

DESCRIPTION

The VR110 Series is designed to meet the fast load transients required by Intel® Xeon® processors and is fully compliant with the latest Intel® VRM 11.0 specifications. High efficiency of 84% at full load for reduced power dissipation simplifies system thermal management. Available in 2U, 1.5U, 1U and new 0.66U form factors, the VR110 Series is ideal for use in a wide variety of server applications.

FEATURES

- Intel® VRM 11.0 compliant
- 4 height options 2.5", 1.86", 1.18" and 0.78" (63.5mm, 47.2mm, 29.9mm and 19.9mm)
- DAC programmable output voltage
- Power good output signal
- Differential remote sense
- Remote enable
- Supervisory functions
 - Output overcurrent
 - Short circuit protection
 - Overtemperature indicator
 - Output current level indicator
- Tri-state output when disabled
- Dynamic VID capability
- EN/IEC60950-1 Safety Approval (CB Report)



SELECTION GUIDE - STANDARD LOAD LINE

Model	Input Voltage Range (V)	Output Voltage Range (V)	Peak Current (A)	Device Height	Application Height
VR110B150CS-1C	11.04 – 12.60	0.81875 – 1.60	150	2.5" (63.5mm)	2U
VR110B150CL-1C				1.86" (47.2mm)	1.5U
VR110B150CU-1C				1.18" (29.9mm)	1U
VR110B080CU-1C			80	1.18" (29.9mm)	1U
VR110B080CA-1C				0.78" (19.9mm)	<1U

INPUT CHARACTERISTICS - ALL MODELS

Parameter	Conditions ①	MIN.	TYP.	MAX.	Units
Input voltage operating range		11.04	12.0	12.60	V
Under voltage lockout VR110B080CA-1C only	Turn-on threshold		9.5		V
	Turn-off threshold		8.2		
	Hysteresis voltage		1.4		
Under voltage lockout All other models	Turn-on threshold		5.8		V
	Turn-off threshold		5.0		
	Hysteresis voltage		0.85		
Maximum input current	Typical: 130A, 1.325VID		15.3		A
	Max: 150A, 1.6VID			22.4	
No-load input current	Enable state, no load		300		mA
Recommended input capacitance	Nichicon RHT1C331MDN1		2		each
Disabled input current	Disabled state		40		mA
Enable - positive logic	On state range	0.9		5.0	V
	Off state range	-0.3		0.4	

OUTPUT CHARACTERISTICS - 150A Models

Parameter	Conditions ①	MIN.	TYP.	MAX.	Units
Output voltage range	7-Bit DAC controlled	0.81875		1.6	V
Line regulation		-2	0	2	mV
Load Line ②		1.22	1.25	1.28	mΩ
Ripple & noise ③	20MHz bandwidth		6.4		mVp-p
Output current range	Continuous (TDC)	0		130	A
	Peak, <10 mS	0		150	
Efficiency for 11.0 TDC	IO = 130A, VID = 1.325	83	84		%
Turn-on time	VIN present: enable to 90% VOUT		4	10	mS
Transient response ④	100A step, 100A/μS, ΔVo, Adj	120	125	130	mV
Remote sense ⑤	Compensation range			300	mV
Recommended ceramic ⑥	Murata GRM Series or equivalent	46	50		each
Recommended bulk output	UCC 4PS560MH11 or equivalent	10	17		

OUTPUT CHARACTERISTICS - 80A Models

Parameter	Conditions ①	MIN.	TYP.	MAX.	Units
Output voltage range	7-Bit DAC controlled	0.81875		1.6	V
Line regulation VR110B080CU-1C VR110B080CA-1C		-2	0	2	mV
		-4	0	3	
Load Line ②		1.22	1.25	1.28	mΩ
Ripple & noise ③	20MHz bandwidth		6.4		mVp-p
Output current range	Continuous (TDC)	0		70	A
	Peak, <10 mS	0		80	
Efficiency for 11.0 TDC VR110B080CU-1C VR110B080CA-1C	IO = 70A, VID = 1.325	85	87		%
	IO = 70A, VID = 1.325	86	88		%
Turn-on time	VIN present: enable to 90% VOUT		4	10	mS
Transient response ④	40A step, 100A/μS, ΔVo, Adj	45	50	55	mV
Remote sense ⑤	Compensation range			300	mV
Recommended ceramic ⑥	Murata GRM Series or equivalent	46	50		Each
Recommended bulk output	UCC 4PS560MH11 or equivalent	10	17		

GENERAL CHARACTERISTICS					
Parameter	Conditions ①	MIN.	TYP.	MAX.	Units
Operating temperature range		0		65	°C
Storage temperature range	Non-condensing	-40		85	
MTBF 150A models 80A models	Calculated (RAC PRISM) 45°C			1.097 1.118	x10 ⁶ Hrs
Switching frequency	Per phase		300		KHz
Material flammability		UL 94V-0			
Safety Agency Approval	IEC/EN60950-1	VDE REG.-Nr. C663/CB Certificate #DE1-39070			

