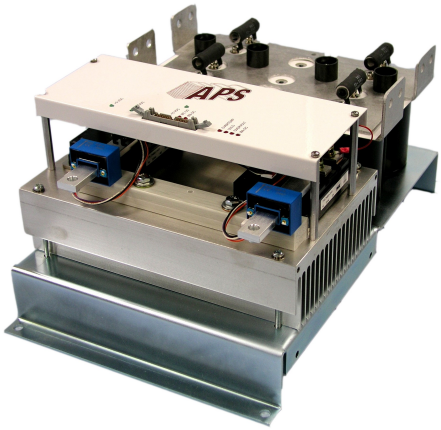
APPLIED POWER SYSTEMS, INC.

IAP100B120 Integrated Advanced PowerStack

100A / 1200V Full-Bridge IGBT Inverter



FEATURES INCLUDE

- Multi-Function Power Assembly
- Compact Size – 8.0” H X 17.6” W X 11.0” D
- DC Bus Voltages to 850VDC
- Snubber-less operation to 650VDC
- Switching frequencies to over 20kHz
- Protective circuitry with fail-safe opto-isolated fault annunciation, including:
  - Over current
  - Over voltage
  - Over Temperature
  - Short circuit
  - P.S. undervoltage
- Opto-isolated or fiber-optic gate drive and fault signal output for electrical isolation and noise immunity
- Integrated cooling with temperature sensors and feedback
- Many options – liquid cooling, front ends, etc.

Configurable Power

The IAP100B120 PowerStack inverter is a flexible, highly integrated IGBT based power assembly with a wide range of applications. These include inverters for renewable energy, energy storage, motor controls, switch mode power supplies (SMPS), UPS, welders, etc. The IAP100B120 PowerStack can be operated at frequencies to over 20kHz. The IAP100B120 PowerStack can be configured as a full bridge or three-phase bridge inverter mounted on an air-cooled or liquid-cooled heat sink. Configurations include options for (full, half or no control) converter input circuitry, inverter output circuitry, cooling and a wide variety of drivers and safety features for the converter front end and IGBT inverter output stage.

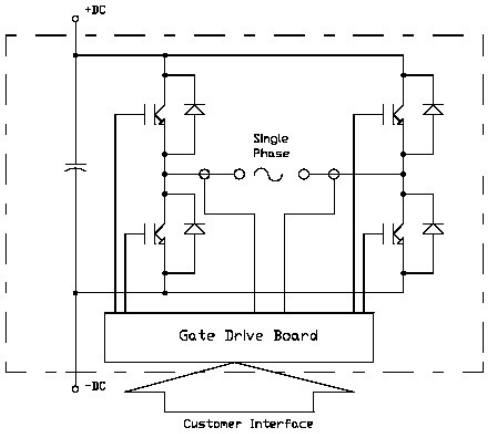
To operate at high switching frequencies, the IAP100B120 PowerStack utilizes a low inductance laminated bus structure, optically isolated or fiber optically coupled gate drive interfaces, isolated gate power supplies and a DC-link capacitor bank.

The IAP100B120 PowerStack provides built in protection features including: over voltage, under voltage lockout, over current, over temperature, short circuit and optional airflow or liquid flow indicators.

Flexibility is a key feature of the IAP100B120 PowerStack. Options include: a choice of converter front ends, rectifier, half or full SCR control, with or without SCR gate firing boards and soft-start circuitry. A choice of cooling methods, forced air or liquid is also available. Customer provided PWM is optically coupled or a fiber optic link can be provided to the IGBT interface. Current feedback is provided by Hall effect transducers.

The IAP100B120 PowerStack is rated to maximum input voltages up to 800 VDC, switching frequencies to over 20kHz, includes many safety features to protect the IGBTs and output circuitry and can be configured to meet your application.

