

VCCM600M Series

600 Watts

- Conduction / Convection / Forced air cooling
- 750W Peak power (<5 sec)
- IEC60601-1 and IEC60601-1-2 2014 immunity
- Modular (factory and user configurable)
- Programable start-up state (laser applications)
- Remote current and voltage programming
- 3 Year warranty



Dimensions:

4" x 7" x 1.61"

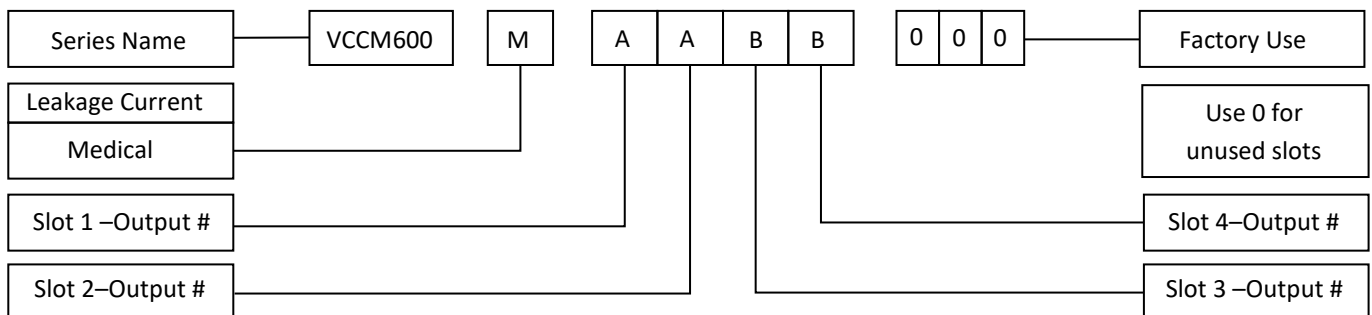
COOL IT YOUR WAY CONDUCTION | CONVECTION | FORCED AIR

The VCCM600M medical conduction cooled power supply delivers an impressive 600W configurable power with a peak of 750W in a ruggedised 4x7" package. The high reliability product with conduction cooled, quiet fan-less operation also meets MIL-STD 810G, 461F, 704F and is also semi F47 compliant. The unit is impressively featured with analogue current and voltage programming, analogue current output signal, 5V 1A bias supply, global inhibit and AC/DC current/voltage power good signals. The unit allows accurate current sharing across multiple option cards to handle the most demanding applications where a large current is required, also the units can be configured in series to support applications requiring high voltages. The units thermal versatility means that it is great for orientation flexibility to best suit your design.

APPLICATIONS

- Medical equipment
- Test and measurement
- Robotics
- Oil and gas
- Telecommunications
- Lab and Analysis equipment
- Display applications
- Avionics
- Laser power
- LED lighting
- Retrofit of legacy PSUs
- Military

Part Numbering



Select modules from module summary table on page 2. The VCCM600 can be configured with 1-4 output modules which can be configured in parallel for higher currents, in series for higher voltages or a combination of both to suit your application. Contact sales to discuss your requirements

VCCM600M Series

Output Module Summary

Model	Output Voltage			Output Current	Rated Power	Peak Power ⁽¹⁾	Load Reg.	Line Reg	Cross Reg.	Ripple & Noise	FPMH ⁽²⁾	Feature Set ⁽³⁾
	Min	Nom	Max									
A	1.5V	5V	7.5V	25A	125W	187.5W	±50mV	±5mV	±10mV	50mVpk-pk	0.5	ABCDEFGF
B	4.5V	12V	15V	15A	150W	225W	±100mV	±12mV	±24mV	120mVpk-pk	0.5	ABCDEFGF
C	9V	24V	30V	7.5A	150W	225W	±150mV	±24mV	±48mV	240mVpk-pk	0.5	ABCDEFGF
D	18V	48V	58V	3.75A	150W	217.5W	±300mV	±48mV	±96mV	480mVpk-pk	0.5	ABCDEFGF
E	4.5V	5V	5.5V	100A	600W	TBD	TBD	TBD	TBD	TBD	TBD	A EFGHIJ
F	10.8V	12V	13.2V	50A	600W	TBD	TBD	TBD	TBD	TBD	TBD	A EFGHIJ
G	21.6V	24V	26.4V	25A	600W	TBD	TBD	TBD	TBD	TBD	TBD	A EFGHIJ
H	43.2V	48V	52.8V	12.5A	600W	TBD	TBD	TBD	TBD	TBD	TBD	A EFGHIJ

Notes

- Peak loading available when unit is adjusted above nominal voltage. Please see option card datasheet for details
- 30°C base & ambient, 100% Load, SR332 Issue 2 Method I Case 3, Grounded, Fixed, Controlled
- A = Remote Sense B = External voltage control C = External current control D = Current output signal E = Current share
 F = Overvoltage protection G = Over temperature protection H = BF rated I = PMBUS capability J = Internal ORing mosfet

