SIL40C2 Series

200 Watts
C-Class Non-Isolated

Total Power: 200 Watts
Input Voltage: 4.5 to 13.8 Vdc
# of Outputs: Single

RoHS 2002/95/EC

Special Features
- Adjustable output voltage (0.6-5 V, 40 A max.)
- Power good output signal (open collector)
- Input under voltage lockout
- Operating ambient temperature up to 70 ^{O}C with suitable derating and forced air cooling
- Remote ON/OFF
- No minimum load requirements
- Non-latching over-current protection
- Compact footprint, vertical, horizontal, and horizontal SMT options
- Wide input voltage 4.5-13.8 V
- RoHS compliant

Safety
- UL/ cUL TBD
- TÜV Product ServiceTBD

Product Descriptions

The SIL40C2 is a new high density open frame non-isolated converter series for space-sensitive applications. Each model has a wide input range (4.5-13.8 V) and offer a wide 0.6-5 V output voltage range with a 40 A load. An external resistor adjusts the output voltage from its pre-set value of 0.6 V to any value up to the maximum allowed value for that model. Typical efficiencies are 90% when operated at 5 V input, 2.5 V output at full load. The SIL40C2 series offers remote ON/OFF and overcurrent protection as standard. With full international safety approval including EN60950 and UL/cUL60950, the SIL40C2 reduces compliance costs and time to market.

ARTESYN™
EMBEDDED TECHNOLOGIES

Model Numbers

Standard	Input Voltage	Output Voltage	Maximum Load	Efficiency at Full Load	Max. Load Regulation
SIL40C2-00SADJ-VJ[1]	4.5-13.8Vdc	0.6-5V	40A	90%	±0.5%
SIL40C2-00SADJHJ[1]	4.5-13.8Vdc	0.6-5V	40A	90%	±0.5%
SMT40C2-00SADJJ[1]	4.5-13.8Vdc	0.6-5V	40A	90%	±0.5%

Note 1 - The 'J' at at the end of the part number indicates that the part is Pb-free (RoHS 6/6 compliant). TSE RoHS 5/6 (non PB-free) compliant versions may be available on special request, please contact your local sales representative for details.

Options

None

Electrical Specifications

Absolute Maximum Ratings

Stresses in excess of the maximum ratings can cause permanent damage to the device. Operation of the device is not implied at these or any other conditions in excess of those given in the specification. Exposure to absolute maximum ratings can adversely affect device reliability.

Table 1. Absolute Maximum Ratings:

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Input Voltage DC continuous operation	All	$V_{IN,DC}$	0	-	13.8	V
Power Good Voltage	$V_{IN,DC}$ < 5 V $V_{IN,DC}$ > 5 V	V_{Pgood}	- -	- -	V_{IN} 5.0	V V
Ambient Operating Temperature	See note 1	T_A	0	-	70	°C
Storage Temperature	All	T_{STG}	-40	-	125	°C
MTBF	See note 2 See note 3	- -	- -	TBD 6749409	- -	kHrs kHrs

Note 1 - Measured at thermal reference points. Thermal reference point is defined as the highest temperature measured at any one of the specified thermal reference points. See derating curves.
Note 2 - MIL-HDBK-217F, $V_{IN,DC} = V_{IN,nom}$, $I_O = I_{O,max}$, ambient 25 °C. Ground benign environment.
Note 3 - Telcordia SR-332 Issue 2, ground benign, ambient 40°C, $V_{IN,DC} = V_{IN,nom}$, $I_O = I_{O,max}$.

Input Specifications

Table 2. Input Specifications:

Parameter	Conditions[1]	Symbol	Min	Typ	Max	Unit
Input Voltage Turn on Turn off Operating	 All All All	$V_{IN,DC}$	 - - 4.5	 4.3 4.0 -	 - - 13.8	 V V V
Standby Input Current (V_O =Off)	Disable	$I_{IN,standby}$	-	10	20	mA
No Load Input Current (V_O =On, I_O = 0A)	Enable	I_{IN,no_load}	-	100	-	mA
Input Voltage Variation	See note 2	dv/dt	-	1.2	-	V/ms
Turn On Delay	See note 3	t_{Turn_On}	-	2	3	mSec
Rise Time	All	t_r	-	1	2	mSec
Power Good Delay	See note 4	-	-	0.2	-	mSec
Switching Frequency	Fixed frequency	f_{SW}	-	500	-	kHz
Control Pin Open Circuit Voltage 5V 12V	$I_{IN,max}$= 0 µA open circuit voltage	$V_{IN,max}$	 - -	 1.4 2.4	 - -	 V V
Low Level Input Current 5V 12V	$V_{IN,min}$ = 0.0 V	$I_{IN,max}$	 - -	 0.5 1.2	 - -	 mA mA
High Level Input Current	See note 5	$I_{IN,max}$	0	-	1.0	µA
High Level Input Voltage	See note 6	$V_{IN,max}$	1.2	-	-	V
Low Level Input Voltage	See note 7	$V_{IN,min}$	-	-	0.7	V
Input Capacitance Internal filter External filter	See note 8	 C_{IN} C_{bypass}	 - -	 88 1	 - -	 uF uF

