C Class Non-Isolated

SIL30C SERIES



[2 YEAR WARRANTY]

Single output

Nide trim range (0.9V to 5.0V)
lorizontal and vertical models available
ligh power density design means reduced board space requirement
Remote sense
Power good output signal (open collector)
Dperating ambient temperature to 80°C with suitable de-rating and forced air cooling
Remote ON/OFF (active high)
Over-temperature protection
DA minimum load
nput undervoltage lockout
Over-current and short-circuit protection

Current sharing option

The SIL30C is a new high density openframe non-isolated converter series for space sensitive applications. The converter has a wide input range (10.2 to 13.8Vdc) and offers a wide 0.9 to 5V output voltage range with a 30A load. An external resistor adjusts the output voltage from its preset value of 0.9V to any value up to the 5V maximum. The SIL has a typical efficiency of 91%. The series offers remote ON/OFF, over-temperature protection and over-current protection as standard. Its current share facility supports parallel operation of multiple SIL30C units and the remote sense feature enables the SIL30C compensate for voltage drops between the converters output and the load. With full international safety approvals including EN60950 and UL/cUL60950 the SIL30C reduces compliance costs and time to market.



Absolute Maximum Ratings

Characteristic	Symbol	Min	Тур	Max	Units	Notes and Conditions
Input voltage - continuous	V _{in (cont)}	-0.3		13.8	V DC	V _{in(+)} - V _{in(-)}
Operating temperature	T _{op}	0		80	°C	Measured at thermal reference points, see Note 1. Higher ambient operation possible with forced air cooling. See de-rating curves
Power Good pull-up voltage				11	V	
Storage temperature	T _{storage}	-40		125	°C	
Output current	lout	0		30	А	

All specifications are typical at nominal input Vin = 12V, full load under any resistive load combination at 25°C unless otherwise stated.

Input Characteristics Characteristic Symbol Min Тур Max Units **Notes and Conditions** Input voltage - operating 10.2 12.0 13.8 V DC Vin (oper) Input current - no load 230 mADC Vin (min) - Vin (max), enabled lin Converter disabled Input current - Quiescent 30 mADC lin (off) Input voltage variation dv/dt Product was tested at 1.2V/ms. 1.0 V/ms Much higher dV/dt is possible (>10V/ms). Consult factory for details

Turn On/Off

Characteristic	Symbol	Min	Тур	Max	Units	Notes and Conditions
Input voltage - turn on	V _{in (on)}	8.5	9.0	9.5	V DC	
Input voltage - turn off	V _{in (off)}	7.1	7.6	8.1	V DC	
Turn on delay - enabled,	T _{delay}			30	msec	With the Remote ON/OFF signal
then power applied	(power)					asserted, this is the time from
						when the input voltage reaches
						the minimum specified operating
						voltage until the POWER GOOD
The state of the s	-					is asserted high
Iurn on delay - power	I delay (Bemote ON/OFF)			30	msec	$v_{in} = v_{in} (nom)$, then Remote ON/OFE asserted. This is the
asserted						time taken until the POWER
						GOOD is asserted high
Output to Power Good	T _{delay}			8	msec	Output voltage in full regulation
delay						to POWER GOOD asserted high
Rise time	T _{rise}		3		msec	From 10% to 90%; full resistive
						load, 2 x 680µF external
						capacitance

Signal Electrical Interface						
Characteristic - Signal Name	Symbol	Min	Тур	Max	Units	Notes and Conditions
At remote/control ON/OFF pin Open collector or equivalent compatible Control pin open circuit voltage	Vib		2.27	2.50	V	See Notes 2 and 3 See Application Note 132 for Remote ON/OFF details In = 0 uA: open circuit voltage
High level input current	lih			1	μA	Current flowing into control pin when pin is pulled high (max. at V _{ih} = 13.8V)
High level input voltage	V _{ih}	2.40			Vin	Converter guaranteed on when control pin is greater than V _{ih} (max)
Low level input voltage	v _{il}			0.80	V	Converter guaranteed off when control pin is less than V _{il} (max)
Low level input current	l _{il (max)}			1.3	mA	$V_{ii} = 0.0 V;$