Schematic:



IAP100B120 PowerStack

Absolute Maximum Ratings – T_J=25°C unless otherwise specified

General	Symbol	Value	Units
IGBT Junction Temperature	T_J	-40 to +150	°C
Storage Temperature	T_{STG}	-40 to +125	°C
Voltage applied to DC terminals	V_{CC}	800	Volts
Isolation voltage, AC 1 minute, 60Hz sinusoidal	V_{ISO}	2500	Volts
IGBT Inverter			
Collector Current (T_C=25°C)	I_C	100	Amperes
Peak Collector Current (T_J<150°C)	I_{CM}	200	Amperes
Emitter Current	I_E	100	Amperes
Peak Emitter Current	I_{EM}	200	Amperes
Maximum Collector Dissipation (TJ<150°C)	P_{CD}	555	Watts
Gate Drive Board			
Unregulated +24V Power Supply		30	Volts
Regulated +15V Power Supply		18	Volts
PWM Signal Input Voltage (Factory Settable from 3.3 - 15)		15	Volts
Fault Output Supply Voltage		30	Volts
Fault Output Current		50	mA

IGBT Inverter Electrical Characteristics, T_J=25°C unless otherwise specified

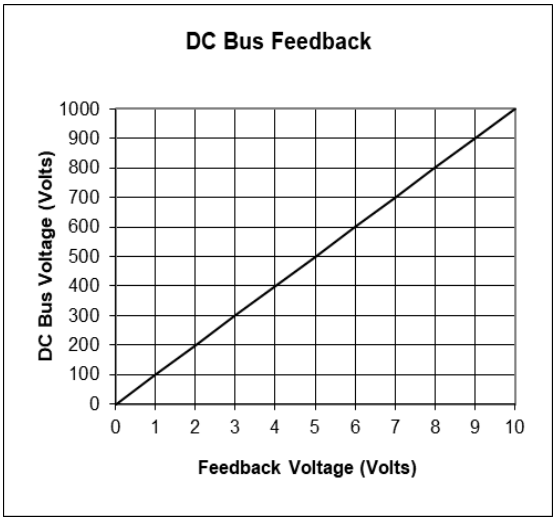
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Collector Cutoff Current	I_{CES}	$V_{CE}=V_{CES}$, V_{GE}=0V	-	-	1	mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=100A, T_J=25°C	-	1.75	2.15	Volts
		I_C=100A, T_J=125°C	-	2.05	-	Volts
Emitter-Collector Voltage	V_{EC}	IE=100A	-	-	3.2	Volts
Inductive Load Switching Times	$t_{d(on)}$	V_{CC}=600V I_C=100A V_{GE}=15V R_G=1.6Ω	-	-	130	ηs
	t_r		-	-	20	ηs
	$t_{d(off)}$		-	-	300	ηs
	t_r		-	-	45	ηs
Diode Reverse Recovery Time	T_{rr}		-	-	150	ηs
Diode Reverse Recovery Charge	Q_{rr}		-	15.7	-	µC
DC Link Capacitance			-	3300	-	µF

