

Description

The 74LVT245BB is an octal transceiver designed for asynchronous communication between data buses. The device transmits data from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the direction-control (DIR) input. The output-enable (\overline{OE}) Pin can be used to disable the device so the buses effectively are isolated.

The device is designed for operation with a power supply range of 2.7V to 3.6V.

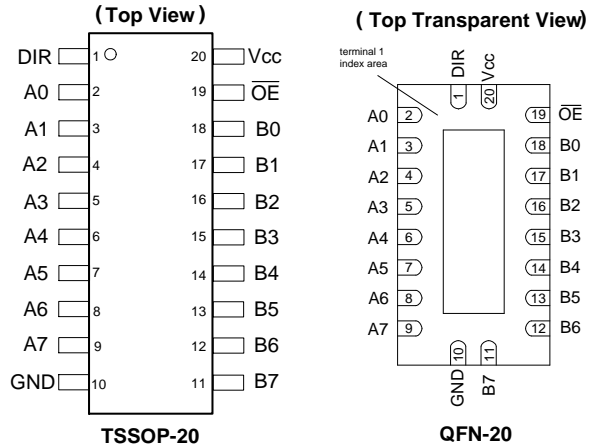
The inputs are tolerant to 5.5V allowing this device to be used in a mixed voltage environment. The device is fully specified for partial power down applications using I_{OFF} . The I_{OFF} circuitry disables the output preventing damaging current backflow when the device is powered down.

Features

- Supply Voltage Range from 2.7V to 3.6V
- Outputs Sink 64mA or Source 32mA
- CMOS Low Power Consumption
- I_{OFF} Supports Partial Power-Down Operation
- Inputs or Outputs Accept Up to 5.5V
- Inputs Include Bus-Hold – No Resistors on Unused Inputs.
- Inputs can be Driven by 3.3V or 5V Allowing for Mixed Voltage Applications
- Schmitt Trigger Action at All Inputs
- Outputs in 3-State During Power Up – Allows for Hot Insertion
- Outputs Have Less than 125 μ A Leakage when Forced to 5.5V
- ESD Protection Tested per JESD 22
 - Exceeds 200-V Machine Model (A115)
 - Exceeds 2000-V Human Body Model (A114)
 - Exceeds 1000-V Charged Device Model (C101)
- Latch-Up Exceeds 500mA per JESD 78, Class II
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. “Green” Device (Note 3)**

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen and Antimony free, "Green" and Lead-Free.
 3. Halogen and Antimony free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Pin Assignments

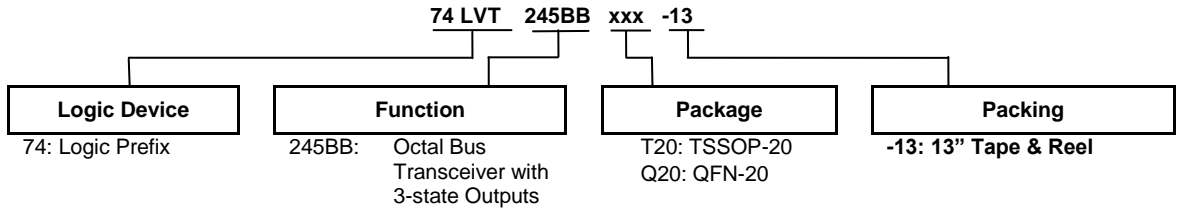


Applications

- General Purpose Logic
- Bus Driving
- Power Down Signal Isolation
- Wide Array of Products such as:
 - Servers, PCs, Notebooks, Netbooks, Ultrabooks
 - Networking Computer Peripherals, Hard Drives, CD/DVD ROM
 - TVs, DVDs, DVRs, Set Top Boxes

