Murata Power Solutions

VR110 Series

Solutions for Intel® VRM 11.0

To Be Discontinued*

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)

RoHS COMPLIANT

For full details go to www.murata-ps.com/rohs

REG.-Nr. C663

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
VR110B150CU-3C ①		0.8375 – 1.60		1.18″ (29.9mm)	1U
VR110B080CU-1C		0.81875 – 1.60	80	1.18″ (29.9mm)	1U
VR110B080CA-1C				0.78″ (19.9mm)	<1U

INPUT CHARACTERISTICS - ALL MODELS

Parameter	Conditions ②	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 ②	MIN.	TYP.	MAX.	Units
Output voltage range	7-Bit DAC controlled	0.81875		1.6	V
Line regulation		–2	0	2	mV
Load Line ③		1.22	1.25	1.28	mΩ
Ripple & noise ④	20MHz bandwidth		6.4		mVp-p
Output current range	Continuous (TDC) Peak, <10 mS	0 0		130 150	A
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 ⑤	100A step, 100A/µS, Δ Vo, Adj	120	125	130	mV
Remote sense ⑥	Compensation range			300	mV
Recommended ceramic ⑦	Murata GRM Series or equivalent	46	50		each
Recommended bulk output	UCC 4PS560MH11 or equivalent	10	17		

OUTPUT CHARACTERISTICS - 80A Models

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

GENERAL CHARACTERISTICS					
Parameter	Conditions ②	MIN.	TYP.	MAX.	Units
Operating temperature range		0		65	ºC
Storage temperature range	Non-condensing	–40		85	
MTBF 150A models 80A models	Calculated (RAC PRISM) 45ºC			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	VR110B150CU-3C	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	VR110B150CU-3C	3.0	85
	1U	VR110B080CU-1C	1.06	30
	0.66U	VR110B080CA-1C	1.6	45.36

PROTECTION CHARACTERISTICS – 150A Models						
Parameter	Conditions ②		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		ºC
	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 ②		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		ºC
	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	

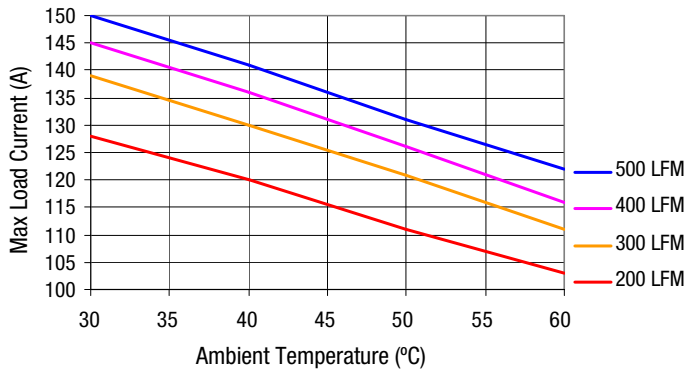
PROTECTION CHARACTERISTICS – VR110B080CA-1C (80A, 0.66U)						
Parameter	Conditions ②		MIN.	TYP.	MAX.	Units
Output overcurrent shutdown	Non-latching		90		115	A
Overvoltage shutdown	Non-latching, above VID		150	175	200	mV
Overtemperature indicator	Non-latching, at hot spots			125		ºC
	Worst case junction 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

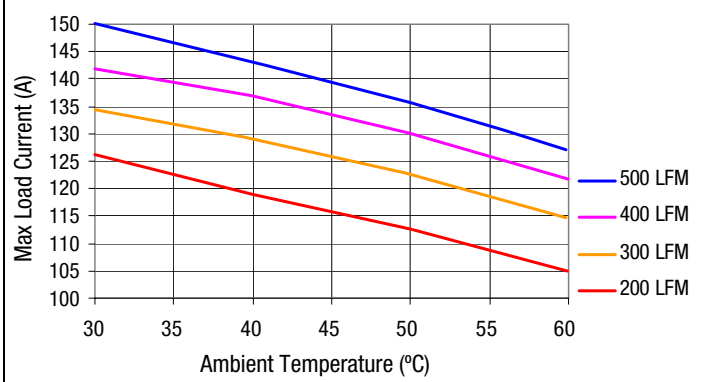
① Backward compatible to VR102B150CU-3C.
② V_{IN} = 12Vdc, T_A = 25ºC, Airflow = 400LFM unless otherwise noted.
③ The output impedance is 1.25mΩ.
④ Output ripple voltage is specified when measured with Intel® specified capacitance at the output of the converter.
⑤ Transient response is specified with Intel® specified capacitors at the output of the converter.
⑥ If remote sense is not required or used, the Sense(+) and Sense(–) pins must be connected to Vo(+) and Vo(–) respectively.
⑦ 10µF ceramic X5R or X6S.