MECHANICAL CHARACTERISTICS				
Parameter	Form Factor	Part Number	US (L x W x H)	Metric (L x W x H)
Dimensions	2U	VR110B150CS-1C	3.8" x 0.870" x 2.5"	96.52mm x 22.10mm x 63.50mm
	1.5U	VR110B150CL-1C	3.8" x 1.0" x 1.86"	96.52mm x 24.50mm x 47.24mm
	1U	VR110B150CU-1C	3.8" x 0.870" x 1.18"	96.52mm x 22.10mm x 29.97mm
	1U	VR110B080CU-1C	3.8" x 0.475" x 1.18"	96.52mm x 12.07mm x 29.97mm
	0.66U	VR110B080CA-1C	3.675" x 0.75" x 0.782"	93.35mm x 19.05mm x 19.86mm
Parameter	Form Factor	Part Number	US (oz)	Metric (g)
Weight	2U	VR110B150CS-1C	3.53	100
	1.5U	VR110B150CL-1C	3.0	85
	1U	VR110B150CU-1C	3.0	85
	1U	VR110B080CU-1C	1.06	30
	0.66U	VR110B080CA-1C	TBD	TBD

PROTECTION CHARACTERISTICS – 150A Models					
Parameter	Conditions ①	MIN.	TYP.	MAX.	Units
Output overcurrent shutdown	Latching	160		190	A
Overvoltage shutdown	Latching, above VID	100	150	200	mV
Overtemperature indicator	Non-latching, at hot spots		125		°C
	Worst case junction temperature				
Load indicator 150A	VID = 1.325	0A load	0.0	0.22	V
		75A load	0.9	1.2	
		150A load	1.7	2.4	

PROTECTION CHARACTERISTICS – VR110B080CU-1C (80A, 1U, No heatsink)					
Parameter	Conditions ①	MIN.	TYP.	MAX.	Units
Output overcurrent shutdown	Latching	83		115	A
Overvoltage shutdown	Latching, above VID	100	150	200	mV
Overtemperature indicator	Non-latching, at hot spots		125		°C
	Worst case junction temperature				
Load indicator 80A	VID = 1.325	0A load	0.0	0.22	V
		40A load	0.9	1.2	
		80A load	1.7	2.4	

