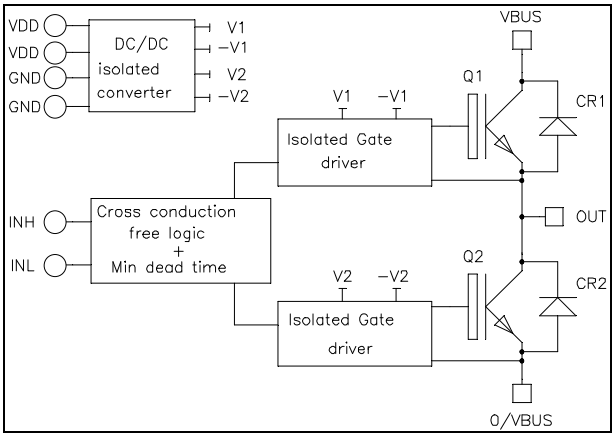
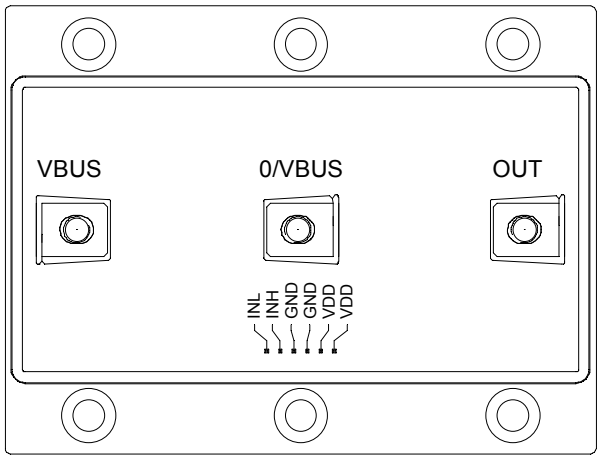
APTLGF350A608G

Phase leg Intelligent Power Module

V_{CES} = 600V
I_C = 350A @ Tc = 80°C





Application

- Motor control
- Uninterruptible Power Supplies
- Switched Mode Power Supplies
- Amplifier

Features

- ***Non Punch Through (NPT) FAST IGBT***
  - Low voltage drop
  - Low tail current
  - Soft recovery parallel diodes
  - Low diode VF
  - Low leakage current
  - RBSOA & SCSOA rated

- ***Integrated Fail Safe IGBT Protection (Driver)***
  - Top Bottom input signals Interlock
  - Isolated DC/DC Converter

- Low stray inductance
- M5 power connectors
- High level of integration

Benefits

- Outstanding performance at high frequency operation
- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Very high noise immunity
  (common mode rejection > 25kV/µs)
- Galvanic Isolation: 3750V for the optocoupler
  2500V for the transformer
- 5V logic level with Schmitt-trigger Input
- Single V_{DD}=5V supply required
- Secondary auxiliary power supplies internally generated (15V, -6V)
- Optocoupler qualified to AEC-Q100 test guidelines
- RoHS compliant

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.
See application note APT0502 on www.microsemi.com

All ratings @ T_j = 25°C unless otherwise specified

1. Inverter Power Module

Absolute maximum ratings

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{CES}	Collector - Emitter Breakdown Voltage		600	V
I_C	Continuous Collector Current	T_C = 25°C	430	A
		T_C = 80°C	350	
I_{CM}	Pulsed Collector Current	T_C = 25°C	700	
P_D	Maximum Power Dissipation	T_C = 25°C	1562	W
RBSOA	Reverse Bias Safe Operating Area	T_j = 125°C	800A@550V	

Electrical Characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
I_{CES}	Zero Gate Voltage Collector Current	V_{GE} = 0V V_{CE} = 600V	T_j = 25°C			0.5	mA
			T_j = 125°C			1.5	
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	V_{DD} = V_{IN} = 5V I_C = 400A	T_j = 25°C		2	2.5	V
			T_j = 125°C		2.2		

