MDP13N50G / MDF13N50G

N-Channel MOSFET 500V, 13.0A, 0.5Ω

General Description

These N-channel MOSFET are produced using advanced MagnaChip's MOSFET Technology, which provides low on-state resistance, high switching performance and excellent quality.

These devices are suitable device for SMPS, high Speed switching and general purpose applications.

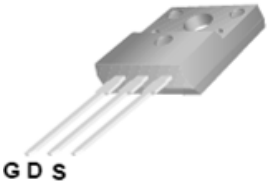
Features

- V_{DS} = 500V
- V_{DS} = 550V @ Tjmax
- I_D = 13.0A @ V_{GS} = 10V
- $R_{DS(ON)}$ < 0.5Ω @ V_{GS} = 10V

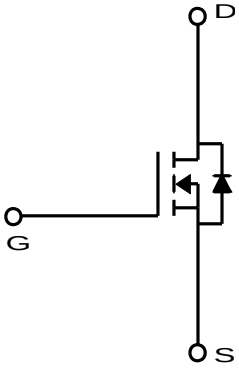
Applications

- Power Supply
- HID
- Lighting

TO-220
MDP Series



TO-220F
MDF Series



Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	MDP13N50G	MDF13N50G	Unit
Drain-Source Voltage		V_{DSS}	500		V
Drain-Source Voltage @ Tjmax		V_{DSS} @ T_{jmax}	550		V
Gate-Source Voltage		V_{GSS}	±30		V
Continuous Drain Current	T_C=25°C	I_D	13	13*	A
	T_C=100°C		8.2	8.2*	A
Pulsed Drain Current(1)		I_{DM}	52	52*	A
Power Dissipation	T_C=25°C	P_D	187	42	W
	Derate above 25 °C		1.49	0.33	W/ °C
Repetitive Avalanche Energy(1)		E_{AR}	18.7		mJ
Peak Diode Recovery dv/dt(3)		dv/dt	4.5		V/ns
Single Pulse Avalanche Energy(4)		E_{AS}	580		mJ
Junction and Storage Temperature Range		T_J, T_{stg}	-55~150		°C

* Id limited by maximum junction temperature

Thermal Characteristics

Characteristics	Symbol	MDP13N50G	MDF13N50G	Unit
Thermal Resistance, Junction-to-Ambient(1)	$R_{\theta JA}$	62.5	62.5	°C/W
Thermal Resistance, Junction-to-Case(1)	$R_{\theta JC}$	0.67	3.0	

Ordering Information

Part Number	Temp. Range	Package	Packing	RoHS Status
MDP13N50GTH	-55~150°C	TO-220	Tube	Halogen Free
MDF13N50GTH	-55~150°C	TO-220F	Tube	Halogen Free

Electrical Characteristics (Ta =25°C)

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	I_D = 250μA, V_{GS} = 0V	500	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	3.0	-	5.0	
Drain Cut-Off Current	I_{DSS}	V_{DS} = 500V, V_{GS} = 0V	-	-	1	μA
Gate Leakage Current	I_{GSS}	V_{GS} = ±30V, V_{DS} = 0V	-	-	100	nA
Drain-Source ON Resistance	$R_{DS(ON)}$	V_{GS} = 10V, I_D = 6.5A		0.39	0.5	Ω
Forward Transconductance	g_{fs}	V_{DS} = 40V, I_D = 6.5A	-	13	-	S
Dynamic Characteristics						
Total Gate Charge	Q_g	V_{DS} = 400V, I_D = 13A, V_{GS} = 10V(3)	-	33		nC
Gate-Source Charge	Q_{gs}		-	10.4		
Gate-Drain Charge	Q_{gd}		-	13		
Input Capacitance	C_{iss}	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz	-	1390		pF
Reverse Transfer Capacitance	C_{rss}		-	6.3		
Output Capacitance	C_{oss}		-	173		
Turn-On Delay Time	$t_{d(on)}$	V_{GS} = 10V, V_{DS} = 250V, I_D = 13A, R_G = 25Ω(3)	-	57		ns
Rise Time	t_r		-	54		
Turn-Off Delay Time	$t_{d(off)}$		-	112		
Fall Time	t_f		-	37		
Drain-Source Body Diode Characteristics						
Maximum Continuous Drain to Source Diode Forward Current	I_S		-	13	-	A
Source-Drain Diode Forward Voltage	V_{SD}	I_S = 13A, V_{GS} = 0V	-		1.4	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 13A, dI/dt = 100A/μs(3)	-	325		ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	2.9		μC