Input Module Specifications

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Input voltage	85		264	VAC	Nominal is 100V-240V RMS. Derate from 120VAC by 5W/V to 85VAC
	120		370	VDC	
Input frequency	47		63	Hz	For 400Hz please contact sales
Power factor		0.99			
Input current			6	A	
Input current limit		7		A	
Inrush current			20	A	265VRMS 25°C (cold start)
Input protection			8	A	Both lines fused 5x20 fast fuses
No load input power	10		21	W	10W disabled outputs, 21W enabled outputs
Standby power		0.5		W	Latched off state 120VRMS
Efficiency			90	%	See graphs for details
Holdup	17	20	21	mS	600W at 120VRMS input
UVP	78		84	VRMS	Turn on under voltage
Overtemperature protection	115		125	°C	
Reliability ⁽¹⁾			1.1	FPMH	Input module
			0.4	FPMH	Transformer module
Size	7 (177.8) x 4(101.6) x 1.6 (41)			Inches (mm)	LxWxH
weight		650+100/module		g	
Isolation voltages			4000	VAC	Input to output (2 MOPP)
			4000	VAC	Input to J2 standby control (2 MOPP)
			1500	VAC	Input to chassis (1 MOPP)
			500	VDC	Global signals (J3) to output/chassis
			500	VDC	Output to output / chassis (standard modules)
		1500	VAC	Output to output / chassis (BF rated modules, 1 MOPP)	
Earth leakage current			200	uA	Normal condition, 264VAC, 63Hz, 25°C
Touch leakage current			20/200	uA	Standard modules NC / SFC
			TBD/TBD	uA	BF rated modules NC / SFC
Patient leakage current			N/A	uA	Standard modules NC /SFC 264VAC, 60Hz, 25°C NC/SFC
			TBD/TBD	uA	BF rated modules NC /SFC 264VAC, 60Hz, 25°C NC/SFC

Global Signal Specifications

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Bias Voltage	4.8	5	5.2	V	
Bias Current			1	A	
AC_OK Voltage	0/4.8	0.03/5	0.1/5.2	V	Low output level / High output level
AC_OK Current			10	mA	
Power good Voltage	0.1		0.3	V	Open collector output, Low output level. All slots. Absolute max 6V
Power good Current			50	mA	Open collector output. Current sink only. All slots
Tsns Voltage	0	0.4	5	V	Typical at 0°C internal temp, 19.5mV/°C
Tsns Current			100	uA	
Inhibit Voltage	0 / 0.25		0.8 / 6	V	Low input level / high input level. All slots
Inhibit Current			1	mA	10K input impedance. All slots

Environmental

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating temperature	-40 ⁽¹⁾		70	°C	Max baseplate temp 105°C. See p5 for thermal data
Storage temperature	-51		85	°C	
Operating humidity	5		95	%RH	Non condensing
Storage humidity	5		95	%RH	Non condensing
Operating altitude	-200		3000	M	
Non-operating altitude	-200		5000	M	
Operating shock			30,18	g.mS	EN60068-2-27:Half sine, 3 axes, 3+ 3-. 810G: Method 516.6, Procedure IV, Transit drop
Non-operating shock			50,11	g.mS	
Vibration			2	g	EN60068-2-6: sine, 10-500Hz, 3 axes, 1oct/min 10 cycles each axis
			0.02,256 non op 0.0122,1 op	g ² /Hz, grms	EN60068-2-64: Random, 5-500Hz, 3 axes, 30min. 810G:method 514.6, Procedure I (general vibration) Cat 4 Fig 514.6C-3, Cat 7 Fig 514.6C-5, Cat 24 Fig 514.6E-1
Thermal shock non-operational	-51		85	°C	MIL-STD-810G Method 503.5 Procedure I-C, Multi-cycle. 3 Shocks

Installation Specifications

Parameter	Details	Parameter	Details
Equipment class	I	Flammability rating	94V-2
Overvoltage category	II	Ingress protection	IP10
Material group	IIIb (indoor use only)	ROHS compliance	2011/65/EU
Pollution degree	2	Intended usage environment	Home healthcare

Notes

1. Some specifications will not be met below -20°C

EMC: Emissions

	Standard	Test level	Notes & Conditions
Conducted	EN55022/11	B	FCC part 15, CISPR 22/11
	MIL-STD-461F	CE102	10KHz-10MHz
Radiated	EN55022/11	B	
	MIL-STD-461F	RE102	30Hz-18Ghz Grounded, fixed. Compliant when mounted in enclosure
Harmonic current	EN61000-3-2	Class A	
Voltage flicker	EN61000-3-3		