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*	*Min*	*Typ*	*Max*	*Unit*
C_{ies}	Input Capacitance	V_{GE} = 0V V_{CE} = 25V f = 1MHz		17.2		nF
C_{oes}	Output Capacitance			1.88		
C_{res}	Reverse Transfer Capacitance			1.6		
T_r	Rise Time	Inductive Switching (25°C) V_{DD} = V_{IN} = 5V V_{Bus} = 400V ; I_C = 400A		25		ns
T_f	Fall Time			30		
T_r	Rise Time	Inductive Switching (125°C) V_{DD} = V_{IN} = 5V V_{Bus} = 400V I_C = 400A		25		ns
T_f	Fall Time			45		
E_{on}	Turn-on Switching Energy			17.2		mJ
E_{off}	Turn-off Switching Energy			14		
I_{sc}	Short Circuit data	V_{DD} = V_{IN} = 5V; V_{Bus} =360V $t_p \leq$ 10µs ; T_j = 125°C		1800		A
R_{thJC}	Junction to Case thermal resistance				0.08	°C/W

Reverse diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			600			V
I_{RM}	Maximum Reverse Leakage Current	V_R = 600V	T_j = 25°C			350	µA
			T_j = 150°C			500	
I_F	DC Forward Current		Tc = 80°C		400		A
V_F	Diode Forward Voltage	I_F = 400A	T_j = 25°C		1.6	2	V
			T_j = 150°C		1.5		
t_{rr}	Reverse Recovery Time	I_F = 400A V_R = 300V di/dt =4800A/µs	T_j = 25°C		125		ns
			T_j = 150°C		220		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		19		µC
			T_j = 150°C		40		
E_{rr}	Reverse Recovery Energy		T_j = 25°C		4.4		mJ
			T_j = 150°C		9.6		
R_{thJC}	Junction to Case thermal resistance					0.20	°C/W

2. Driver

Absolute maximum ratings

Symbol	Parameter		Max ratings	Unit
V_{DD}	Supply Voltage		5.5	V
V_{INi}	Input signal voltage i=L, H		5.5	
I_{VDDmax}	Maximum Supply current	V_{INi} = 0V, i =L & H	0.35	A
		V_{DD}=5V, V_{INH} = /V_{INL} ; F_{out} = 60kHz	2	
f_{max}	Maximum Switching Frequency		60	kHz

