



Lambda's new X10 Series of Power Modules are ideally suited for Telecommunications and Network applications.

X10

Series Power Modules

PRODUCT SPECIFICATIONS

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Table of Contents

1. ABSOLUTE MAXIMUM RATINGS	2
2. ELECTRICAL SPECIFICATIONS	2
Table 1. Input Specifications	2
Table 2. Output Specifications	3
Table 3. Isolation Specifications	4
Table 4. General Specifications	4
Table 5. Feature Specifications	5
3. OUTLINE DIAGRAM/RECOMMENDED HOLE PATTERN	6
4. DE-RATING CURVE FOR X10 SERIES	7
5. PART NUMBER DESCRIPTION	8
Table 6. Option Codes	8

1. Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operations section of the X10 Application Manual. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Module	Symbol	Min	Typ	Max	Unit
Input Voltage: Continuous	X10-24	V_i	0	–	50	Vdc
	X10-48	V_i	0	–	80	Vdc
	X10-48	$V_i, trans$	0	–	100	V
Transient (100 ms)	X10-48	$V_i, trans$	0	–	100	V
Operating Case Temperature (See Derating Curves**)	All	T_c	-40	–	105*	°C
Storage Temperature	All	T_{stg}	-55	–	125	°C
I/O Isolation	All	–	–	–	1500	Vdc

*Maximum case temperature varies based on power dissipation. See derating curves.

**Refer to the Application Manual for all figures.

2. Electrical Specifications

Table 1. Input Specifications

Parameter	Module	Symbol	Min	Typ	Max	Unit
Operating Input Voltage	X10-24	V_i	18	24	36	Vdc
	X10-48	V_i	36	48	75	Vdc
Maximum Input Current ($V_i=0$ to V_i, max ; $I_o=I_o, max$; see figures*)	X10-24	I_i, max	–	–	1.6	A
	X10-48	I_i, max	–	–	800	mA
Inrush Transient	All	I^2t	–	–	0.2	A ² s
Input reflected-ripple Current (5 Hz to 20 MHz; 12 μ H source impedance; $T_A=25$ °C; see Figures*.)	All	I_i	–	5	–	mAp-p
Input Ripple Rejection (100 Hz-120 Hz)	All	–	–	45	–	dB

*Refer to the Application Manual for all figures.

Fusing Considerations

CAUTION: This power module is not internally fused. An input line fuse must always be used.

This encapsulated power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of a sophisticated power architecture. To preserve maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse. The safety agencies require a normal-blow, dc fuse with a maximum rating of 5 A. Based on the information provided in this data sheet on inrush energy and maximum dc input current, the same type of fuse with a lower rating can be used. Refer to the fuse manufacturer's data for further information.

Table 2. Output Specifications

Parameter	Module Suffix	Symbol	Min	Typ	Max	Unit	
Output Voltage Set Point ($V_i=V_i$, nom; $I_o=I_o$, max; $T_A = 25\text{ }^\circ\text{C}$)	S03	V_o , set	3.17	3.3	3.43	Vdc	
	S05	V_o , set	4.80	5.0	5.20	Vdc	
	S12	V_o , set	11.52	12.0	12.48	Vdc	
	D12	V_{o1} , set V_{o2} , set	11.40 -11.40	12.0 -12.0	12.60 -12.60	Vdc Vdc	
Output Voltage (Over all line, load, and temperature conditions until end of life; See figures*)	S03	V_o , set	3.13	–	3.47	Vdc	
	S05	V_o , set	4.75	–	5.25	Vdc	
	S12	V_o , set	11.40	–	12.60	Vdc	
	D12	V_{o1} , set V_{o2} , set	10.80 -10.80	– –	13.20 -13.20	Vdc Vdc	
Output Regulation (see figures)* (Line ($V_i=V_i$, min to V_i , max) Load ($I_o=I_o$, min to I_o , max) Temperature ($T_c = -40\text{ }^\circ\text{C}$ to $+85\text{ }^\circ\text{C}$)	S03,S05, S12	–	–	–	5	mV	
		–	–	0.01	0.1	% V_o	
	S03,S05, S12	–	–	–	10	mV	
		–	–	0.1	0.2	% V_o	
S03,S05, S12	–	–	25	100	mV		
S12	–	–	–	.5	2.0	% V_o	
Output Ripple and Noise (Across 2x 0.47 μF ceramic capacitors, see figures*.); RMS Peak-to-Peak (5 Hz to 20 MHz)	S03,S05, S12 D12	–	–	–	30	mVrms	
		–	–	–	35	mVrms	
		–	–	–	50	mVrms	
	S03,S05, S12 D12	–	–	–	–	100	mVp-p
		–	–	–	–	120	mVp-p
		–	–	–	–	150	mVp-p
External Load Capacitance	S03, S05, S12	–	–	–	10000	μF	
Output Current (At $I_o < I_o$, min, the modules may exceed output ripple specifications, but operation is guaranteed.)	S03	I_o	0.15	–	2.42	A	
	S05	I_o	0.1	–	2.0	A	
	S12	I_o	0.08	–	0.83	A	
	D12	I_{o1} , I_{o2}	0.06	–	0.42	A	
Output Current-limit Inception ($V_o=90\%$ V_o , set; see figures*.)	S03	I_o	–	–	5	A	
	S05	I_o	–	–	4	A	
	S12	I_o	–	–	2.5	A	
	D12	I_{o1} , I_{o2}	–	–	2.5	A	
Output Short-circuit Current ($V_o=0.25\text{ V}$)	S03	I_o	–	–	7.5	A	
	S05	I_o	–	–	6	A	
	S12	I_o	–	–	3.5	A	
	D12	I_{o1} , I_{o2}	–	–	3.5	A	