EMC: Immunity

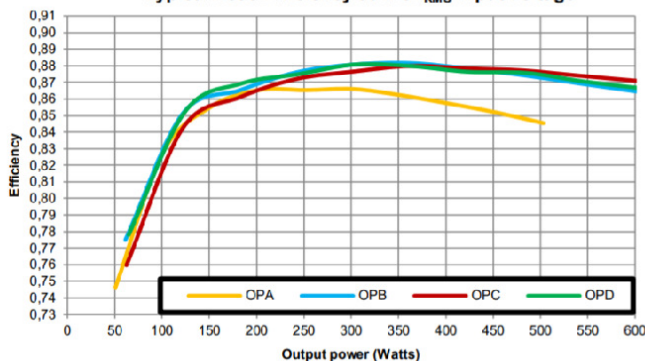
	Standard	Test level	Criteria	Notes & Conditions
ESD	EN61000-4-2	4	A	15KV Air, 8KV Contact
Radiated	EN61000-4-3	3	A	10V/m 80MHz-2.7GHz sine wave 80% AM 1KHz
EFT	EN61000-4-4	3	A	2KV Power, 1KV I/O 5KHz (Ed4) & 100KHz (Ed5)
Surges	EN61000-4-5	Installation Class 3	A	1KV Live-Neutral, 2KV Live/Neutral—Earth
Conducted	EN61000-4-6	3	A	10V, 0.15 to 80MHz sine wave 80AM 1KHz
PFMF	EN61000-4-8	4	A	30A/m 50Hz
Voltage dips	EN61000-4-11	95% 0.5 & 1 cycle A, 30% 25 cycles A (240/100VAC), 60% 10 cycles A/C (240/100VAC)		
Voltage Interruptions	EN61000-4-11	>95% interruption 250 cycles C (IEC60601-1-1-2: 2014)		
Voltage sag immunity	SEMI-F47-0706	95% 1 cycle A, 50% 50 cycles A/B (240/100VAC), 70% 25 cycles A, 80% 50 cycles A, 90% continuous A NOTE: Criterion A achieved for full power when Vin >=160V and at all input voltages when Pout <=350W		
Conducted susceptibility	MIL-STD-461F:CS116	Damped sinusoidal transient, cables and power leads 10KHz-100MHz		
Shipboard electric Power	MIL-STD1399	Voltages pike test Type 1, 115V 50Hz single phase		
Conducted susceptibility	MIL-STD-461F:CS101	Power leads 30Hz-150KHz		
	MIL-STD-461F:CS114	Bulk cable injection 10KHz-200MHz		
	MIL-STD-461F:CS115	Bulk cable injection impulse excitation		
Radiated susceptibility	MIL-STD-461F:RS101	Magnetic field 30Hz-100KHz		
Aircraft electric power characteristic	MIL-STD-704F	SAC102,104,105,109,110 (MIL-HDBK-704-2) SXF102,104,105,109,110 (MIL-HDBK-704-6)		

Safety Approvals

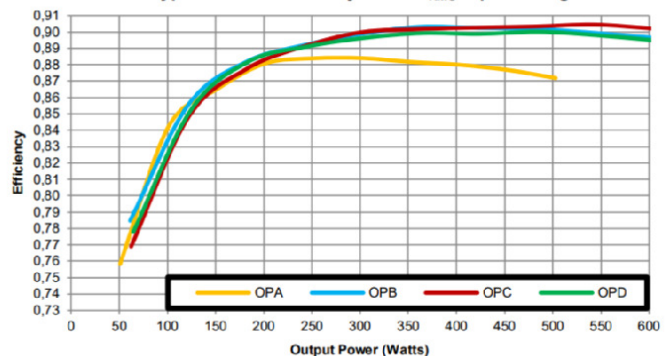
	Safety standard	Notes & Conditions
UL	UL60601-1 2006 2nd edition CAN/CSA-22.2 No. 60601-1:14 Ed 3 ANSI/AAMI ES60601-1 (2005 +C1:09 + A210)	UL file E316486
CB	IEC 60601-1: 3.1 edition	
CE	EN60601-1 A12 2014	2014/30/EU EMC directive, 2014/35/EU Low voltage directive

Efficiency

Typical Load Efficiency at 120V_{RMS} input voltage



Typical Load Efficiency at 220V_{RMS} input voltage



Thermal Performance

Conduction cooled

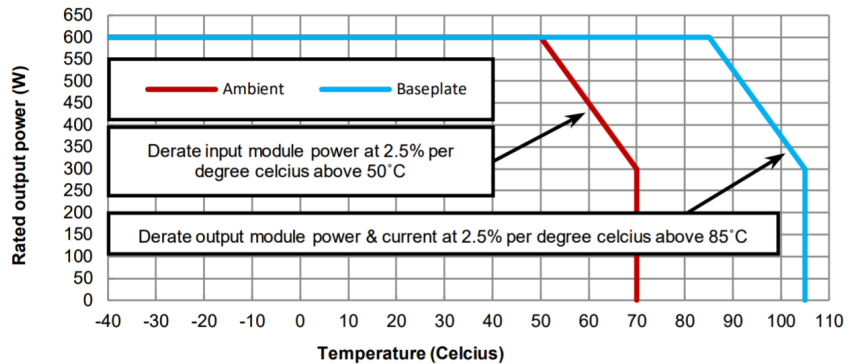
Apply appropriate deratings to both input & output modules based on temperatures.

Ambient derating applies to input module rated & peak power. Baseplate derating applies to output module power and current, and bias supply power.

Plot is for a fully configured 4 x 150W output modules fitted.

Similar deratings apply to input module peak power, output module peak power and current. See user manual for detail

Any mounting orientation is allowed.



