650V 12A SiC Schottky MPS™ Diode

V_{RRM}	=	650 V
I_F	=	12 A
Q_C	=	31 nC

Features

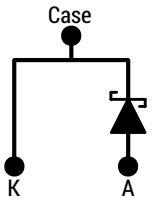
- Gen5 SiC MPS™Technology for Low V_F of 1.22V
- Benchmark Low Built-In Voltage (V_{BI})
- Superior Figure of Merit Q_C * V_F
- Enhanced Surge Current & UIS Robustness
- Low Thermal Resistance
- Zero Reverse Recovery and Zero Forward Recovery
- Excellent dV/dt Ruggedness

Package

Case (K)



TO-220-2



RoHS

REACH

Advantages

- Lowest Conduction Losses Across All Load Conditions
- Increased System Power Density
- Optimal Price Performance
- High System Reliability
- Reduced Cooling Requirements
- Temperature Independent Fast Switching
- Easy to Parallel without Thermal Runaway

Applications

- Switched Mode Power Supply (SMPS)
- Server and Telecom Power Supply
- Solar Microinveter
- Power Factor Correction (PFC)
- Uninterruptible Power Supply (UPS)

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Values	Unit	Note
Repetitive Peak Reverse Voltage	V_{RRM}		650	V	
Continuous Forward Current	I_F	T_C = 25°C, D = 1	35	A	Fig. 4
		T_C = 110°C, D = 1	22		
		T_C = 152°C, D = 1	12		
Non-Repetitive Peak Forward Surge Current, Half Sine Wave	$I_{F,SM}$	T_C = 25°C, t_P = 10 ms	72	A	
		T_C = 150°C, t_P = 10 ms	60		
Repetitive Peak Forward Surge Current, Half Sine Wave	$I_{F,RM}$	T_C = 25°C, t_P = 10 ms	45	A	
		T_C = 150°C, t_P = 10 ms	30		
i^2t Value	$\int i^2dt$	T_C = 25°C, t_P = 10 ms	25	A^2s	
Non-Repetitive Avalanche Energy	E_{AS}	L = 1.1 mH, I_{AS} = 12 A	83	mJ	
Diode Ruggedness	dV/dt	V_R = 0 ~ 520 V	200	V/ns	
Power Dissipation	P_{TOT}	T_C = 25°C	112	W	Fig. 3
Operating and Storage Temperature	T_j , T_{stg}		-55 to 175	°C	

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Electrical Characteristics

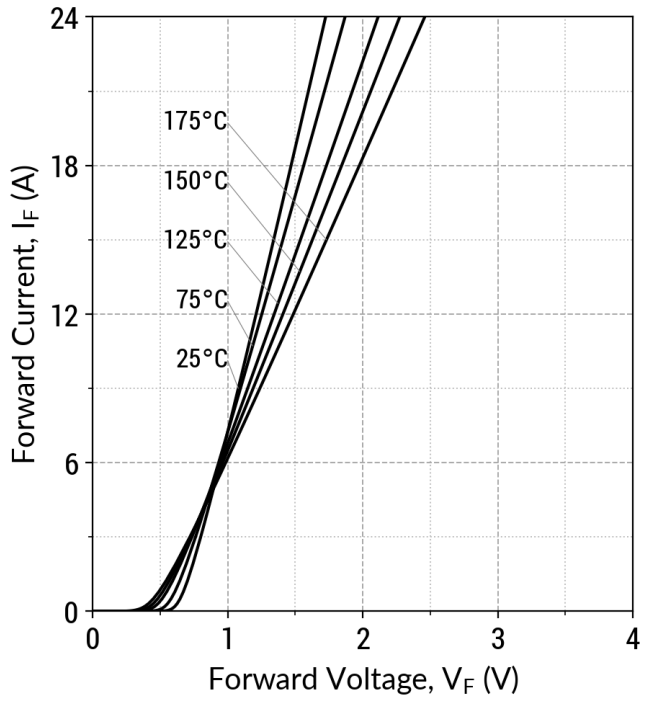
Parameter	Symbol	Conditions		Values Min.	Values Typ.	Values Max.	Unit	Note
Diode Forward Voltage	V_F	I_F = 12 A, T_j = 25°C			1.22	1.45	V	Fig. 1
		I_F = 12 A, T_j = 125°C			1.4			
Reverse Current	I_R	V_R = 650 V, T_j = 25°C			4	200	µA	Fig. 2
		V_R = 650 V, T_j = 125°C			83			
Total Capacitive Charge	Q_C	$I_F \le I_{F,MAX}$ dI_F/dt = 200 A/µs	V_R = 300 V		26		nC	Fig. 7
			V_R = 400 V		31			
Switching Time	t_S		V_R = 300 V		< 10		ns	
			V_R = 400 V					
Total Capacitance	C	V_R = 1 V, f = 1MHz			575		pF	Fig. 6
		V_R = 400 V, f = 1MHz			41			