Note 1 - All specifications are typical at nominal input $V_{IN,DC}$=5 V and 12 V, full load under any resistive load combination at 25 °C, unless otherwise stated.
Note 2 - Product was tested at 1.2 V/ms. Much higher dv/dt is possible (>10 V/ms)
Note 3 - With the Remote ON/OFF signal asserted, this is the time from when the input voltage reaches the minimum specified operating voltage until Vout is in regulation.
Note 4 - Output voltage in full regulation power good assesed hign from 10% to 90%, full resistive load, 0 µF capacitance.
Note 5 - Current flowing into control pin when pin is pulled high (max. at Vih = 13.8 V).
Note 6 - Converter guaranteed on when control pin is greater than $V_{IN,max}$(min).
Note 7 - Converter guaranteed off when control pin is less than $V_{IN,min}$(max).
Note 8 - Recommended customer added capacitance.

Input Specifications

Table 3. Input Specifications Con't: 5V and 12V Model, 0.9V Setpoint

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Maximum Input Current ($I_O = I_{O,max}$, $I_{SB} = I_{SB,max}$)	$V_{IN,DC}$ = 5Vdc $V_{IN,DC}$ = 12Vdc	$I_{IN,max}$	- -	9.17 3.78	- -	A A
Operating Efficiency	See note 9 See note 10 See note 11 See note 12	η	76.4 77.3 83.1 76.7	78.4 79.3 85.1 78.7	- - - -	% % % %

Table 4. Input Specifications Con't: 5V and 12V Model, 2.5V Setpoint

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Maximum Input Current ($I_O = I_{O,max}$, $I_{SB} = I_{SB,max}$)	$V_{IN,DC}$ = 5Vdc $V_{IN,DC}$ = 12Vdc	$I_{IN,max}$	- -	22.41 9.22	- -	A A
Operating Efficiency	See note 9 See note 10 See note 11 See note 12	η	87.5 88.3 91.1 87.8	89.5 90.3 93.1 89.8	- - - -	% % % %

Table 5. Input Specifications Con't: 12V Model, 5V Setpoint

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Maximum Input Current ($I_O = I_{O,max}$, $I_{SB} = I_{SB,max}$)	$V_{IN,DC}$ = 12Vdc	$I_{IN,max}$	-	17.71	-	A
Operating Efficiency	See note 10 See note 12	η	92.1 91.8	94.1 93.8	- -	% %

Note 9 - $V_{IN,DC}$ =5Vdc , $I_O = I_{O,max.}$
Note 10 - $V_{IN,DC}$ =12Vdc , $I_O = I_{O,max.}$
Note 11 - $V_{IN,DC}$ =5Vdc , I_O = 50% $I_{O,max.}$
Note 12 - $V_{IN,DC}$ =12Vdc , I_O = 50% $I_{O,max.}$

Output Specifications

Table 6. Output Specification: 5V and 12V Model (0.9V Setpoint)

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Nominal Setpoint voltage	All	V_O	0.891	0.9	0.909	V
Line Regulation	All	$\pm\%V_O$	-	-	0.2	%
Load Regulation	All	$\pm\%V_O$	-	-	0.5	%
Output Current						
Continuous	All	I_O	0	-	40	A
Short Circuit	All	I_{SC}	-	112	-	Apk
Output Ripple and Noise						
5 V	Measurement band width 20 MHz	V_O	-	25	-	mVpk-pk
12 V	All	V_O	-	25	-	mVpk-pk
Dynamic Response						
Peak Deviation	See note 1	V_O	-	95	-	mV
Settling Time	See note 2	t_s	-	30	-	µSec
External Load Capacitance	See note 3	Cext	-	0	20,000	µF
Overcurrent Limit Inception	V_O= 90% of $V_{O,nom}$	I_{OC}	-	60	-	A

Table 7. 5V and 12V Model (2.5V Setpoint)

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Nominal Setpoint voltage	All	V_O	2.475	2.5	2.525	V
Line Regulation	All	$\pm\%V_O$	-	-	0.2	%
Load Regulation	All	$\pm\%V_O$	-	-	0.5	%
Output Current						
Continuous	All	I_O	0	-	40	A
Short Circuit	All	I_{SC}	-	138	-	Apk
Output Ripple and Noise						
5 V	Measurement band width 20 MHz	V_O	-	25	-	mVpk-pk
12 V	All	V_O	-	25	-	mVpk-pk
Dynamic Response						
Peak Deviation	See note 1	V_O	-	120	-	mV
Settling Time	See note 2	t_s	-	20	-	µSec
External Load Capacitance	See note 3	Cext	-	0	10,800	µF
Overcurrent Limit Inception	V_O= 90% of $V_{O,nom}$	I_{OC}	-	60	-	A