Reliability	and	Service	Life

Characteristic	Symbol	Min	Тур	Max	Units	Notes and Conditions
Mean time between failure	MTBF	129,386			Hours	MIL-HDBK-217F, V _{in} = V _{in} (nom); I _{out} = I _{out} (max); ambient 25°C; ground benign environment
Mean time between failure	MTBF	4,456,655			Hours	Telcordia SR-332 Issue 3, ground benign, temp. = 40°C, V _{in} = V _{in (nom)} , I _{out} = I _{out (max)}
Mean time between failure	MTBF	TBD			Hours	Demonstrated. This entry will be periodically updated as the number of test hours increase



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Characteristic	Symbol	Min	Тур	Max	Units	Notes and Conditions
Switching frequency	F _{sw}		300		kHz	Fixed frequency
Weight			28.3		g	

Safety Agency Approvals	
Characteristic	
UL/cUL 60950 File No.	E139421
TÜV Product Service IEC 60950	Certificate No. B0211 19870 205

Material Ratings	
Characteristic - Signal Name	Notes and Conditions
Flammability rating	UL94V-0
Material type	FR4 PCB

Model Numbers

Model	Input	Output	Output Current	Typical	Max. Load
Number	Voltage	Voltage	(Max.)	Efficiency	Regulation
SIL30C-12SADJ-V	12VDC	0.9 - 5.0V	30A	91%	±1.5%
SIL30C-12SADJ-VS	12VDC	0.9 - 5.0V	30A	91%	±1.5%
SIL30C-12SADJ-H	12VDC	0.9 - 5.0V	30A	91%	±1.5%
SIL30C-12SADJ-HS	12VDC	0.9 - 5.0V	30A	91%	±1.5%

Suffix Notes:

Suffix '-V' and suffix '-H' are to be used for non-isolated current sharing applications. Suffix ''-VS' and suffix ''-HS' are to be used for isolated current sharing applications.

C Class Non-Isolated

0.9V Setpoint

Input Characteristics

Characteristic	Symbol	Min	Тур	Max	Units	Notes and Conditions
Input current - operating	l _{in}		3.65		A DC	V _{in} = V _{in (nom)} ; I _{out} = I _{out} (max.)
Reflected ripple current	^I in (ripple)		22 63		mA RMS mA pk-pk	l _{out} = l _{out (max.)} , measured with external filter. See Application Note 132 for details
Input capacitance - internal filter	C _{input}		18.8		μF	
Input capacitance - external external input	C _{bypass}		270		μF	Recommended customer added capacitance. Maximum ESR = 20mΩ See Application Note 132 for ripple current requirements

0.9V Setpoint

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Тур	Max	Units	Notes and Conditions
Nominal set-point voltage	Vo (nom)	0.873	0.900	0.927	V DC	V _{in} = V _{in (nom)} ; I _{out} = I _{out} (NL) Worst case condition over line, load, temperature and life
Line regulation				0.2	%	V _{in (min)} to V _{in (max)}
Load regulation				1.5	%	Vin = Vin (nom); l _{out (min)} to lout (max)
Output current continuous	lout	0		30	A DC	
Output current - short circuit	I _{SC}		10		A rms	Continuous, unit auto recovers from short, V _O < 100mV
Output voltage - noise	V _{p-p} V _{rms}			40 15	mV pk-pk mV rms	Measurement bandwidth 20 MHz See Application Note 132 for measurement set-up details
Current sharing			10		%	I _{out} = I _{out} (max)



C Class Non-Isolated

0.9V Setpoint

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Тур	Max	Units	Notes and Conditions
Load transient response - peak deviation	V _{dynamic}		75		mV	Peak deviation for 50% to 75% step load, di/dt = 10A/µsec
Load transient response - recovery	T _{recovery}		150		µsec	Settling time to within 1% of output set point voltage for 50% to 75% step load
External load capacitance	C _{ext}		1,360		μF	Maximum capacitor value may vary with load conditions. Consult factory for details Max ESR = $12m\Omega$ See Application Note 132 for output capacitance values vs. stability

0.9V Setpoint

Protection and Control Features

Characteristic	Symbol	Min	Тур	Max	Units	Notes and Conditions
Overcurrent limit inception Open sense voltage	l _{oc}		43 0.9		A DC V DC	V _o = 90% of V _{o (nom)} Sense pins not connected