Thermal/Package Characteristics

Parameter	Symbol	Conditions	Values Min.	Values Typ.	Values Max.	Unit	Note
Thermal Resistance, Junction - Case	R_{thJC}			1.34		°C/W	Fig. 9
Weight	W_T			2		g	
Mounting Torque	T_M	Screws to Heatsink			1.0	Nm	

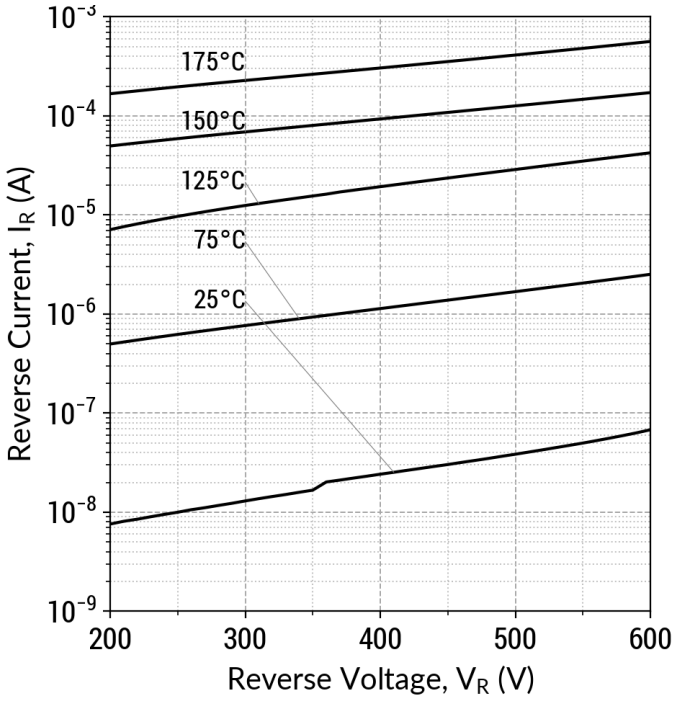
NOTE: This datasheet provides preliminary specifications. Parameters, conditions and values are subject to change.

