HAC300S SERIES:

312 Watts 12V Main Output Models

- 6.67 x 3.94 x 1.59”

Features:

- 12V Main Output Compact PCI Power Supplies
- 5VSB @ 2.5A Auxiliary Output
- Universal AC Input (90-264 VAC)
- Hot-Swap / N+1 Redundant Operation
- 80 Plus Gold Efficienct
- Active Current Sharing
- PMBUs Communication
- PICMG Compliant
- International Safety Approvals
- 2 Year Warranty

INPUT:

Input Voltage	90~264 VAC (Universal)
Input Frequency	47-63Hz
Inrush Current	5.3A @ 230 VAC Cold Start
Input Current	3A @ 115 VAC / 1.5A @ 230 VAC (max)
Hold-Up Time	18ms (minimum)
Leakage Current	<700 µA @ 230 VAC Maximum
Power Factor	EN61000-3-2 Class D Compliant

GENERAL:

Efficiency	75% minimum (230 VAC / Full Load)
Operating Temperature	-40-70°C, derate linearly to 60% Load from 50°C to 70°C
Storage Temperature	-40°C to +85°C
Cooling	200 lfm airflow airflow required for full load
Operating Humidity	5-90% RH, Non-Condensing
Vibration	5 ~ 50 Hz, acceleration 7.35 m/s*s on X,Y and Z Axis

OUTPUT:

Adjustment Range	Fixed
Minimum Load	n/a
Load Regulation	V1 = ±1% / V2 = ±5% (max)
Line Regulation	±1% (Typical)
Ripple & Noise	±1% typ. pk-pk @ 20MHz
Overload Protection	120-130% of max power (Hiccup Mode)
Over Voltage	Latching before130% of nominal
Short Circuit Protection	Trip without damage & auto-recovery
Transient Response	<134mV, recovers <500µs following a 25% load change
	Turn-on & off overshoot < 5% over nominal voltage

APPROVALS:

Emissions	EN55022 “B”, FCC Part 15 Subject J Class B
Safety Approvals	IEC 60950-1

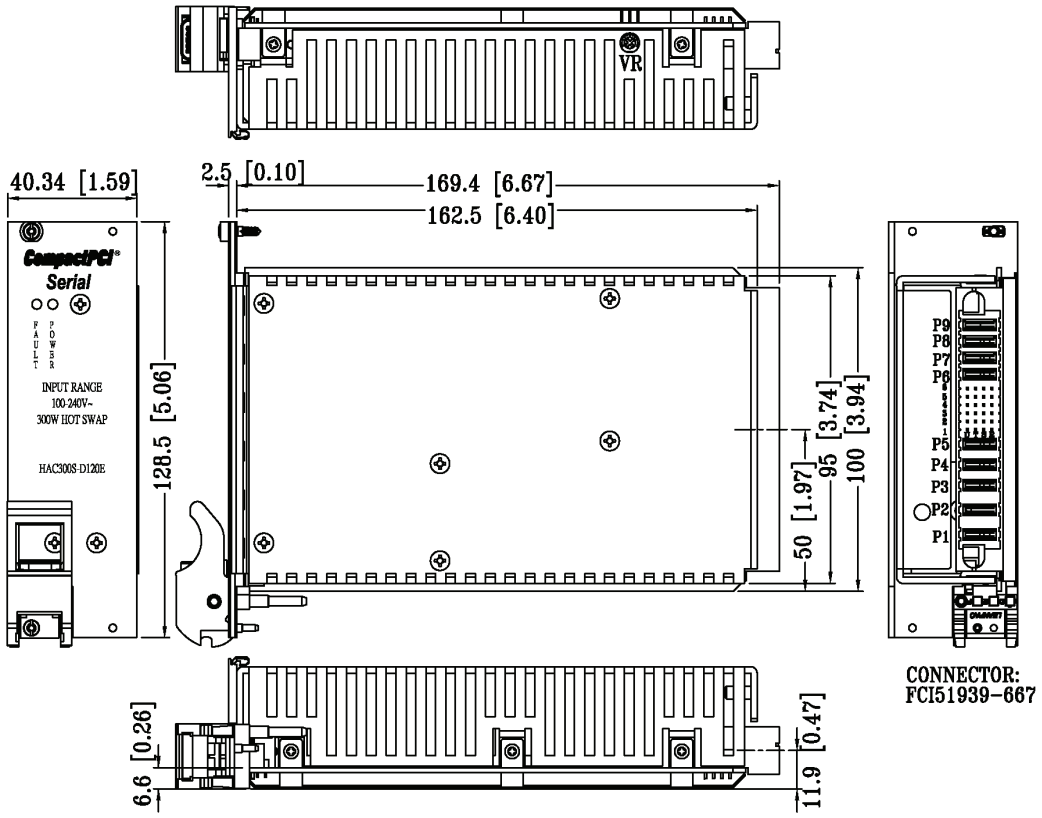
STATUS & CONTROL:

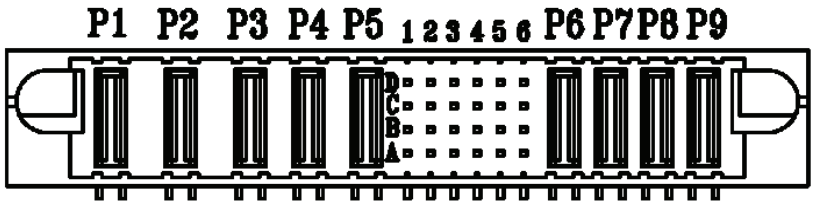
Remote Sense	Available for VO1
DC OK	Available for VO1 & +5Vsb
Current Share	Available for VO1 & +5Vsb
PS Present	Included
PM Bus	Included
Remote on/off	Included
Thermal Sensing	Thermostat Connection

HAC300S SERIES:

Ouput Specifications:

Active PFC	MAIN OUTPUT		AUXILIARY OUTPUT	
HACS300-D120E	12V	25A	5VSB	2.5A





P1	P2	P3	P4	P5	D1	D2	D3	D4	D5	D6	P6	P7	P8	P9
					N/A	FAL	PS_P	COM	DEG	5Vsb				
					C1	**C2**	**C3**	**C4**	**C5**	**C6**				
					N/A	N/A	COM	A0	ALERT	5Vsb				
LINE	NEUTRAL	GND	-	-	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	COM	COM	+12V	+12V
					N/A		PSON	A1	SCL	COM				
					A1	**A2**	**A3**	**A4**	**A5**	**A6**				
					N/A	-VS	+VS	A2	SDA	EN				

HAC300S SERIES:

PMBus Specification

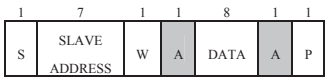
Device identification

A2	*A1*	*A0*	PMBus Bits 7-1	Alert Response Bits 7-1	EEPROM Bits 7-1
0	0	0	0011 000	0001 100	1010 000
0	0	1	0011 001	0001 100	1010 001
0	1	0	0011 010	0001 100	1010 010
0	1	1	0011 011	0001 100	1010 011
1	0	0	0011 100	0001 100	1010 100
1	0	1	0011 101	0001 100	1010 101
1	1	0	0011 110	0001 100	1010 110
1	1	1	0011 111	0001 100	1010 111

