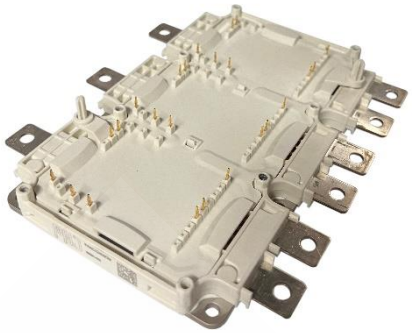
SiC Six-pack Module

PAAC12400CM

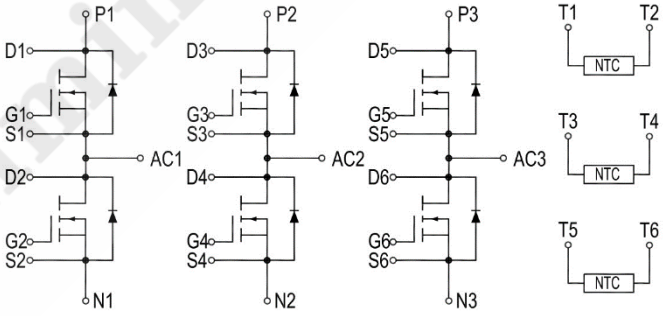


Features

- Silicon Carbide MOSFET
- Low RDSon
- Low Switching Losses
- Si3N4 Ceramic
- PinFin Base Plate

Applications

- Automotive Applications
- EV/HEV
- Motor Drives



Standards Benefits

- Improve System Efficiency
- Increase Power Density
- Reduce Heat Sink Requirement
- Reduce System Cost

Order Information

Part Number	Package	Marking
PAAC12400CM	HPD	PAAC12400CM

Contents

1. Maximum Ratings

At T_J= 25℃, unless specified otherwise

Parameter	Symbol	Value	Unit	Test Conditions
Drain - Source Voltage	V_{DS}	1200	V	
Gate - Source Voltage (Dynamic)	V_{GSmax}	-8 / +19	V	AC (f >1Hz)
Gate - Source Voltage(static) turn-on gate voltage turn-off gate voltage	 $V_{GS,on}$ $V_{GS,off}$	 +15 -3	V	Static
Continuous Drain Current	I_D	400	A	V_{GS} =15V T_F = 60℃
Power Dissipation	P_D	1000	W	
Operating Junction Temperature	T_J	-40 To +150	℃	

2. Electrical Characteristics

At T_J= 25℃, unless specified otherwise (Per Position)

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	1200	/	/	V	
Gate Threshold Voltage	$V_{GS(th)}$	1.8	2.9	/	V	V_{DS}= V_{GS} I_D= 141.6mA T_J= 25℃
Reverse Bias Drain Current	I_{DSS}	/	15	800	μA	V_{GS}= 0V V_{DS}= 1200V

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
Reverse Bias Drain Current	I_{DSS}	/	1	/	μA	V_{GS}= -3V V_{DS}= 1200V
Gate-Source Leakage Current	I_{GSS}	/	20	2000	nA	V_{GS}= 15V V_{DS}= 0V
Drain-Source On-State Resistance	$R_{DS(on)}$	/	3.13	4.07	mΩ	V_{GS}= 15V I_D= 400A
Turn-on Energy	E_{on}	/	39.62	/	mJ	V_{DS}= 800V I_{DS}= 400A V_{GS}= -3V/15V R_G= 5.0Ω L= 20μH
Turn-off Energy	E_{off}	/	28.90	/		
Turn-On Delay Time	$T_{d(on)}$	/	126.6	/	nS	
Rise Time	T_r	/	263.2	/		
Turn-Off Delay Time	$T_{d(off)}$	/	265.9	/		
Fall Time	T_f	/	83.8	/		
Internal Gate Resistance	$R_{G(int)}$	/	0.43	/	Ω	f= 100kHz V_{AC}= 25mV
Input Capacitance	C_{iss}	/	51.8	/	nF	V_{GS}= 0V V_{DS}= 800V f= 100kHz V_{AC}= 25mV
Output Capacitance	C_{oss}	/	1.90	/	nF	
Reverse Transfer Capacitance	C_{rss}	/	93.0	/	pF	
Thermal Resistance from Junction to Cooling Fluid	$R_{\theta JF}$	/	0.09	/	℃/W	per MOSFET, ΔV/Δt= 10.0dm³/min; T_F= 60°C

