

The Amantys Single Channel On-module Gate Drive will drive high power single switch IGBT modules for 2-level and multi-level applications. The gate drive incorporates protection features for the IGBT module and can be configured by the user to optimise the operation of the gate drive in the power stack of the end application. 1200V and 1700V variants are also available.

- High current drive into gate: 35A peak
- Two input voltage options: 15V or 24V
- Operating temperature range: -40°C to +85°C
- Type I and type II short circuit protection
- Power supply undervoltage protection
- User configurable
- Logging of fault events
- LED status indication
- EN 50155 compliant for railway applications
- IEC 61800-5-1 compliant for variable speed drives
- Thermal shock and vibration to IEC 61373
- EMC compliant to EN 50121-3-2, EN 50121-5, IEC 61800-3
- Lead free design, RoHS compliant
- 12 months warranty

Absolute Maximum Ratings

Permanent damage may occur if the Absolute Maximum Ratings are exceeded.

Parameter	Notes	Units	Min	Typ	Max
Supply Voltage	Configured for 24V input voltage	V			28
	Configured for 15V input voltage	V			16.5
Quiescent supply current	Not switching, unprogrammed PLD (24V)	mA			105
	Not switching, unprogrammed PLD (15V)	mA			100
Gate peak current	Limited by gate output FETs.	A			35
DC-DC Converter Peak Power	Continuous operation with 24V input voltage	W			5
	Continuous operation with 15V input voltage	W			3
DC link voltage	Limited by transient voltage suppressors (TVS)				
	Configured for 1200V IGBT modules	V			950
	Configured for 1700V IGBT modules	V			1420
	Configured for 3300V IGBT modules	V			2600

Power Supply Characteristics (15 V input mode)

All data refers to +25 °C unless otherwise stated

Parameter	Notes	Units	Min	Typ	Max
Nominal Supply Voltage	A current limited supply (<2.0A) is recommended	V	14.5	15.0	15.5
Supply current	Without load, not switching, OFF	mA		80	104
	Operation at 3kHz into 1µF load with 330nF additional gate-emitter capacitance	mA		270	350

Power Supply Characteristics (24V input mode)

All data refers to +25 °C unless otherwise stated

Parameter	Notes	Units	Min	Typ	Max
Nominal Supply Voltage	A current limited supply (<2.0A) is recommended	V	21.6	24.0	26.4
Supply current	Without load, not switching, OFF	mA		60	78
	Operation at 3kHz into 1µF load with 330nF gate-emitter capacitance	mA		175	230

General Electrical Characteristics

All data refers to +25 °C unless otherwise stated

Under-voltage lockout threshold on 15V supply	Internal power supply of gate drive	V		12.9	
Coupling capacitance	Primary to output	pF		10	15
Dielectric test voltage	50Hz AC for 10 seconds, primary to output	V _{rms}			7400
Gate voltage (IGBT on)		V	15.0		
Gate voltage (IGBT off)		V			-8.8

Gate drive configured for 1200V operation

All data refers to +25 °C unless otherwise stated

Operating voltage (V _{peak})	Primary to secondary side	V			1200
Lower threshold for clamp		V		800	
Peak clamped V _{ce}		V	1150		

Gate drive configured for 1700V operation

All data refers to +25 °C unless otherwise stated

Operating voltage (V _{peak})	Primary to secondary side	V			1700
Lower threshold for clamp		V		1200	
Peak clamped V _{ce}		V	1650		

Gate drive configured for 3300V operation

All data refers to +25 °C unless otherwise stated

Operating voltage (V _{peak})	Primary to secondary side	V			3300
Lower threshold for clamp		V		2600	
Peak clamped V _{ce}		V	3200		

Physical Parameters

Parameter	Notes	Units	Min	Typ	Max
Length	All dimensions have a tolerance of +/- 0.5mm	mm			194
Width		mm			45
Height		mm			10
Weight		g		65	
Screw torque	Maximum torque on gate, emitter and collector	Nm			2.0

