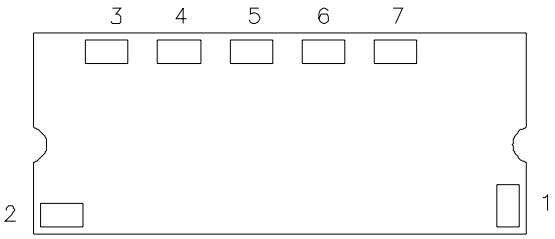


Vin=3.3V, Vo=2.5V

NON-ISOLATED DC/DC CONVERTERS

2.4V-5.5V Input 0.75V-3.63V/10A Output



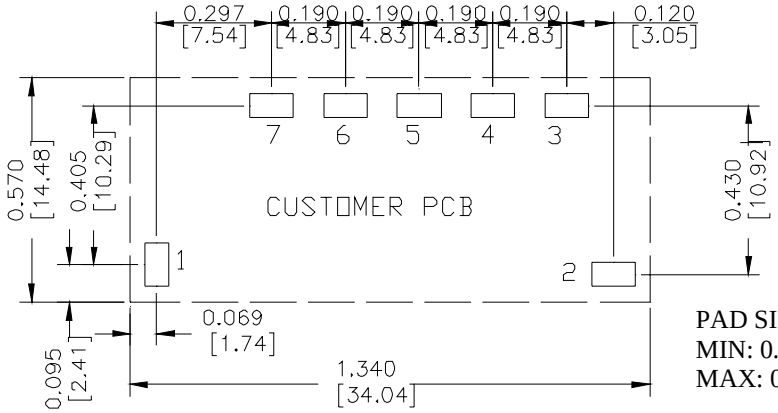


BOTTOM VIEW

Pin Connections

Pin	Function
1	Remote On/Off
2	Vin
3	SEQ
4	Ground
5	Vout
6	Trim
7	Remote Sense

RECOMMENDED PAD LAYOUT



PAD SIZE:
MIN: 0.14"* 0.095" (3.05mm * 2.41mm)
MAX: 0.165"* 0.11" (3.43mm * 2.79mm)

CORPORATE

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