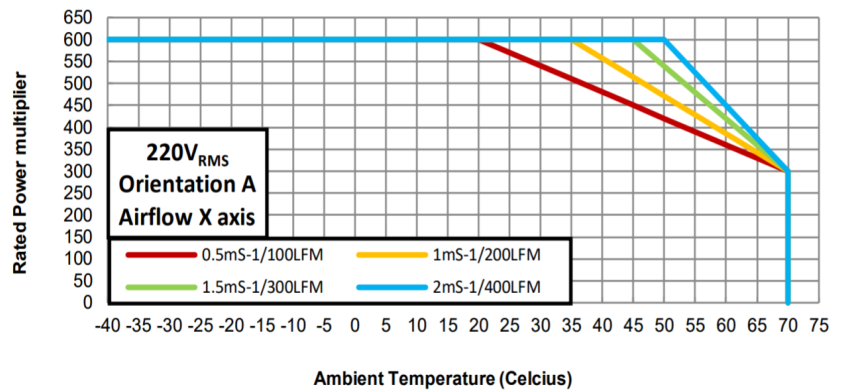
Forced air cooled

Plot shows typical performance of a fully configured VCCM600M-CCCC under controlled conditions with no heatsink attached and unit mounted 25mm from surface.

Unit mounted in orientation A with air flow in X direction, 220Vrms Input voltage.

Actual ratings must be determined in the user application.

See user manual for more detailed information.



Convection cooled

Plot shows typical performance of a fully configured system under controlled conditions.

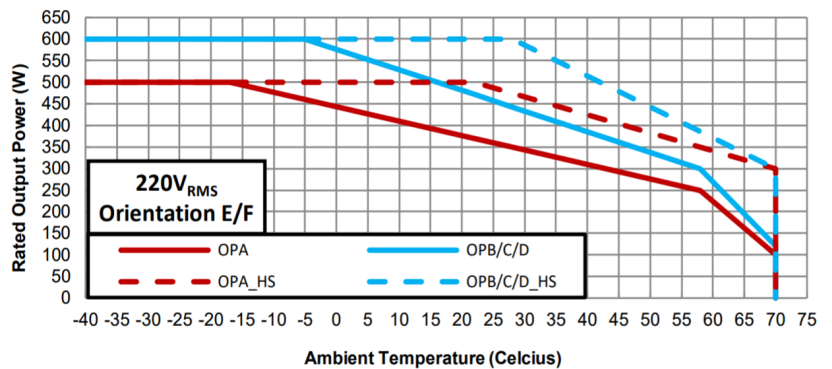
Solid line shows performance with no heatsink attached.

Dashed line shows performance with standard heatsink attached.

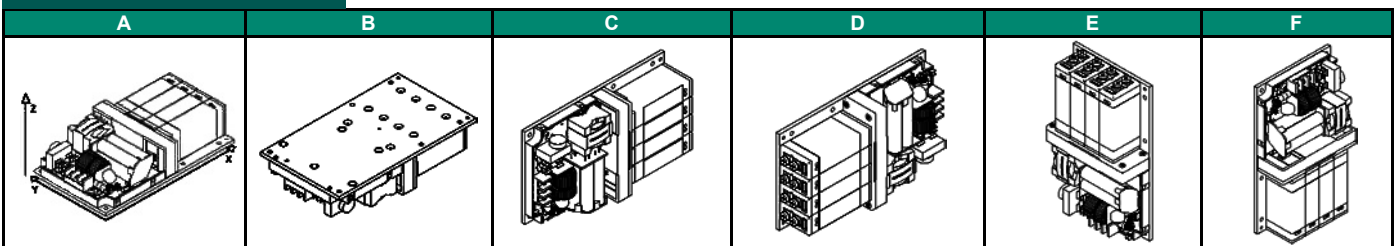
Unit mounted in orientation E in free space, 220Vrms input voltage.

Actual ratings must be determined in the user application.