Standards Compliance

All data refers to +25°C unless otherwise stated

	Notes	Test Standard
Impulse test	18 kV 1.2/50 μs primary to output	Type test
Dielectric test	7.4 kVrms primary to output, 50 Hz, 60 sec	Type test
Partial discharge	≥2.6 kV rms extinction, <10 pC, input to output	Type test and production test
EMC Immunity	EN 50121-3-2 Rolling Stock, EN 50121-5 Trackside, IEC 61800-3 Variable Speed Drives	
Electrostatic discharge	Air ±8 kV, contact ±6 kV, Perf Criterion B	IEC 61000-4-2
Radiated immunity	10 V/m 80-2000 MHz, Perf Criterion A	IEC 61000-4-3
Fast burst immunity	±4 kV, Perf Criterion A	IEC 61000-4-4
Surge immunity	±2 kV, Perf Criterion B	IEC 61000-4-5
Conducted immunity	10 Vrms, Perf Criterion A	IEC 61000-4-6
Magnetic field immunity	100 A/m AC, 300 A/m DC, Perf Criterion A	IEC 61000-4-8
Damped osc. voltage	2.5 kV line-earth, Perf Criterion B	IEC 61000-4-12
Radiated emissions (E-field)	20-230/230-1000 MHz, 50/57 dBμV/m q-pk, 3 m	EN 55011 class A, group 1
Conducted emissions	0.15-0.5/0.5-30 MHz 99/93 dBμV/m quasi-pk	EN 55016-2-1

General specifications

All data refers to +25°C unless otherwise stated

Parameter	Notes	Units	Min	Typ	Max
Operating temperature		°C	-40		85
Storage temperature		°C	-40		85
Humidity	With conformal coating compliant to EN 50155 Railways Applications Electronic Equipment Used on Rolling Stock	%		85	95
Material flammability rating	UL94V-0 rated				
Pollution degree	Class 2				
Maximum altitude	Derate above this: Amantys to advise	m			2000
Environmental compliance	Reach compliant				
	RoHS compliant				
Creepage	Primary to output	mm	26		
	Primary to IGBT main emitter terminal	mm	20		
Clearance	Primary to output	mm	20		
	Primary to IGBT main emitter terminal	mm	20		

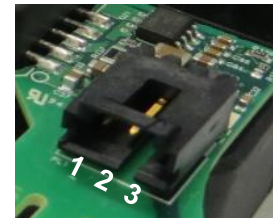
Power Supply Interface

The power supply input connector has three options that are specified at the time of order

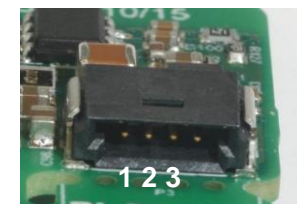
Interface	Description	Manufacturer	Part Number
Input	3 way connector	TE Connectivity (Tyco)	AMP - 104257-2 - Housing, Receptacle, 3-way
Input	4 way connector	ERNI	214012

Power Supply Input Connections

		Pin Number		
		1	2	3
TE Connectivity / Tyco	TE5-103635-2	0V	VDC	0V



		Pin Number			
		1	2	3	4
ERNI	214012	0V	VDC	VDC	0V



Fibre-optic Interface

Interface	Description	Manufacturer	Part Number
Optical input (PWM)	Receiver	Avago	AFBR-2529Z
Optical output (ACK)	Transmitter	Avago	AFBR-1529Z

LED Status Indication

The gate drive has two LEDs, red and green, that communicate the status of the gate drive.

LED	Behaviour	Status
Green	Lit continuously	Supply OK
Green	Flashing 1Hz	Gate drive receiving PWM input
Red	Lit continuously	Power supply below minimum voltage
Red	Flashing intermittently	Short circuit gate-emitter or power supply fault
Red	Flashing 1Hz	Short circuit condition in converter
Green/Red	Both lit continuously	PLD not programmed (LEDs will be dimly lit)
Green/Red	Flashing simultaneously	PLD programmed with test design
Green/Red	Both off	No supply or LEDs are broken

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	Vge when the power device is turned on	V	±0.01
Vge Off	Vge when the power device is turned off	V	±0.01
Vce On	Vce when the power device is turned on; i.e. the saturation voltage	V	±0.01
Vce Off	Vce 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

Note: The gate drive can be configured by using a Power Insight Adapter and the Power Insight Configurator Software

Name	Comment
Gate On Resistor (1 to 63)	Turn-on resistor value
Gate Off Resistor (1 to 63)	Turn-off resistor value
Gate Soft Turn Off (1 to 63)	Turn-off resistor value under fault condition
Gate - Emitter Capacitor (1 to 4)	Gate - Emitter capacitor
Fault Lock out time	After fault time before gate drive can be switched
Desaturation Detection time	Adjustment of the time of the desaturation comparator for type I short circuit
Desaturation Detection Voltage	Adjustment of the voltage desaturation comparator for type I short circuit
Level mode	2 or 3-level mode operation

Gate Drive Transmit LED Drive Current

Note: the drive current of the transmit (ACK) LED on the gate drive can be driven with different drive currents that are configurable by the user.

The lifetime of the transmit LED can be prolonged by driving with a lower current.

