

## Amantys 1200V/1700V Gate Drives

Incorporating Amantys Power Insight™ Technology



The Amantys AP12A and AP17A are compact, single channel gate drives for high-power IGBT modules. They drive all leading manufacturer's modules and fit within the footprint of the 140x190mm package popular in high power converters, eliminating the need for external mechanical protection.

The incorporation of Amantys Power Insight technology provides the additional reassurance of configurable monitoring of key parameters and comprehensive data logging and analysis.

The single circuit board features a fibre-optic interface, an integrated DC-DC converter and is constructed from commercially available, off the shelf components.

The AP12A and AP17A are part of a family of IGBT gate drives with various voltage and current ratings. Members of the family can be customised for specific customer requirements.

For more information please visit our website [www.amantys.com](http://www.amantys.com).

### Features

- Support for wide range of IGBT modules
  - ◆ Infineon
  - ◆ Mitsubishi
  - ◆ Hitachi
  - ◆ Fuji Electric
  - ◆ Dynex
  - ◆ ABB
- Improved design and sourcing flexibility
- Suitable for 140x190mm and 140x130mm packages
- Comprehensive IGBT protection
  - ◆ Short circuit protection
  - ◆ Supply under-voltage lockout
  - ◆ Active clamping of  $V_{CE}$  at turn-off
- High isolation on board DC-DC converter
  - ◆ Excellent power density
  - ◆ 17mm creepage and 11mm clearance
- Designed and tested to traction isolation standards
- 2- and 3-level topology support
- High reliability and long-life operation
  - ◆ Extensive HALT, HASS and HTOL testing
- Manufactured to ISO9001
- EMC tested to EN50121-5, EN50121-3-2 and EN55011
- Two zone selective clamping of  $V_{CE}$  at turn-off
- Amantys Power Insight
  - ◆ Monitoring of key gate drive data
  - ◆ Signalling compatible with other gate drive manufacturers
  - ◆ On-board data logging
- Optional conformal coating

### Applications

- HVDC power transmission
- MVDC power distribution
- Industrial motor drives
- Locomotive traction
- Wind turbine converters
- Solar converters
- Marine propulsion
- Laser technology
- Research

## Absolute Maximum Ratings

Parameter	Comment	Min	Max	Units
Supply Voltage ( $V_{DC}$ )	$V_{DC}$ to GND	14.5	15.5	V
Gate Peak Current ( $I_{OUT}$ )	IGBT specific	-	-	A
IGBT collector current ( $I_{CE}$ )	IGBT specific	-	-	A
Gate Drive Output Power	-	-	3	W
Supply Current ( $I_{DC}$ )	-	-	550	mA
Output Power DC-DC Converter	-	-	9.5	W
Switching Frequency	IGBT specific	-	-	kHz
Insulation Test Voltage	(50Hz/1min) Primary to output	-	4000	$V_{ac}(eff)$
DC link Voltage – 1200V (switching / not switching)	-	-	800 / 950	V
DC link Voltage – 1700V (switching / not switching)	-	-	1200 / 1420	V
Operating Temperature	-	-40	+85	°C
Storage Temperature	-	-40	+90	°C

Note: "IGBT specific" – Refer *IGBT Module Data*, page 6.

## Electrical Characteristics

All data refer to +25 °C and  $V_{DC} = 15V$  unless otherwise specified.