NEW PRODUCT

Ordering Information



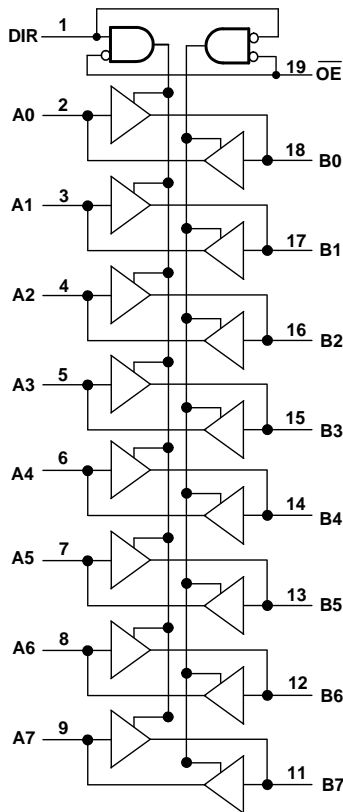
Part Number	Package Code	Package (Note 4 & 5)	Package Size	13" Tape and Reel	
				Quantity	Part Number Suffix
74LVT245BBT20-13	T20	TSSOP-20	6.4mm x 6.5mm x 1.2mm 0.65mm lead pitch	2,500/Tape & Reel	-13
74LVT245BBQ20-13	Q20	V-QFN4525-20	2.5mm x 4.5mm x 0.95mm 0.50mm lead pitch	2,500/Tape & Reel	-13

- Notes:
4. Pad layout as shown on Diodes Incorporated's package outline PDFs, which can be found on our website at <http://www.diodes.com/package-outlines.html>.
 5. V-QFN4525-20 is a JEDEC recognized naming convention that specifies the package thickness category as V and the number 4525 describes the package as 4.5mm x 2.5mm.

Pin Descriptions

Pin Number	Pin Name	Description
1	DIR	Direction
2	A0	Data I/O
3	A1	Data I/O
4	A2	Data I/O
5	A3	Data I/O
6	A4	Data I/O
7	A5	Data I/O
8	A6	Data I/O
9	A7	Data I/O
10	GND	Ground
11	B7	Data I/O
12	B6	Data I/O
13	B5	Data I/O
14	B4	Data I/O
15	B3	Data I/O
16	B2	Data I/O
17	B1	Data I/O
18	B0	Data I/O
19	\overline{OE}	Output Enable
20	V _{CC}	Supply Voltage

Logic Diagram



Function Table

INPUTS		Operation
\overline{OE}	DIR	
L	L	B Data to A Bus
L	H	A Data to B Bus
H	X	Bus Isolation

Absolute Maximum Ratings (Notes 6 & 7)

Symbol	Description	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	kV
ESD CDM	Charged Device Model ESD Protection	1	kV
ESD MM	Machine Model ESD Protection	200	V
V _{CC}	Supply Voltage Range	-0.5 to +4.6	V
V _I	Input Voltage Range (Note 7)	-0.5 to +7.0	V
V _O	Output Voltage Range Output in OFF of HIGH State (Note 7)	-0.5 to +7.0	V
I _{IK}	Input Clamp Current V _I < 0V	-50	mA
I _{OK}	Output Clamp Current V _O < 0V	-50	mA
I _{OL}	Output Current – LOW State	128	mA
I _{OH}	Output Current – HIGH State	-64	mA
T _J	Operating Junction Temperature	-40 to +150	°C
T _{STG}	Storage Temperature	-65 to +150	°C
P _{TOT}	Total Power Dissipation	500	mW

- Notes:
- Stresses beyond the absolute maximum may result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.
 - Forcing the maximum allowed voltage could cause a condition exceeding the maximum current or conversely forcing the maximum current could cause a condition exceeding the maximum voltage. The ratings of both current and voltage must be maintained within the controlled range.

Recommended Operating Conditions (Note 8)

Symbol	Parameter	Conditions	Min	Max	Unit
V _{CC}	Supply Voltage	—	2.7	3.6	V
V _I	Input Voltage	—	0	5.5	V
V _O	Output Voltage	—	0	5.5	V
I _{OH}	High-Level Output Current	V _{CC} = 3.0V	—	-32	mA
I _{OL}	Low-Level Output Current	V _{CC} = 3.0V	—	32	mA
		V _{CC} = 3.0V (Note 9)	—	64	
Δt/ΔV	Input Transition Rise or Fall Rate	—	—	10	ns/V
T _A	Operating Free-Air Temperature	—	-40	+125	°C

- Notes:
- Unused inputs should be held at V_{CC} or ground.
 - For I_{ol} > 32mA the current duty cycle ≤ 50%, Frequency > 1Khz.