Typical Performance Curves - Derating
(V_{IN} = 12V; VID = 1.325V)

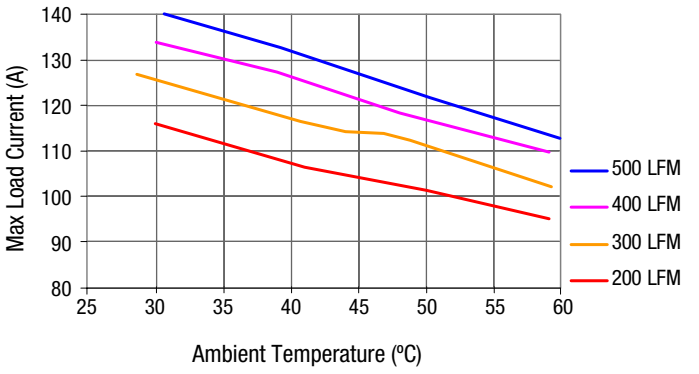
THERMAL DERATING GRAPH – VR110B150CS-1C (150A, 2U)



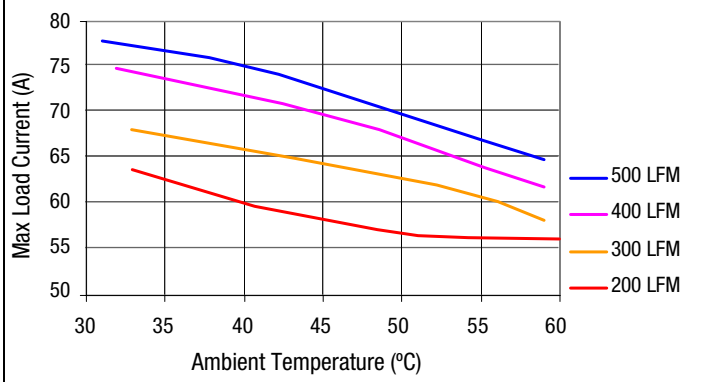
THERMAL DERATING GRAPH – VR110B150CL-1C (150A, 1.5U)



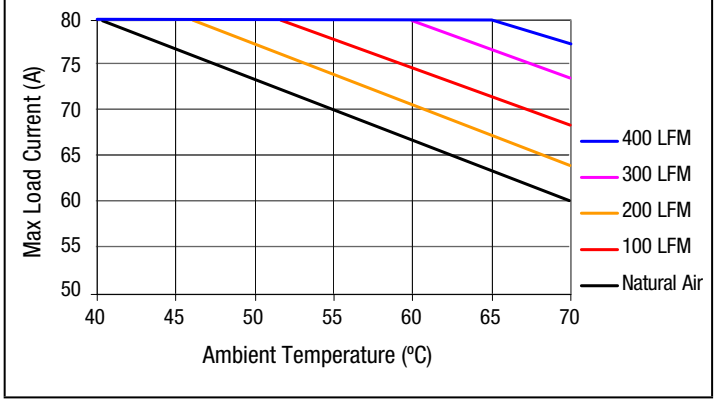
THERMAL DERATING GRAPH – VR110B150CU-1C (150A, 1U)



THERMAL DERATING GRAPH – VR110B080CU-1C (80A, 1U, No heatsink)