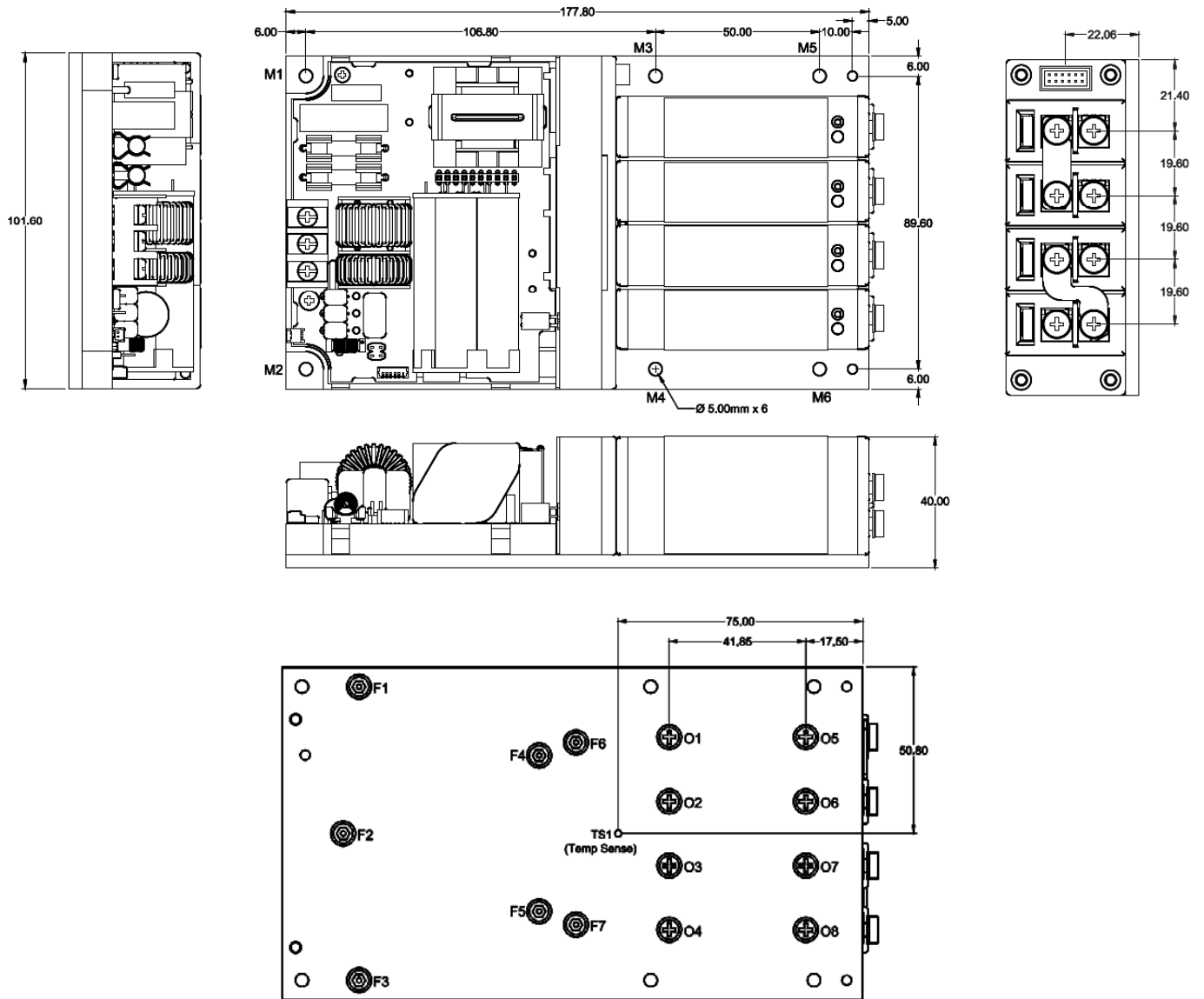
See user manual for more detailed information.