Figure 1: Typical Forward Characteristics



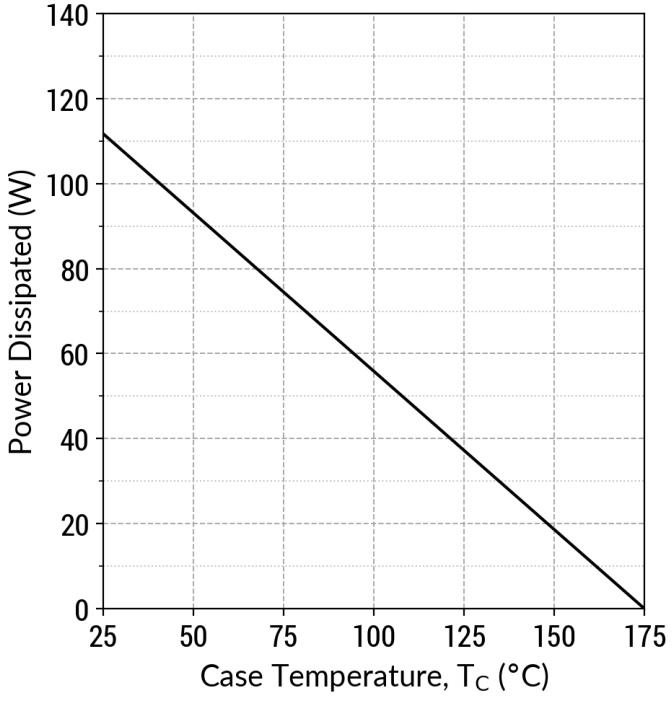
$I_F = f(V_F,T_j)$; $t_P = 250\ \mu s$

Figure 2: Typical Reverse Characteristics



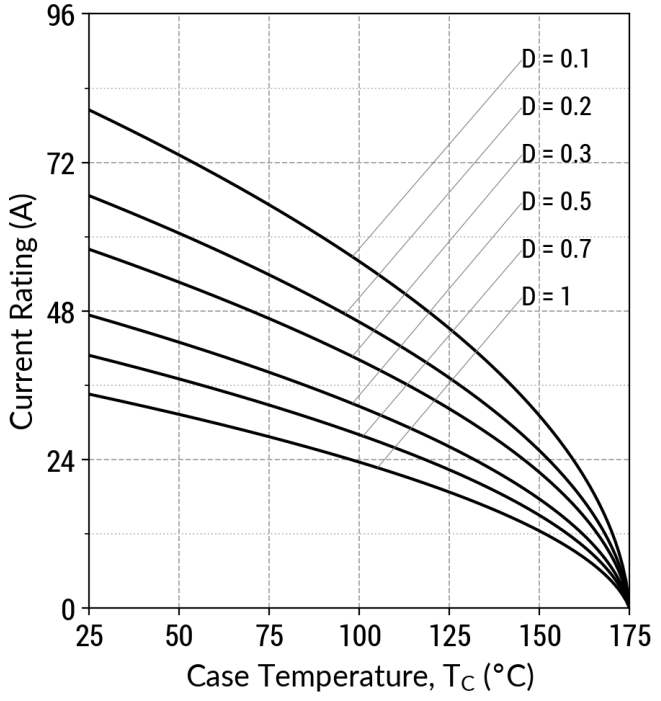
$I_R = f(V_R,T_j)$

Figure 3: Power Derating Curves



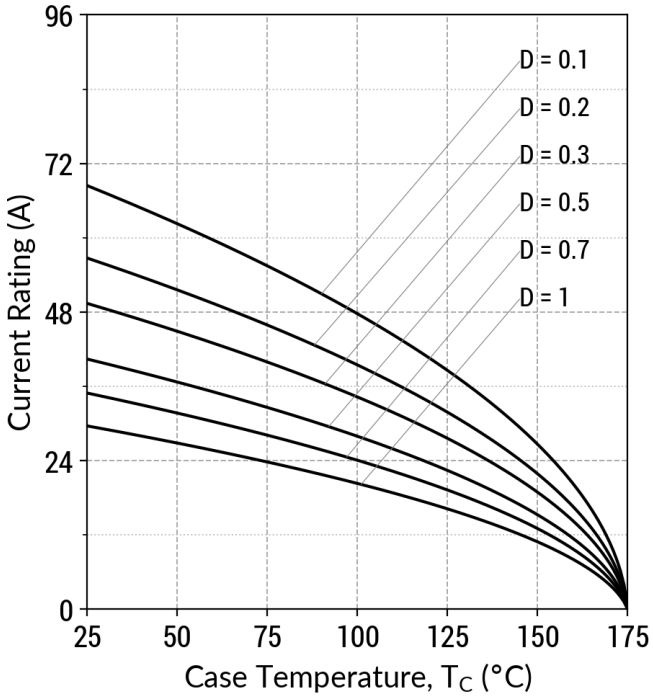
$P_{TOT} = f(T_C)$; $T_j = 175°C$

Figure 4: Current Derating Curves (Typical V_F)



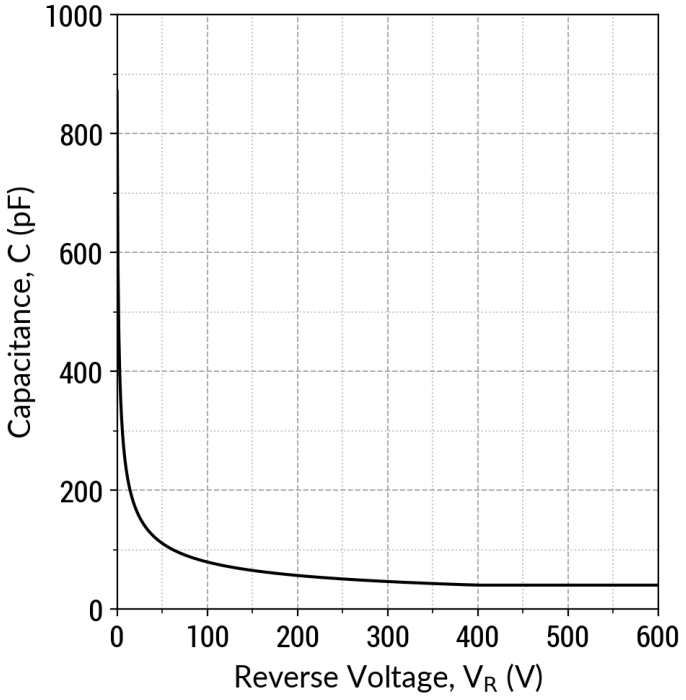
$I_F = f(T_C)$; $D = t_P/T$; $T_j \leq 175°C$; $f_{SW} > 10kHz$