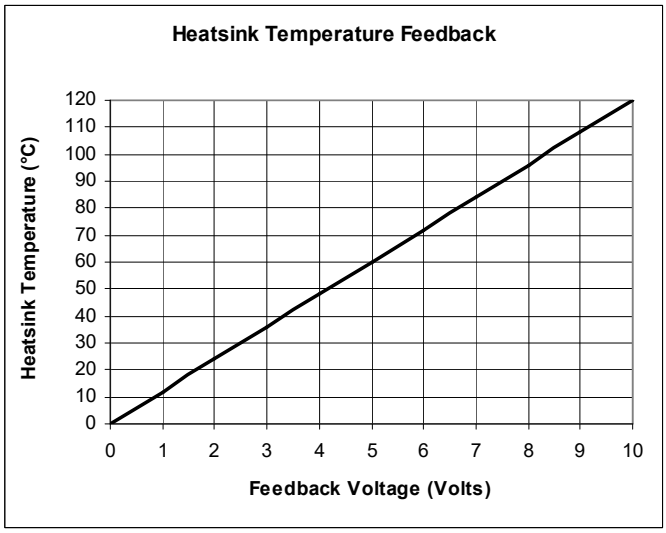
Thermal and Mechanical Parameters

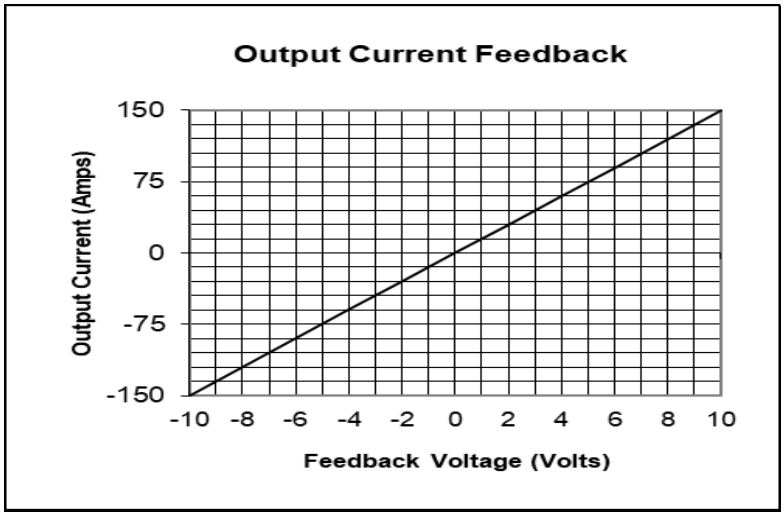
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
IGBT Thermal Resistance, Junction to Case	$R_{\Theta(j-c)}$	Per IGBT ½ module	-	-	0.27	°C/W
FWD Thermal Resistance, Junction to Case	$R_{\Theta(j-c)}$	Per FWD ½ module	-	-	0.48	°C/W
Heatsink Thermal Resistance	$R_{\Theta(s-a)}$	1500 LFM airflow	-	.045	-	°C/W
Mounting Torque, AC terminals			-	75	90	In-lb
Mounting Torque, DC terminals			-	130	150	In-lb
Mounting Torque, case mounting			-	130	150	In-lb
Weight			-	21	-	lb

Gate Drive Board Electrical Characteristics

Parameter	Min	Typ	Max	Units
Unregulated +24V Power Supply	20	24	30	Volts
Regulated +15V Power Supply	14.4	15	18	Volts
PWM Input On Threshold	12	15	-	Volts
PWM Inout Off Threshold	-	0	2	Volts
Output Overcurrent Trip	-	150	-	Amperes
Overtemperature Trip	61	63	65	°C
Overvoltage Trip	-	900	-	Volts
DC Link Voltage Feedback	See Figure Below			Volts
Heatsink Temperature Feedback	See Figure Below			Volts
Output Current Feedback	See Figure Below			Volts