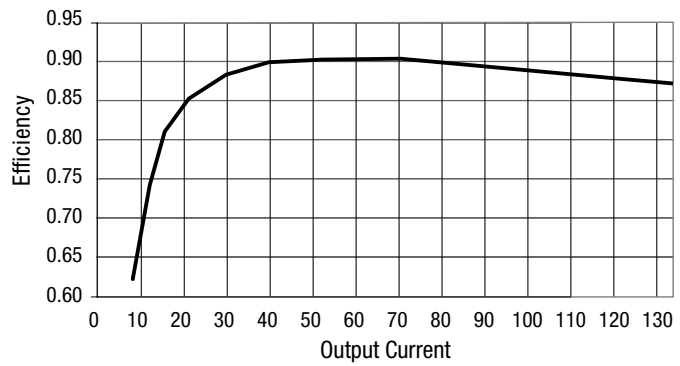
THERMAL DERATING GRAPH – VR110B080CA-1C (80A, 0.66U)



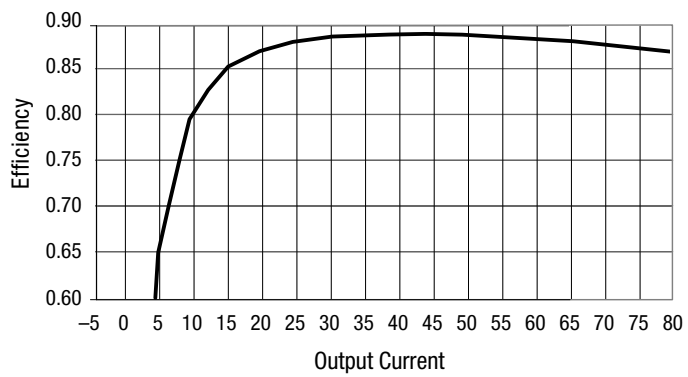
Typical Performance Curves - Efficiency

(V_{IN}= 12V; VID = 1.325V; T_{AMB} = 25°C with 400 LFM airflow)

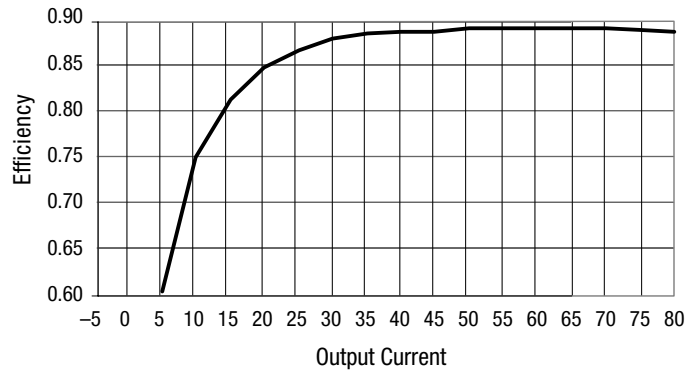
TYPICAL EFFICIENCY CURVE – All 150A models



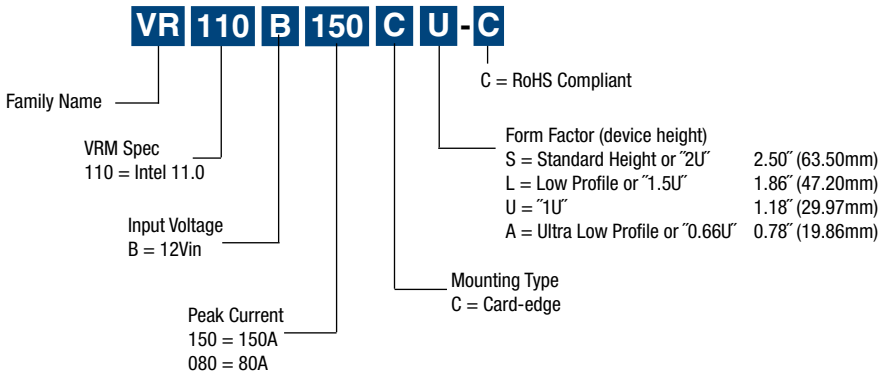
TYPICAL EFFICIENCY CURVE – VR110B080CU-1C (80A, 1U, No heatsink)



TYPICAL EFFICIENCY CURVE – VR110B080CA-1C (80A, 0.66U)



PART NUMBER CODING



PACKAGE SPECIFICATIONS

PIN ASSIGNMENT - ALL VR110 MODELS (EXCEPT "-3C" VERSION)

Pin	Signal	Pin	Signal
1	VSS	**54**	V_{IN}+
2	VSS	**53**	V_{IN}+
3	VSS	**52**	V_{IN}+
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_PRES	**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_PRES and VRM_ID are connected to V_{SS} on the VRM through a 100Ω resistor.
† LL0, LL1 gives 1.25mΩ load line only.