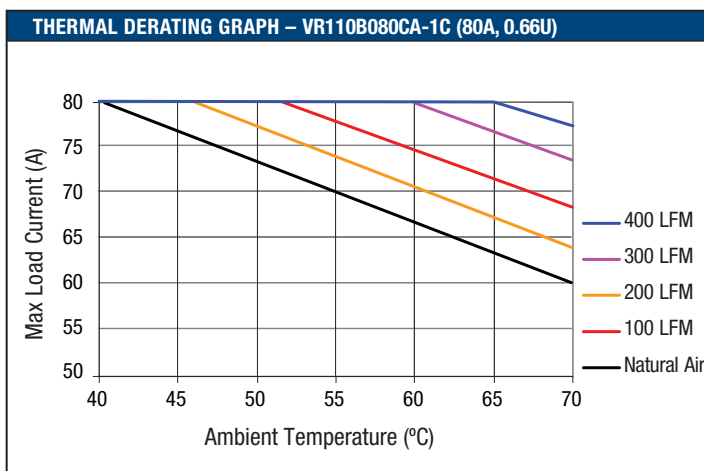
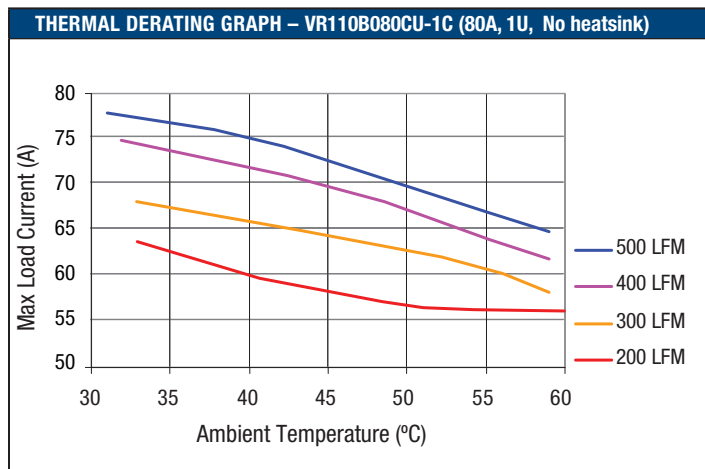
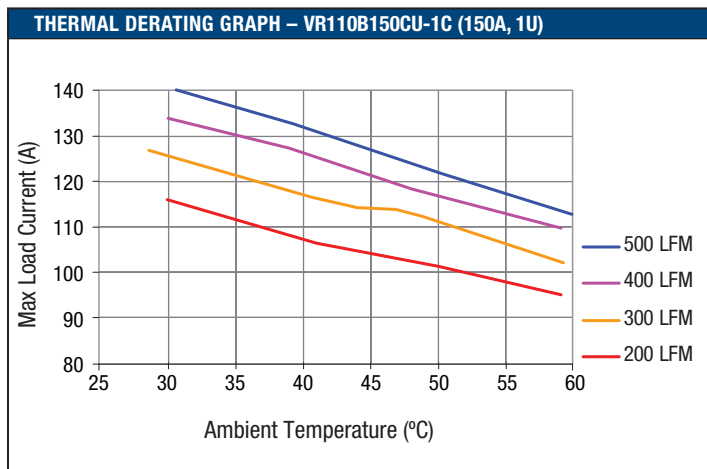
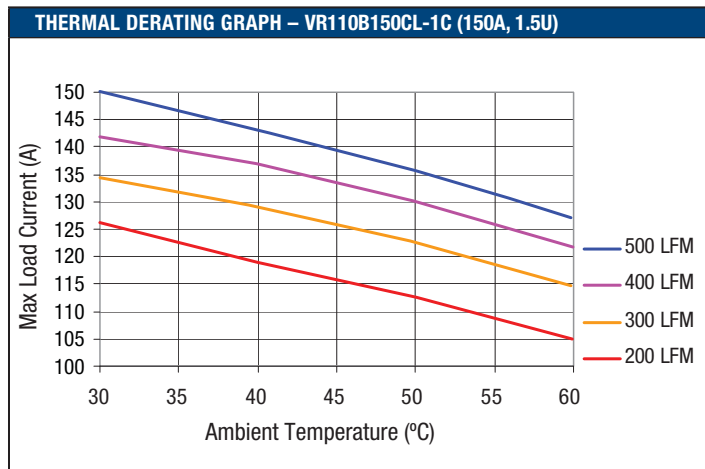
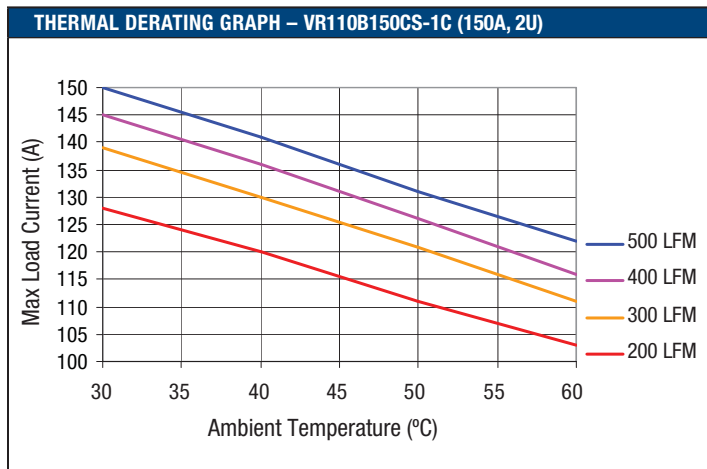
PROTECTION CHARACTERISTICS – VR110B080CA-1C (80A, 0.66U)					
Parameter	Conditions ①	MIN.	TYP.	MAX.	Units
Output overcurrent shutdown	Non-latching	90		115	A
Overvoltage shutdown	Non-latching, above VID	150	175	200	mV
Overtemperature indicator	Non-latching, at hot spots		125		°C
	Worst case junction temperature				
Load indicator 80A	VID = 1.325	0A load	0.02	0.17	V
		40A load	0.55	0.75	
		80A load	1.1	1.5	

NOTES

- ① $V_{IN} = 12V_{dc}$, $T_A = 25^\circ C$, Airflow = 400LFM unless otherwise noted.
- ② The output impedance is 1.25mΩ.
- ③ Output ripple voltage is specified when measured with Intel® specified capacitance at the output of the converter.
- ④ Transient response is specified with Intel® specified capacitors at the output of the converter.
- ⑤ If remote sense is not required or used, the Sense(+) and Sense(-) pins must be connected to Vo(+) and Vo(-) respectively.
- ⑥ 10μF ceramic X5R or X6S.