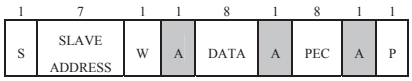
Alert Response

當裝置偵測到異常時，會將 SMBALERT# 訊號腳拉為低電位來通知系統,
而系統須以 Receive byte protocol (slave address with R/W bit = 0x19) 來詢問裝置位址(不含 R/W 位元),
當完成詢問動作後，裝置會釋放 SMBALERT# 訊號,
取得裝置位址後，系統再查詢各分頁的 STATUS_BYTE 的內容，從中取得發生問題的模組,
再依 STATUS_BYTE/STATUS_WORD 的指示，索引出對應的狀態暫存器，即可獲得發生的原因,
若同時有二個以上裝置發出 SMBALERT# 訊號時,
在詢問位址的過程中，裝置會自行仲裁，位址最低的將最先獲得回應，所以必須再次進行詢問直到 SMBALERT# 釋放為止
當狀態暫存器未被清除時，再發生相同的原因是不會引發 SMBALERT#,
下達 CLEAR_FAULTS 去清除狀態值，或改變 PS_EN_OUT 訊號準位亦可清除狀態

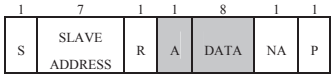
PMBus Protocol



Send byte protocol

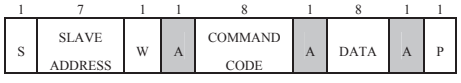


Send byte protocol with PEC

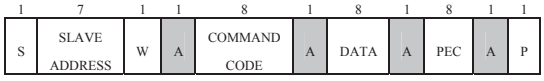


Receive byte protocol

Receive byte protocol with PEC



Write byte protocol

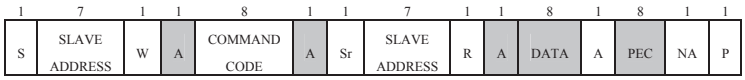


Write byte protocol with PEC

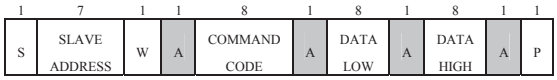
HAC300S SERIES:

PMBus Protocol

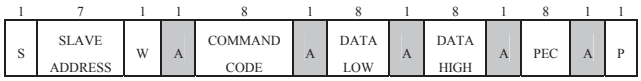
Read byte protocol



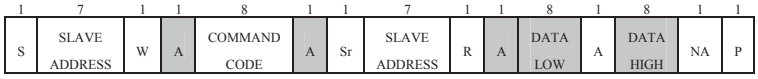
Read byte protocol with PEC



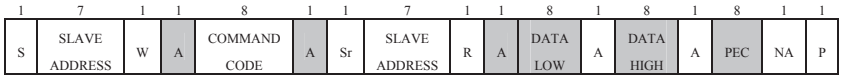
Write word protocol



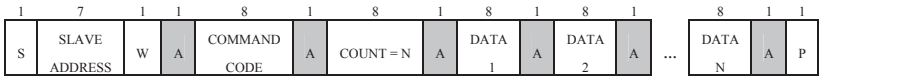
Write word protocol with PEC



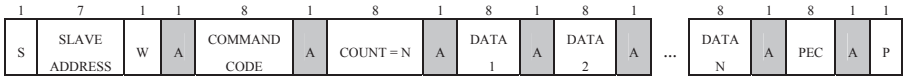
Read word protocol



Read word protocol with PEC



Write block protocol



Write block protocol with PEC

Read block protocol

Read block protocol with PEC

HAC300S SERIES:

PMBus Command					
Code	**Name**	**Protocol**	**Data Format**	**Scope**	
00h	PAGE	Read/Write Byte	Byte	Common*1	
03h	CLEAR_FAULTS	Send Byte	n/a	Common	
19h	CAPABILITY	Read Byte	Byte	Common	
42h	VOUT_OV_WARN_LIMIT	Read Word	Linear*3	Page*2	
43h	VOUT_UV_WARN_LIMIT	Read Word	Linear	Page	
4Ah	IOUT_OC_WARN_LIMIT	Read Word	Linear	Page	
4Fh	OT_FAULT_LIMIT	Read Word	Linear	Page	
51h	OT_WARN_LIMIT	Read Word	Linear	Page	
52h	UT_WARN_LIMIT	Read Word	Linear	Page	
6Ah	POUT_OP_WARN_LIMIT	Read Word	Linear	Page	
78h	STATUS_BYTE	Read Byte	Byte	Page	
79h	STATUS_WORD	Read Word	Word	Page	
7Ah	STATUS_VOUT	Read Byte	Byte	Page	
7Bh	STATUS_IOUT	Read Byte	Byte	Page	
7Dh	STATUS_TEMPERATURE	Read Byte	Byte	Page	
7Eh	STATUS_CML	Read Byte	Byte	Common	
81h	STATUS_FANS_1_2	Read Byte	Byte	Common	
8Bh	READ_VOUT	Read Word	Linear	Page	
8Ch	READ_IOUT	Read Word	Linear	Page	
8Dh	READ_TEMPERATURE_1	Read Word	Linear	Common	
8Eh	READ_TEMPERATURE_2	Read Word	Linear	Common	
~~90h~~	~~READ_FAN_SPEED_1~~	~~Read Word~~	~~Linear~~	~~Common~~	
96h	READ_POUT	Read Word	Linear	Page	
98h	PMBUS_REVISION	Read Byte	Byte	Common	
9Ah	MFR_MODEL	Read Block	String	Common	
9Bh	MFR_REVISION	Read Block	String	Common	
9Ch	MFR_LOCATION	Read Block	String	Common	
9Dh	MFR_DATE	Read Block	String	Common	
9Eh	MFR_SERIAL	Read Block	String	Common	
A0h	MFR_VIN_MIN	Read Word	Linear	Common	
A1h	MFR_VIN_MAX	Read Word	Linear	Common	
A2h	MFR_IIN_MAX	Read Word	Linear	Common	
A3h	MFR_PIN_MAX	Read Word	Linear	Common	
A4h	MFR_VOUT_MIN	Read Word	Linear	Page	
A5h	MFR_VOUT_MAX	Read Word	Linear	Page	
A6h	MFR_IOUT_MAX	Read Word	Linear	Page	
A7h	MFR_POUT_MAX	Read Word	Linear	Page	
A8h	MFR_TAMBIENT_MAX	Read Word	Linear	Common	
A9h	MFR_TAMBIENT_MIN	Read Word	Linear	Common	

*1 Common – 共通，不分頁

*2 Page – 分頁視為裝置內的一組電源模組，有些命令需要搭配 PAGE 才能取得該電源模組的數值

*3 Linear – 長度為 2 bytes,

其中較低的 11 bits 用來表示尾數(Mantissa)，以 2 補數來表示其範圍(+1023 ~ -1024)

另外較高的 5 bits 為指數(Exponent)，以 2 補數來表示其範圍(+15 ~ -16)

所代表的數值的關係式為 Y = 2^Exponent * Mantissa

15	11	10	0
2's Exponent		2's Mantissa	

HAC300S SERIES:

00h	*PAGE*	*Read/Write Byte*	*Byte*	*Common*
取得或切換目前工作頁				

	HVP450	*HVP600*	
PAGE0	*12V Module*	*12V Module*	
PAGE6	*5Vsb Module*	*5Vsb Module*	

03h	*CLEAR_FAULTS*	*Send Byte*	*n/a*	*Common*
清除目前所有在 STATUS 暫存器的 Warning 及 Fault 位元. 當電源因 Fault 條件成立而造無輸出的情況下, 下達 CLEAR_FAULTS 會令電源會重新啟動. 若 Fault/Warn 的條年仍然存在時, 則 STATUS 暫存器仍會被再一次設定, 並將 SMBALERT#準位設定為 LOW 若改變 PS_EN 的準位也會執行 CLEAR_FAULTS				

19h	*CAPABILITY*	*Read Byte*	*Byte*	*Common*
確認 PMBus 裝置支援的功能				

BIT	DESCRIPTION	MEANING
7	Packet Error Checking	1： 支援 Packet Error Checking
6:5	Maximum Bus Speed	01： 最大傳輸速度 400kHz
4	SMBALERT#	1： 支援 SMBus Alert Response 協定
3:0	Reserve	0