PACKAGE SPECIFICATIONS, CONTINUED: "-3C" VERSION ONLY

PIN ASSIGNMENT - "-3C" VERSION ONLY			
Pin	Signal	Pin	Signal
1	VSS	**54**	V_{IN}+
2	VSS	**53**	V_{IN}+
3	VSS	**52**	V_{IN}+
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	N/C	**44**	N/C
12*	VRM_PRES	**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+

MECHANICAL DIMENSIONS – ALL MODELS

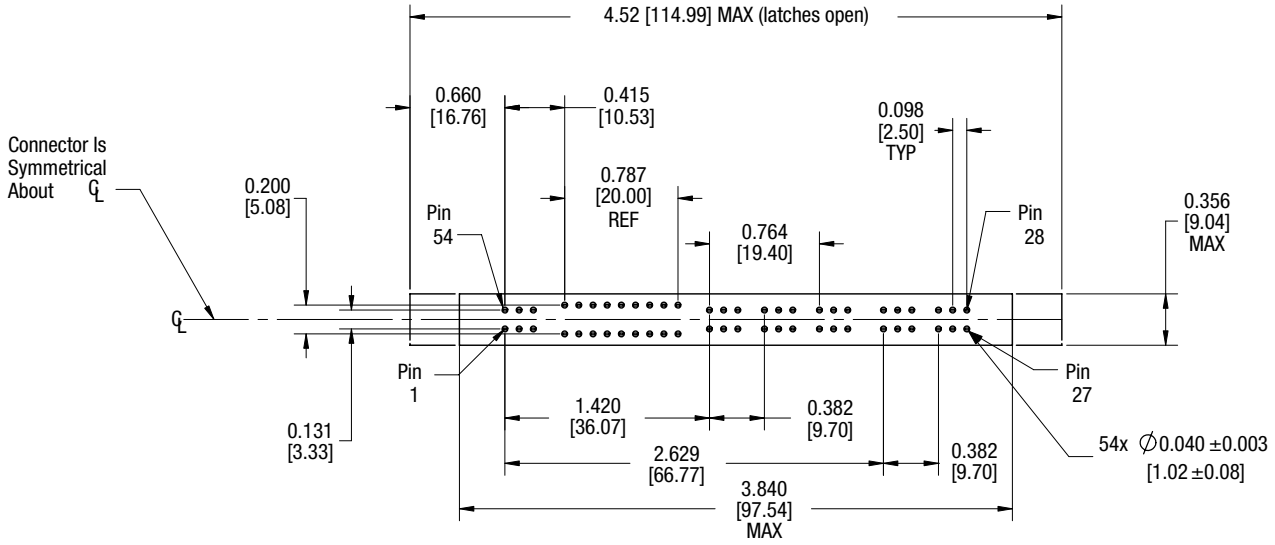


Figure 1. Connector Footprint (Thru-Hole Connector) Viewed From VRM (Top) Side

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)