*Refer to the Application Manual for all figures.

Electrical Specifications *(continued)*

Table 2. Output Specifications *(continued)*

Parameter	Module Suffix	Symbol	Min	Typ	Max	Unit
Efficiency ($V_i=V_i, \text{ nom}; I_o=I_o, \text{ max}; T_A = 25 \text{ }^\circ\text{C}$) see figures*	24-S03	η	76	78	–	%
	24-S05,S12	η	78	80	–	%
	24-D12	η	79	81	–	%
	48-S03	η	76	78	–	%
	48-S05,S12	η	79	81	–	%
	48-D12	η	80	82	–	%
Switching Frequency	All	–	–	265	–	kHz
Dynamic Response (for duals; I_{o1} or $I_{o2}=I_o$ max; $\Delta I_o/\Delta t=1\text{A}/10 \mu\text{s}$; $V_i=V_i, \text{ nom}$; $T_A=25^\circ\text{C}$; see figures*): Load Change from $I_o=50\%$ to 75% of I_o , max: ($C_o<1000\mu\text{F}$, 12v model $C_o<200\mu\text{F}$) Peak Deviation Settling Time ($V_o < 10\%$ of peak deviation) Load Change from $I_o =50\%$ to 25% of I_o , max: Peak Deviation Settling Time ($V_o < 10\%$ of peak deviation)	All	–	–	2	–	% $V_o.\text{set}$
	All	–	–	0.8	–	ms
	All	–	–	2	–	% $V_o.\text{set}$
	All	–	–	0.8	–	ms

*Refer to the Application Manual for all figures.

Table 3. Isolation Specifications

Parameter	Min	Typ	Max	Unit
Isolation Capacitance	–	600	–	pF
Isolation Resistance	10	–	–	M Ω

Table 4. General Specifications

Parameter	Min	Typ	Max	Unit
Calculated MTBF ($I_o = 80\%$ of $I_o, \text{ max}$; $T_a = 40^\circ\text{C}$, Bellcore method):	–	2,600,000	–	Hours
Weight	–	–	28.3 (1.0)	g. (oz.)
Hand Soldering (soldering iron 3 mm (0.125 in.) tip, 425°C)	–	–	12	s

Electrical Specifications (continued)

Table 5. Feature Specifications

Parameter	Module Suffix	Symbol	Min	Typ	Max	Unit
Remote On/Off Signal Interface (optional): ($V_i=0$ V to V_i , max; open collector or equivalent compatible; signal referenced to V_i (-) terminal., see Figures*.): Positive Logic-Device Code Suffix/P: Logic Low-Module Off Logic High-Module On Negative Logic-Device Code Suffix/N: Logic Low-Module On Logic High-Module Off Module Specifications: On/Off Current-Logic Low On/Of Voltage: Logic Low Logic High ($I_{on/off}=0$) Open Collector Switch Specifications: Leakage Current During Logic High ($V_{on/off}=10$ V) Output Low Voltage During Logic Low ($I_{on/off} = 1$ mA)						
	All	$I_{on/off}$	–	–	1.0	mA
	All	$V_{on/off}$	-0.7	–	1.2	V
	All	$V_{on/off}$	–	–	10	V
	All	$I_{on/off}$	–	–	50	μ A
	All	$V_{on/off}$	–	–	1.2	V
Turn-on Delay and Rise Times (At 80% of I_o , max; $T_A= 25$ °C; see Figures*.): Case 1: On/Off Input is Set for Unit on, an Input Power is Applied (delay for point at which $V_i=V_i$, min until $V_o =10\%$ of $V_{o,nom}$, $C_{load} = 1000$ uF). Case 2: Input Power is Applied for at Least One Second, and then the On/Off Input is Set to Turn the Module On (delay from point at which on/off input is toggled until $V_o = 10\%$ of $V_{o,nom}$, $C_{load} = 1000$ uF). Output Voltage Rise Time (Time for V_o to rise from 10% of $V_{o,nom}$ to 90% of $V_{o,nom}$) Output Voltage Overshoot (at 80% of I_o , max $T_A = 25$ °C)						
	All	T_{delay}	–	5	20	ms
	All	T_{delay}	–	1	10	ms
	All	T_{rise}	–	0.2	5	ms
	All	–	–	–	5	%

*Refer to the Application Manual for all figures.