3. Reverse Diode Characteristics

At T_J= 25℃, unless specified otherwise (Per Position)

Parameter	Symbol	Value		Unit	Test Conditions
		Typ.	Max.		
Diode Forward Voltage	V_{SD}	5.2	/	V	V_{GS}= -3V I_{SD}= 200A T_J= 25℃
		4.7	/	V	V_{GS}= -3V I_{SD}= 200A T_J= 150℃
Continuous Diode Forward Current	I_S	200	/	A	V_{GS}= -3V
Reverse Recover Time	t_{rr}	25.4	/	ns	V_{GS}= -3V I_{SD}= 400A V_R= 800V
Reverse Recovery Charge	Q_{rr}	813.2	/	μC	
Peak Reverse Recovery Current	I_{rrm}	52.2	/	A	
Reverse Recovery Energy	E_{RR}	0.23	/	mJ	V_{GS}= -3V I_{SD}= 400A V_R= 800V d_{if}/d_t= 3900A/μs

4. Module Physical Characteristics

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
Storage Temperature	T_{stg}	-40	/	125	℃	

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
Weight	W	/	720	/	g	
Mounting Torque	M	1.8	/	2.2	N·m	Screw M4
Comparative Tracking Index	CTI	200	/	/		

5. NTC Thermistor Characteristics

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
Rated Resistance	R_{NTC}	/	5	/	kΩ	T_{NTC}= 25℃
Resistance Tolerance	$\triangle R/R$	-5	/	5	%	T_{NTC}= 25℃
B-value	$B_{25/50}$	/	3380	/	K	T_2= 50℃
B-value	$B_{25/85}$	/	3435	/	K	T_2= 80℃
B-value	$B_{25/100}$	/	3485	/	K	T_2= 100℃
Power Dissipation	P_{NTC}	/	/	10	mW	T_{NTC}= 25℃

6. Typical Performance

At T_J= 25℃, unless specified otherwise (Per Position)

