VRM64 Series
Single output

ARTESYN®
T E C H N O L O G I E S

| DC–DC CONVERTERS | 80 A Non-Isolated | 1 |

NEW Product

RoHS ✓ 2002/95/EC

- • Meets AMD64 Processor specification
- • Allows dynamic VID code changes
- • 5 Bit VID input
- • 0.8 Vdc to 1.55 Vdc in 25 mV steps
- • Up to 100 A/µs load transient
- • Differential remote sense for improved load regulation
- • Vertical plug-in to standard motherboard connector with or without retention latch
- • Output current up to 80 A continuous
- • Open collector power good signal
- • Monotonic turn-on and turn-off
- • Fused input
- • SMBus interface
- • Available RoHS compliant
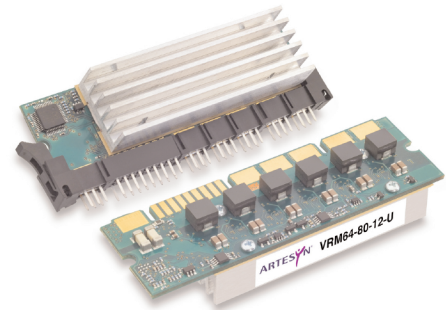
The AMD VRM non-isolated dc-dc converter is designed to meet the exceptionally fast transient response requirements of today's microprocessors and fast switching logic in a compact size at an affordable price. Advanced circuit techniques, component selection, placement optimization, and state-of-the-art silicon integration thermal packaging, provide a high power density, highly reliable, and very precise voltage regulation system for advanced microprocessors.

VDE
2 YEAR WARRANTY

Unless otherwise stated, all specifications are typical at nominal input, maximum continuous rated load at 25 °C and voltages are referenced to Vin-.

SPECIFICATIONS

OUTPUT SPECIFICATIONS

Voltage adjustability	(See VID codes, Table 3)	0.8-1.55 Vdc
Output current		80 A
Voltage setting accuracy		±0.8%
Ripple and noise (See Notes 1, 2)	20 MHz bandwidth	50 mV pk-pk
Short circuit protection (See Note 7)		Continuous current limit, default setting as trip
Remote sensing compensating voltage		Up to 300 mV max.

INPUT SPECIFICATIONS

Input voltage range	12Vin nominal	10.8-13.2 Vdc
Input current	Operation No load Remote OFF	12.5 A max. 1.1 A max. 45 mA max.
UVLO	Turn ON voltage Turn OFF voltage Hysteresis	10.5 V typ. 9.8 V typ. 0.65 V typ.
Start-up time	Nominal line	10 ms max.
Enable Logic compatibility ON OFF		Ref. to -input >1.7 Vdc <0.8 Vdc
+5_ALWAYS	Current demand	250 mA typ.

GENERAL CHARACTERISTICS

Efficiency	1.5 V output @ 60 A	84% typ.
Switching frequency	Fixed (See Note 4)	830 kHz
Approvals and standards		IEC/EN60950 VDE
Material flammability		UL94V-0
Weight		<52 g (<2 oz)
MTBF	Telcordia SR-332	>2,000,000 hours
Mating connector (See Table 1 for pin out)	Tyco/Elcon	283-0172-01303
Connector fingers		Gold plated, 30 µ-inches

ENVIRONMENTAL SPECIFICATIONS

Maximum temperature shock	Operating	5 °C/10 min.
Temperature shock	Operating Non-operating	10 °C/hour 20 °C/hour
Humidity (Non-condensing)	Operating Non-operating	85% RH 95% RH
Altitude	Operating Non-operating	10,000 feet max. 50,000 feet max.
Shock	Operational and non-operational	30 G 11ms Half sine wave
Vibration (See Note 8)	Operational and non-operational	0.02 G²/Hz max.
Electrostatic discharge IEC61000-4-2 (See Note 6)	Indirect air Indirect contact	15 kV 8 kV
Thermal performance (See Note 5)	Operating ambient temperature	0 °C to +60 °C
	Non-operating	-40 °C to +100 °C

International Safety Standard Approvals

VDE VDE Certificate No. 2487000-3336-0016

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INPUT VOLTAGE	OUTPUT VOLTAGE	OVP	OUTPUT CURRENT (MIN)	OUTPUT CURRENT (MAX.)	EFFICIENCY (TYP.)	REGULATION LOAD	MODEL NUMBER [10,11]
12 Vdc	0.8-1.55 Vdc	2.2 Vdc	0 A	80 A	84%	50 mV	VRM64-80-12-UY