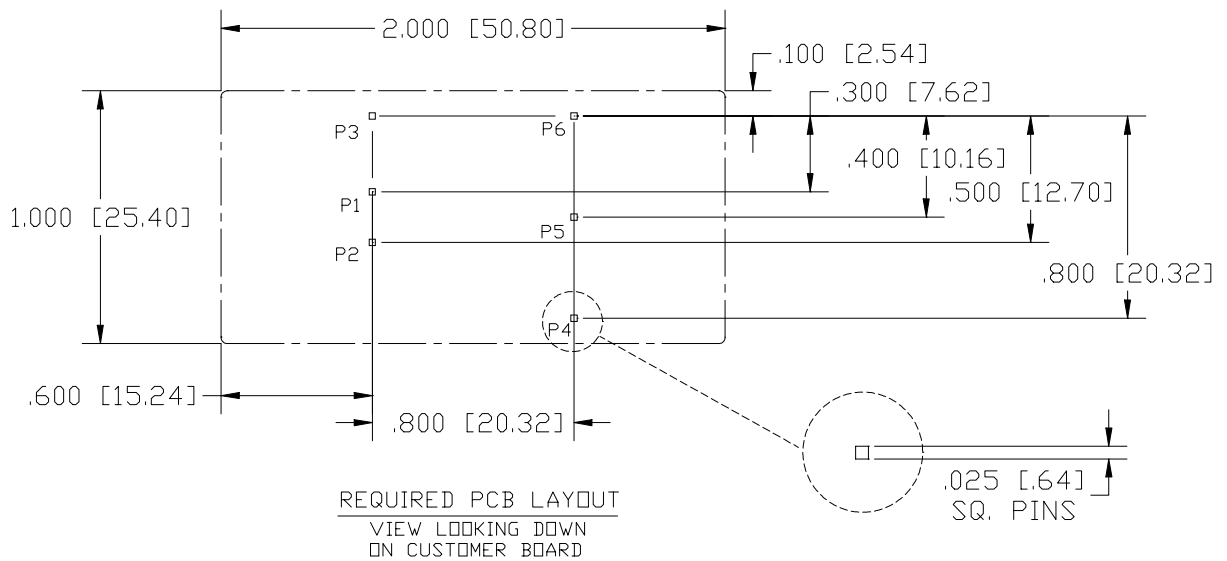
Parameter	Module Suffix	Symbol	Min	Typ	Max	Unit
Output Voltage Set-point Adjustment Range (optional: single outputs only)	S03, S05, S12,	-	90	-	110	%Vo,nom
Output Overvoltage Clamp	S03	Vo clamp	3.7	-	5.7	V
	S05	Vo clamp	5.6	-	7.0	V
	S12	Vo clamp	13.2	-	16.0	V
	D12	Vo1 clamp	13.2	-	18.0	V
		Vo2 clamp	-13.2	-	-18.0	V
Undervoltage Lockout (Turn off, hysteresis = 3v (X1024), 6v (X1048))	X10-24	Vuvlo	11	14	-	V
	X10-48	Vuvlo	20	27	-	V

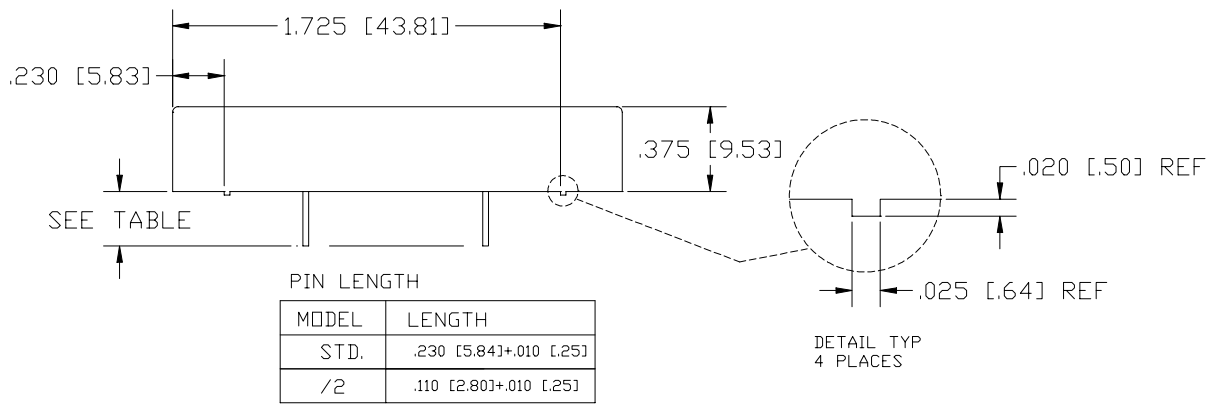
3. Outline Diagram/Recommended Hole Pattern

Dimensions are in inches and (mm).