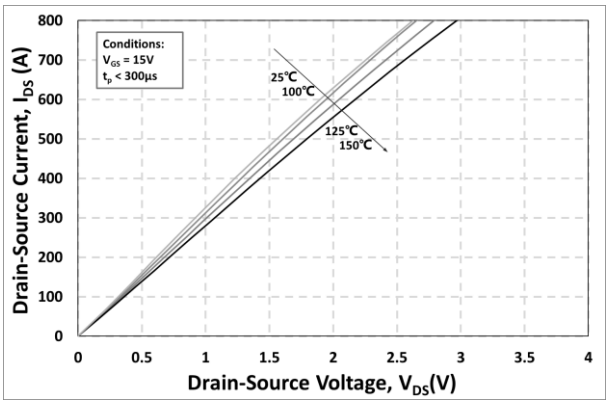


Figure 1. Output Characteristics for Various Junction Temperatures

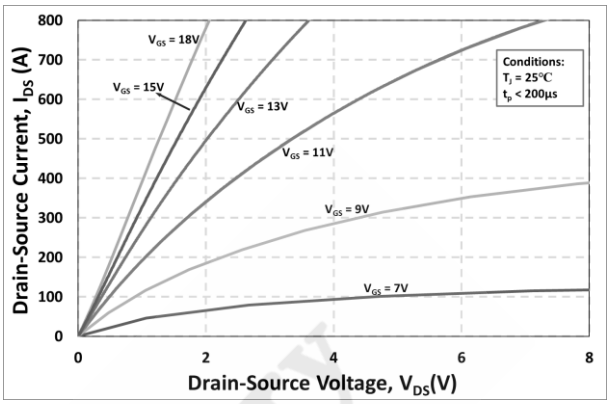


Figure 2. Output Characteristics T_J = 25℃

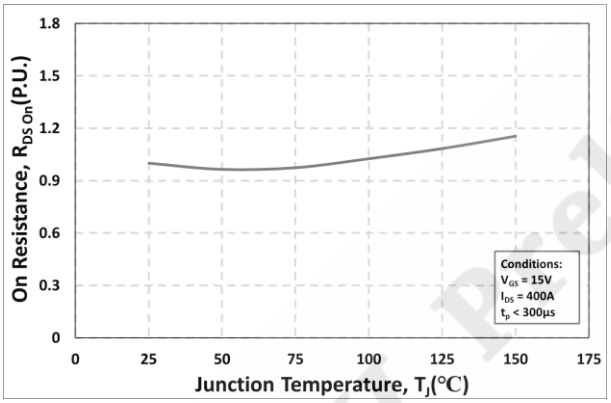


Figure 3. Normalized On-State Resistance vs. Junction Temperature

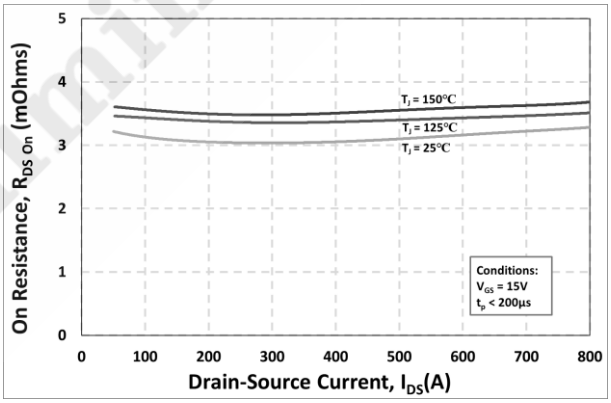


Figure 4. On-Resistance vs. Drain Current Various Temperatures

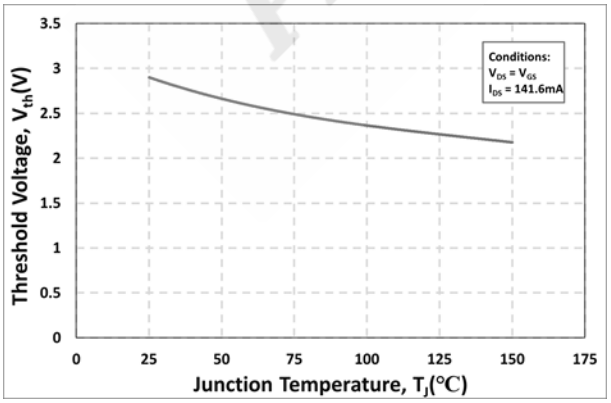


Figure 5. Threshold Voltage vs. Junction Temperature

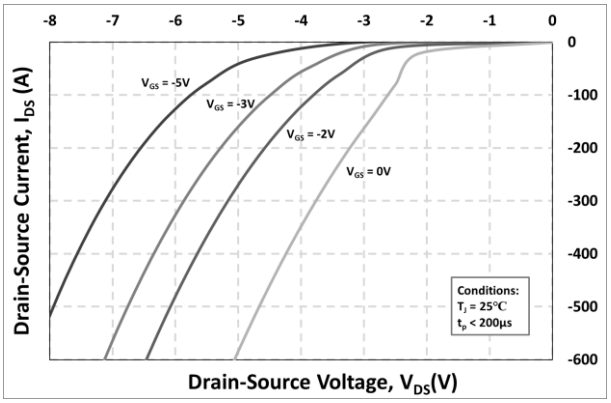