Figure 5: Current Derating Curves (Maximum V_F)



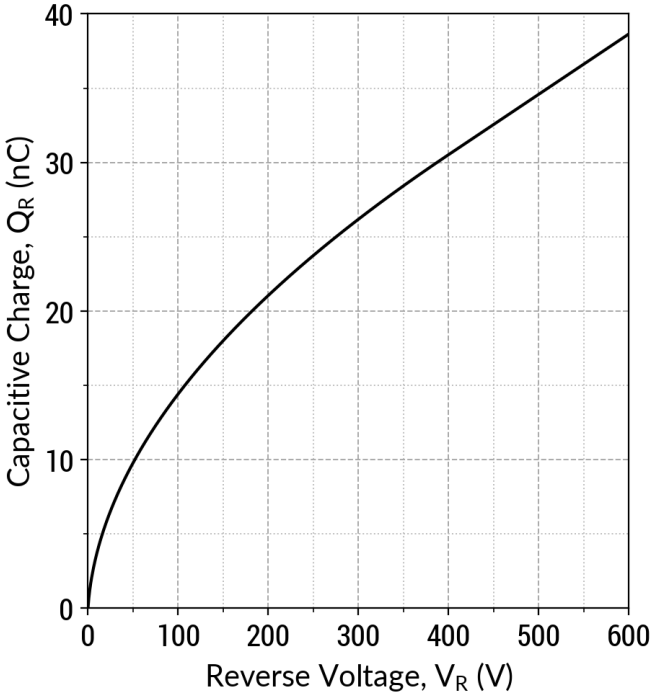
$I_F = f(T_C)$; $D = t_P/T$; $T_j \leq 175°C$; $f_{SW} > 10kHz$