Tolerance: .xx ± 0.01 (.25 mm), .xxx ± .005 (.13 mm)

If slightly lower height is needed, the four standoffs can be dropped through holes on the user's PWB. By dropping the standoffs through the PWB, the module height will be decreased to 9.6 mm (0.380 in.) typical height.



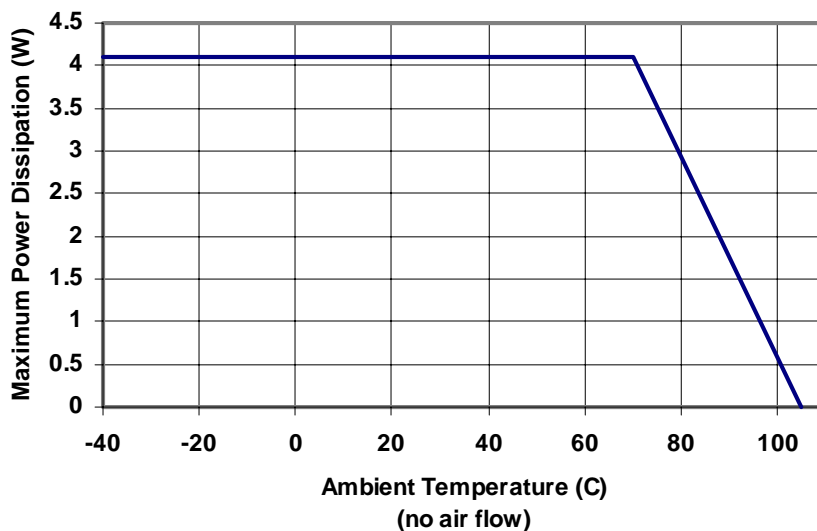


*Unless specified as an option, all units come with the standard .230 [5.84]+.010 [.25]

Pin	Function	Pin	Function
P1	Vi(-)	P4	Vo(+) or Vo1(+)
P2	Vi(+)	P5	COMMON (dual outputs) or TRIM (optional on single outputs) Pin is not present on single outputs unless option is specified. Pin is always present on dual outputs.
P3	ON/OFF (optional) Pin is not present unless option is specified.	P6	Vo(-) or Vo2(-)

4. De-rating Curve for X10 Series

De-rating Curve for X1024,1048



5. Part Number Description

X ↓ Series	10 ↓ Output Power 10 = 10 Watt	48 ↓ Input Voltage 24 = 24V 48 = 48V	S ↓ Single/Dual Output S = Single Output D = Dual Output	03 ↓ Output Voltage 03 = 3.3V 05 = 5V 12 = 12V	/xxx ↓ Option Code (see table 6)
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Table 6. Option Codes

Optional features may be ordered using the device code suffixes shown below.

Option	Model Suffix
Output voltage adjustment. Not available on dual output models.	/T
Short pin: 2.8 mm ± 0.25 mm (0.110 in. ± 0.010 in.)	/2
Positive logic remote on/off	/P
Negative logic remote on/off	/N
Positive logic remote on/off and short pin [2.8mm ± .25 mm (0.110 in. ± 0.010 in.)]	/P2
Output voltage adjustment and short pin [2.8mm ± .25 mm (0.110 in. ± 0.010 in.)] Not available on dual output models.	/T2
Positive logic remote on/off and output voltage adjustment. Not available on dual output models.	/PT
Positive logic remote on/off, output voltage adjustment and short pin [2.8mm ± .25 mm (0.110 in.± 0.010 in.)] Not available on dual output models.	/PT2
Negative Logic remote on/off and short pin [2.8mm ± .25 mm (0.110 in. ± 0.010 in.)]	/N2
Negative logic remote on/off and output voltage adjustment. Not available on dual output models.	/NT
Negative logic remote on/off, output voltage adjustment and short pin [2.8mm ± .25 mm (0.110 in. ± 0.010 in.)] Not available on dual output models.	/NT2

Example 1: X10-48S05

X10 Family
 48: Volts Input
 S05: Single Output, 5 Volts
 Standard pin: .230 [5.84] + .010 [.25]
 No options

Example 2: X10-48S05/PT2

X10 Family
 48 Volts Input
 S05: Single Output, 5 volts
 Positive logic remote on/off, output voltage adjustment and short pin [2.8mm ± .25 mm (0.110 in.± 0.010 in.)]