Figure 6. Body Diode Characteristics

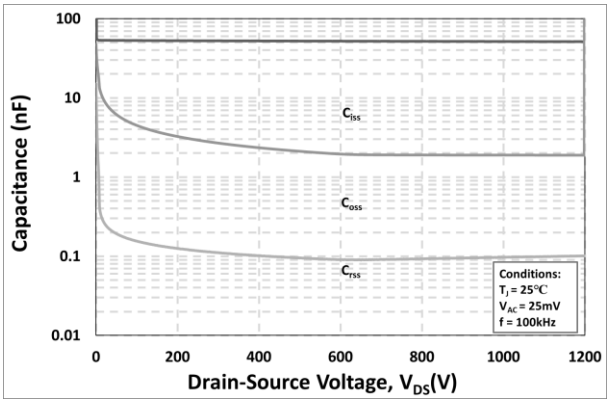


Figure 7. Capacitances vs. Drain-Source Voltage

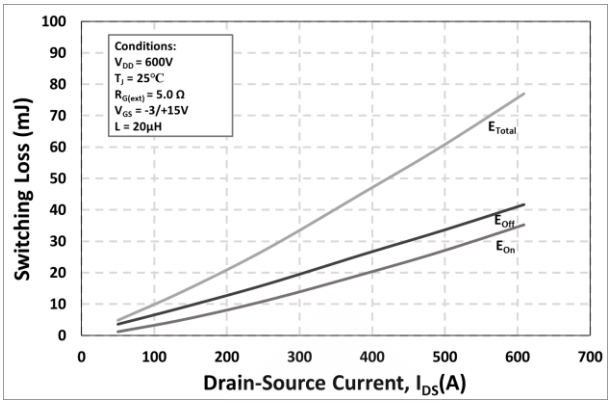


Figure 8. Switching Loss vs. Drain-Source Current (V_{DS} = 600 V)

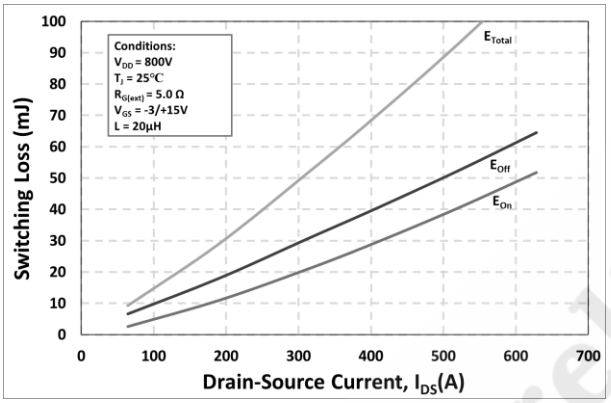


Figure 9. Switching Loss vs. Drain-Source Current (V_{DS} = 800 V)

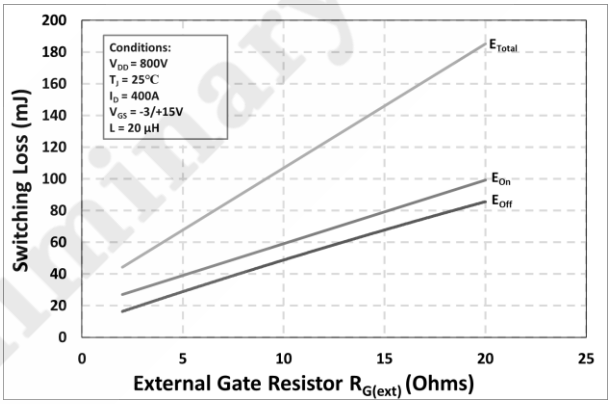


Figure 10. Switching Loss vs. External Gate Resistance

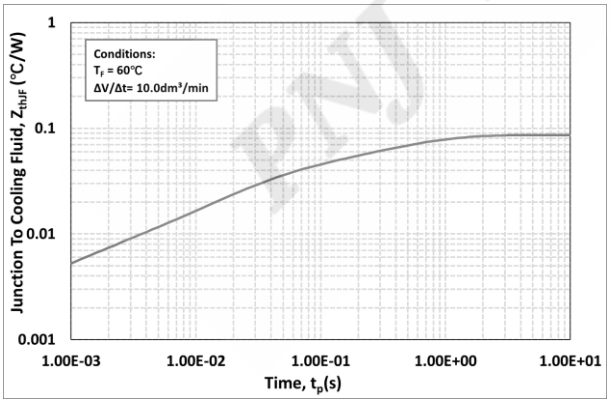


Figure 11. Transient Thermal Impedance (Junction – Cooling Fluid)