Orientation definitions



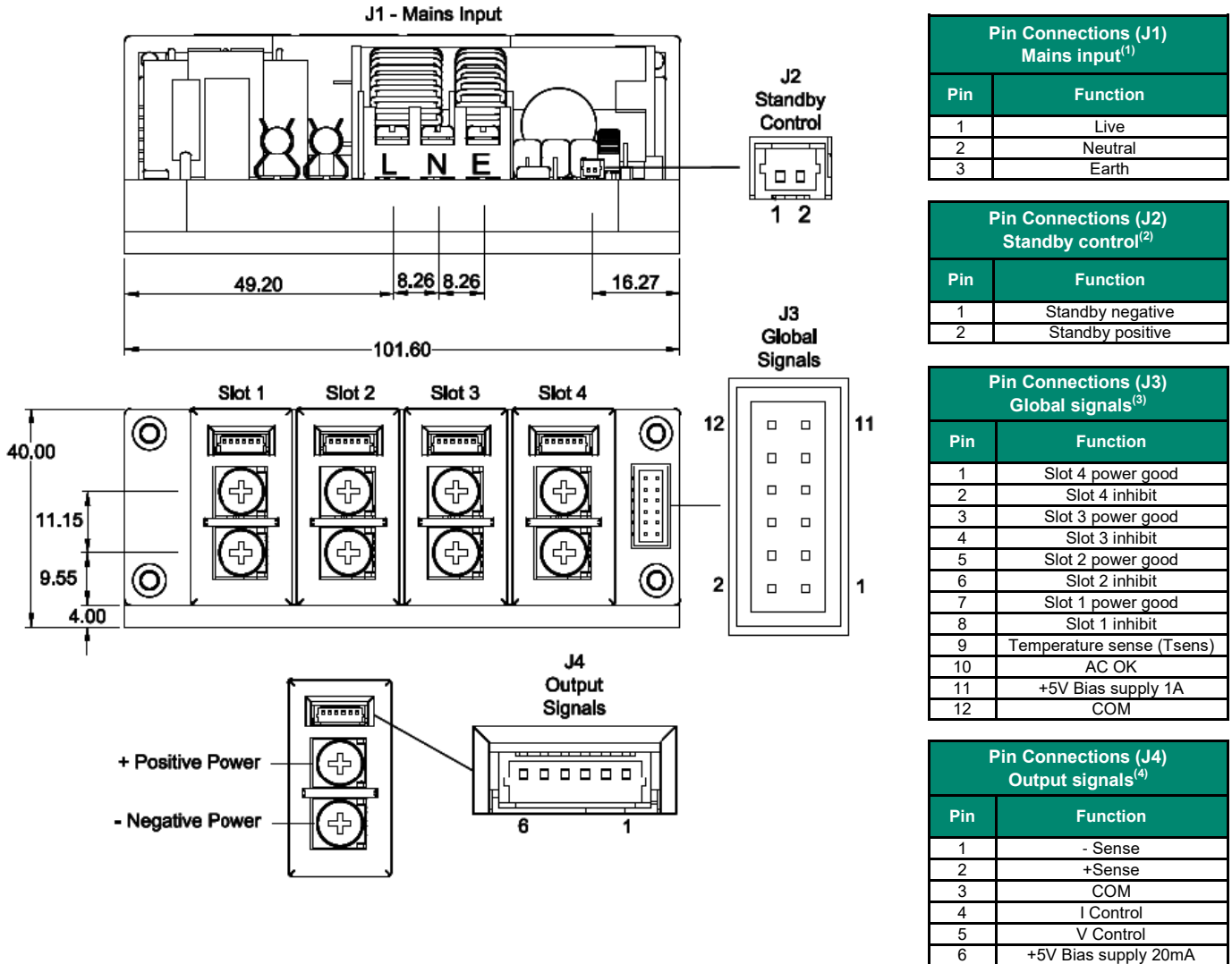
Mechanical Details



Notes

1. All dimensions in mm and in accordance with DIN27681/-2 Class C
2. Baseplate mount (M1-6) 5mm \varnothing 4mm thick, 0.55NM torque
3. Output module mount (O1-8) M3 CSK, 8mm, 0.35NM
4. Transformer module mount (F6-7) M3 CSK, 8mm, 0.35NM torque

Connector Details



Notes

- J1 3 x 6-32 screw terminal 0.8Nm / 7Ln-In torque
- J2 28-30AWG molex 5010210200 housing (0500588000 pins)
- J3 28-30AWG wire to board: molex 0511101260 housing (0503948051 pins), wire to IDC cable molex 0875681273
- J4 28-30AWG molex 5010210200 housing (0500588000 pins)
- All dimensions in mm and in accordance with DIN27681/-2 Class C

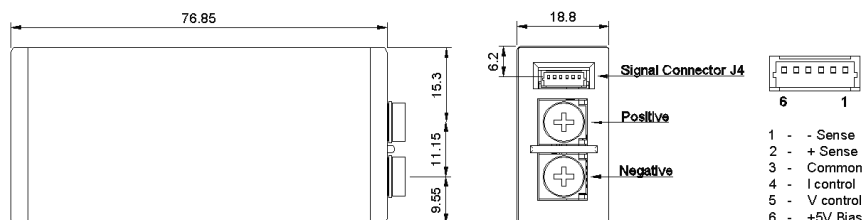
VCCM600 Series output module A 1.5-7.5V

125 Watts

- Peak power 187.5W (<5 sec)
- Remote current and voltage programming via analogue
- Current share in parallel operation
- Remote sense
- 5 Year warranty



Parameter	Min	Typical	Max	Units	Notes & Conditions
Output voltage range	1.5	5	7.5	V	Manual adjustment
Output current rating			25	A	
Output power rating			125	W	
Peak power rating			187.5	W	Max 5 seconds
Initial voltage setting accuracy	-0.5		0.5	%	Factory set units
Load regulation	-50		50	mV	Measured at sense terminals
Line regulation	-0.1		0.1	% Vnom	Measured at sense terminals
Cross regulation	-0.2		0.2	% Vnom	Measured at sense terminals
Minimum Load	0			W	
Temperature coefficient	-0.02		+0.02	% /°C	
Noise and ripple			1	% Vnom	20MHz bandwidth pk-pk
Transient response			1	V	25%-75% load change at 1A/us recovery within 10% in 100uS
Turn on rise time	1.5		3.5	mS	Monotonic 10%-90%
Turn on overshoot			0.1	% Vset	
Turn on delay		2000	3000	mS	AC-Power good
		15	20	mS	Enable to power good
Current share accuracy	-5		+5	%	Error from ideal sharing current for loads >20% of rating
Open sense offset			2	% Vnom	Voltage offset between sense lines and output terminals when sense lines unused
Holdup voltage			6	V	
Isolation to ground			500	V	Each output terminal
Overcurrent protection	105	115	125	%Inom	
Reverse current protection	-6		0	%Inom	
Short circuit protection		125/3/1		mS/%V	Period/Duty cycle/Voltage Threshold (Measured at sense terminals)
Overvoltage protection		9.5		V	
Over temperature protection	115		125	°C	Various locations
Sense cable protection	-1		2	V	Positive
	-1		1	V	Negative
Power good threshold		90		% Vset	Low threshold only
Current output signal	0		125	%Inom	$V_{current} = 4 * I_{out}/I_{rated}$
Current limit control	0		100	%Inom	$I_{limit} = I_{rated} * V_{control}/4$
Remote voltage control	0		131.5	% Vset	$V_{out} = V_{set} * (5 - V_{control})/3.8$
Bias supply	4.5		5.2	V	10mA max
Reliability			0.5		30°C base, 100% load, SR332 Issue 2 Method I, Case 3, Ground, Fixed, Controlled
Size	3(77) x 0.74(18.8) x 1.41(36)			Inches (mm)	LxWxH
weight		100		g	