0.9V Setpoint

Efficiency

Characteristic	Symbol	Min	Тур	Max	Units	Notes and Conditions
Efficiency	h	66.8	68.8		%	I _{out} = 100% lout (max), V _{in} = V _{in} (nom)
Efficiency	h	71.6	73.6		%	l _{out} = 50% l _{out} (max), V _{in} = V _{in} (nom)

C Class Non-Isolated

2.5V Setpoint

Input Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input current - operating Reflected ripple current	l _{in} l _{in (ripple)}		7.59 35		A DC mA RMS	V _{in} = V _{in (nom)} ; I _{out} = I _{out} (max.) I _{out} = I _{out} (max.), measured
Input capacitance - internal filter	C _{input}		150 18.80		mA pk-pk μF	with external filter. See Application Note 132 for details
Input capacitance - external external input	C _{bypass}		270		μF	Recommended customer added capacitance. Maximum ESR = 20mΩ See Application Note 132 for ripple current requirements

2.5V Setpoint

Electrical Characteristics – O/P

Characteristic	Symbol	Min	Тур	Max	Units	Notes and Conditions
Nominal set-point voltage	Vo (nom)	2.425	2.575	2.563	V DC	V _{in} = V _{in (nom)} ; I _{out} = I _{out (NL)} Worst case condition over line, load, temperature and life
Line regulation				±0.2	%	I _{out} = V _{in (min)} to V _{in (max)}
Load regulation				±1	%	V _{in} = V _{in (nom)} ; I _{out (min)} to I _{out (max)}
Output current continuous	lout	0		30	A DC	
Output current - short circuit	I _{sc}		23.9		A rms	Continuous, unit auto recovers from short, V _O < 100mV
Output voltage - noise	V _{p-p} V _{rms}			50 15	mV pk-pk mV rms	Measurement bandwidth 20 MHz See Application Note 132 for measurement set-up details
Current sharing			±10		%	l _{out} = l _{out} (max)



C Class Non-Isolated

2.5V Setpoint

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Тур	Max	Units	Notes and Conditions
Load transient response - peak deviation	V _{dynamic}		75		mV	Peak deviation for 50% to 75% step load, di/dt = 10A/µsec
Load transient response - recovery	T _{recovery}		150		µsec	Settling time to within 1% of output set point voltage for 50% to 75% step load
External load capacitance	C _{ext}		1360		μF	Maximum capacitor value may vary with load conditions. Consult factory for details Max ESR = $12m\Omega$ See Application Note 132 for output capacitance values vs. stability

2.5V Setpoint

Protection and Control Features

Characteristic	Symbol	Min	Тур	Max	Units	Notes and Conditions
Overcurrent limit inception Open sense voltage	l _{oc}		42 2.5		A DC V DC	V _o = 90% of V _{o (nom)} Sense pins not connected

2.5V Setpoint

Efficiency

Characteristic	Symbol	Min	Тур	Max	Units	Notes and Conditions
Efficiency	h	81.3	83.3		%	l _{out} = 100% lout (max), V _{in} = V _{in} (nom)
Efficiency	h	84.9	86.9		%	$ I_{out} = 50\% I_{out} \text{ (max)}, $ $ V_{in} = V_{in} \text{ (nom)} $

C Class Non-Isolated

5V Setpoint

Input Characteristics

Characteristic	Symbol	Min	Тур	Max	Units	Notes and Conditions
Input current - operating	l _{in}		13.62		A DC	V _{in} = V _{in (nom)} ; I _{out} = I _{out} (max.)
Reflected ripple current	^I in (ripple)		15 50		mA RMS mA pk-pk	l _{out} = l _{out (max.)} , measured with external filter. See Application Note 132 for details
Input capacitance - internal filter	C _{input}		18.8		μF	
Input capacitance - external external input	C _{bypass}		270		μF	Recommended customer added capacitance. Maximum ESR = $20m\Omega$ See Application Note 132 for ripple current requirements

5V Setpoint

Electrical Characteristics - O/P

Electrical characteristics of						
Characteristic	Symbol	Min	Тур	Max	Units	Notes and Conditions
Nominal set-point voltage	Vo (nom)	4.85	5.15	5.125	V DC	Vin = Vin (nom); Iout = Iout (NL) Worst case condition over line, load, temperature and life
Line regulation				±0.2	%	I _{out} = V _{in (min)} to V _{in (max)}
Load regulation				±1	%	V _{in} = V _{in (nom)} ; l _{out (min)} to l _{out (max)}
Output current continuous	lout	0		30	A DC	
Output current - short circuit	I _{sc}			23.9	A rms	Continuous, unit auto recovers from short, V _O < 100mV
Output voltage - noise	V _{p-p}			50	mV pk-pk	Measurement bandwidth 20 MHz
	V _{rms}			15	mV rms	See Application Note 132 for measurement set-up details
Current sharing				±10	%	I _{out} = I _{out} (max)