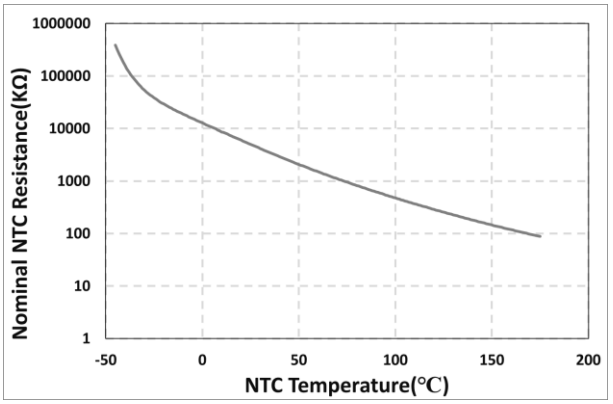


Figure 12. Nominal NTC Resistance vs. NTC Temperature

7. Definitions

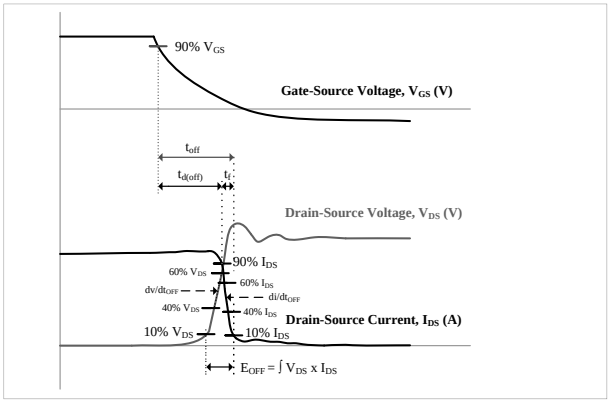


Figure 13. Turn-off Transient Definitions

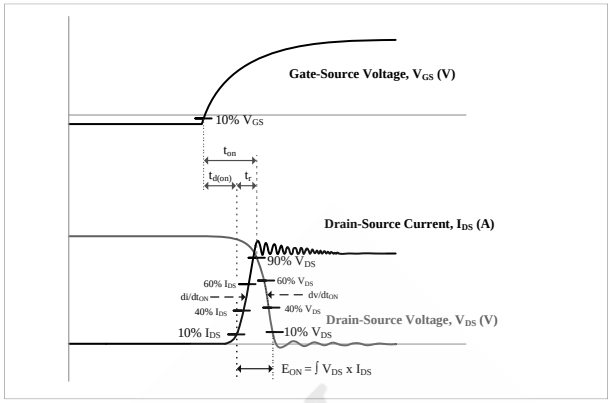


Figure 14. Turn-on Transient Definitions

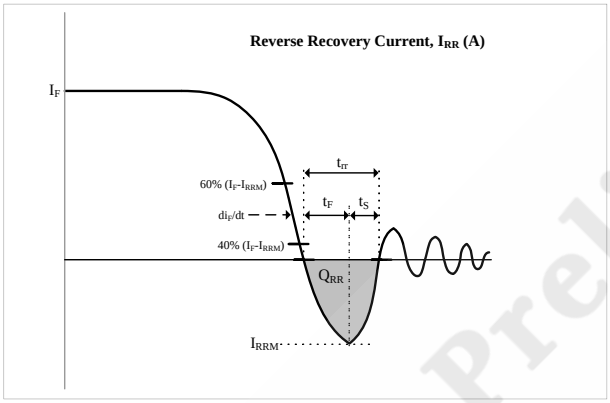


Figure 15. Reverse Recovery Definitions

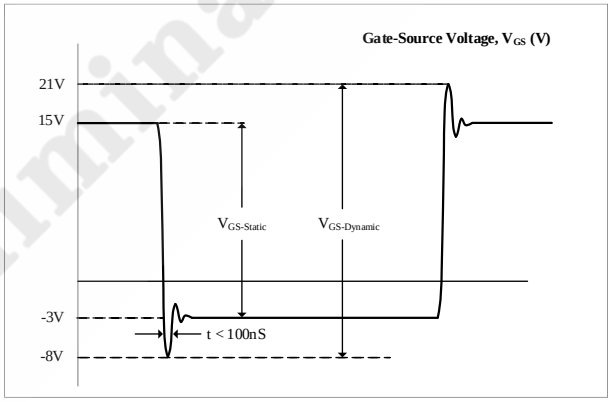
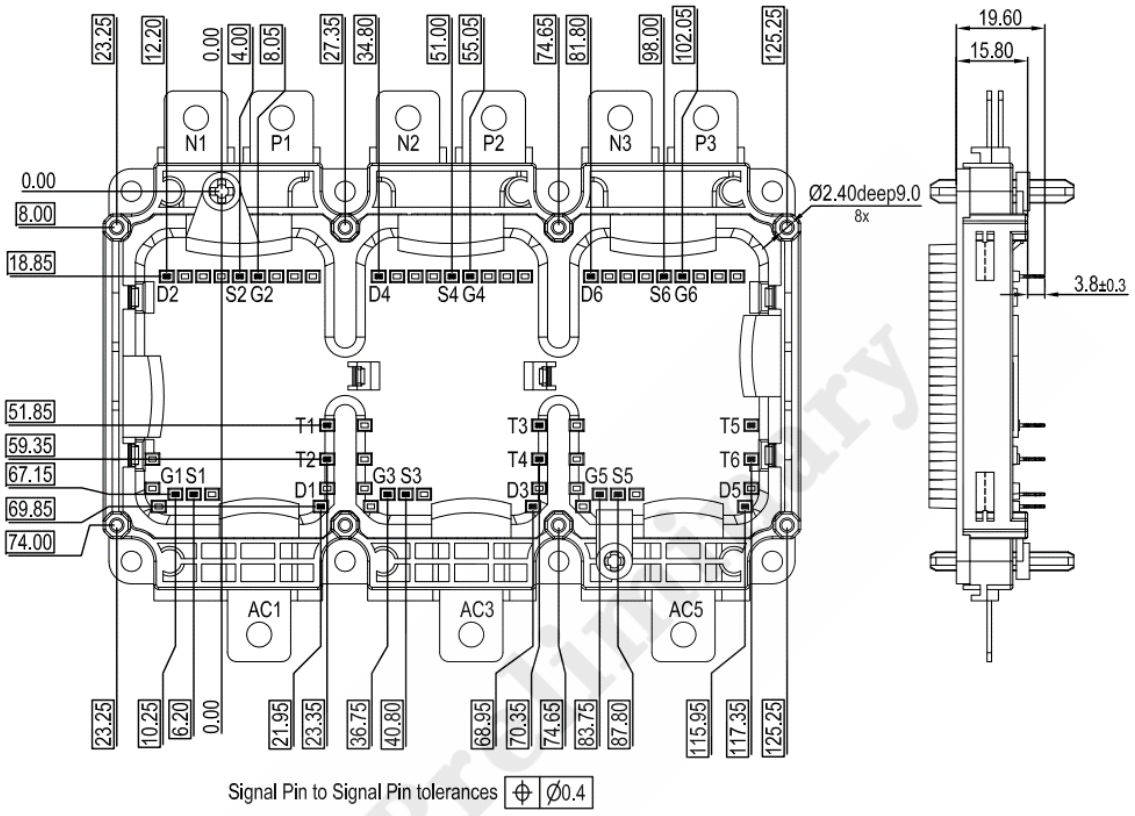


Figure 16. Vgs Transient Definitions

8. Package Outlines



Drawing and Dimensions

Important Notice

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, PN Junction hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

PN Junction reserves the right to make changes at any time to any products or information herein, without notice. “Typical” parameters which may be provided in PN Junction data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including “Typical” must be validated for each customer application by customer’s technical experts.

In addition, any information given in this document is subject to customer’s compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer’s products and any use of the product of PN Junction in customer’s applications. The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer’s technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on the product, technology, delivery terms and conditions and prices please contact your nearest PN Junction office (www.pnjsemi.com).

Warnings

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest PN Junction office.

Except as otherwise explicitly approved by PN Junction in a written document signed by authorized representatives of PN Junction, PN Junction’s products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.