Driver Electrical Characteristics

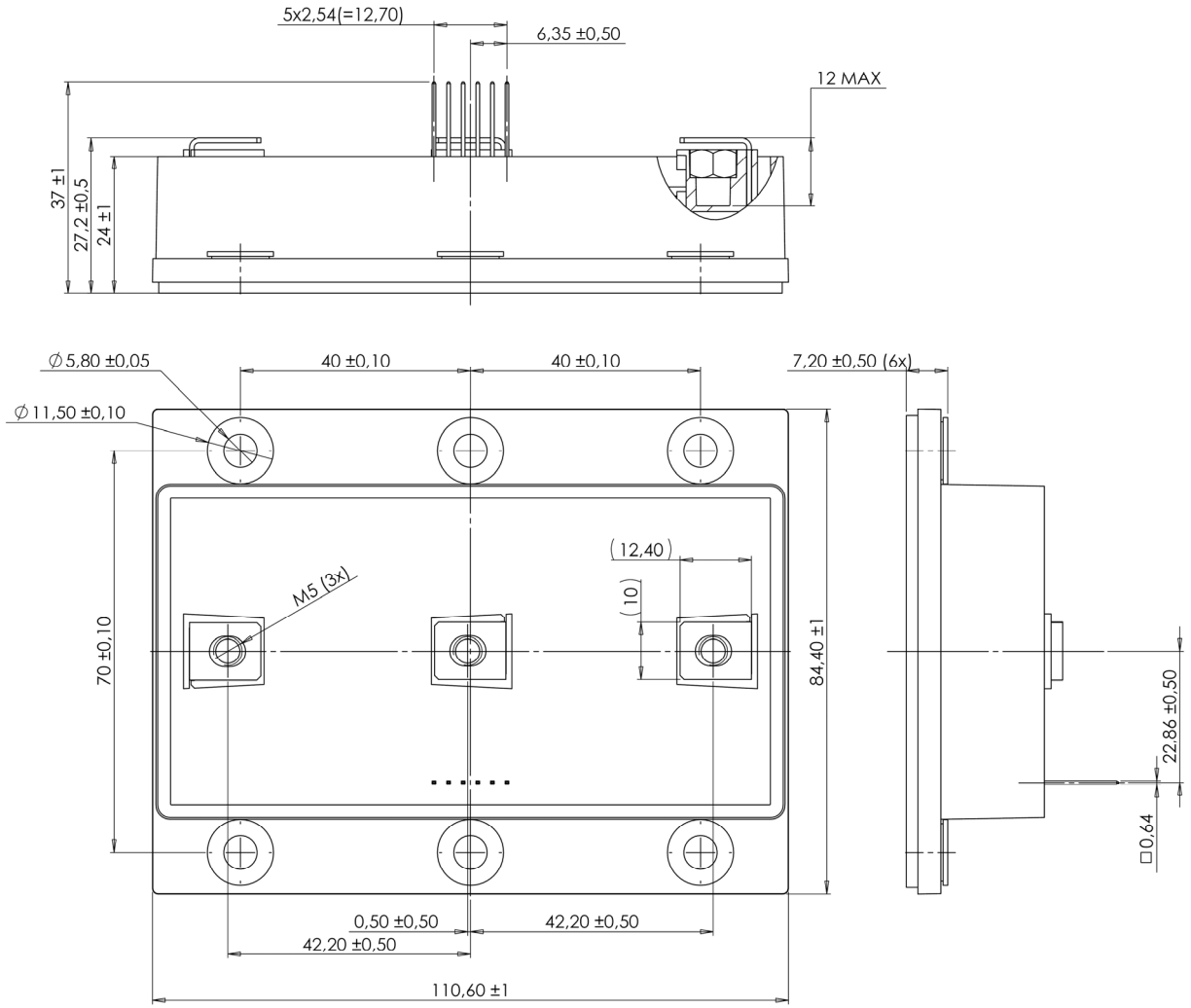
Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_{DD}	Operating Supply Voltage		4.5	5	5.5	V
$V_{INi(max)}$	Maximum Input Voltage	i = L, H	-0.5	5	5.5	V
$V_{INi\ (th+)}$	Positive Going Threshold Voltage			3.2		
$V_{INi(th-)}$	Negative Going Threshold Voltage			1		
R_{INi}	Input Resistance *			1		kΩ
$T_{d(on)}$	Turn On delay time	Driver + IGBT		1100❶		ns
D_T	Built in dead time			600		
$T_{d(off)}$	Turn Off delay time	Driver + IGBT		750		
PWD	Pulse Width Distortion				300	ns
PDD	Propagation Delay Difference between any two driver	$T_{d(on)}$ - $T_{d(off)}$	-350		350	
V_{ISOL}	Primary to Secondary Isolation		2500			V_{RMS}

* Low impedance guarantees good noise immunity.
❶ Including built in dead time.

3. Package characteristics

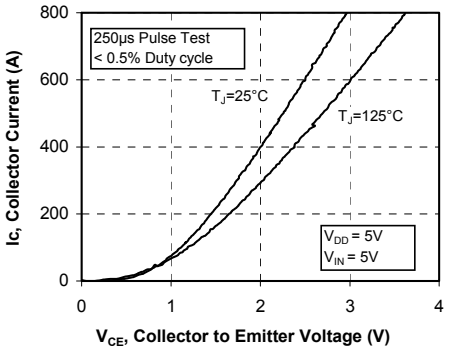
Symbol	*Characteristic*			*Min*	*Typ*	*Max*	*Unit*
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000			V
T_J	Operating junction temperature range			-40		150	°C
T_{OP}	Operating Ambient Temperature			-40		85	
T_{STG}	Storage Temperature Range			-40		100	
T_C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M5	2		4.7	N.m
		For terminals	M5	2		4	
Wt	Package Weight				550		g