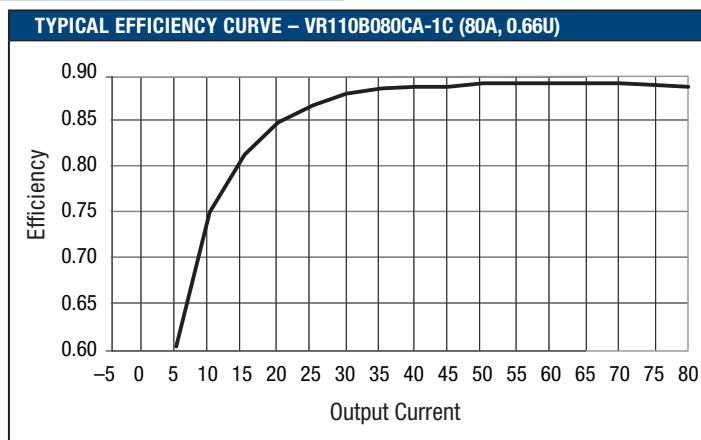
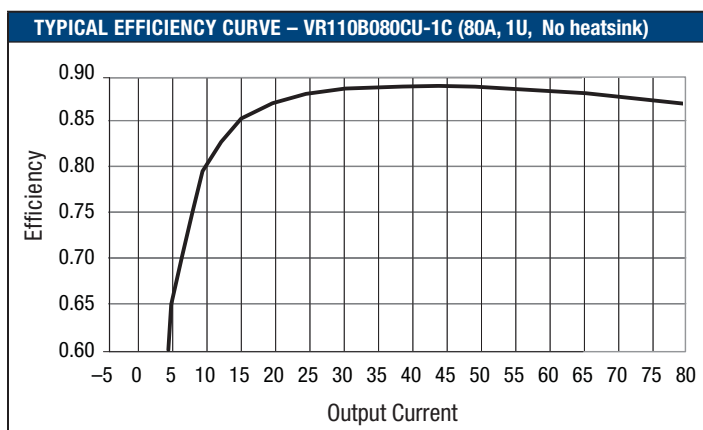
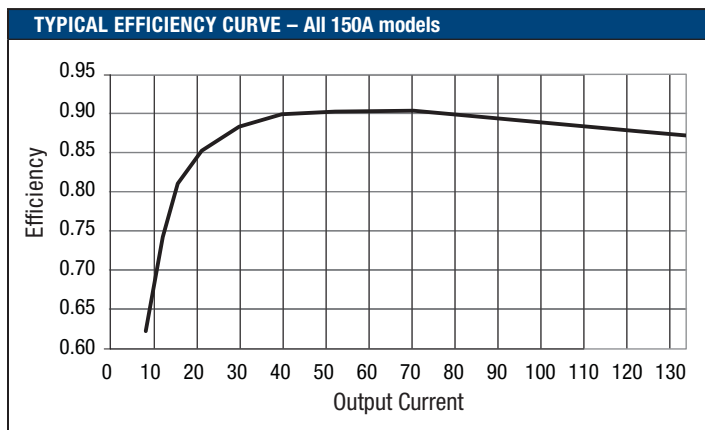
Typical Performance Curves - Derating

($V_{IN} = 12V$; $V_{ID} = 1.325V$)

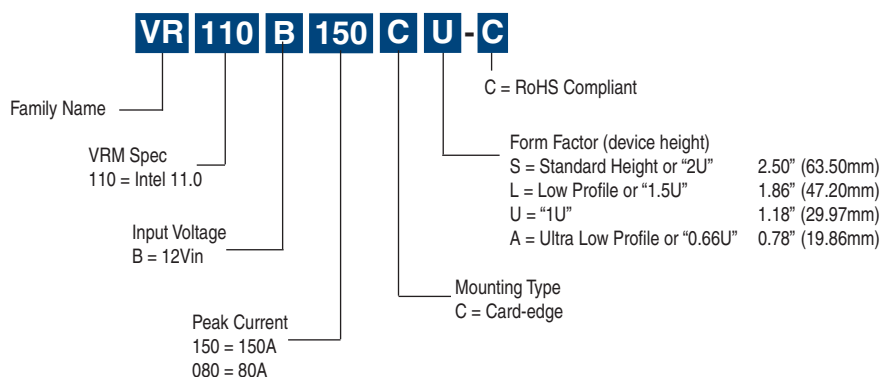


Typical Performance Curves - Efficiency

($V_{IN} = 12V$; $V_{ID} = 1.325V$; $T_{AMB} = 25^{\circ}C$ with 400 LFM airflow)



PART NUMBER CODING



PACKAGE SPECIFICATIONS

PIN ASSIGNMENT - ALL VR110 MODELS

Pin	Signal	Pin	Signal
1	VSS	54	VIN+
2	VSS	53	VIN+
3	VSS	52	VIN+
4	VID4	51	VID3
5	VID2	50	VID1
6	VID0	49	VID5
7	VO_SEN+	48	VO_SEN-
8	PWRGD	47	VR_HOT
9	OUTEN	46†	LL0
10	LOAD CURRENT	45†	LL1
11	VID6	44	VID_SELECT
12*	VRM_PRESENSE	43*	VRM_ID
13	VO+	42	VO+
14	VO+	41	VO+
15	VO+	40	VO+
16	VSS	39	VSS
17	VSS	38	VSS
18	VSS	37	VSS
19	VO+	36	VO+
20	VO+	35	VO+
21	VO+	34	VO+
22	VSS	33	VSS
23	VSS	32	VSS
24	VSS	31	VSS
25	VO+	30	VO+
26	VO+	29	VO+
27	VO+	28	VO+

* VRM_PRESENSE and VRM_ID are connected to Vss on the VRM through a 100Ω resistor.