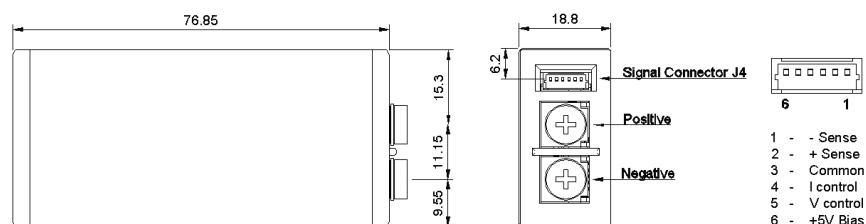
VCCM600 Series output module B 4.5-15V

150 Watts

- Peak power 225W (<5 sec)
- Remote current and voltage programming via analogue
- Current share in parallel operation
- Remote sense
- 5 Year warranty



Parameter	Min	Typical	Max	Units	Notes & Conditions
Output voltage range	4.5	12	15	V	Manual adjustment
Output current rating			15	A	
Output power rating			150	W	
Peak power rating			225	W	Max 5 seconds
Initial voltage setting accuracy	-0.5		0.5	%	Factory set units
Load regulation	-100		100	mV	Measured at sense terminals
Line regulation	-0.1		0.1	% Vnom	Measured at sense terminals
Cross regulation	-0.2		0.2	% Vnom	Measured at sense terminals
Minimum Load	0			W	
Temperature coefficient	-0.02		+0.02	% /°C	
Noise and ripple			1	% Vnom	20MHz bandwidth pk-pk
Transient response			1.5	V	25%-75% load change at 1A/us recovery within 10% in 100uS
Turn on rise time	1.5		3.5	mS	Monotonic 10%-90%
Turn on overshoot			0.1	% Vset	
Turn on delay		2000	3000	mS	AC-Power good
		15	20	mS	Enable to power good
Current share accuracy	-5		+5	%	Error from ideal sharing current for loads >20% of rating
Open sense offset			2	% Vnom	Voltage offset between sense lines and output terminals when sense lines unused
Holdup voltage			12.5	V	
Isolation to ground			500	V	Each output terminal
Overcurrent protection	105	115	125	%Inom	
Reverse current protection	-6		0	%Inom	
Short circuit protection		125/3/2		mS/%V	Period/Duty cycle/Voltage Threshold (Measured at sense terminals)
Overvoltage protection		18		V	
Over temperature protection	115		125	°C	Various locations
Sense cable protection	-1		2	V	Positive
			1	V	Negative
Power good threshold		90		% Vset	Low threshold only
Current output signal	0		125	%Inom	$V_{current} = 4 * I_{out}/I_{rated}$
Current limit control	0		100	%Inom	$I_{limit} = I_{rated} * V_{control}/4$
Remote voltage control	0		131.5	% Vset	$V_{out} = V_{set} * (5 - V_{control})/3.8$
Bias supply	4.5		5.2	V	10mA max
Reliability			0.5		30°C base, 100% load, SR332 Issue 2 Method I, Case 3, Ground, Fixed, Controlled
Size	3(77) x 0.74(18.8) x 1.41(36)			Inches (mm)	LxWxH
weight		100		g	



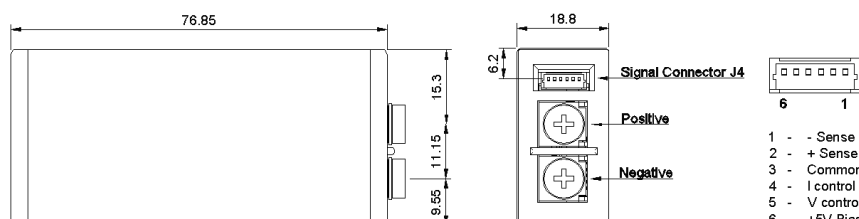
VCCM600 Series output module C 9-30V

150 Watts

- Peak power 225W (<5 sec)
- Remote current and voltage programming via analogue
- Current share in parallel operation
- Remote sense