42h	*VOUT_OV_WARN_LIMIT*	*Read Word*	*Linear [V]*	*Page*
此設定值, 為輸出過電壓(Warning)的條件, 當電源輸出電壓大於此設定值時, 將影響以下內容 1. STATUS_BYTE.NONE_OF_THE_ABOVE = 1 2. STATUS_WORD.VOUT = 1 3. STATUS_VOUT. OV_WARNING = 1 4. SMBALERT# = LOW_LEVEL				

	12V Module (PAGE0)		5Vsb Module (PAGE6)
HAC300	13.2V (0xd34d)		5.5V (0xcac0)

43h	*VOUT_UV_WARN_LIMIT*	*Read Word*	*Linear [V]*	*Page*
此設定值, 為輸出低電壓(Warning)的條件, 當電源輸出電壓小於此設定值時, 將影響以下內容 1. STATUS_BYTE.NONE_OF_THE_ABOVE = 1 2. STATUS_WORD.VOUT = 1 3. STATUS_VOUT. UV_WARNING = 1 4. SMBALERT# = LOW_LEVEL				

	12V Module (PAGE0)		5Vsb Module (PAGE6)
HAC300	10.8V(0xd2b4)		4.5V (0xca40)

4Ah	*IOUT_OC_WARN_LIMIT*	*Read Word*	*Linear [A]*	*Page*
此設定值, 為輸出過電流(Warning)的條件, 當電流輸出電壓大於此設定值時, 將影響以下內容 1. STATUS_BYTE.NONE_OF_THE_ABOVE = 1 2. STATUS_WORD.IOUT = 1 3. STATUS_IOUT. OC_WARNING = 1 4. SMBALERT# = LOW_LEVEL				

	12V Module (PAGE0)		5Vsb Module (PAGE6)
HAC300	27.5A (0xdB70)		n/a

HAC300S SERIES:

4Fh	*OT_FAULT_LIMIT*	*Read Word*	*Linear [℃]*	*Page*
此設定值，為 Oring-FET 過溫度(Fault)的條件，當 Oring-FET 溫度大於此設定值時，將影響以下內容 1. STATUS_BYTE.TEMPERATURE = 1 2. STATUS_TEMPERATURE .OT_FAULT = 1 3. SMBALERT# = LOW_LEVEL 4. STATUS_BYTE. OFF = 1 (電源將停止輸出) 5. 若溫度冷却至 OT_WARN_LIMIT 時，電源將自動開啟且 STATUS_BYTE.UINT_IS_OFF = 0;				

	12V Module (PAGE0)		5Vsb Module (PAGE6)
HAC300	105℃ (0x0069)		n/a

51h	*OT_WARN_LIMIT*	*Read Word*	*Linear [℃]*	*Page*
此設定值，為 Oring-FET 過溫度(Warn)的條件，當 Oring-FET 溫度大於此設定值時，將影響以下內容 1. STATUS_BYTE.TEMPERATURE = 1 2. STATUS_TEMPERATURE .OT_WARNING = 1 3. SMBALERT# = LOW_LEVEL				

	12V Module (PAGE0)	53V Module (PAGE1)	5Vsb Module (PAGE6)
HAC300	95℃ (0x005f)	95℃ (0x005f)	n/a

6Ah	*POUT_OP_WARN_LIMIT*	*Read Word*	*Linear*	*Page*
此設定值，為輸出過負載(Fault)的條件，當電源輸出功率大於此設定值時，將影響以下內容 4. STATUS_BYTE.IOUT_OC = 1 5. STATUS_WORD.IOUT = 1 6. STATUS_IOUT. OP_WARN = 1 7. SMBALERT# = LOW_LEVEL				