Electrical Characteristics

Symbol	Parameter	Test Conditions	V _{CC}	T _A = -40°C to +85°C			Unit
				Min	Typical	Max	
V _{IK}	Input Clamping Voltage	I _{IK} = -18mA	2.7V	-1.2	-0.9	—	—
V _{IH}	High-Level Input Voltage	—	2.7V to 3.6V	2.0	—	—	V
V _{IL}	Low-Level input Voltage	—	2.7V to 3.6V	—	—	0.8	V
V _{OH}	High-Level Output Voltage	I _{OH} = -100μA	2.7V to 3.6V	V _{CC} -0.2	V _{CC} -0.1	—	V
		I _{OH} = -8mA	2.7V	2.4	2.5	—	
		I _{OH} = -34mA	3.0V	2.0	2.2	—	
V _{OL}	Low-Level Output Voltage	I _{OL} = 100μA	2.7V to 3.6V	—	0.1	0.2	V
		I _{OL} = 24mA	2.7V	—	0.3	0.5	
		I _{OL} = 16mA	3.0V	—	0.25	0.4	
		I _{OL} = 24mA	3.0V	—	0.3	0.5	
		I _{OL} = 64mA	3.0V	—	0.4	0.55	
I _{OFF}	Power Down Leakage Current	V _I or V _O = 0 to 4.5V	0V	—	±1	±100	μA
I _{O-Leakage}	Output Leakage Current	V _O = 5.5V; Output HIGH	3.6V	—	60	125	μA
I _{OZPU}	Power-Up I/O Leakage	V _O = 0.5V to 3.0V \overline{OE} = Don't Care	0V to 1.2V	—	15	±100	μA
I _{OZPD}	Power-Down I/O Leakage	V _O = 0.5V to 3.0V \overline{OE} = Don't Care	0V to 1.2 V	—	15	±100	μA
I _I	Input Current Control Pins	V _I = 5.5V	0V or 3.6V	—	1	10	μA
		V _I = V _{CC} or GND	3.6V	—	±0.1	±1	
	Input Current I/O Data Pins	V _I = 5.5V	3.6V	—	1	20	μA
		V _I = V _{CC}	3.6V	—	.1	1	
		V _I = GND	3.6V	-5	-1	—	
I _{BHL}	Bus Hold LOW Current	V _I = 0.8V	3.0V	75	150	—	μA
I _{BHH}	Bus Hold HIGH Current	V _I = 2.0V	3.0V	-150	-75	—	μA
I _{BHLO}	Bus Hold LOW Overdrive Current	V _I = 3.6V	0V to 3.0V	500	—	—	μA
I _{BHHO}	Bus Hold HIGH Overdrive Current	V _I = 3.6V	0V to 3.0V	—	—	-500	μA
I _{CC}	Supply Current	V _I = GND or V _{CC} , I _O = 0	3.6 V	—	—	—	mA
		Outputs HIGH		—	0.13	0.19	
		Output LOW		—	3	12	
		Outputs Disabled		—	0.13	0.19	
ΔI _{CC}	Additional Supply Current	One Input at V _{CC} -0.6V Others at V _{CC} or Ground I _O = 0A	3.0V to 3.6V	—	100	200	μA
C _I	Input Capacitance	Control Pins	V _I = GND or V _{CC} 0V to 3.6V	—	4	—	pF
		I/O Pins		—	10	—	

Switching Characteristics (Figure 1)