Figure 6: Typical Junction Capacitance vs Reverse Voltage Characteristics



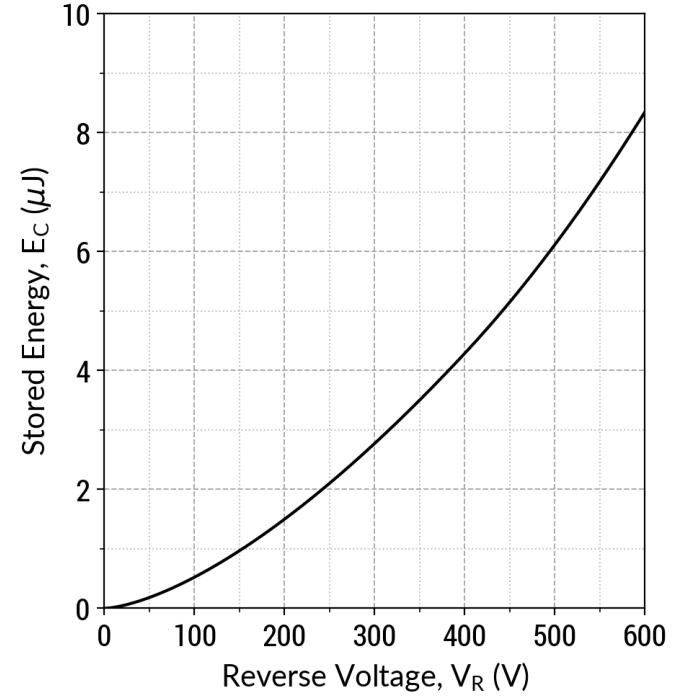
$C = f(V_R)$; $f = 1MHz$

Figure 7: Typical Capacitive Charge vs Reverse Voltage Characteristics



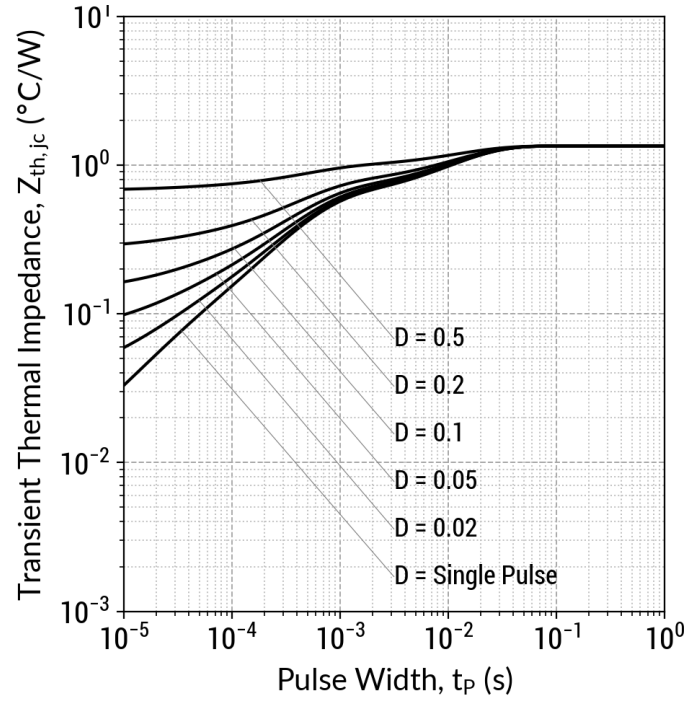
$Q_C = f(V_R)$; $f = 1MHz$

Figure 8: Typical Capacitive Energy vs Reverse Voltage Characteristics



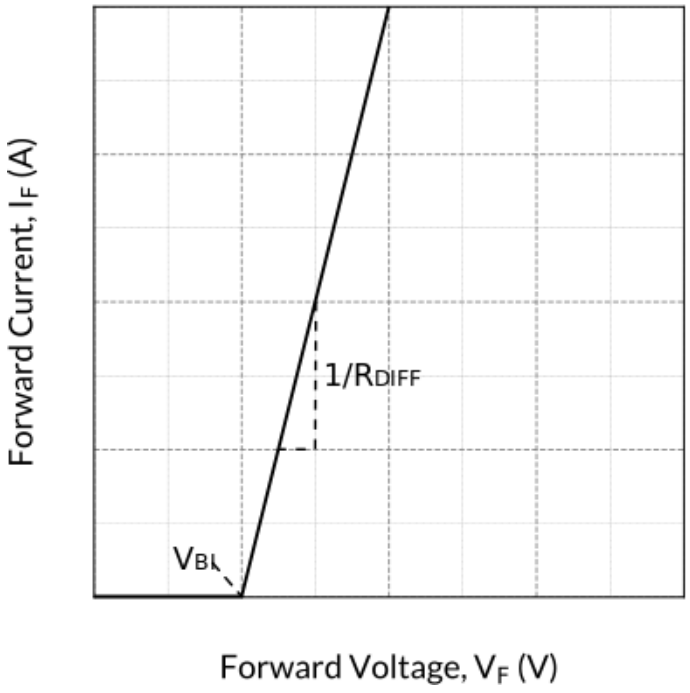
$E_C = f(V_R)$; $f = 1MHz$

Figure 9: Transient Thermal Impedance



$Z_{th,jc} = f(t_P,D)$; $D = t_P/T$

Figure 10: Forward Curve Model



$I_F = f(V_F,T_j)$

Forward Curve Model Equation:

$I_F = (V_F - V_{BI})/R_{DIFF}$ (A)

Built-In Voltage (V_{BI}):

$V_{BI}(T_j) = m \times T_j + n$ (V)

m = -0.00122 (V/°C)

n = 0.724 (V)

Differential Resistance (R_{DIFF}):

$R_{DIFF}(T_j) = a \times T_j^2 + b \times T_j + c$ (Ω)

a = 8.51e-07 (Ω/°C^2)

b = 8.51e-05 (Ω/°C)