† LL0, LL1 gives 1.25mA load line only.

MECHANICAL DIMENSIONS – ALL MODELS

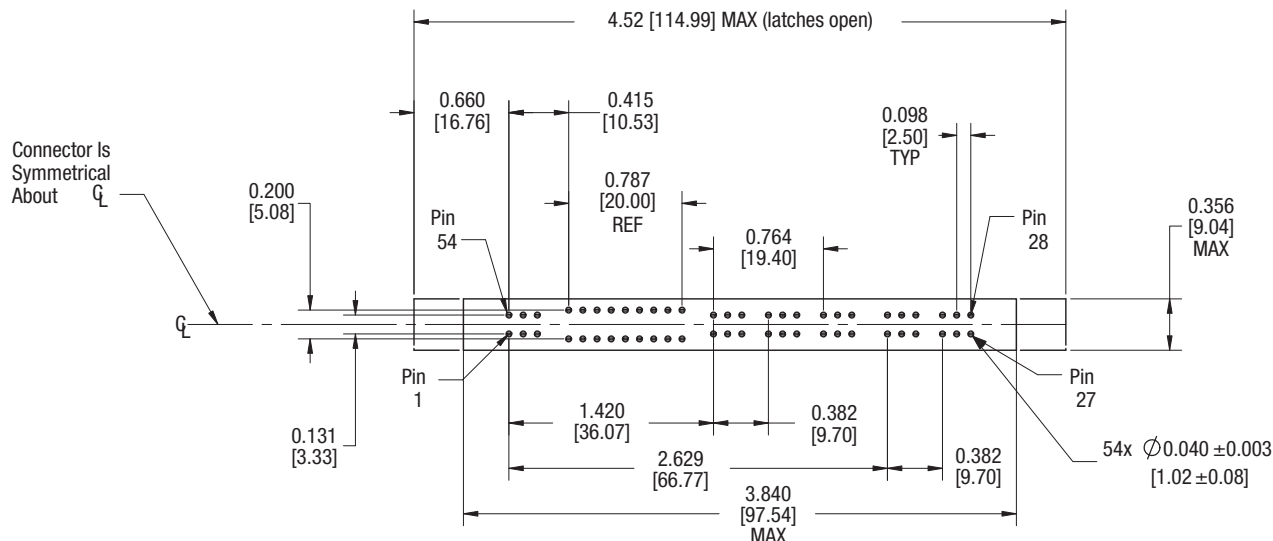


Figure 1. Connector Footprint (Thru-Hole Connector) Viewed From VRM (Top) Side

Recommended Mating Connectors

Tyco 1651826-1 (Vertical, 0.18" Solder Tail, Long)
1651929-1 (Vertical, 0.12" Solder Tail, Short)
1766336-1 (Vertical, Surface Mount)
1766436-1 (Vertical, Compliant Pin)

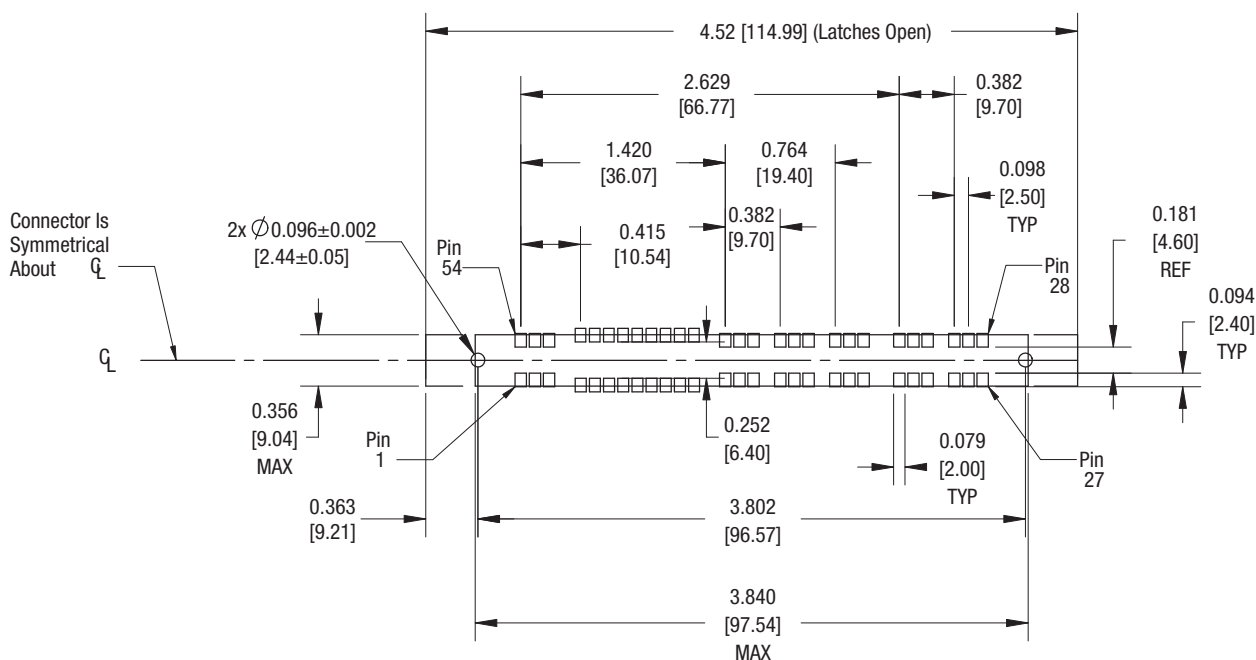
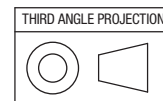