Power Supply	Comment	Min	Typ	Max	Units
Nominal Supply Voltage ( $V_{DC}$ )	$V_{DC}$ to GND	14.5	15	15.5	V
Requires current limited supply - 2.0A					
Supply Current ( $I_{DC}$ )	Without load	-	100	120	mA
	Operation	-	-	500	mA
Under Voltage Lockout	$V_{UVLO}$	-	12.9	-	V
Efficiency ( $\eta$ )	Internal DC-DC converter	85	89	-	%
Turn on threshold ( $V_{th}$ )	-	-	13	-	V
Hysteresis on/off	-	-	0.5	-	V
Coupling Capacitance ( $C_{io}$ )	Primary to output	-	10	15	pF
<b>Short-circuit Protection</b>					
$V_{CE}$ monitoring threshold	Between aux terminals	-	65	-	V
Response time	2-level mode	-	-	10	$\mu s$
Blocking time	2-level mode	-	100	-	ms
<b>Over Voltage Protection (1200V)</b>					
Lower Vce threshold for clamp circuit operation	-	-	800	-	V
Peak Clamped Vce	-	-	-	1150	V
Two-zone clamping voltage difference ( $V_{CH}$ )	-	-	150	-	V
Two-zone clamp delay period ( $t_{cd}$ )	-	-	10	-	$\mu s$
<b>Over Voltage Protection (1700V)</b>					
Lower Vce threshold for clamp circuit operation	-	-	1200	-	V
Peak Clamped Vce	-	-	-	1650	V
Two-zone clamping voltage difference ( $V_{CH}$ )	-	-	220	-	V
Two-zone clamp delay period ( $t_{cd}$ )	-	-	10	-	$\mu s$
<b>Timing Characteristics</b>					
Turn on delay $t_{pd(on)}$	-	-	400	-	ns
Turn off delay $t_{pd(off)}$	-	-	400	-	ns
Acknowledge delay time	At status output	-	60	-	ns
Acknowledge pulse width	At status output	500	-	1000	ns

## Electrical Insulation

Operating Voltage – 1200V	-	-	1200	V
Operating Voltage – 1700V	-	-	1700	V
Test Voltage (50Hz/1min)	-	-	4000	V <sub>AC(eff)</sub>
Partial discharge extinction voltage	For standards compliance refer to Amantys	1803	-	V <sub>AC(eff)</sub>
Creepage distance		17	-	mm
Clearance distance		11	-	mm

## Gate Voltage

On:	-	+15	-	V
Off:	-	-10	-	V

## Amantys Power Insight

Amantys Power Insight technology is incorporated into the gate drive board and provides a powerful tool which enables the monitoring and control of aspects of inverter systems.

A range of monitoring parameters is measured on board and is available for transfer over the fibre-optic link to the Amantys Power Insight Adapter for detailed analysis. In addition certain parameters can be configured and a range of faults and events are reported. Please refer to separate generic Power Insight documentation for further information.

The following table lists the parameters that are measured on the module.

### Measured Parameters

Name	Comment	Units / Resolution
Gate drive temperature	On board temperature	°C / ±1.0
+15V supply rail	Secondary side voltage	V / ±0.01
Vge On	The gate voltage when the power device is turned on	V / ±0.01
Vge Off	The gate voltage when the power device is turned off	V / ±0.01
Vce On	The collector voltage when the power device is turned on; i.e. the saturation voltage	V / ±0.10
Vce Off	The collector voltage when the power device is turned off	V / ±1.0
Product Code		String
Serial Number		String
Software Part Numbers [0 - 9]	Part number strings for up to 10 software components included in this product	String
Build Date	Date of configuration	YYYYMM

### Configurable Parameters

Gate On Resistor (1 to 15)	Turn-on resistor value
Gate Off Resistor (1 to 15)	Turn-off resistor value
Gate Soft Turn Off (1 to 15)	Turn-off resistor value under fault
Fault Lock out time	Time to recover from fault turn-off
Desaturation Detection time	Adjustment of the time of the desaturation comparator for type I short circuit
Level mode	2 or 3-level mode operation

## Amantys Power Insight (cont.) Event Reporting

Type I short circuit	Report of type I short circuit count
Type II short circuit	Report of type II short circuit count
Undervoltage Lockout	Report of undervoltage lockout protection count
Overvoltage clamp activation	Report of overvoltage clamp activation count
Number of switching cycles	Report of number of switching cycle count

## Electrical / Optical Interface

Interface	Description	Manufacturer	Part Number
Digital Input In	Fibre-Optic Receiver	Avago	AFBR-2529Z
Status Output	Fibre-Optic Transmitter	Avago	AFBR-1529Z
Power Supply	4-way, surface-mount, connector	ERNI	214012
	or 3 pin, male, 2.54 mm pitch	TE Connectivity	TE5-103635-2