4. LP8 Package outline (dimensions in mm)

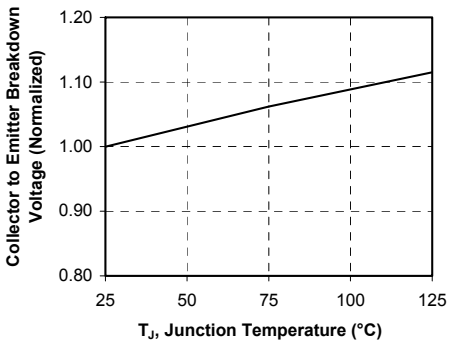


Typical IGBT Performance Curve

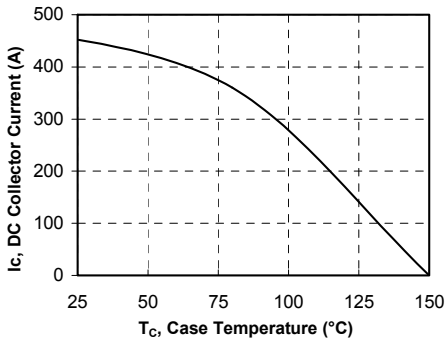
Output characteristics



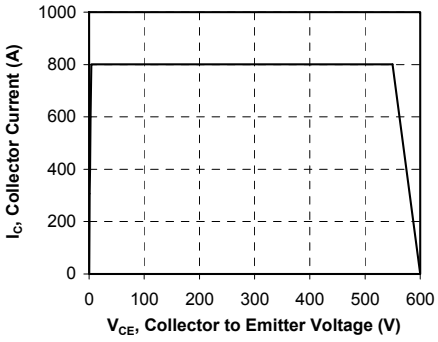
Breakdown Voltage vs Junction Temp.



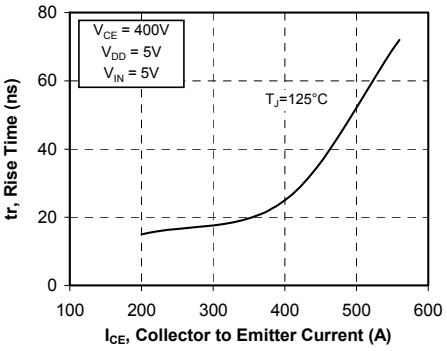
DC Collector Current vs Case Temperature



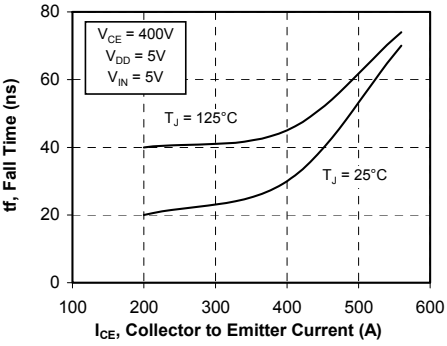
Reverse Bias Safe Operating Area



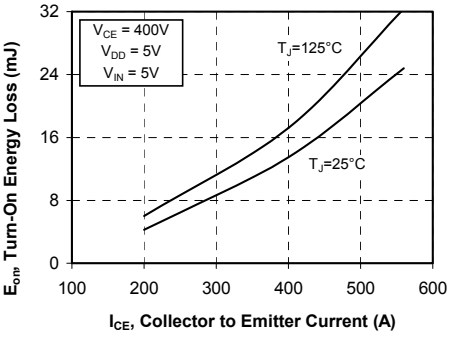
Current Rise Time vs Collector Current



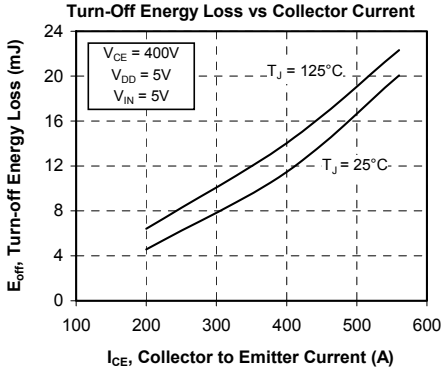
Current Fall Time vs Collector Current



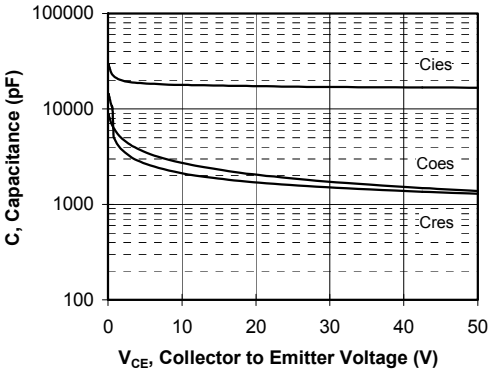
Turn-On Energy Loss vs Collector Current