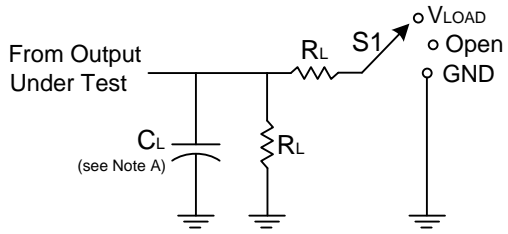
Symbol	Parameter	V _{CC}	T _A = -40°C to +85°C			Unit
			Min	Typ	Max	
t _{PLH}	LOW to HIGH Propagation Delay A _N to B _N or B _N to A _N	2.7V	—	—	5.5	ns
		3.3V ± 0.3	1.2	2.4	4.8	
t _{PHL}	HIGH to LOW Propagation Delay A _N to B _N or B _N to A _N	2.7V	—	—	4.7	ns
		3.3V ± 0.3	1.2	2.4	4.4	
t _{PZH}	Z-State to HIGH Enable Time \overline{OE} to A _N or \overline{OE} to B _N	2.7V	—	—	8.9	ns
		3.3V ± 0.3	1.3	3.3	7.7	
t _{PZL}	Z-State to LOW Enable Time \overline{OE} to A _N or \overline{OE} to B _N	2.7V	—	—	6.9	ns
		3.3V ± 0.3	1.7	3.2	6.4	
t _{PHZ}	HIGH to Z-State Disable Time \overline{OE} to A _N or \overline{OE} to B _N	2.7V	—	—	6.5	ns
		3.3V ± 0.3	2.2	3.6	6.0	
t _{PLZ}	LOW to Z-State Disable Time \overline{OE} to A _N or \overline{OE} to B _N	2.7V	—	—	5.5	ns
		3.3V ± 0.3	2.2	3.4	5.5	

Package Characteristics

Symbol	Parameter	Package	Test Conditions	Min	Typ.	Max	Unit
θ _{JA}	Thermal Resistance Junction-to-Ambient	TSSOP-20	(Note 10)	—	74	—	°C/W
θ _{JC}	Thermal Resistance Junction-to-Case	TSSOP-20	(Note 10)	—	15	—	°C/W
θ _{JA}	Thermal Resistance Junction-to-Ambient	V-QFN4525-20	(Note 10)	—	67	—	°C/W
θ _{JC}	Thermal Resistance Junction-to-Case	V-QFN4525-20	(Note 10)	—	20	—	°C/W

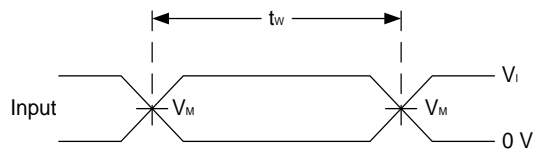
Note: 10. Test conditions for TSSOP-20 and V-QFN4525-20: Devices mounted on 4 layer FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout per JESD 51-7.

Parameter Measurement Information

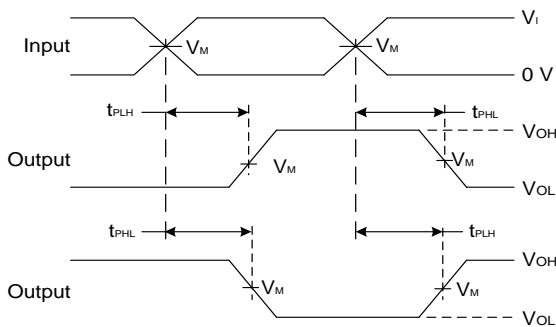


TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND

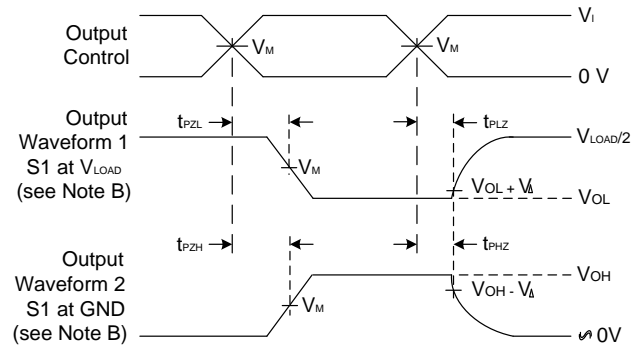
V_{CC}	Inputs		V_M	V_{LOAD}	C_L	R_L	V_{Δ}
	V_I	t_R/t_F					
$3.3V \pm 0.3V$	2.7V	$\leq 2.5ns$	1.5V	6V	50pF	500 Ω	0.3V