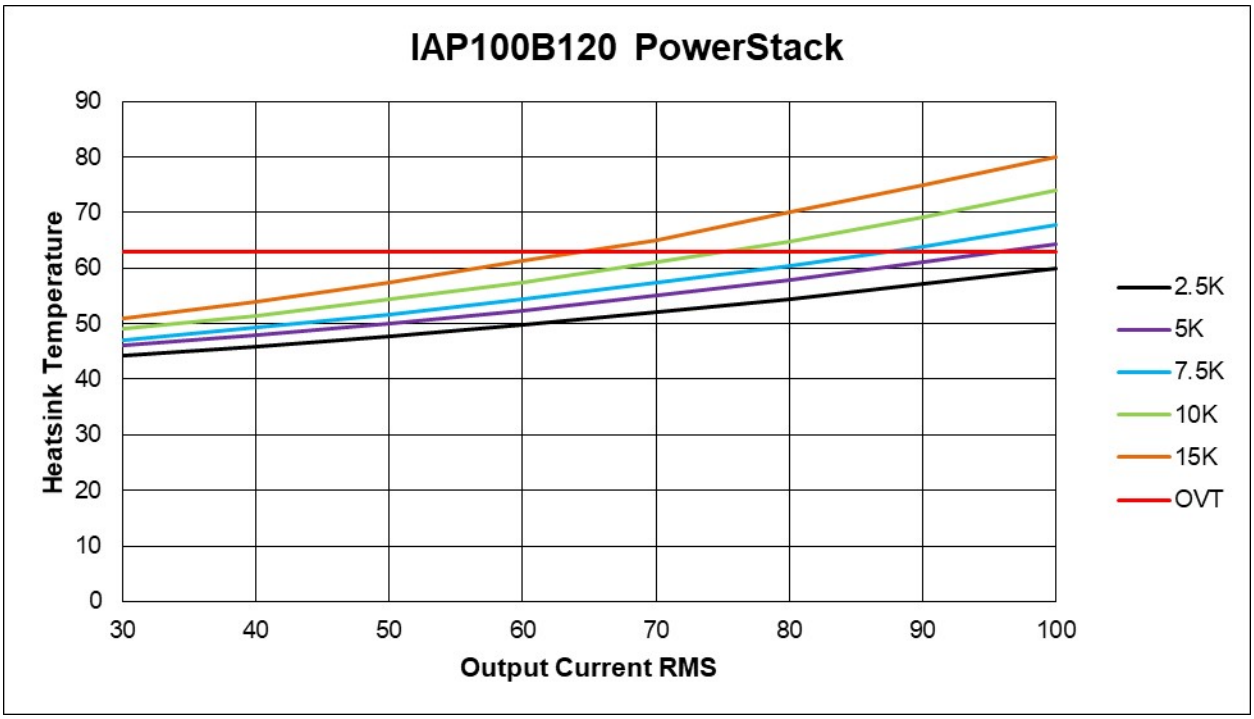






Performance Curves

Effective Output Current vs. Carrier Frequency (Typical)



Conditions	Symbol	Value	Units
Ambient Temperature	T_A	40	°C
DC Bus Voltage	V_{CC}	600	Volts
Load Power Factor	COS Φ	0.8	
IGBT Saturation Voltage	$V_{CE(sat)}$	Typical @ T_J=125°C	Volts
IGBT Switching Loss	E_{SW}	Typical @ T_J=125°C	mJ
Airflow	-	1500	LFM
Switching Conditions	Single phase PWM, 60Hz sinusoidal output		

Options for the BAP75T120-XX

	Option Number								
Option	01	02	03	04	05	06	07	08	09
Blower	X		X		X		X		X
Half-Control SCR Converter		X	X						
Full Control SCR Converter				X	X				
Diode Converter						X	X		
Dual Inverter								X	X

Interface

Pin #	Signal Name	Description
1	Shield	Connected to circuit ground
2	PWM A-	0-15V signal controlling the duty cycle of A- IGBT
3	Phase A Error[1]	Open collector output, external pull-up resistor required. LOW=No Error; Floating=Phase A overcurrent or short circuit
4	PWM A+	0-15V signal controlling the duty cycle of A+ IGBT
5	PWM B-	0-15V signal controlling the duty cycle of B- IGBT
6	Phase B Error[1]	Open collector output, external pull-up resistor required. LOW=No Error; Floating=Phase A overcurrent or short circuit
7	PWM B+	0-15V signal controlling the duty cycle of B+ IGBT
8	**Not Used**	
9	**Not Used**	
10	**Not Used**	
11	OverTemp[1]	Open collector output, external pull-up resistor required. LOW=No Error; Floating=Heatsink overtemp
12	Not Connected	
13	DC Link Voltage	Analog voltage representation of DC link voltage
14	24VDC Input Power[2]	20-30VDC input voltage range
15	24VDC Input Power[2]	20-30VDC input voltage range
16	15VDC Input Power[2]	14.4-18VDC input voltage range
17	15VDC Input Power[2]	14.4-18VDC input voltage range
18	GND	Ground reference for 15 and 24VDC inputs
19	GND	Ground reference for 15 and 24VDC inputs
20	Heatsink Temperature	Analog voltage representation of heatsink temperature
21	GND[3]	Tied to pins 18 and 19
22	I_{OUT} Phase A	Analog voltage representation of phase A output current
23	GND[3]	Tied to pins 18 and 19
24	I_{OUT} Phase B	Analog voltage representation of phase B output current
25	**Not Used**	
26	**Not Used**	

NOTES:
1. Open collectors can be pulled up to 30VDC Max and sink 50mA continuous.
2. **DO NOT** connect a 15VDC and 24VDC source to the unit at the same time. Use one or the other.
3. GND signals to be used for analog feedback signals, i.e. twisted pair with I_{OUT} Phase A.

Gate Drive Interface Connector

Description	Symbol	Type	Manufacturer
Gate Drive Interface Header	J1	0.100” x 0.100” latching header, 26 pin	3M #3429-6002 or equivalent
Recommending Mating Socket	-	0.100” x 0.100” IDC socket, 26 pin	3M #3399-7600 or equivalent
Recommended Strain Relief	-	Plastic strain relief	3M #3448-3026 or equivalent

Mechanical Information