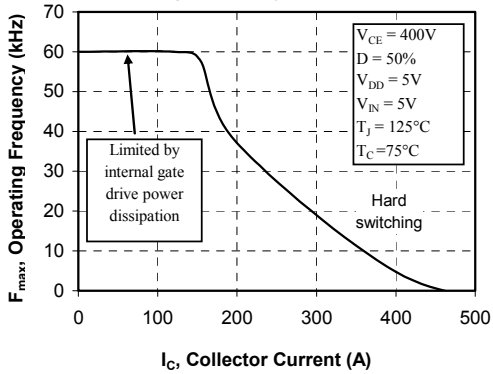
Turn-Off Energy Loss vs Collector Current



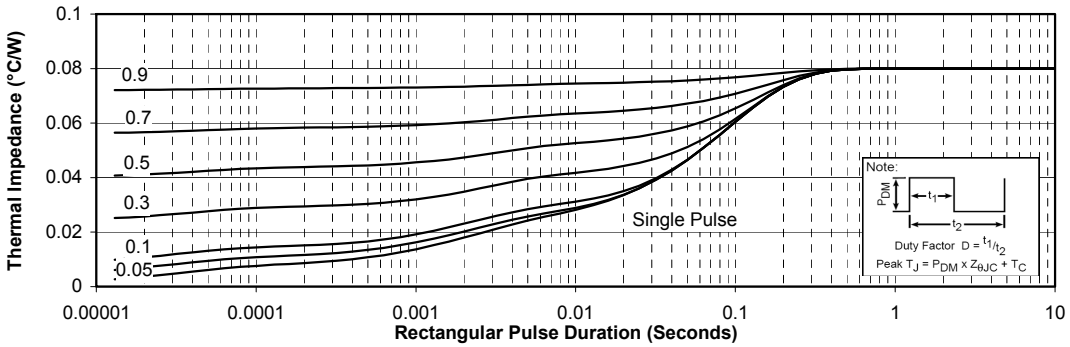
Capacitance vs Collector to Emitter Voltage



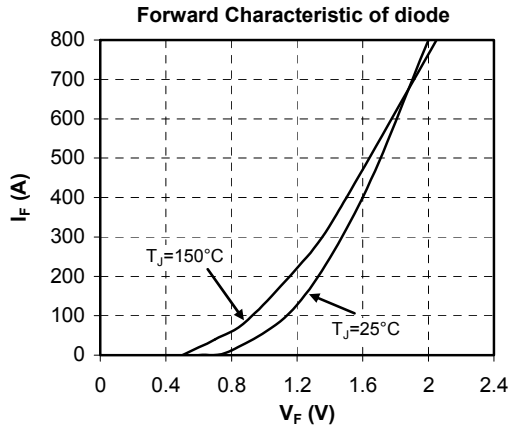
Operating Frequency vs Collector Current