	12V Module (PAGE0)		5Vsb Module (PAGE6)
HAC300	330W (0xfa94)		n/a

78h	*STATUS_BYTE*	*Read Byte*	*Byte*	*Page*
狀態暫存器，為 STATUS_WORD 的低位組				

BIT	NAME	MEANING
~~7~~	~~BUSY~~	~~0~~
6	OFF	指示輸出禁止
5	VOUT_OV	曾發生輸出端過電壓
4	IOUT_OV	曾發生輸出端過電流
3	VIN_UV	曾發生輸入端低電壓
2	TEMPERATURE	曾發生溫度異常，詳見 STATUS_TEMPERATURE
1	CML	曾發生通訊異常，詳見 STATUS_CML
0	NONE_OF_THE_ABOVE	非以上列舉異常發生，明確的指示需透 STATUS_WORD 獲得

HAC300S SERIES:

79h	STATUS_WORD	Read Word	Word	Page
狀態暫存器				

BIT	NAME	MEANING
15	VOUT	曾發生輸出電壓異常，詳見 STATUS_VOUT
14	IOUT	曾發生輸出電流/功率異常，詳見 STATUS_IOUT
~~13~~	~~INPUT~~	0
~~12~~	~~MFR~~	0
~~11~~	~~POWER_GOOD#~~	NC
10	FAN	曾發生風扇轉速異常，詳見 STATUS_FAN
~~9~~	~~OTHER~~	0
~~8~~	~~UNKNOW~~	0
~~7~~	~~BUSY~~	同 STATUS_BYTE
6	OFF	
5	VOUT_OV	
4	IOUT_OV	
3	VIN_UV	
2	TEMPERATURE	
1	CML	
0	NONE_OF_THE_ABOVE	

7Ah	STATUS_VOUT	Read Byte	Byte	Page

BIT	NAME	MEANING
~~7~~	~~OV_FAULT~~	0
6	OV_WARNING	當輸出電壓曾高於 VOUT_OV_WARN_LIMIT
5	UV_WARNING	當輸出電壓曾高於 VOUT_UV_WARN_LIMIT
4	~~UV_FAULT~~	0
3		0
2		0
1		0
0		0

7Bh	STATUS_IOUT	Read Byte	Byte	Page

BIT	NAME	MEANING
~~7~~	~~OC_FAULT~~	0
~~6~~	~~OC_LV_FAULT~~	0
5	OC_WARNING	當輸出電流曾高於 IOUT_OC_WARN_LIMIT
4	~~UC_FAULT~~	0
3		0
2		0
~~1~~	~~OP_FAULT~~	0
0	OP_WARNING	當輸出功率曾高於 POUT_OP_WARN_LIMIT

7Dh	STATUS_TEMPERATURE	Read Byte	Byte	Page

BIT	NAME	MEANING
7	OT_FAULT	Oring-FET 溫度曾高於 OT_FAULT_LIMIT
6	OT_WARNING	Oring-FET 溫度曾高於 OT_WARN_LIMIT
~~5~~	~~UT_WARNING~~	
~~4~~	~~UT_FAULT~~	
3		
2		
1		
0		

HAC300S SERIES:

7Eh	STATUS_CML	Read Byte	Byte	Common
當滿足表格所列之通訊失敗的條件時，除了該位元被設定外，還將影響以下內容 1. STATUS_BYTE.CML = 1 2. SMBALERT# = LOW_LEVEL				

BIT	NAME	MEANING
7	UNSUPPORT_COMMAND	未實作此命令碼的讀或寫的功能
6	UNSUPPORT_DATA	在當前 PAGE 此命令碼不接受，或資料不被認知
5	PEC_FAIL	詳見 System Management Bus Specification Rev 1.1
4		
3		
2		
~~1~~	~~COMM_OTHER~~	
0		

81h	STATUS_FANS_1_2	Read Byte	Byte	Common
當滿足表格所列之風扇異常的條件時，除了該位元被設定外，還將影響以下內容 3. STATUS_BYTE.NONE_OF_THE_ABOVE = 1 4. STATUS_WORD.FAN= 1 5. SMBALERT# = LOW_LEVEL				