Output Specifications

Table 8. Output Specifications Con't: 12V Model (5V Setpoint)

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Nominal Setpoint voltage	All	V_O	4.95	5.00	5.05	V
Line Regulation	All	$\pm\%V_O$	-	-	$\pm$0.2	%
Load Regulation	All	$\pm\%V_O$	-	-	$\pm$0.5	%
Output Current continuous short circuit	Continuous, unit auto recovers	 I_O I_{SC}	 0 -	 - 150	 40 -	 A Apk
Output Ripple and Noise	All	V_O	-	35	-	mVpk-pk
Dynamic Response Peak Deviation Settling Time	 See note 1 See note 2	 V_O t_s	 - -	 150 20	 - -	 mV µSec
External Load Capacitance	All	Cext	-	0	330	µF
Overcurrent Limit Inception	All	I_{OC}	-	56	-	A

Note 1 - Peak deviation for 50% to 75% step load, di/dt = 10 A/µs.
Note 2 - Settling time to within 1% of output set-point voltage for 50% to 75% step load.

Performance Curves - 0.9V setpoint

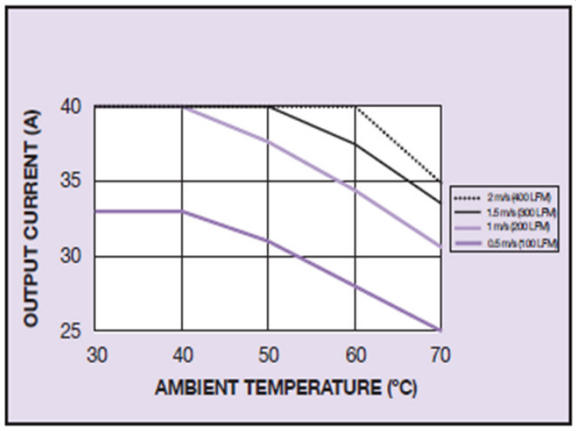


Figure 1: Thermal Derating Curve 5 Vin[1] (0.9V setpoint)

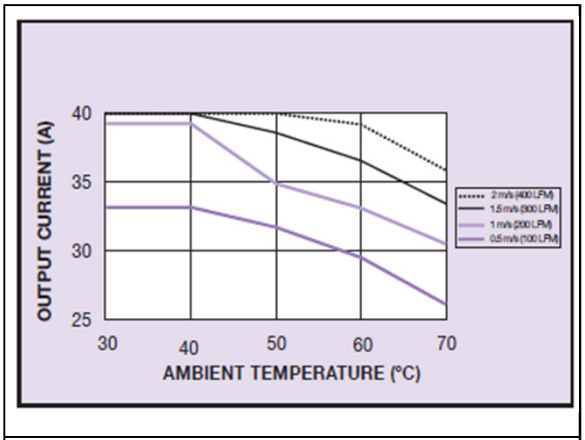


Figure 2: Thermal Derating Curve 12 Vin[1] (0.9V setpoint)

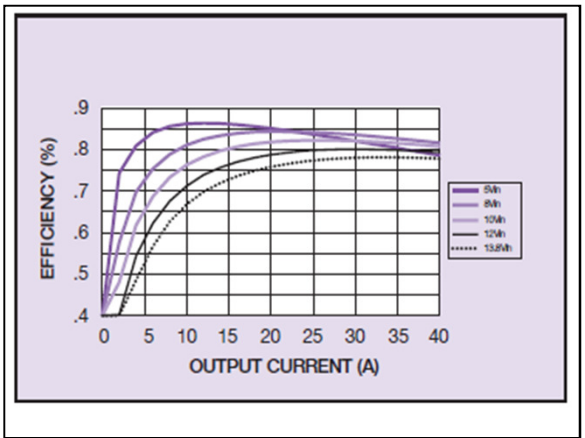


Figure 3: Efficiency (0.9V setpoint)