LED Drive Level	Units	LED Current	Comments
LED Drive Level 1	mA	1.82	Longest lifetime for LED
LED Drive Level 2	mA	2.73	
LED Drive Level 3	mA	3.64	
LED Drive Level 4	mA	4.55	
LED Drive Level 5	mA	6.37	

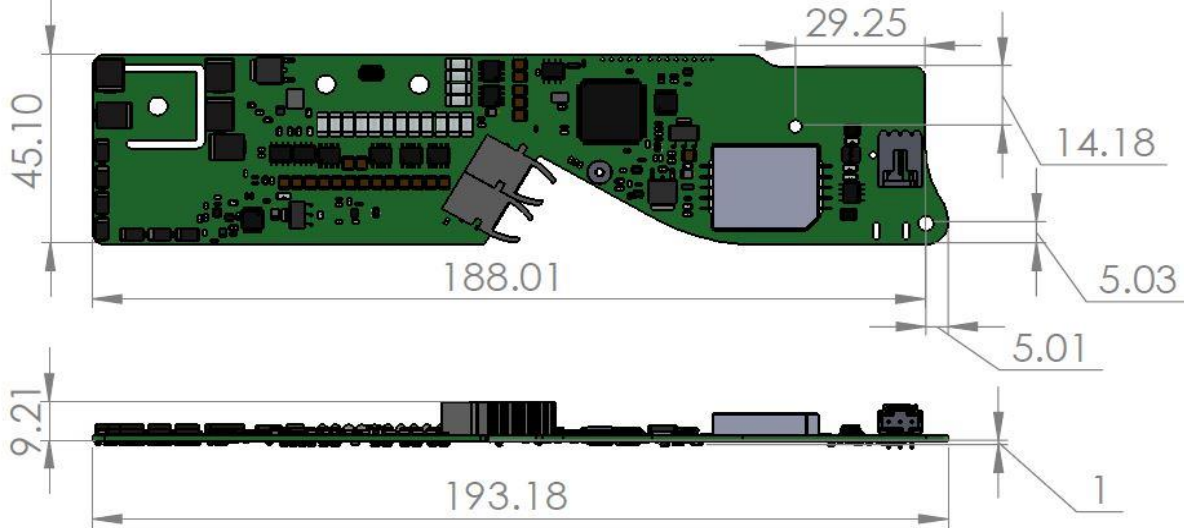
Event Counters

Note: The gate drive records the events below on board the gate drive. The event counters can be viewed using a Power Insight Adapter and the Power Insight Configurator

Event	
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

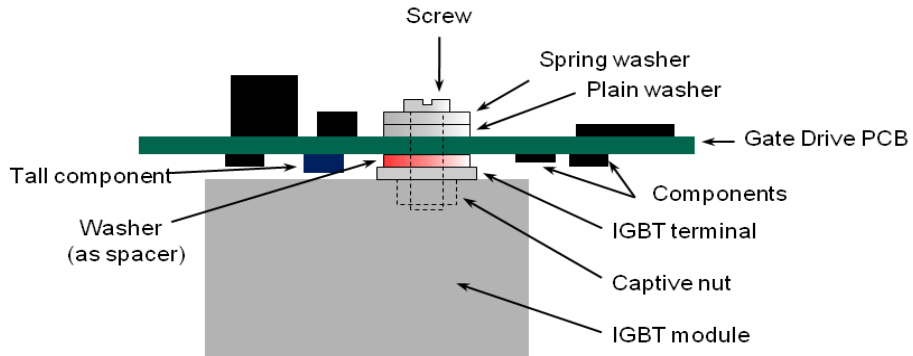
Mechanical Dimensions

Note: All dimensions in mm



Mounting the gate drive on the IGBT module

It is recommended to use screws with internal spring shake-proof washers to connect the gate drive to the IGBT module. This prevents loose washers from finding their way into the power assembly. Alternatively a combination of plain and spring washers are acceptable. In some cases washers may be required underneath the gate drive to ensure there is sufficient mechanical clearance between the IGBT module and any tall components on the underside of the board (see mechanical dimensions).



Ordering Information

Part Number	Description
AP33AXXY-ZZZZ	Generic Part Code of 3300V Gate Drive
AP17GXXY-ZZZZ	Generic Part Code of 1700V Gate Drive
AP12GXXY-ZZZZ	Generic Part Code of 1200V Gate Drive
XX Variant Code	Description
A1	15V input - Power Connector 4-pin ERNI
A2	15V input - Power Connector 3 pin Tyco
A4	24V input - Power Connector 3 pin Tyco
Y Variant Code	Description
0	No coating
C	Conformal Coating
ZZZZ Variant Code	Description
4 digit number e.g. -0001	Unique identifier for each customer configuration

Legal Disclaimer

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Important Information



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.