BIT	NAME	MEANING
7	FAN1_FAULT	當目前風扇設定為全速且所偵測的轉速，低於設計值的 80%時
6		
5	FAN1_WARNING	當目前風扇設定值與所偵測的轉速，低於設計值的 80%時
4		
~~3~~	~~FAN1_OVERRIDDEN~~	
2		
1		
0		

8Bh	READ_VOUT	Read Word	Linear	Page
讀取目前 PAGE 的電壓值				

8Ch	READ_IOUT	Read Word	Linear	Page
讀取目前 PAGE 的電流值				

8Dh	READ_TEMPERATURE_1	Read Word	Linear	Page
讀取目前 PAGE 的 Oring-FET 溫度值				

8Eh	READ_TEMPERATURE_2	Read Word	Linear	Common
讀取目前內部環境溫度(℃)				

90h	READ_FAN_SPEED_1	Read Word	Linear	Common
讀取目前風扇轉速				

96h	READ_POUT	Read Word	Linear	Page
讀取目前 PAGE 的功率值				

98h	PMBUS_REVISION	Read Byte	Byte	Common
相容於 PMBus Specification Part I Revision 1.1 / Part II Revision 1.1				

HAC300	0x11

HAC300S SERIES:

9Ah	MFR_MODEL	Read Block	String	Common
機種名				
HAC300	HAC300S-D120E			

9Bh	MFR_REVISION	Read Block	String	Common
硬體版本.韌體版本				
HAC300	0A.0A			

9Ch	MFR_LOCATION	Read Block	String	Common
生產地				
HAC300	Kaohsiung, TW			

9Dh	MFR_DATE	Read Block	String	Common
生產日期 ####$$%% #### - 年, $$ - 月, %% - 日				
HAC300	20120130			

9Eh	MFR_SERIAL	Read Block	String	Common
產品序號 ##$$%%%% ## - 年, $$ - 週別, %%%% - 流水號				
HAC300	12050001			

A0h	MFR_VIN_MIN	Read Word	Linear	Common
最小輸入額定電壓				
HAC300	90V (0xf8b4)			

A1h	MFR_VIN_MAX	Read Word	Linear	Common
最大輸入額定電壓				
HAC300	264V (0xfa10)			

A2h	MFR_IIN_MAX	Read Word	Linear	Common
最大輸入額定電流				
HAC300	4.17A (0xd10b)			

HAC300S SERIES:

A3h	*MFR_PIN_MAX*	*Read Word*	*Linear*	*Common*
最大輸入額定功率				
HAC300	375W (0x0232177)			

A4h	*MFR_VOUT_MIN*	*Read Word*	*Linear*	*Page*
最小輸出額定電壓				
	12V Module (PAGE0)		5Vsb Module (PAGE6)	
HAC300	11.16V (0xd2ca)		4.84V (0xca6c)	

A5h	*MFR_VOUT_MAX*	*Read Word*	*Linear*	*Page*
最大輸出額定電壓				
	12V Module (PAGE0)		5Vsb Module (PAGE6)	
HAC300	12.83V (0xd335)		5.34V (0xcaac)	

A6h	*MFR_IOUT_MAX*	*Read Word*	*Linear*	*Page*
最大輸出額定電流				
	12V Module (PAGE0)		5Vsb Module (PAGE6)	
HAC300	25A (0xdb20)		2.5A (0xc940)	

A7h	*MFR_POUT_MAX*	*Read Word*	*Linear*	*Page*
最大輸出額定功率				
	12V Module (PAGE0)		5Vsb Module (PAGE6)	
HAC300	300W (0xfa58)		12.5W (0xf819)	

A8h	*MFR_TAMBIENT_MAX*	*Read Word*	*Linear*	*Common*
最大工作環境額定溫度				
HAC300	50℃ (0x0032)			

A9h	*MFR_TAMBIENT_MIN*	*Read Word*	*Linear*	*Common*
最小工作環境額定溫度				
HAC300	-5°C (0x07fb)			