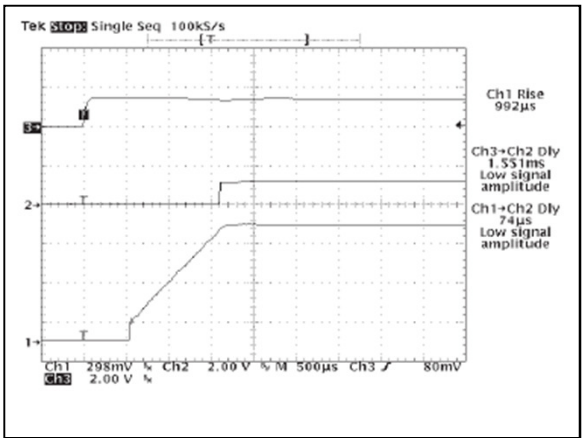


Figure 4: Control On/Off (0.9V setpoint)
Ch1: Output Voltage, Ch3: Enable

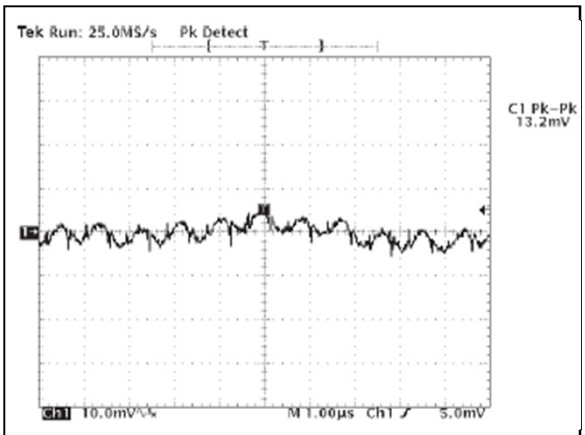


Figure 5: Typical Ripple Output (0.9V setpoint)

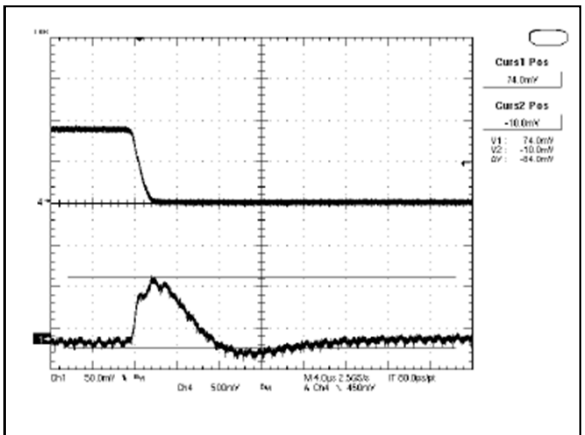


Figure 6: Translent Response 100% -75% (0.9V setpoint)
Ch 1: Output Voltage Deviation, Ch 4: Current Step ant 5A/div

Performance Curves - 0.9V setpoint

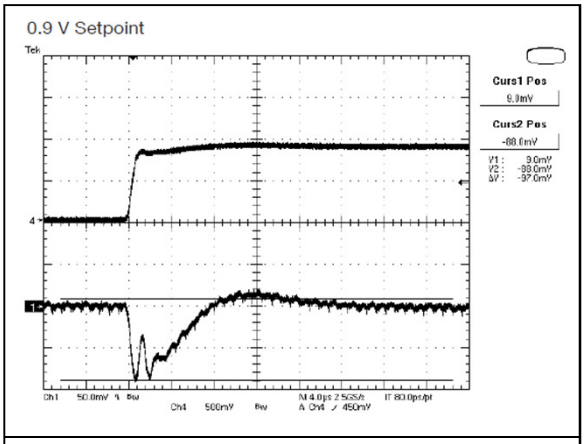


Figure 7: Transient Response 75% - 100% (0.9V setpoint)
Ch 1: Output Voltage Deviation, Ch 4: Current Step at 5A/div

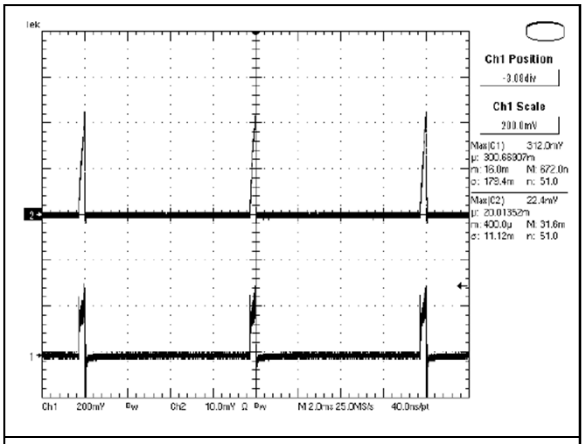


Figure 8: Short Circuit Characteristic (0.9V setpoint)
Ch 1: Output Voltage, Ch 2: Output Current at 50 A/div

Performance Curves - 2.5V setpoint

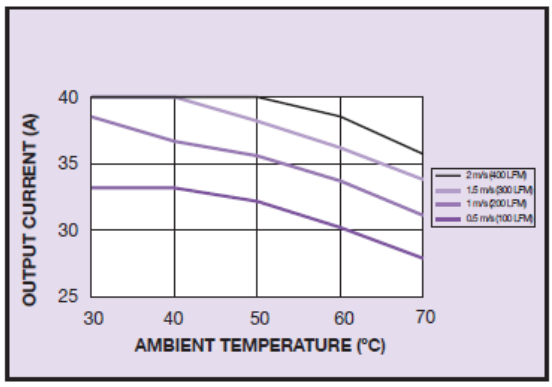


Figure 9: Thermal Derating Curve 5Vin[1] (2.5V setpoint)