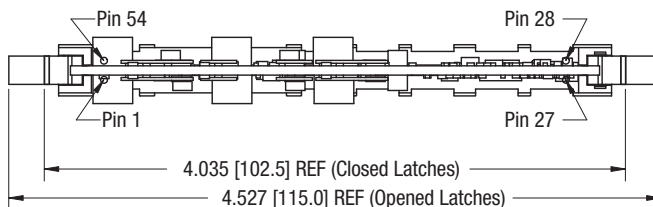
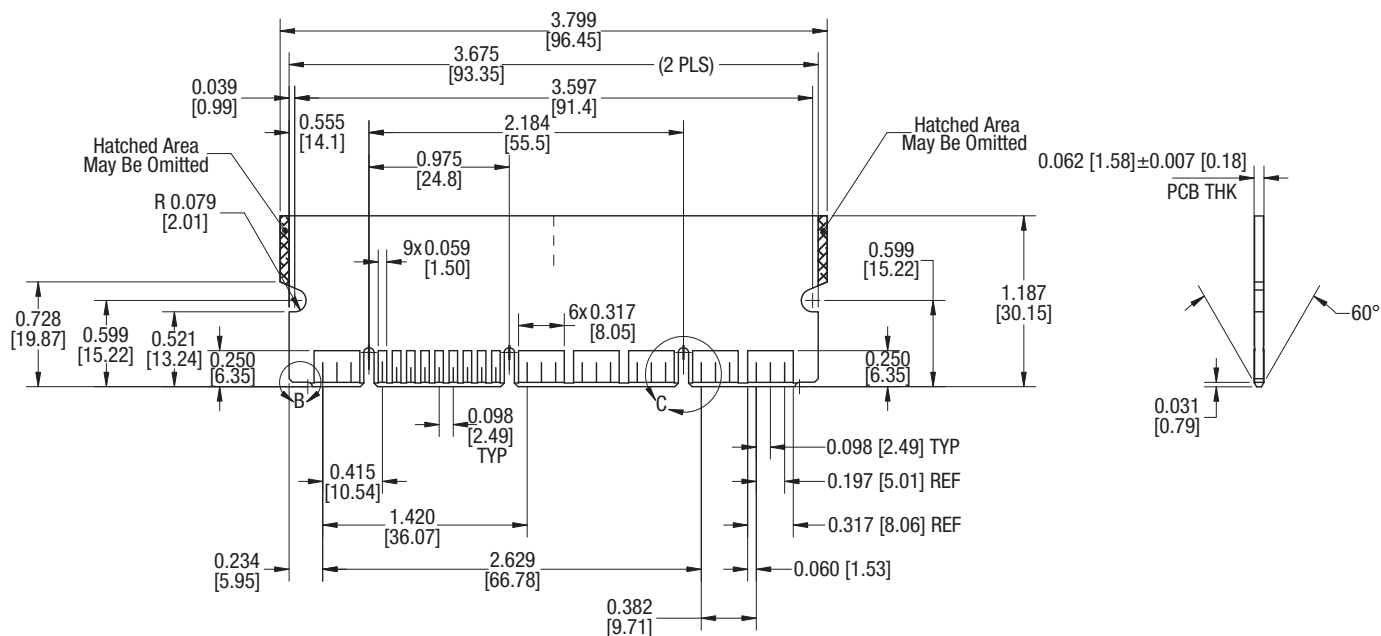
Figure 2. Connector Footprint (Surface Mount Connector) Viewed From VRM (Top) Side

Dimensions are in inches [mm]

Tolerances (Unless otherwise Specified)
X.XX ±.02 (±0.5mm)
X.XXX ±.010 (±0.25mm)

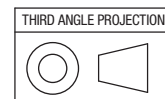


MECHANICAL DIMENSIONS



Dimensions are in inches [mm]

Tolerances (Unless otherwise Specified)
X.XX ±.02 (±0.5mm)
X.XXX ±.010 (±0.25mm)