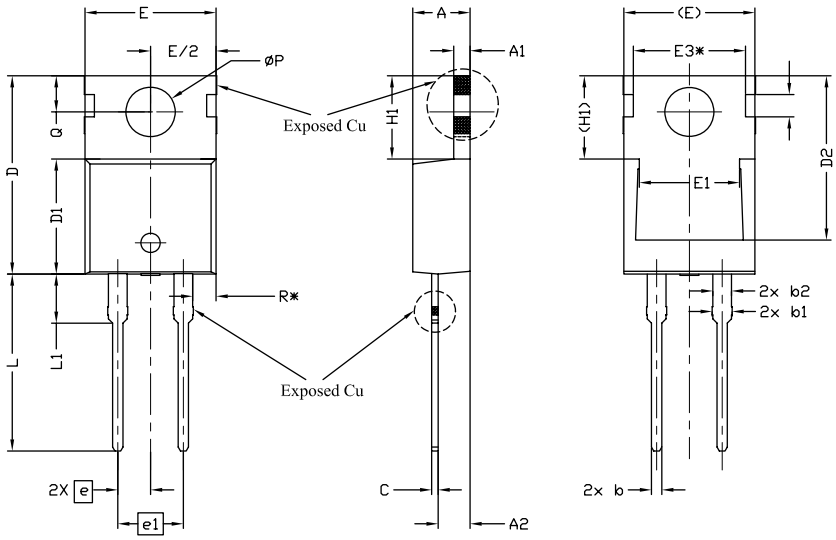
c = 0.0405 (Ω)

Forward Power Loss Equation:

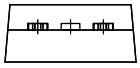
$P_{LOSS} = V_{BI}(T_j) \times I_{AVG} + R_{DIFF}(T_j) \times I_{RMS}^2$

Package Dimensions

TO-220-2 Package Outline

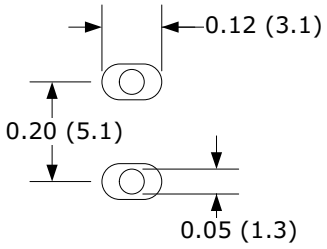


SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	4.24	4.44	4.64
A1	1.15	1.27	1.40
A2	2.30	2.48	2.70
b	0.70	0.80	0.90
b1	1.20	1.55	1.75
b2	1.20	1.45	1.70
c	0.40	0.50	0.60
D	14.70	15.37	16.00
D1	8.82	8.92	9.02
D2	12.43	12.73	12.83
E	9.96	10.16	10.36
E1	6.86	7.77	8.89
E3*		8.70REF.	
e		2.54BSC	
e1		5.08BSC	
H1	6.30	6.45	6.60
L	13.47	13.72	13.97
L1	3.60	3.80	4.00
ØP	3.75	3.84	3.93
Q	2.60	2.80	3.00
Q1*		1.73REF.	
R*		1.82REF.	

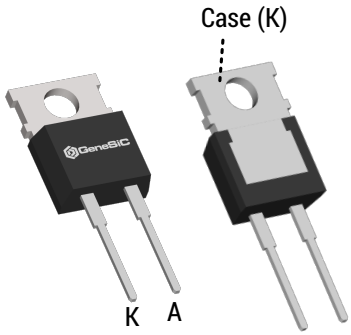


Note:
1. Package Reference: JEDEC TO220, Variation AB.
2. All Dimensions Are In mm.
3. Slot Required, Notch May Be Rounded
4. Dimension D & E Do Not Include Mold Flash. Mold Flash Shall Not Exceed 0.127mm Pre Side. These Dimensions Are Measured At The Outermost Extreme Of The Plastic Body.
5. Thermal Pad Contour Optional Within Dimensions E, H1, D2 & E1.
6. Dimension E2 & H1 Define A Zone Where Stamping And Singulation Irregularities Are Allowed.
7. "*" is reference .

Recommended Solder Pad Layout



Package View



NOTE

1. CONTROLLED DIMENSION IS MILLIMETER.
2. DIMENSIONS DO NOT INCLUDE END FLASH, MOLD FLASH, MATERIAL PROTRUSIONS.

Compliance

RoHS Compliance

The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2011/65/EC (RoHS 2), as adopted by EU member states on January 2, 2013 and amended on March 31, 2015 by EU Directive 2015/863. RoHS Declarations for this product can be obtained from your Navitas representative.

REACH Compliance

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Related Links

- Reliability: https://navitassemi.com/contact-navitas/
- Quality: https://navitassemi.com/quality/

Revision History

- Rev 24/May: Updated with most recent data

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