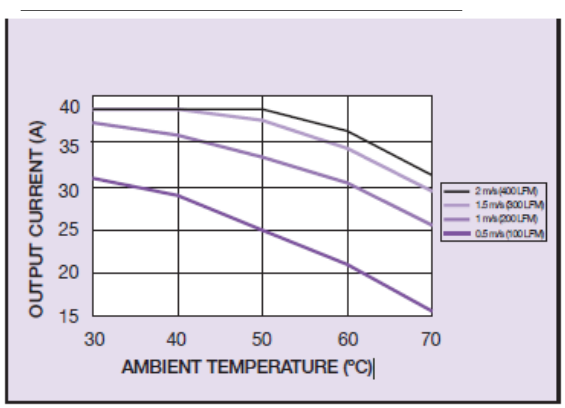


Figure 10: Thermal Derating Curve 12Vin[1] (2.5V setpoint)

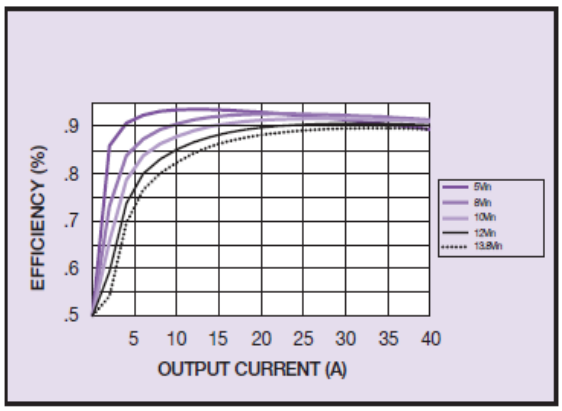


Figure 11: Efficiency (2.5V setpoint)

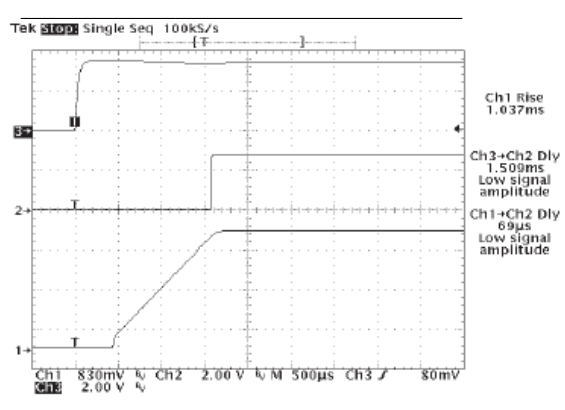


Figure 12: Control On/Off (2.5V setpoint)
Ch 1: Output Voltage, Ch 3: Enable

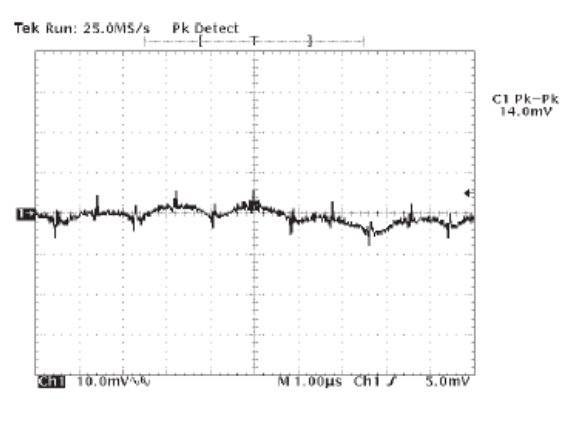


Figure 13: Typical Output Ripple (2.5V setpoint)

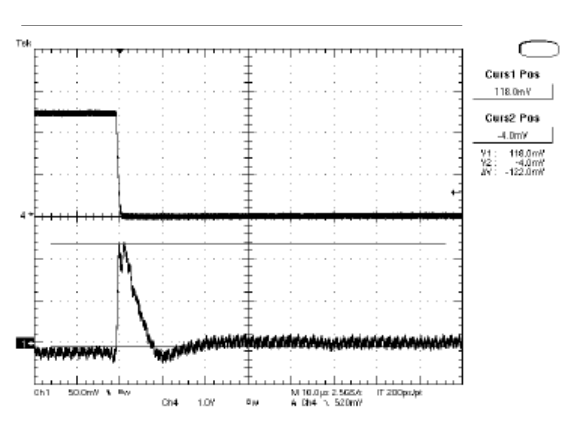


Figure 14: Transient Response 100% - 75% (2.5V setpoint)
Ch 1: Output Voltage Deviation, Ch 4: Current step at 4 A/div