### Power Supply Connector (ERNI)

Description	Voltage	Pins
Zero volts	0V	1 and 4
Supply Voltage	V <sub>DC</sub>	2 and 3

### Power Supply Connector (TE Connectivity)

Description	Voltage	Pins
Zero volts	0V	1 and 3
Supply Voltage	V <sub>DC</sub>	2

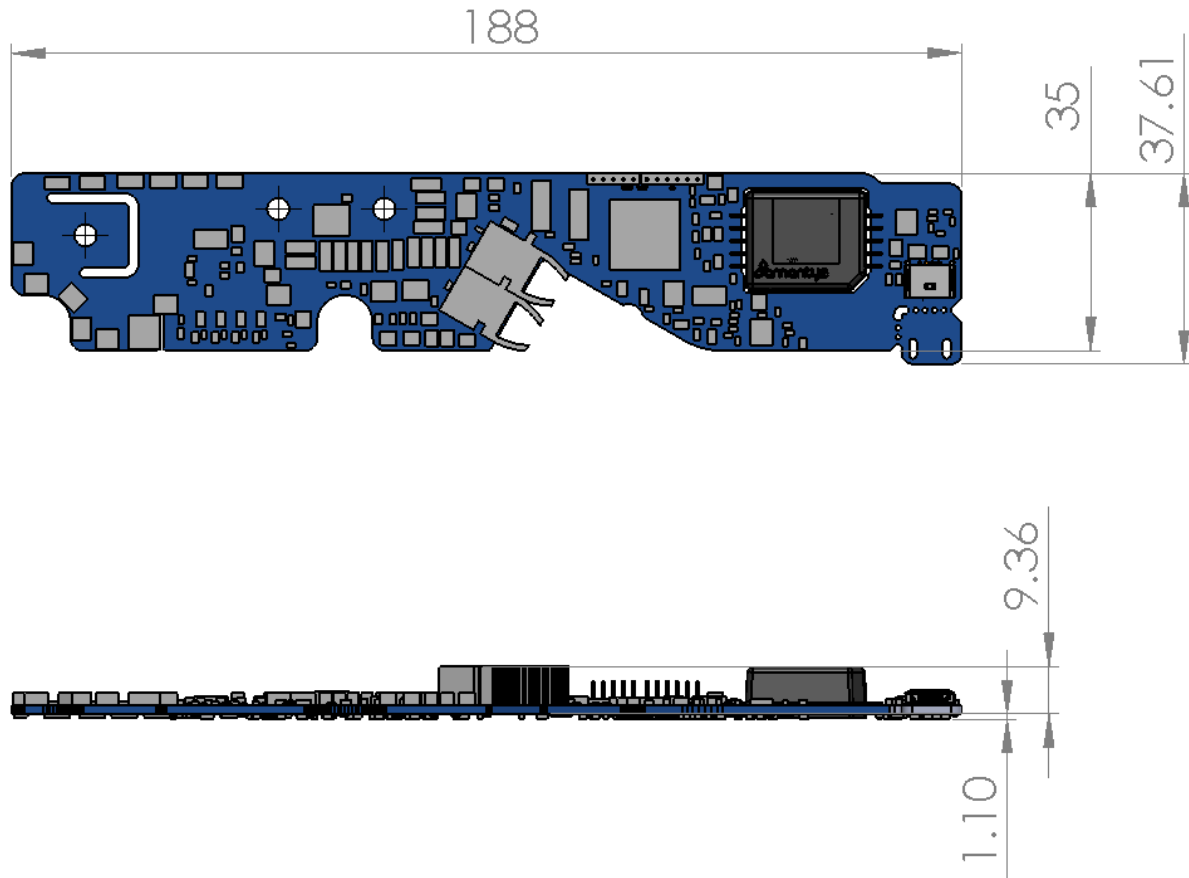
**Note.** If required, the power cable can be secured to the circuit board using cable ties. The cable tie area must be removed if access is required to the adjacent IGBT module fixing point.