MECHANICAL DIMENSIONS

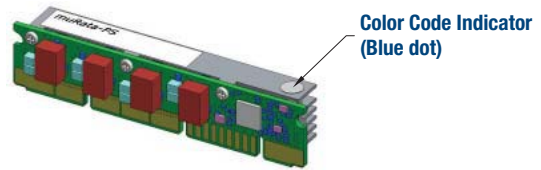
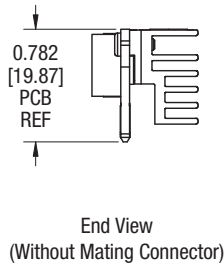
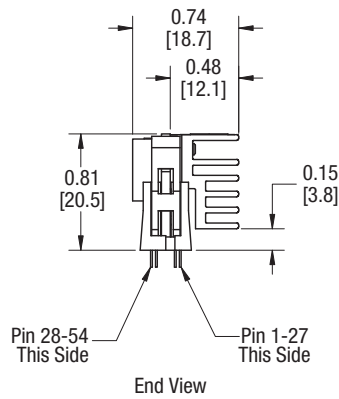


Figure 5. VR110B080CA-1C (80A, 0.66U)

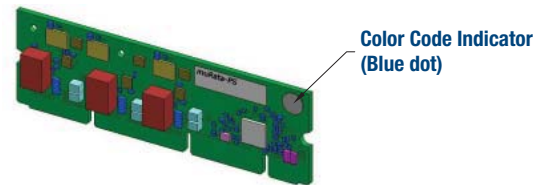
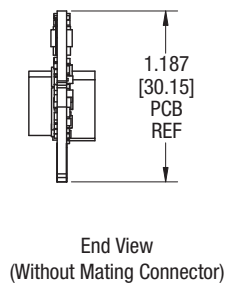
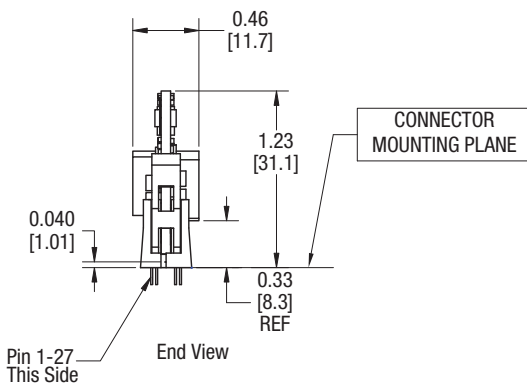


Figure 6. VR110B080CU-1C (80A, 1U)

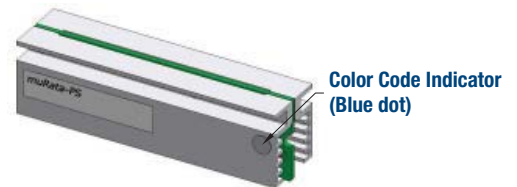
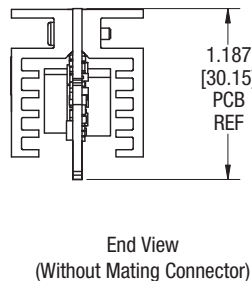
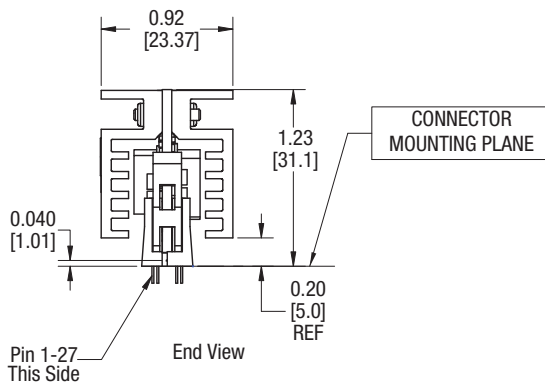
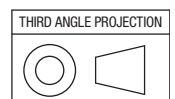


Figure 7. VR110B150CU-1C (150A, 1U)

Dimensions are in inches [mm]

Tolerances (Unless otherwise Specified)
X.XX ±.02 (±0.5mm)
X.XXX ±.010 (±0.25mm)