Performance Curves - 2.5V setpoint

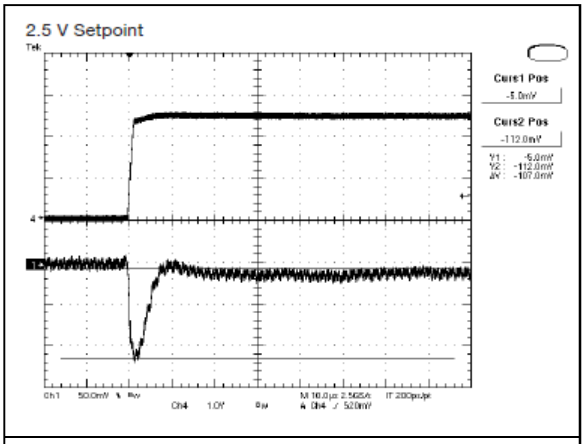


Figure 15: Transient Response 75% - 100% (2.5V setpoint)
Ch 1: Output Voltage Deviation, Ch 4: Current step at 4 A/div

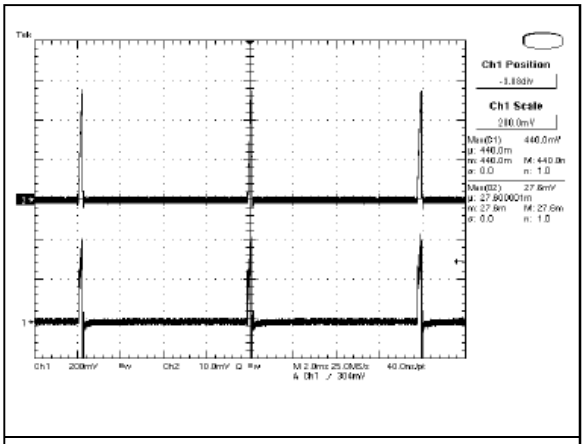


Figure 16: Short Circuit Characteristic (0.9V setpoint)
Ch 1: Output Voltage, Ch 2: Output Current at 50 A/div

Performance Curves - 5V setpoint

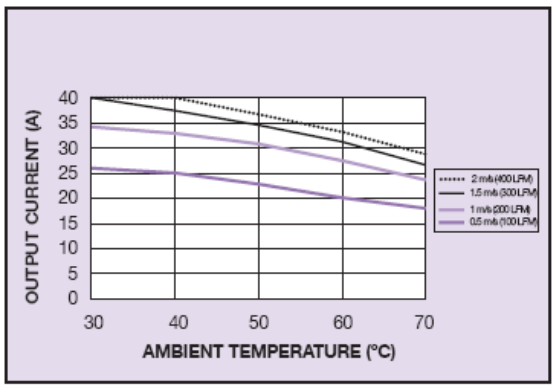


Figure 17: Thermal Derating Curve 12 Vin[1] (5V setpoint)

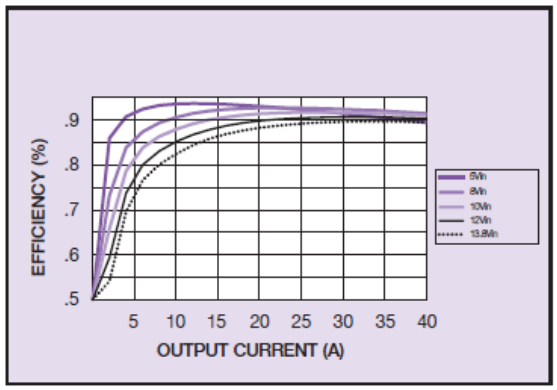


Figure 18: Efficiency (5V setpoint)

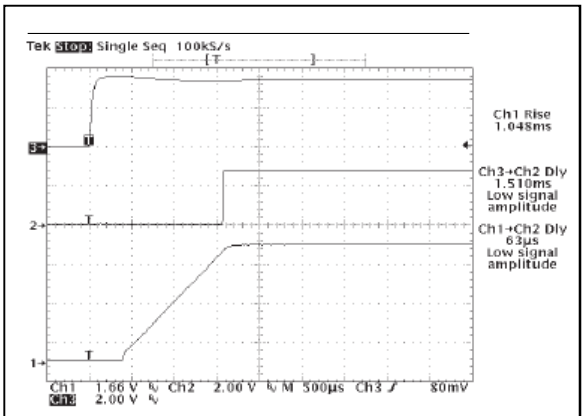


Figure 19: Control On/Off (5V setpoint)
Ch 1: Output Voltage, Ch 3: Enable

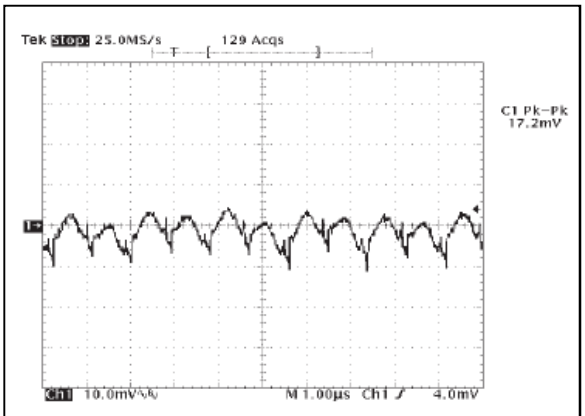


Figure 20: Typical Output Ripple (5V setpoint)