Note :

1. Pulse width is based on R θJC & R θJA and the maximum allowed junction temperature of 150°C.
2. Pulse test: pulse width ≤300us, duty cycle≤2%, pulse width limited by junction temperature TJ(MAX)=150°C.
3. I_{SD} ≤9.0A, di/dt≤200A/us, V_{DD}=50V, R_g =25Ω, Starting TJ=25°C
4. L=6.2mH, I_{AS}=13.0A, V_{DD}=50V, , R_g =25Ω, Starting TJ=25°C

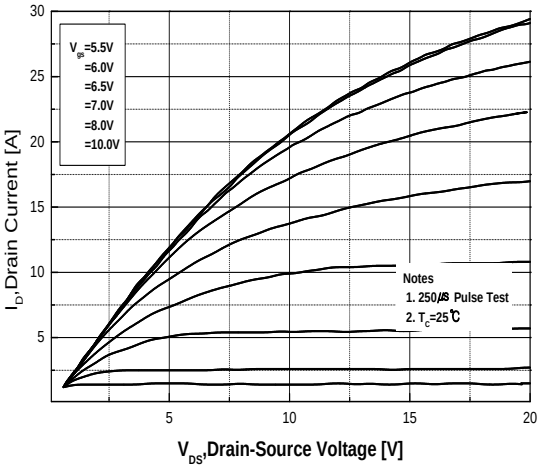


Fig.1 On-Region Characteristics

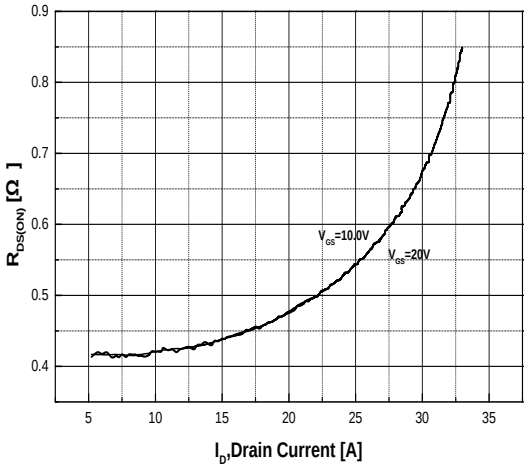


Fig.2 On-Resistance Variation with Drain Current and Gate Voltage

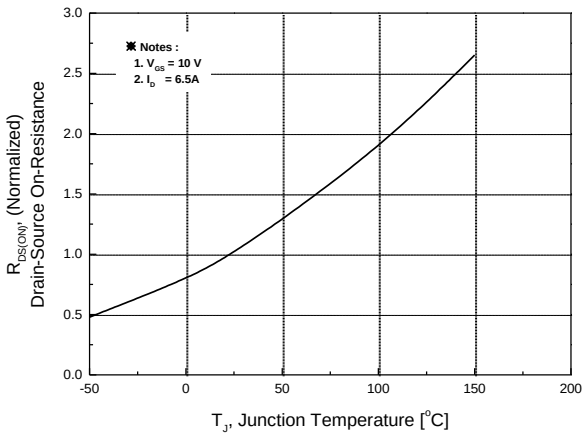