## Digital Interface

Interface	Minimum	Typical	Maximum	Units
Switch command pulse width	800	-	-	ns
Acknowledge delay	-	60	-	ns
Acknowledge pulse width	500	600	1000	ns

Status output transmitter is normally on.  
Acknowledge and error signals are periods of light off.

**Mechanical/Physical Characteristics (1200V / 1700V)**

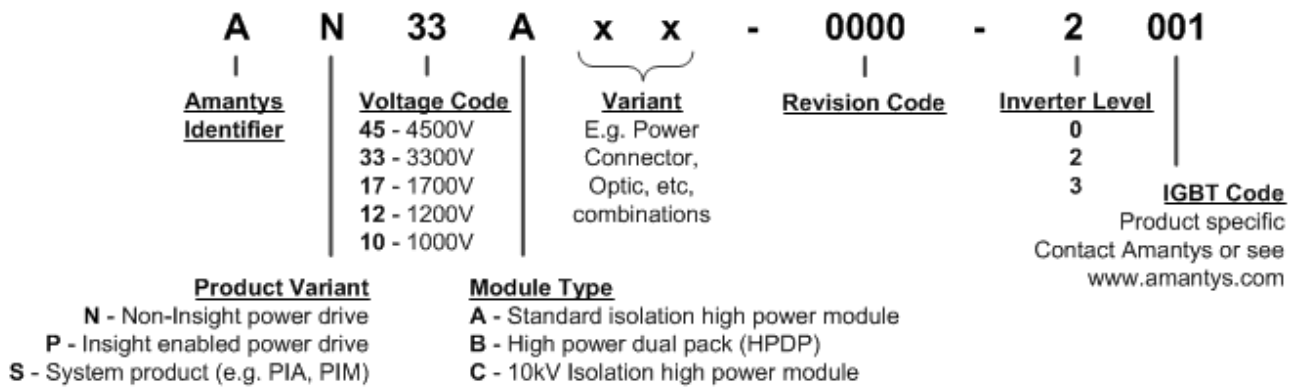


Dimensions	Height	Width	Depth	Units
Net (Single board)	10.46	188	38	mm
Mounting / Connection			Maximum	Unit
Standard three screw fixing, maximum torque setting			2.0	Nm
Weight				Units
Net (Single board)		52		g
Temperature		Minimum	Maximum	Units
Operating		-40	+85	°C
Non-operating		-40	+90	°C
Humidity			Maximum	Units
Operating / Non-operating			85	%
EMC				
Industrial, scientific, medical and railway applications: EN50121-5, EN50121-3-2 and EN55011				
Safety				
Flammability: UL94 V0				
Environmental				
Pollution Degree 2; Installation (Overvoltage) Category 2 (IEC 60077 and IEC 61287)				

## IGBT Module Data

For IGBT module specific data, please contact info@amantys.com.

## Gate Drive Order Codes



## Examples

Part code	Voltage	Power Connector
AP12AA1	1200V	ERNI 214012
AP12AA2	1200V	Tyco TE5-103635-2
AP17AA1	1700V	ERNI 214012
AP17AA2	1700V	Tyco TE5-103635-2

The product can be ordered with an optional conformal coating. Please contact Amantys for details.



## Important

The data contained herein is intended exclusively for qualified engineers who are experienced with, and trained in, working with high voltage apparatus which involves risk to life. Strict compliance with all relevant safety regulations for the target application is essential.

Any handling of electronic devices is subject to the general specifications for protecting electrostatic sensitive devices according to international standard IEC 747-1, Chapter IX or European standard EN 100015 (i.e. the workplace, tool, operating environment, etc. must comply with these standards). Failure to comply may lead to the product becoming damaged.

## Legal Disclaimer

This data sheet specifies devices but cannot promise to deliver any specific characteristics. No warranty or guarantee is given - either expressly or implicitly - regarding delivery, performance or suitability.

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## Revision Table

Revision	Comments	Release Date
01	First issue	March 2015
02	Changed Power Drive to Gate Drive	April 2016