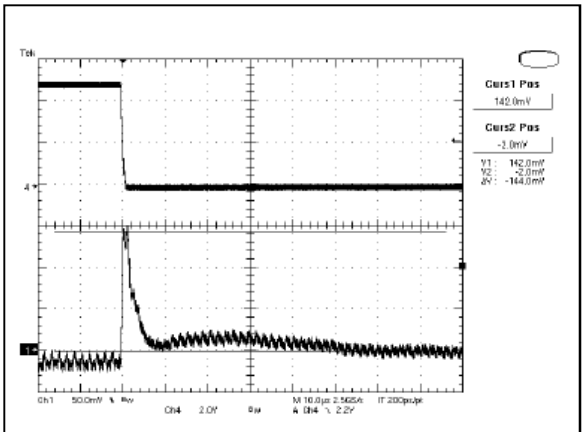


Figure 21: Transient Response 100% - 75% (5V setpoint)
Ch 1: Output Voltage Deviation, Ch 4: Current step at 4 A/div

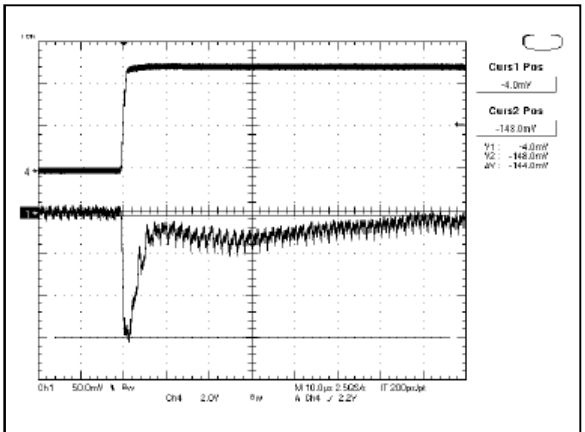


Figure 22: Transient Response 75% - 100% (5V setpoint)
Ch 1: Output Voltage Deviation, Ch 4: Current step at 4 A/div

Performance Curves - 5V setpoint

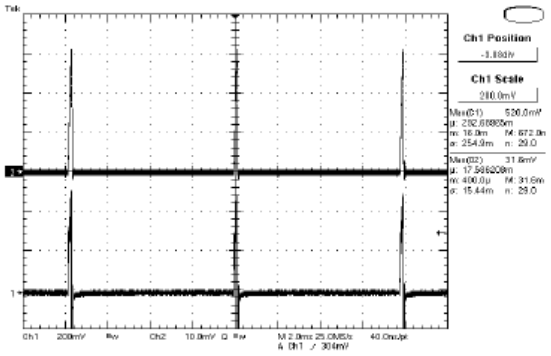
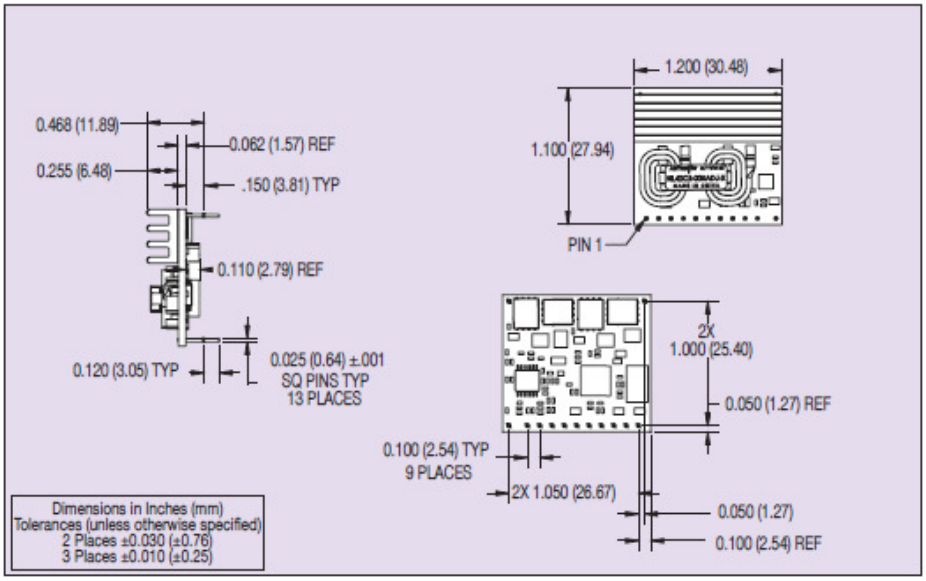


Figure 23: Short Circuit Characteristic (5V setpoint)
Ch 1: Output Voltage, Ch 2: Output Current at 50A/div

Note 1- The airflow direction should always be parallel to the heatsink fins.