C Class Non-Isolated

5V Setpoint

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Тур	Max	Units	Notes and Conditions
Load transient response - peak deviation	V _{dynamic}		75		mV	Peak deviation for 50% to 75% step load, di/dt = 10A/µsec
Load transient response - recovery	T _{recovery}		150		µsec	Settling time to within 1% of output set point voltage for 50% to 75% step load
External load capacitance	C _{ext}		1360		μF	Maximum capacitor value may vary with load conditions. Consult factory for details Max ESR = $12m\Omega$ See Application Note 132 for output capacitance values vs. stability

5V Setpoint

Protection and Control Features

Characteristic	Symbol	Min	Тур	Max	Units	Notes and Conditions
Overcurrent limit inception Open sense voltage	l _{oc}		41 5		A DC V DC	V _o = 90% of V _{o (nom)} Sense pins not connected

5V Setpoint

Efficiency

Characteristic	Symbol	Min	Тур	Max	Units	Notes and Conditions
Efficiency	h	88.8	90.8		%	l _{out} = 100% lout (max), V _{in} = V _{in} (nom)
Efficiency	h	90.7	92.7		%	l _{out} = 50% l _{out (max)} , V _{in} = V _{in (nom)}





Figure 1: Thermal De-rating Curve



Figure 3: Short Circuit Characteristic (Channel 1: Output Current at 10A/div, Channel 4: Output Voltage)







Figure 2: Efficiency vs Load and Line







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Figure 9: Thermal De-rating Curve



Figure 11: Short Circuit Characteristic (Channel 1: Output Current at 10A/div, Channel 4: Output Voltage)







Figure 10: Efficiency vs Load and Line



Figure 12: Transient Response 50-75% (Channel 1: Current load step at 2A/div, Channel 4: Output Voltage deviation)



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C Class Non-Isolated



30A DC/DC Converter

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Figure 17: Thermal De-rating Curve



Figure 19: Short Circuit Characteristic (Channel 1: Output Current at 10A/div, Channel 4: Output Voltage)



Figure 21: Transient Response 75 - 50% (Channel 1: Current load step at 2A/div, Channel 4: Output Voltage deviation)



Figure 18: Efficiency vs Load and Line







(Channel 2: DC Input, Channel 3: Power Good Channel 4: Output Voltage)

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Figure 24: Typical Ripple and Noise

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Figure 25: Mechanical Drawing - Horizontal



Figure 26: Mechanical Drawing - Vertical



Note 1

Thermal reference point is defined as the highest temperature measured at any one of the specified thermal reference points. See Figure 19: Thermal reference point.

Note 2

The control pin is referenced to Vin-

Note 3

The SIL30C is supplied as standard with active High logic. Control input pulled low: Unit Disabled Control input left open: Unit Enabled

Note 4

Thermal reference set up: Unit mounted on an edge card test board 215mm x 115mm. Test board mounted vertically. For test details and recommended set-up see Application Note 132.

Note 5

3-200Hz, sweep at 1/2 octave/min from low to high frequency, and then from high to low. Thirty minute dwell at all resonant points.

CAUTION: Hazardous internal voltages and high temperatures. Ensure that unit is accessible only to trained personnel. The user must provide the recommended fusing in order to comply with safety approvals.





Pin Connections	
Pin No.	Function
1	TRIM
2	No Pin
3	Ground
4	POWER GOOD
5	Not Connected
6	Current Share
7	Ground
8	Ground
9	Remote ON/OFF
10	Remote Sense (GND)
11	Remote Sense (O/P)
12	Vin
13	Vin
14	Vin
15	Vout
16	Vout
17	Ground
18	Vout
19	Ground
20	Vout
21	Ground
22	Vout
23	Ground
24	Vout

Figure 28: Dimensions and Pinout



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+852 2699 2868

♦+353 24 93130

≪+43 1 80150

800 769 7274 ♦+508 628 5600

SIL30C Series 30A DC/DC Converter