Voltage Waveform Pulse Duration



**Voltage Waveform Propagation Delay Times
Inverting and Non Inverting Outputs**



**Voltage Waveform Enable and Disable Times
Low and High Level Enabling**

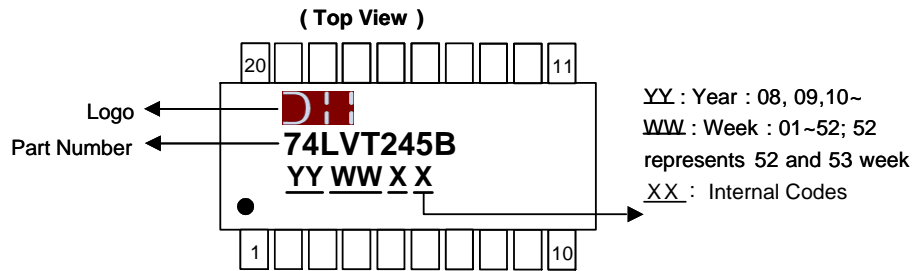
- Notes:
- A. Includes test lead and test apparatus capacitance.
 - B. All pulses are supplied at pulse repetition rate ≤ 10 MHz.
 - C. Inputs are measured separately one transition per measurement.

Figure 1 Load Circuit and Voltage Waveforms

NEW PRODUCT

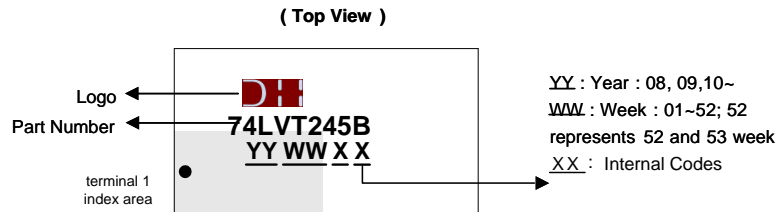
Marking Information

1) TSSOP20



Part Number	Package
74LVT245BBT20-13	TSSOP-20

2) QFN-20 (V-QFN4525-20)

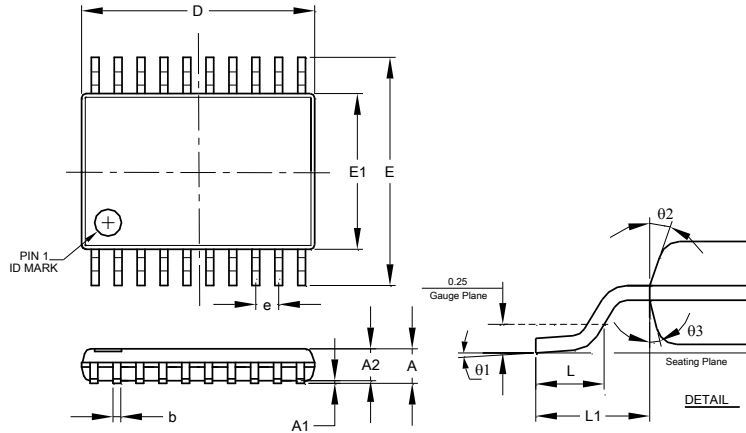


Part Number	Package
74LVT245BBQ20-13	V-QFN4525-20

Package Outline Dimensions

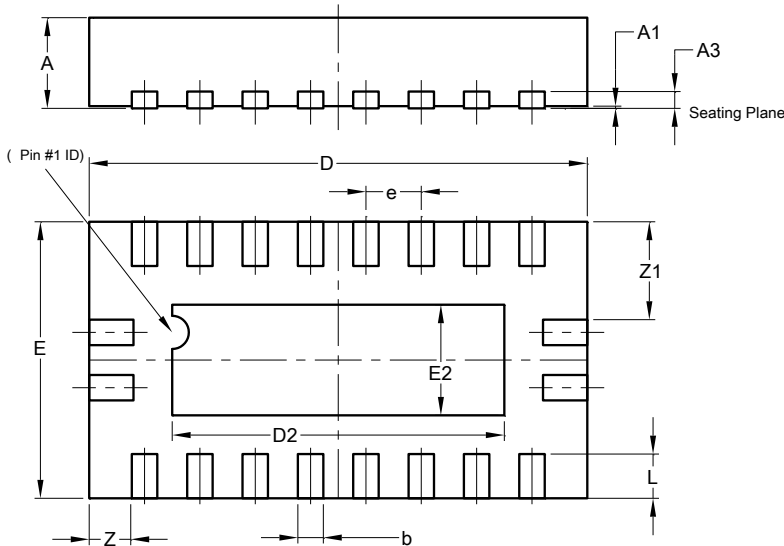
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