PIN CONNECTIONS

PIN NO.	FUNCTION	PIN NO.	FUNCTION
1	GND	54	+12 Vin
2	GND	53	+12 Vin
3	GND	52	+12 Vin
4	VID4	51	VID3
5	VID2	50	VID1
6	VID0	49	Current Share
7	COREFB H	48	COREFB L
8	PWRGD	47	CB_{OUT}
9	Enable	46	ADD 0
10	SM_{DA}	45	ADD 1
11	SM_{CL}	44	-VRMPRES
12	SGND	43	+5 V_always
13	V_{DD} Core +	42	V_{DD} Core +
14	V_{DD} Core +	41	V_{DD} Core +
15	V_{DD} Core +	40	V_{DD} Core +
16	GND	39	GND
17	GND	38	GND
18	GND	37	GND
19	V_{DD} Core +	36	V_{DD} Core +
20	V_{DD} Core +	35	V_{DD} Core +
21	V_{DD} Core +	34	V_{DD} Core +
22	V_{DD} Core +	33	V_{DD} Core +
23	V_{DD} Core +	32	V_{DD} Core +
24	V_{DD} Core +	31	V_{DD} Core +
25	GND	30	GND
26	GND	29	GND
27	GND	28	GND

Table 1: Pin Connections

VOLTAGE IDENTIFICATION (VID) CODES

VID4	VID3	VID2	VID1	VID0	VDAC
1	1	1	1	1	Off
1	1	1	1	0	0.800
1	1	1	0	1	0.825
1	1	1	0	0	0.850
1	1	0	1	1	0.875
1	1	0	1	0	0.900
1	1	0	0	1	0.925
1	1	0	0	0	0.950
1	0	1	1	1	0.975
1	0	1	1	0	1.000
1	0	1	0	1	1.025
1	0	1	0	0	1.050
1	0	0	1	1	1.075
1	0	0	1	0	1.100
1	0	0	0	1	1.125
1	0	0	0	0	1.150
0	1	1	1	1	1.175
0	1	1	1	0	1.200
0	1	1	0	1	1.225
0	1	1	0	0	1.250
0	1	0	1	1	1.275
0	1	0	1	0	1.300
0	1	0	0	1	1.325
0	1	0	0	0	1.350
0	0	1	1	1	1.375
0	0	1	1	0	1.400
0	0	1	0	1	1.425
0	0	1	0	0	1.450
0	0	0	1	1	1.475
0	0	0	1	0	1.500
0	0	0	0	1	1.525
0	0	0	0	0	1.550

Table 2: Voltage Identification (VID) Codes

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SIGNAL ELECTRICAL INTERFACE

CHARACTERISTIC - SIGNAL NAME	SYMBOL	MIN	TYP	MAX	UNITS	NOTES AND CONDITIONS
ENABLE - on	ENABLE $_{(on)}$	1.7		5.5	V	No pull up resistor provided by the VRM
ENABLE - off	ENABLE $_{(off)}$	-0.3		0.8	V	No pull up resistor provided by the VRM
PWRGD - high	$V_{PWRGD\ (high)}$	1.7			V	No pull up resistor provided by the VRM
PWRGD - low	$V_{PWRGD\ (low)}$	-0.3		0.8	V	Open-collector output to not more than 5.5 V, max current 5 mA
PWRGD - low threshold			150		mV	Below VID setting
PWRGD - turn-on response to ENABLE going high	T_{rise}	2	2.5	10	ms	For waveforms, refer to Application Note 185
VID - high	$V_{ih\ (VID)}$	1.7		5.5	V	
VID - low	$V_{il\ (VID)}$	-0.3		0.8	V	
OVP1 (See Note 7)			2.2		V	Default setting is trip. At OVP1 or OVP2 whichever is smaller
OVP2 (See Note 7)			133		%	Of VID Setting
OVP drive voltage	$CB_{\_OUT}$		4		V	
SMBus Address high	$ADD_{\_x\ (high)}$	3.8			V	
SMBus Address low	$ADD_{\_x\ (low)}$	-0.3		0.7	V	
SMBus Data high	$SM_{DA\ (high)}$	2.1		5.5	V	
SMBus Data low	$SM_{DA\_x\ (low)}$	-0.3		0.8	V	

ELECTROMAGNETIC COMPATIBILITY

CHARACTERISTIC - SIGNAL NAME	SYMBOL	MIN	TYP	MAX	UNITS	NOTES AND CONDITIONS
ESD - Indirect air				15	kV	EN61000-4-2 In end user equipment
ESD - Indirect contact				8	kV	EN61000-4-2 In end user equipment
Input characteristics: Input current - operating	I_{IN}		12		A	$V_{in} = V_{in}$ (typ.), $I_{out\ (cont.)}$ = 80 A, VID = 1.5 V
Input capacitance - external bypass	C_{INext}		1600		µF	