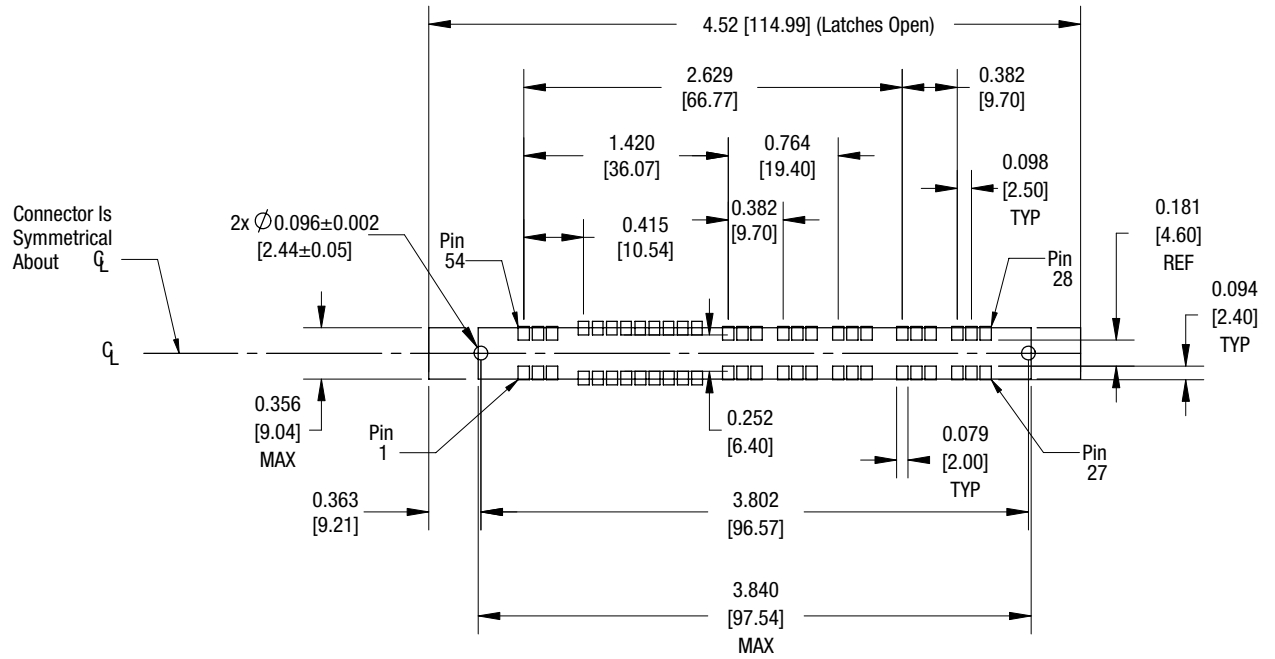


Figure 2. Connector Footprint (Surface Mount Connector) Viewed From VRM (Top) Side

Dimensions are in inches [mm]