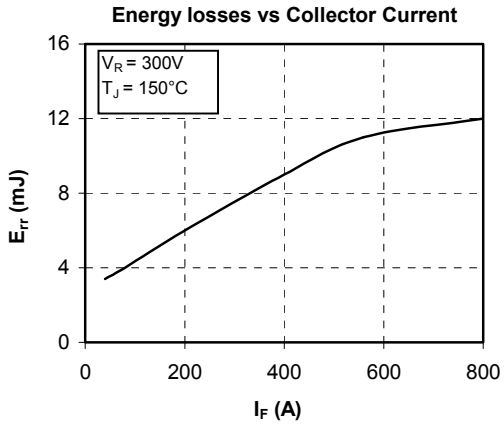


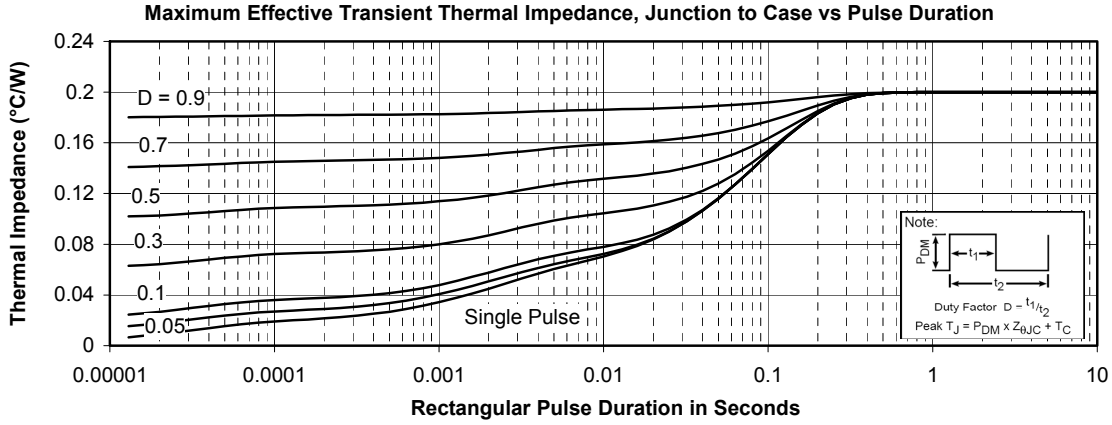
Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



Typical diode Performance Curve







DISCLAIMER

The information contained in the document (unless it is publicly available on the Web without access restrictions) is PROPRIETARY AND CONFIDENTIAL information of Microsemi and cannot be copied, published, uploaded, posted, transmitted, distributed or disclosed or used without the express duly signed written consent of Microsemi. If the recipient of this document has entered into a disclosure agreement with Microsemi, then the terms of such Agreement will also apply. This document and the information contained herein may not be modified, by any person other than authorized personnel of Microsemi. No license under any patent, copyright, trade secret or other intellectual property right is granted to or conferred upon you by disclosure or delivery of the information, either expressly, by implication, inducement, estoppels or otherwise. Any license under such intellectual property rights must be approved by Microsemi in writing signed by an officer of Microsemi.

Microsemi reserves the right to change the configuration, functionality and performance of its products at anytime without any notice. This product has been subject to limited testing and should not be used in conjunction with life-support or other mission-critical equipment or applications. Microsemi assumes no liability whatsoever, and Microsemi disclaims any express or implied warranty, relating to sale and/or use of Microsemi products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright or other intellectual property right. Any performance specifications believed to be reliable but are not verified and customer or user must conduct and complete all performance and other testing of this product as well as any user or customers final application. User or customer shall not rely on any data and performance specifications or parameters provided by Microsemi. It is the customer's and user's responsibility to independently determine suitability of any Microsemi product and to test and verify the same. The information contained herein is provided "AS IS, WHERE IS" and with all faults, and the entire risk associated with such information is entirely with the User. Microsemi specifically disclaims any liability of any kind including for consequential, incidental and punitive damages as well as lost profit. The product is subject to other terms and conditions which can be located on the web at http://www.microsemi.com/legal/tnc.asp

Life Support Application

Seller's Products are not designed, intended, or authorized for use as components in systems intended for space, aviation, surgical implant into the body, in other applications intended to support or sustain life, or for any other application in which the failure of the Seller's Product could create a situation where personal injury, death or property damage or loss may occur (collectively "Life Support Applications").
Buyer agrees not to use Products in any Life Support Applications and to the extent it does it shall conduct extensive testing of the Product in such applications and further agrees to indemnify and hold Seller, and its officers, employees, subsidiaries, affiliates, agents, sales representatives and distributors harmless against all claims, costs, damages and expenses, and attorneys' fees and costs arising, directly or directly, out of any claims of personal injury, death, damage or otherwise associated with the use of the goods in Life Support Applications, even if such claim includes allegations that Seller was negligent regarding the design or manufacture of the goods.

Buyer must notify Seller in writing before using Seller's Products in Life Support Applications. Seller will study with Buyer alternative solutions to meet Buyer application specification based on Sellers sales conditions applicable for the new proposed specific part.