Notes

1 Recommended output capacitance, 48 x 22 µF ceramic MLCC.
2 50 mV pk-pk ripple. Vin = 12 V, Vout = 1.5 V, Iout = 80 A.
3 With the recommended capacitors (See Note 1) across the output, the output voltage stays within the load regulation window for all loads and transient events, up to 80 A. It will also allow instantaneous VID-on-the-fly changes of up to 500 mV at 80 A.
4 VRM64 uses a five phase buck topology. Each phase switches at 830 kHz. This gives an equivalent switching frequency of 4.2 MHz
5 Maximum current requires adequate forced air over the converter. Please consult Figure 1 for thermal derating.
6 When the VRM detects an output over-voltage event, the OVP pin transitions to logic high. This signal can be used to shut down the supply to the VRM, or drive an external crowbar device.

7 These are default settings. The current limit may be set to 'trip' or 'hiccup'. The output overvoltage limits, input overvoltage and undervoltage settings, the output droop and offset, the current limit setpoint and many others can be changed by component changes. Please consult the factory for details.
8 0.01 G^2/Hz from 5 Hz to 20 Hz, maintaining 0.02 G^2/Hz from 20 Hz to 500 Hz, all axes.
9 In accordance with AMD requirements, PWRGD will go high at least 2 ms after VDD settles within specifications.
10 The 'Y' suffix indicates that these parts are TSE RoHS 5/6 (non Pb-free) compliant. Pb-free (RoHS 6/6) compliant versions may be available on special request, please contact your local sales representative for details.
11 NOTICE: Some models do not support all options. Please contact your local Artesyn representative or use the on-line model number search tool at http://www.artesyn.com/powergroup/products.htm to find a suitable alternative.

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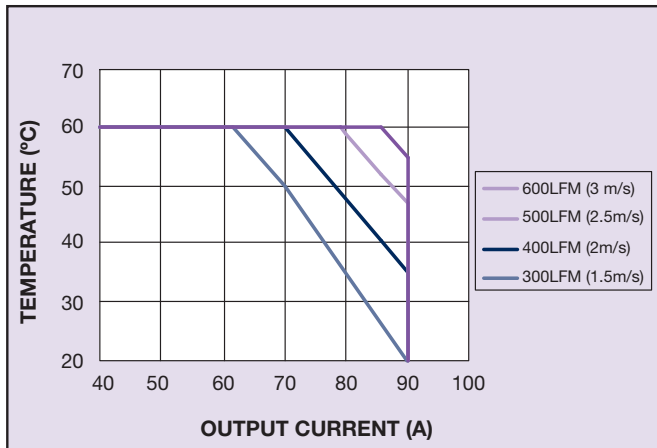

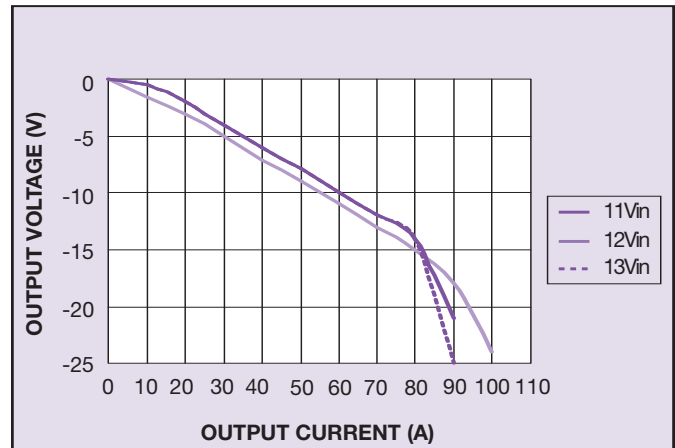**Figure 1: Typical Thermal Derating At Sea Level
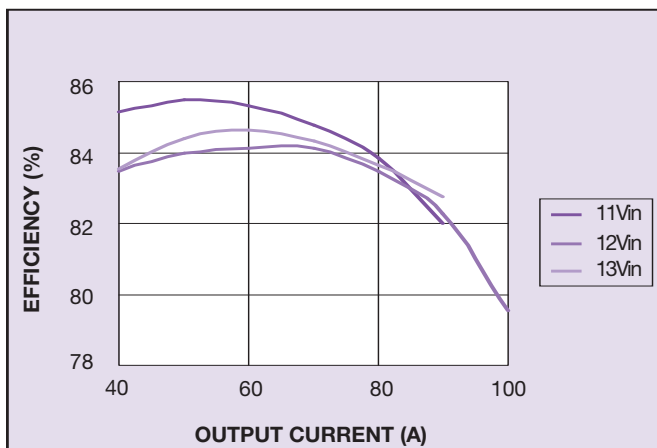(12 Vin, 1.5 Vout)**