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

THIRD ANGLE PROJECTION

MECHANICAL DIMENSIONS

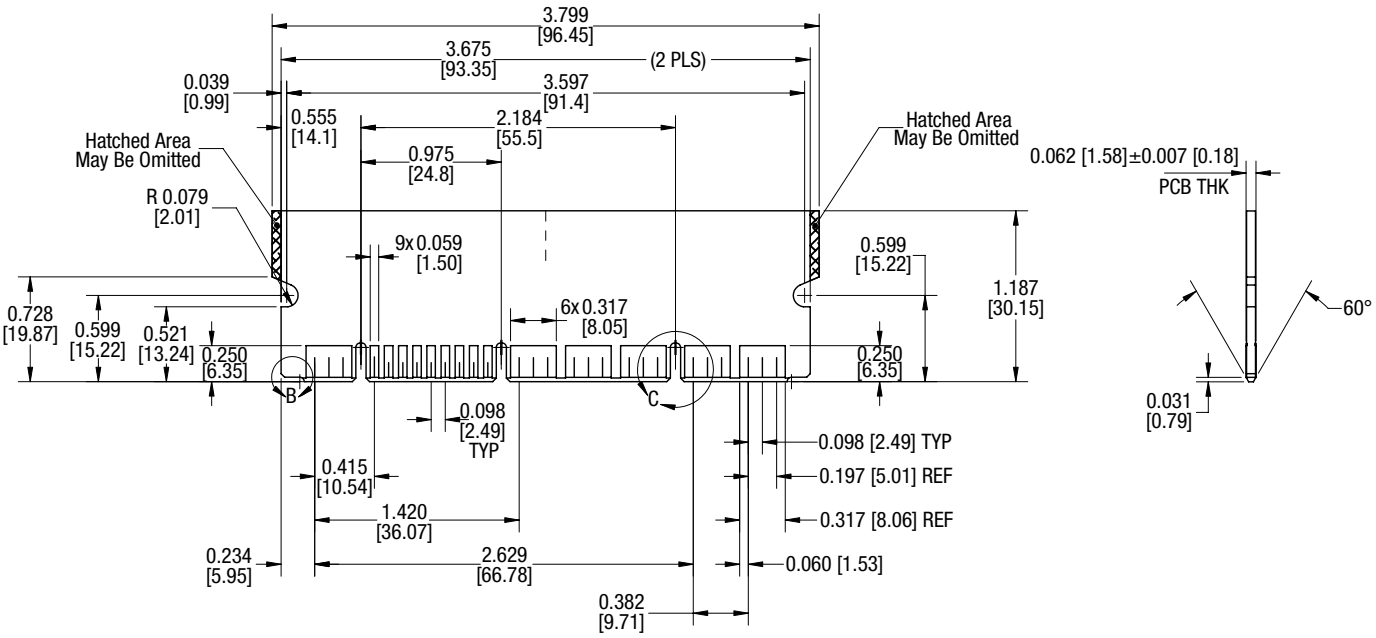


Figure 3. Circuit Board Outline

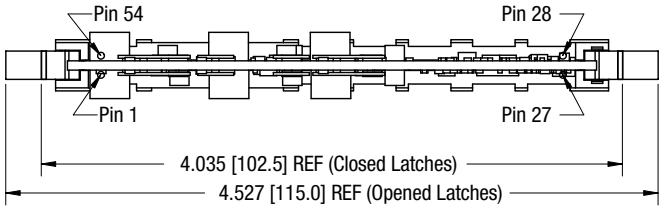


Figure 4. Top View (shown without heat sinks)

Dimensions are in inches [mm]

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

THIRD ANGLE PROJECTION

MECHANICAL DIMENSIONS

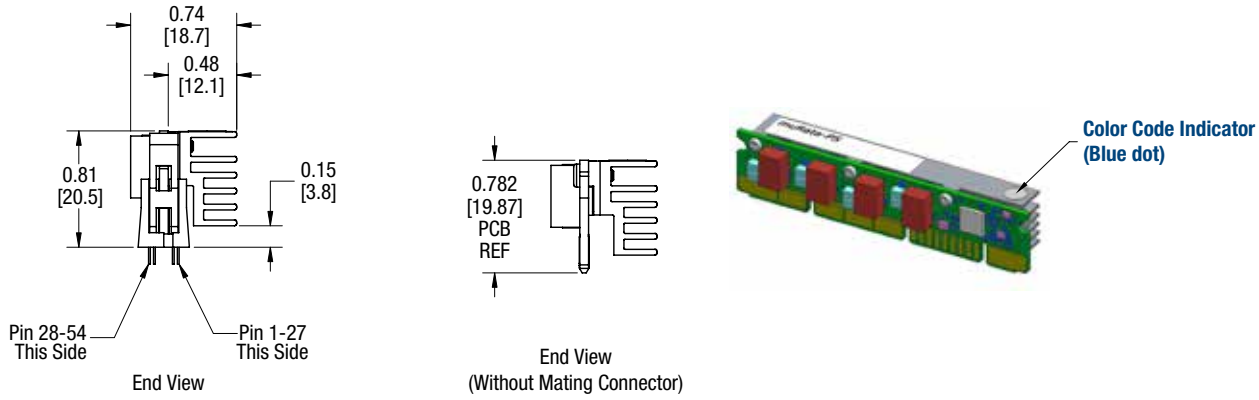


Figure 5. VR110B080CA-1C (80A, 0.66U)