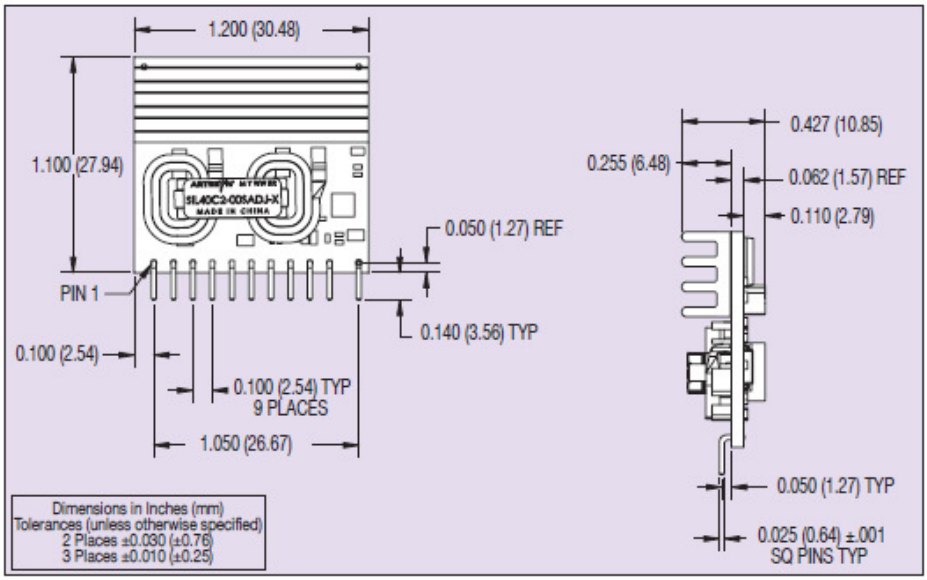
Mechanical Specifications

Mechanical Outlines – Pin Connections



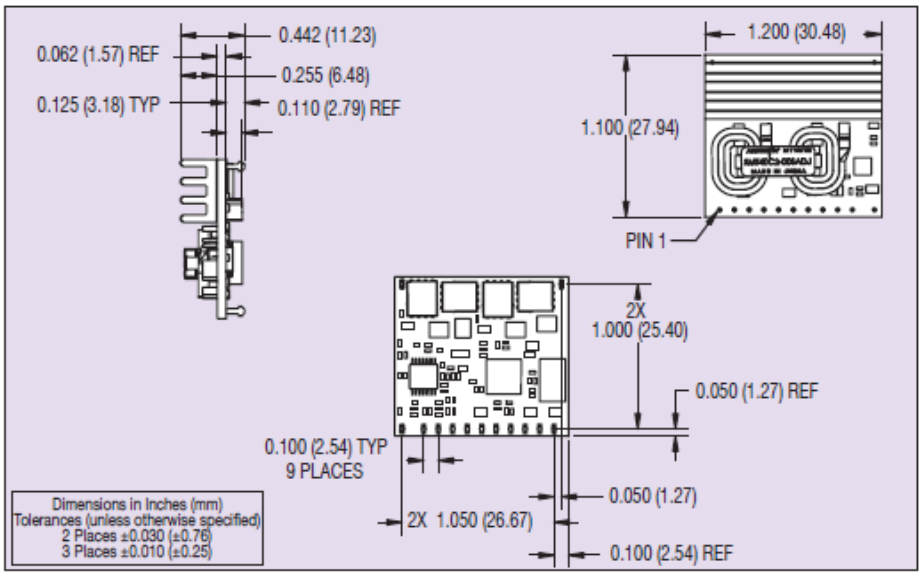
Mechanical Drawing – Horizontal

Pin No	Function
1	Vout
2	Vout
3	Vout
4	Trim
5	Enable
6	Power Good
7	Ground
8	Ground
9	(+) Sense
10	Vin
11	Vin
12	*Mech Support
13	*Mech Support



Mechanical Drawing - Vertical

Mechanical Outlines – Pin Connections



Pin No	Function
1	Vout
2	Vout
3	Vout
4	Trim
5	Enable
6	Power Good
7	Ground
8	Ground
9	(+) Sense
10	Vin
11	Vin
12	*Mech Support
13	*Mech Support

Horizontal and SMT version only

Weight

The SIL40C2 series weight is 17/0.6 g/oz. typical.

Record of Revision and Changes

Issue	Date	Description	Originators
1.0	02.04.2017	First Issue	K. Ma

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