Fig.3 On-Resistance Variation with Temperature

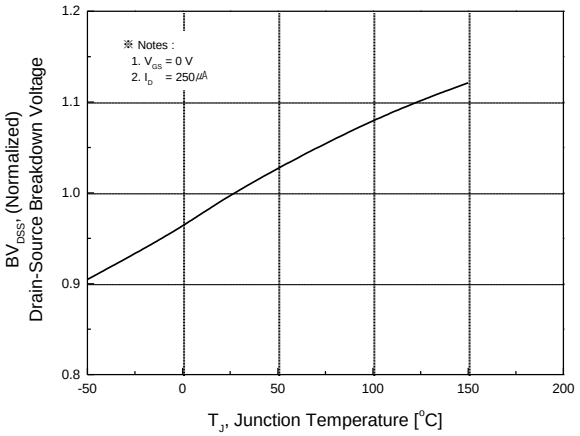


Fig.4 Breakdown Voltage Variation vs. Temperature

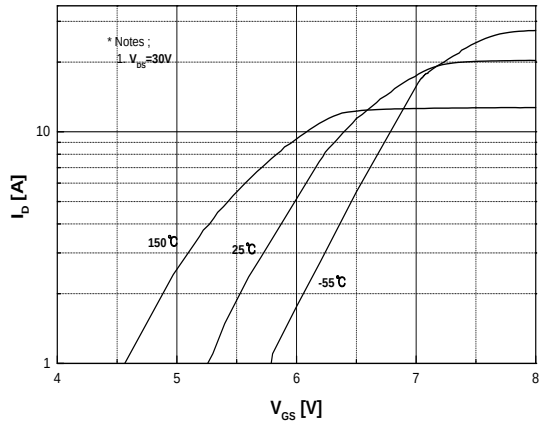


Fig.5 Transfer Characteristics

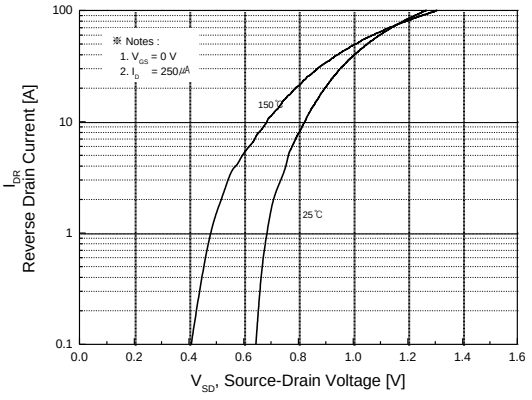


Fig.6 Body Diode Forward Voltage Variation with Source Current and Temperature

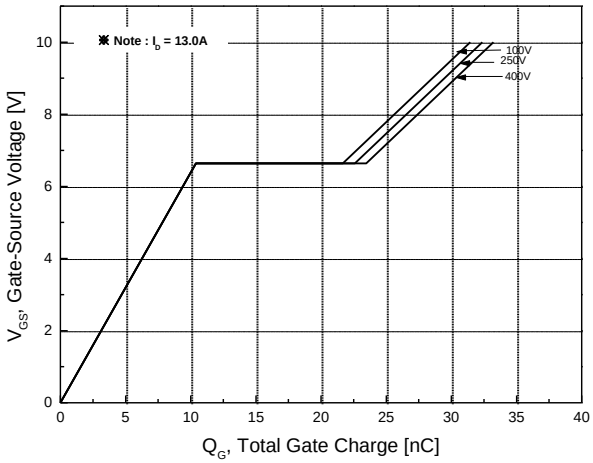


Fig.7 Gate Charge Characteristics

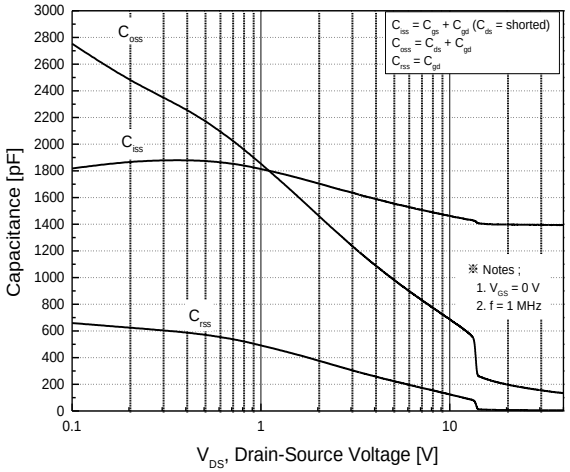


Fig.8 Capacitance Characteristics

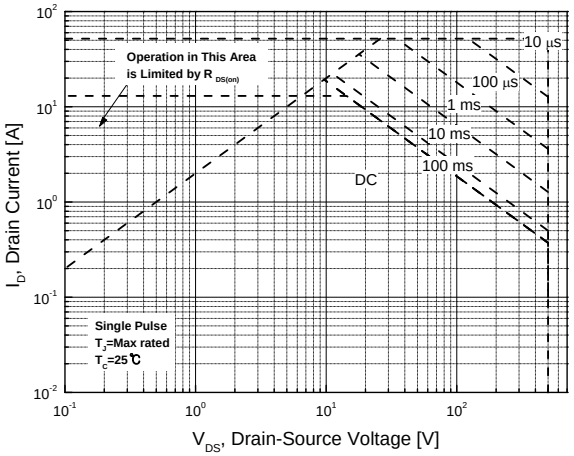


Fig.9 Maximum Safe Operating Area
MDP13N50G(TO-220)