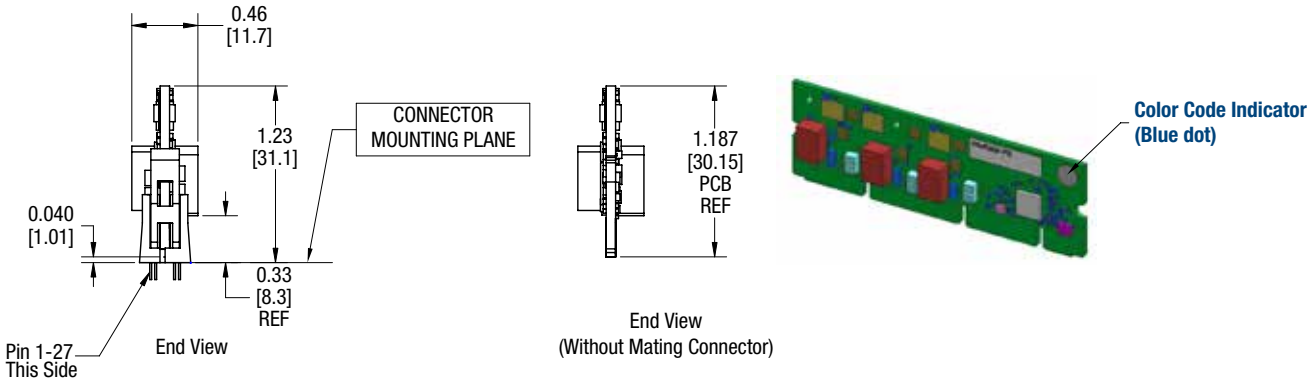


Figure 6. VR110B080CU-1C (80A, 1U)

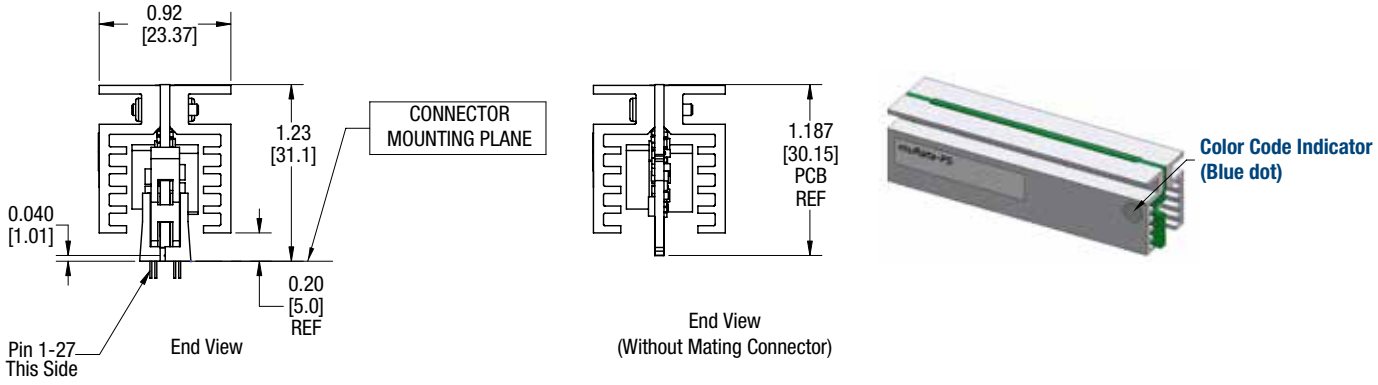


Figure 7. VR110B150CU-1C (150A, 1U)

Dimensions are in inches [mm]