MECHANICAL DIMENSIONS

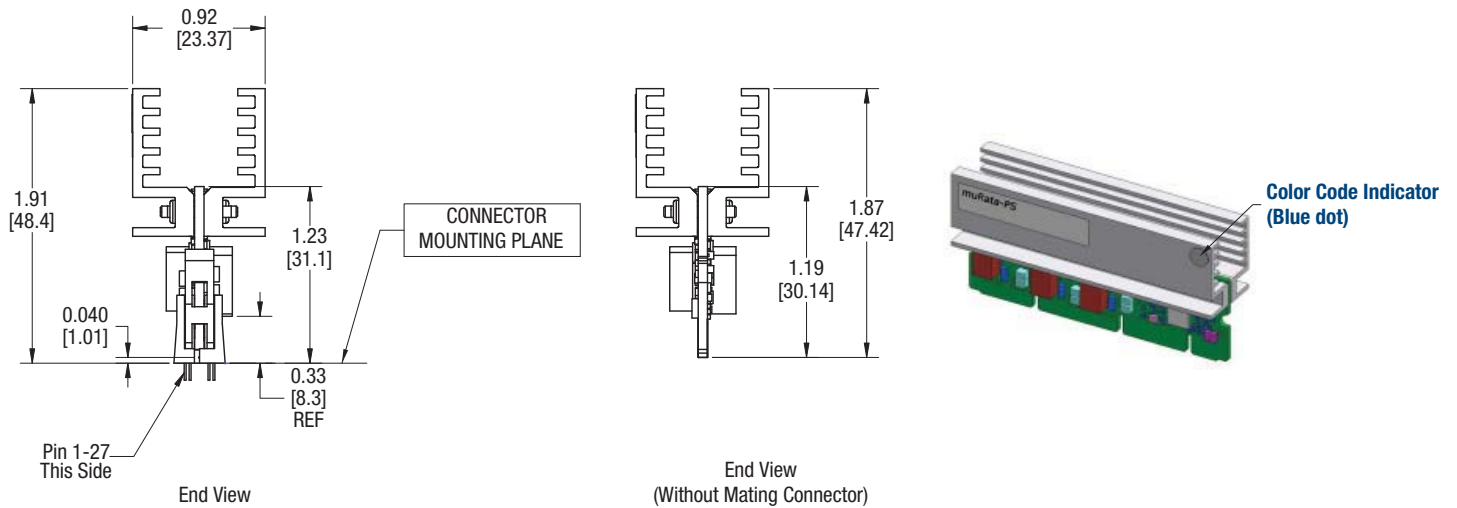


Figure 8. VR110B150CL-1C (150A, 1.5U)

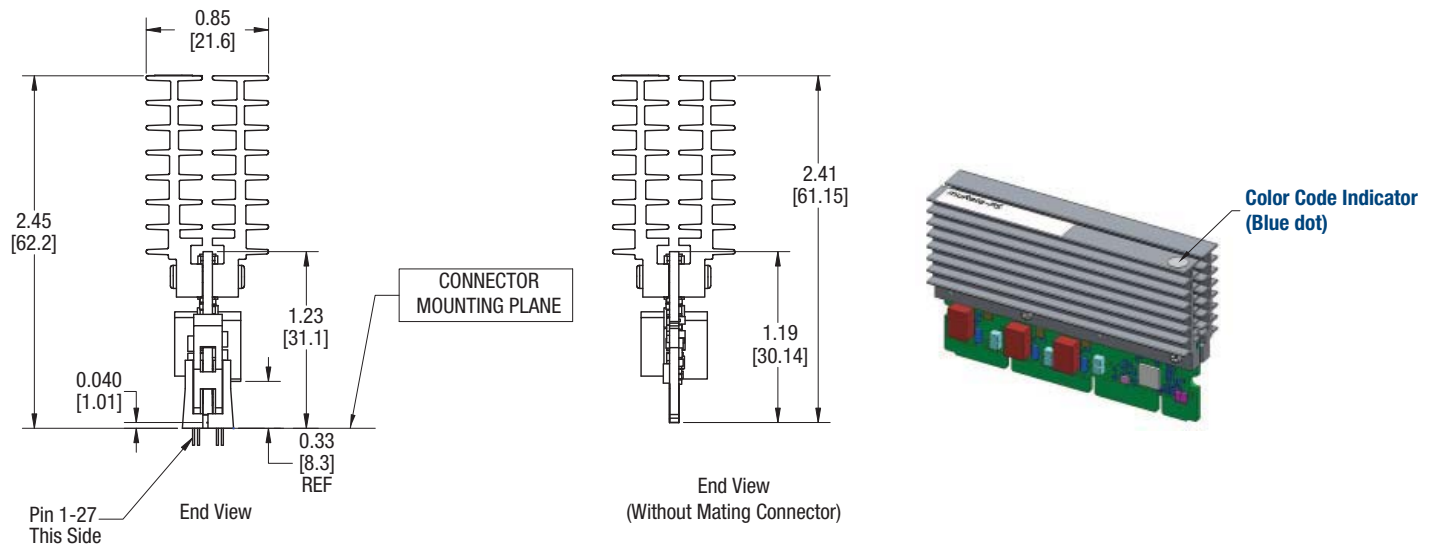
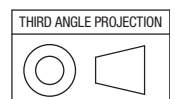


Figure 9. VR110B150CS-1C (150A, 2U)

Dimensions are in inches [mm]

Tolerances (Unless otherwise Specified)
X.XX ±.02 (±0.5mm)
X.XXX ±.010 (±0.25mm)



RoHS COMPLIANCY

The following parts are in compliance with the European Union Directive 2002/95/EC (RoHS) with respect to the following substances: lead (Pb), cadmium (Cd), mercury (Hg), hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).

VR110B150CS-1C

VR110B150CL-1C

VR110B150CU-1C

VR110B080CU-1C

VR110B080CA-1C

RoHS PROCESS NOTE

These products are not intended to go through a reflow solder process. See recommended interface options.

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ISO 9001 and 14001 REGISTERED

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