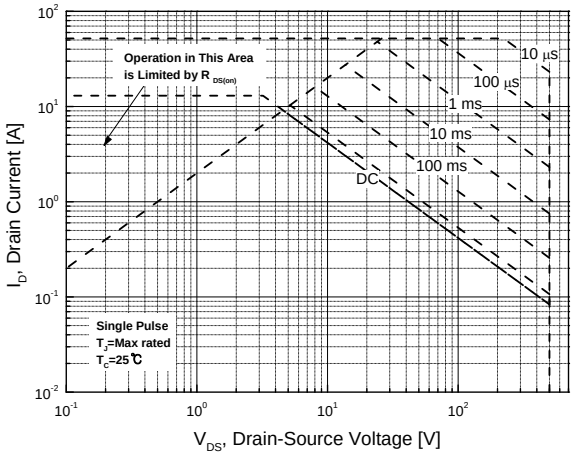


Fig.10 Maximum Safe Operating Area
MDF13N50G(TO-220F)

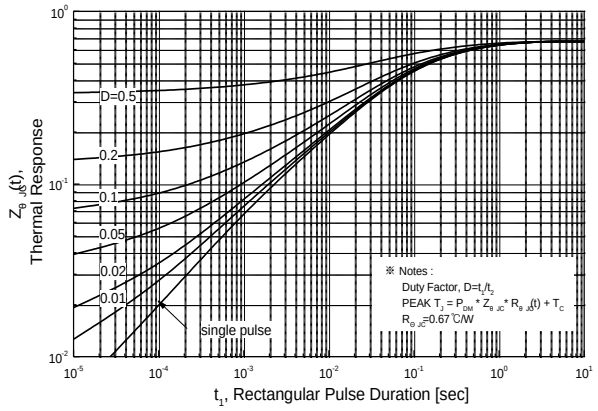


Fig.11 Transient Thermal Response Curve
MDP13N50G(TO-220)

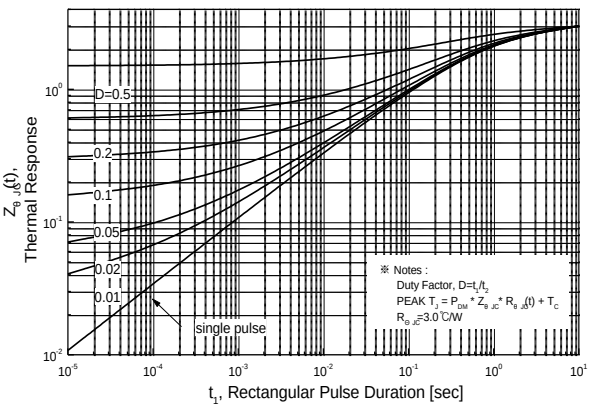


Fig.12 Transient Thermal Response Curve
MDF13N50G(TO-220F)

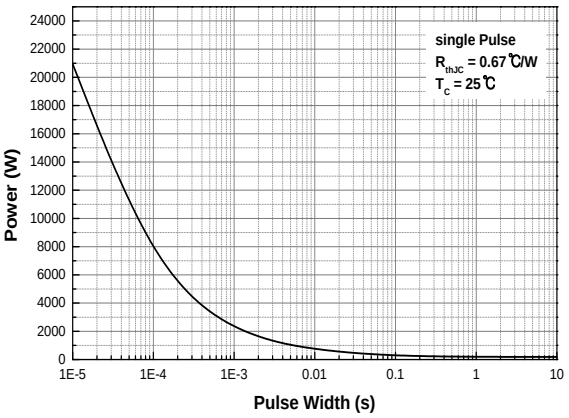


Fig.13 Single Pulse Maximum Power Dissipation MDP13N50G(TO-220)