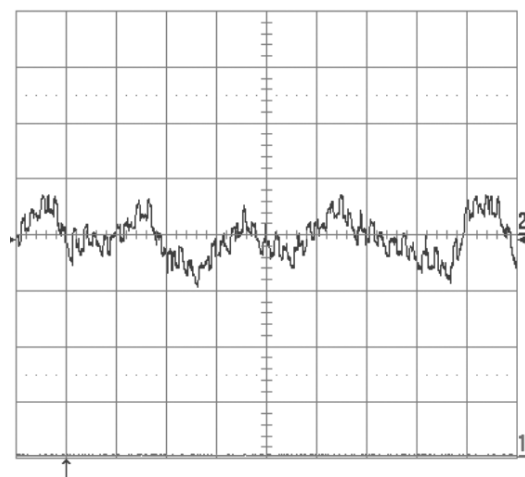**Figure 2: Load Regulation**

Figure 3: Typical Efficiency Vs Load

**Figure 4: Output Ripple and Noise
10 mV Per Square, 2 µs Per Square**

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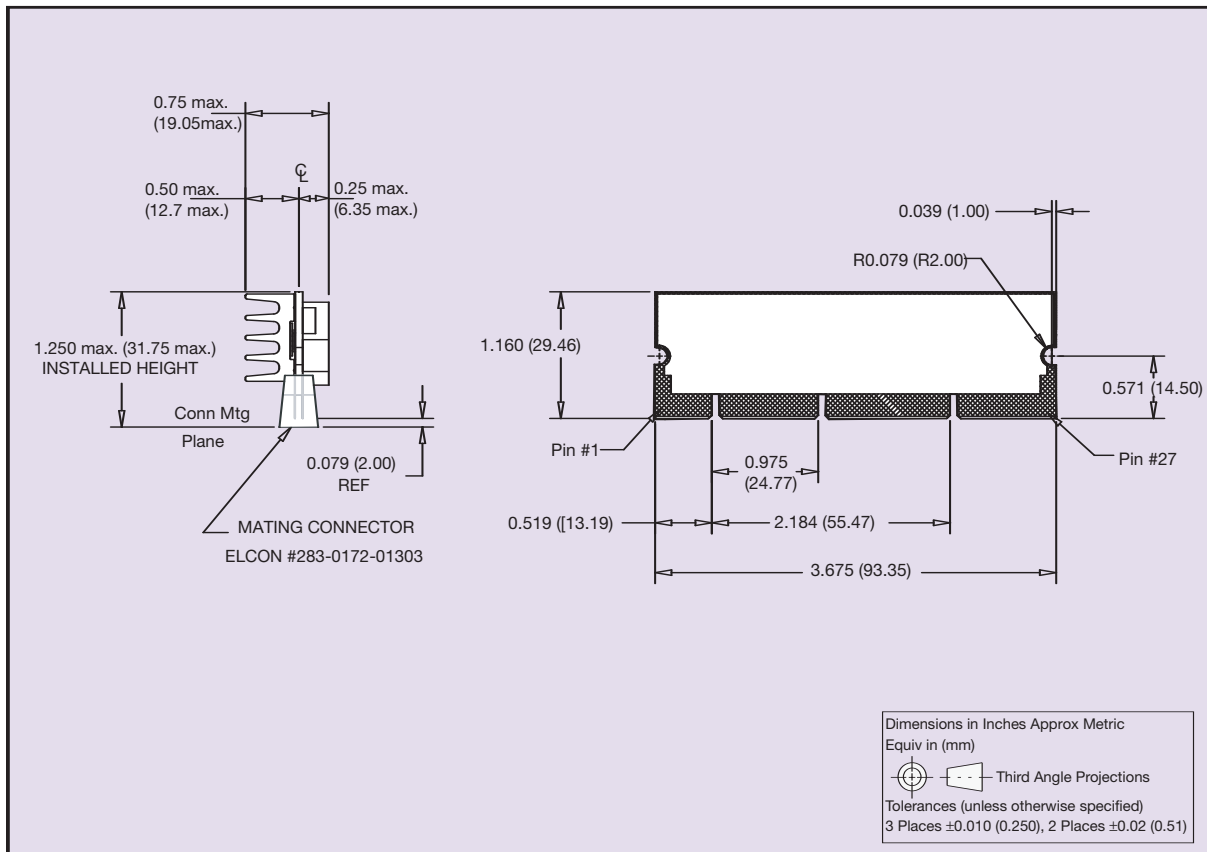
Figure 5: Mechanical Drawing

Please consult our website for the following items: ✔ Application Note

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