TSSOP-20



TSSOP-20			
Dim	Min	Max	Typ
A	—	1.20	—
A1	0.05	0.15	—
A2	0.80	1.05	—
b	0.19	0.30	—
c	0.09	0.20	—
D	6.40	6.60	6.50
E	6.20	6.60	6.40
E1	4.30	4.50	4.40
e	0.65 BSC		
L	0.45	0.75	0.60
L1	1.0 REF		
theta1	0°	8°	—
theta2	10°	14°	12°
theta3	10°	14°	12°
All Dimensions in mm			

V-QFN4525-20

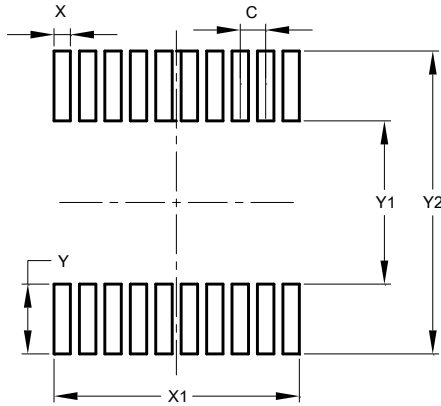


V-QFN4525-20			
Dim	Min	Max	Typ
A	0.75	0.85	0.80
A1	0.00	0.05	0.02
A3	—	—	0.15
b	0.18	0.30	0.23
D	4.45	4.55	4.50
D2	2.85	3.15	3.00
E	2.45	2.55	2.50
E2	0.85	1.15	1.00
e	0.50BSC		
L	0.30	0.50	0.40
Z	—	—	0.385
Z1	—	—	0.885
All Dimensions in mm			

Suggested Pad Layout

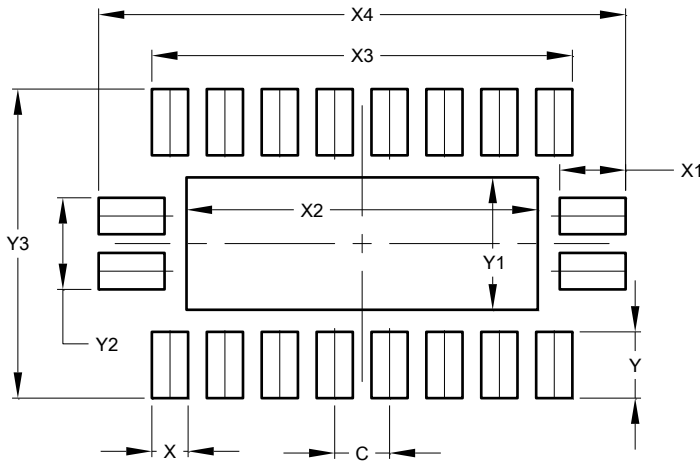
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

TSSOP-20



Dimensions	Value (in mm)
C	0.650
X	0.420
X1	6.270
Y	1.780
Y1	4.160
Y2	7.720

V-QFN4525-20



Dimensions	Value (in mm)
C	0.500
X	0.330
X1	0.600
X2	3.200
X3	3.830
X4	4.800
Y	0.600
Y1	1.200
Y2	0.830
Y3	2.800

IMPORTANT NOTICE

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel. Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and determinative format released by Diodes Incorporated.

LIFE SUPPORT

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or
2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

Copyright © 2016, Diodes Incorporated

www.diodes.com