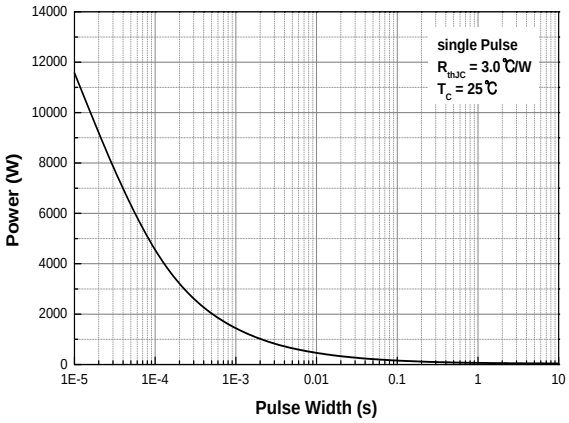


Fig.14 Single Pulse Maximum Power DissipationMDF13N50G (TO-220F)

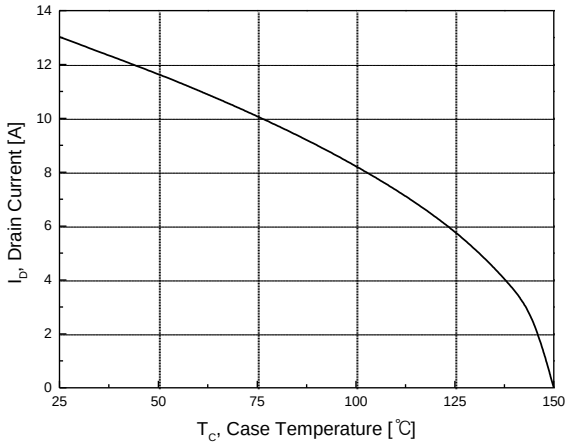
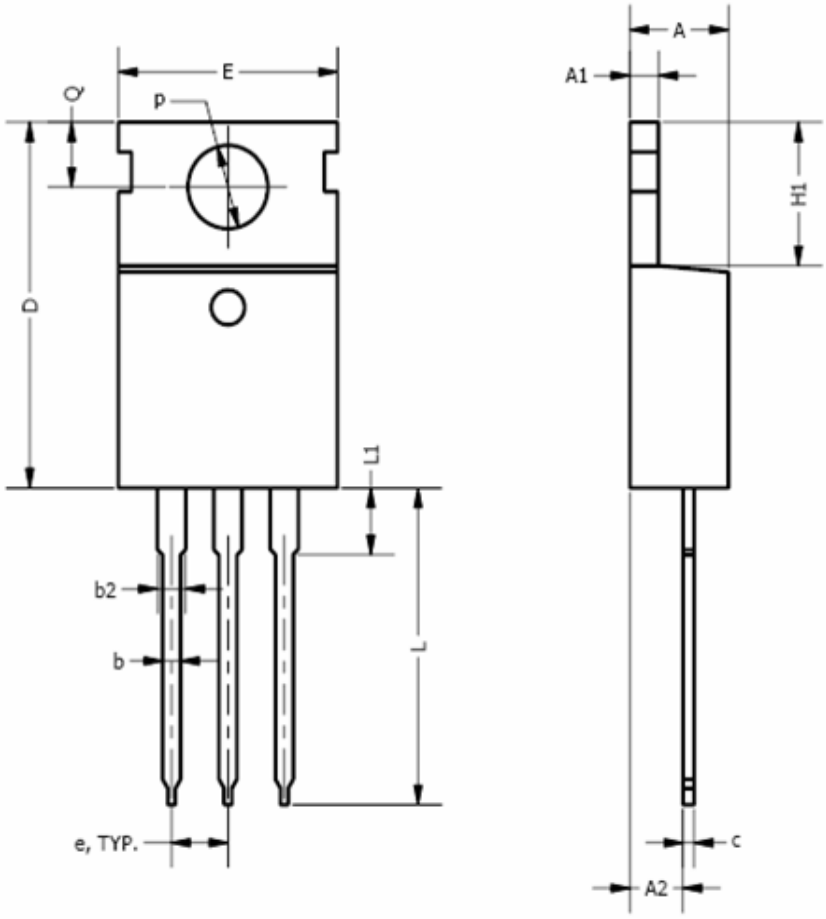