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

THIRD ANGLE PROJECTION

MECHANICAL DIMENSIONS

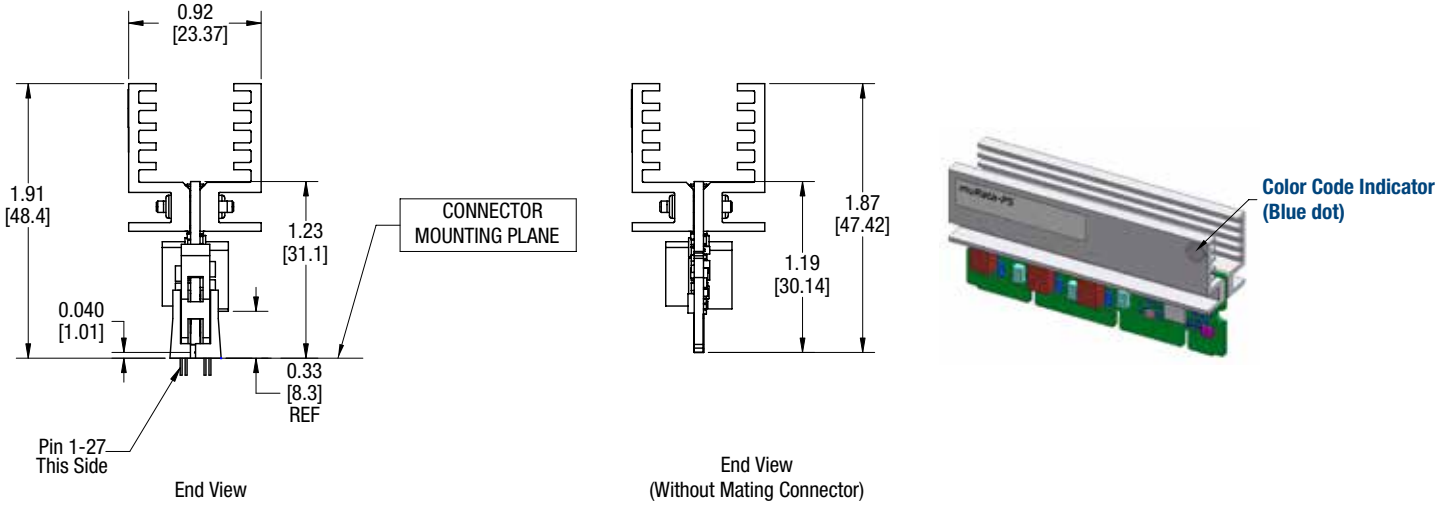


Figure 8. VR110B150CL-1C (150A, 1.5U)

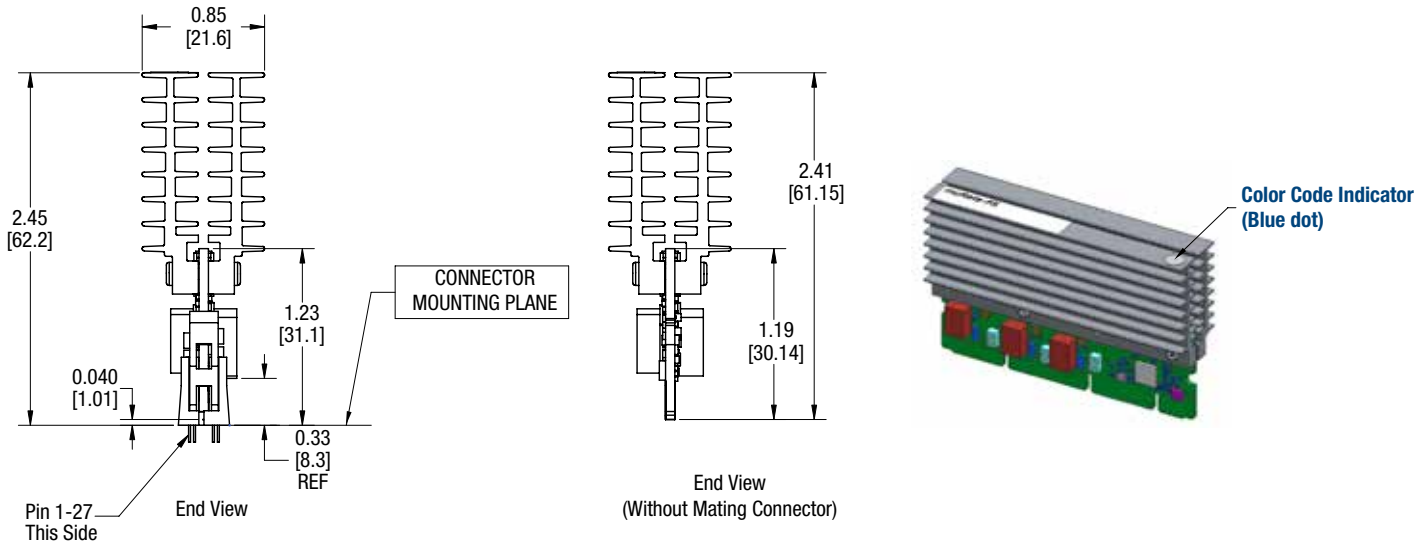
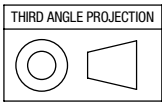


Figure 9. VR110B150CS-1C (150A, 2U)

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.

Murata Power Solutions, Inc.
11 Cabot Boulevard, Mansfield, MA 02048-1151 U.S.A.
ISO 9001 and 14001 REGISTERED

Mouser Electronics

Authorized Distributor

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VR110B080CA-1C VR110B150CL-1C