Parameter	Min	Typical	Max	Units	Notes & Conditions
Output voltage range	9	24	30	V	Manual adjustment
Output current rating			7.5	A	
Output power rating			150	W	
Peak power rating			225	W	Max 5 seconds
Initial voltage setting accuracy	-0.5		0.5	%	Factory set units
Load regulation	-150		150	mV	Measured at sense terminals
Line regulation	-0.1		0.1	% Vnom	Measured at sense terminals
Cross regulation	-0.2		0.2	% Vnom	Measured at sense terminals
Minimum Load	0			W	
Temperature coefficient	-0.02		+0.02	% /°C	
Noise and ripple			1	% Vnom	20MHz bandwidth pk-pk
Transient response			3	V	25%-75% load change at !A/us recovery within 10% in 100uS
Turn on rise time	1.5		3.5	mS	Monotonic 10%-90%
Turn on overshoot			0.1	% Vset	
Turn on delay		2000	3000	mS	AC-Power good
		15	20	mS	Enable to power good
Current share accuracy	-5		+5	%	Error from ideal sharing current for loads >20% of rating
Open sense offset			2	% Vnom	Voltage offset between sense lines and output terminals when sense lines unused
Holdup voltage			25	V	
Isolation to ground			500	V	Each output terminal
Overcurrent protection	105	115	125	%Inom	
Reverse current protection	-6		0	%Inom	
Short circuit protection		125/3/3.5		mS/%/V	Period/Duty cycle/Voltage Threshold (Measured at sense terminals)
Overvoltage protection		36		V	
Over temperature protection	115		125	°C	Various locations
Sense cable protection	-1		2	V	Positive
			1	V	Negative
Power good threshold		90		% Vset	Low threshold only
Current output signal	0		125	%Inom	$V_{current} = 4 * I_{out}/I_{rated}$
Current limit control	0		100	%Inom	$I_{limit} = I_{rated} * V_{control}/4$
Remote voltage control	0		131.5	% Vset	$V_{out} = V_{set} * (5 - V_{control})/3.8$
Bias supply	4.5		5.2	V	10mA max
Reliability			0.5		30°C base, 100% load, SR332 Issue 2 Method I, Case 3, Ground, Fixed, Controlled
Size	3(77) x 0.74(18.8) x 1.41(36)			Inches (mm)	LxWxH
weight		100		g	



Permitted wire size:

10-20AWG

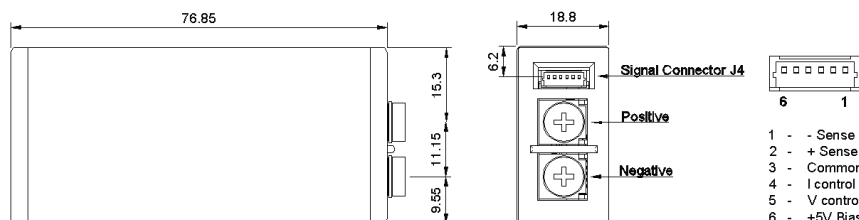
VCCM600 Series output module D 18-58V

150 Watts

- Peak power 217.5W (<5 sec)
- Remote current and voltage programming via analogue
- Current share in parallel operation
- Remote sense
- 5 Year warranty



Parameter	Min	Typical	Max	Units	Notes & Conditions
Output voltage range	18	48	58	V	Manual adjustment
Output current rating			3.75	A	
Output power rating			150	W	
Peak power rating			217.5	W	Max 5 seconds
Initial voltage setting accuracy	-0.5		0.5	%	Factory set units
Load regulation	-300		300	mV	Measured at sense terminals
Line regulation	-0.1		0.1	% Vnom	Measured at sense terminals
Cross regulation	-0.2		0.2	% Vnom	Measured at sense terminals
Minimum Load	0			W	
Temperature coefficient	-0.02		+0.02	% /°C	
Noise and ripple			1	% Vnom	20MHz bandwidth pk-pk
Transient response			3	V	25%-75% load change at !A/us recovery within 10% in 100uS
Turn on rise time	1.5		3.5	mS	Monotonic 10%-90%
Turn on overshoot			0.1	% Vset	
Turn on delay		2000	3000	mS	AC-Power good
		15	20	mS	Enable to power good
Current share accuracy	-5		+5	%	Error from ideal sharing current for loads >20% of rating
Open sense offset			2	% Vnom	Voltage offset between sense lines and output terminals when sense lines unused
Holdup voltage			50	V	
Isolation to ground			500	V	Each output terminal
Overcurrent protection	105	115	125	%Inom	
Reverse current protection	-6		0	%Inom	
Short circuit protection		125/3/3.5		mS/%V	Period/Duty cycle/Voltage Threshold (Measured at sense terminals)
Overvoltage protection		66		V	
Over temperature protection	115		125	°C	Various locations
Sense cable protection	-1		2	V	Positive
			1	V	Negative
Power good threshold		90		% Vset	Low threshold only
Current output signal	0		125	%Inom	$V_{current} = 4 * I_{out}/I_{rated}$
Current limit control	0		100	%Inom	$I_{limit} = I_{rated} * V_{control}/4$
Remote voltage control	0		131.5	% Vset	$V_{out} = V_{set} * (5 - V_{control})/3.8$
Bias supply	4.5		5.2	V	10mA max
Reliability			0.5		30°C base, 100% load, SR332 Issue 2 Method I, Case 3, Ground, Fixed, Controlled
Size	3(77) x 0.74(18.8) x 1.41(36)			Inches (mm)	LxWxH
weight		100		g	



Permitted wire size:

10-20AWG