Fig.15 Maximum Drain Current vs. Case Temperature

■ Physical Dimension

3 Leads, TO-220

Dimensions are in millimeters unless otherwise specified

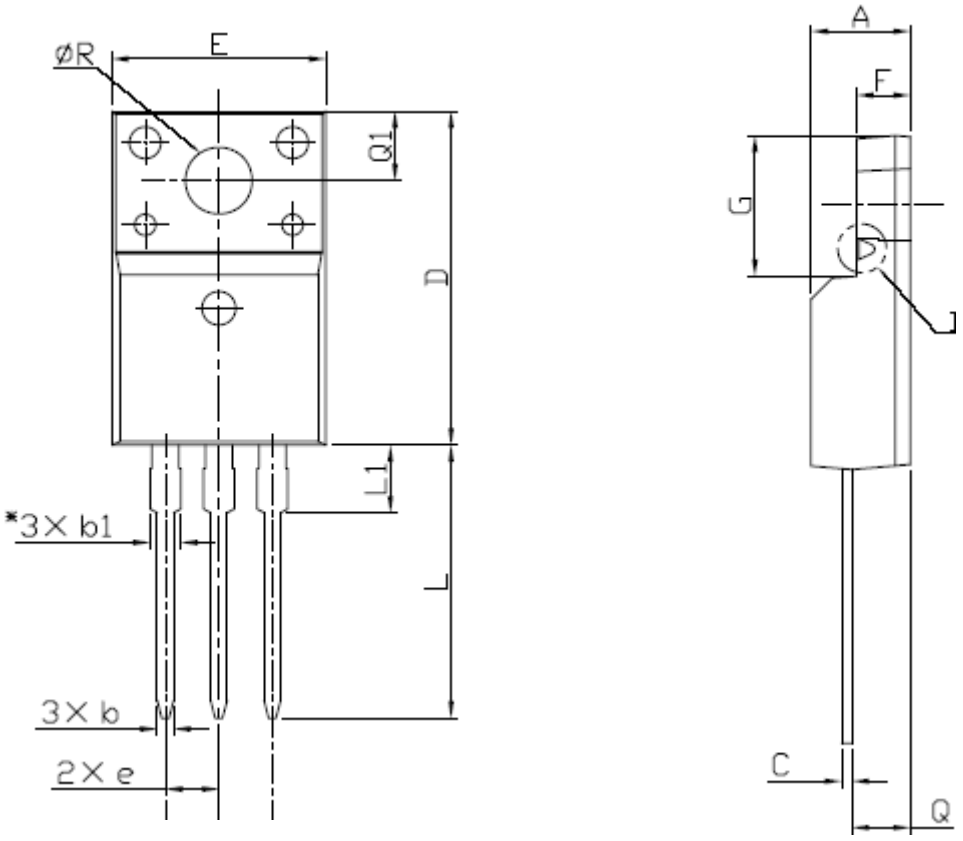


Symbol	Min	Nom	Max
A	3.56		4.83
A1	0.50		1.40
A2	2.03		2.92
b	0.38	0.69	1.02
b2	1.14	1.45	1.78
c	0.36		0.61
D	14.22		16.51
e	2.54 TYP		
E	9.65		10.67
H1	5.84		6.86
L	12.70		14.73
L1			6.35
ΦP	3.53		4.09
Q	2.54		3.43

■ Physical Dimension

3 Leads, TO-220F

Dimensions are in millimeters unless otherwise specified



Symbol	Min	Nom	Max
A	4.50		4.93
b	0.63		0.91
b1	1.15		1.47
C	0.33		0.63
D	15.47		16.13
E	9.60		10.71
e		2.54	
F	2.34		2.84
G	6.48		6.90
L	12.24		13.72
L1	2.79		3.67
Q	2.52		2.96
Q1	3.10		3.50
¢R	3.00		3.55

DISCLAIMER:

The Products are not designed for use in hostile environments, including, without limitation, aircraft, nuclear power generation, medical appliances, and devices or systems in which malfunction of any Product can reasonably be expected to result in a personal injury. Seller's customers using or selling Seller's products for use in such applications do so at their own risk and agree to fully defend and indemnify Seller.