LL02BT0603

List

LL02BT0603

Ultra Low Capacitance Bi-Directional TVS For ESD Protection 2.0V

Features

- Each I/O pin can withstand over 1000 ESD strikes for ±10kV (Contact discharge).
- Transient protection for high-speed data lines
  IEC 61000-4-2 (ESD) ±15kV(Air), ±10kV(Contact).
  IEC 61000-4-5 (Lightning) 4.5A(8/20μs).
- Lead-free parts meet RoHS requirements.
- Suffix "-H" indicates Halogen-free part, ex.LL02BT0603-H.

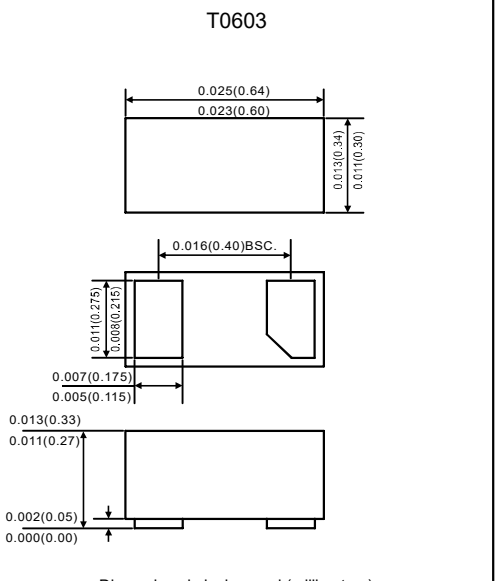
Applications

- Protable applications.
- Communication systems.
- Computers and peripherals.
- High speed data lines: USB 3.X and USB 4.0.

Mechanical data

- Epoxy: UL94-V0 rated flame retardant.
- Case: Molded plastic, T0603.

Package outline



Dimensions in inches and (millimeters)

Maximum ratings (at T_A=25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak pulse current (8/20μs)	I_{PP}	4.5	A
Peak Pulse Power (8/20μs)	P_{PK}	20	W
ESD per IEC 61000-4-2 (Air)	V_{ESD}	±15	kV
ESD per IEC 61000-4-2 (Contact)		±10	
Operating temperature	T_{OPT}	+125	℃
Storage temperature range	T_{STG}	-55 to +150	℃

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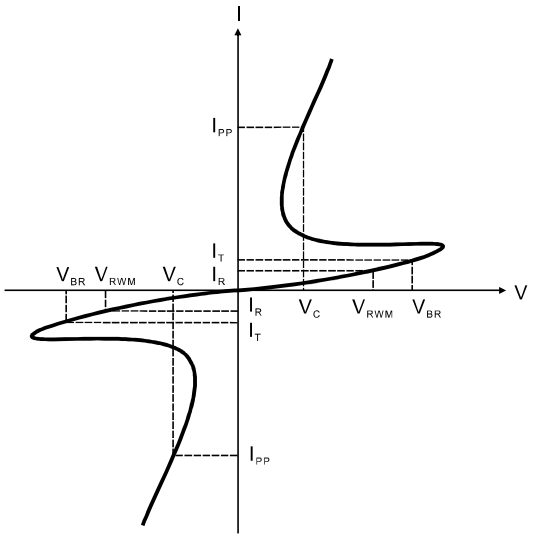
Electrical characteristics (at T_A=25°C unless otherwise noted)

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Reverse stand-off voltage		V_{RWM}			2	V
Reverse leakage current	V_{RWM}=1.5V, T=25°C	I_R		1	10	nA
	V_{RWM}=2.0V, T=25°C			10	50	
Reverse breakdown voltage	I_T=0.01mA	V_{BR}	2.5	3.2		V
Clamping voltage	I_{PP}=4.5A, t_P=8/20μs	V_C		4.5	7	
	I_{PP}=8A, t_P=100ns (Note1)			5.5		
	I_{PP}=16A, t_P=100ns (Note1)			8		
Dynamic resistance	I_{PP}=12A, t_P=100ns (Note1)	R_{DYN}		0.32		Ω
Parasitic capacitance	V_R=0V, f=1.0MHz	C_{ESD}		0.22		pF
	V_R=0V, f=5.0GHz			0.19		
Insertion Loss	f=5GHz	α_{IL}		-0.15		dB
	f=10GHz			-0.98		

Note: 1. Measurements performed using a 100ns transmission line pulse(TLP) system.

Rating and characteristic curves

Symbol	parameter
V_{RWM}	Nominal reverse working voltage
I_R	Reverse leakage current @V_{RWM}
V_{BR}	Reverse breakdown voltage @I_T
I_T	Test current for reverse breakdown
V_C	Clamping voltage @I_{PP}
I_{PP}	Maximum peak pulse current
C_{ESD}	Parasitic capacitance
R_{dyn}	Dynamic resistance
α_{IL}	Insertion loss



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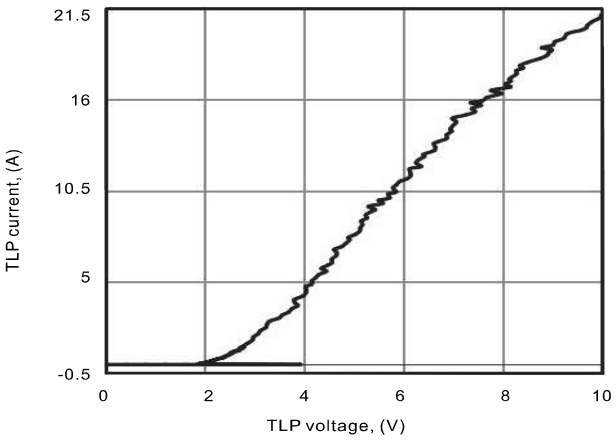
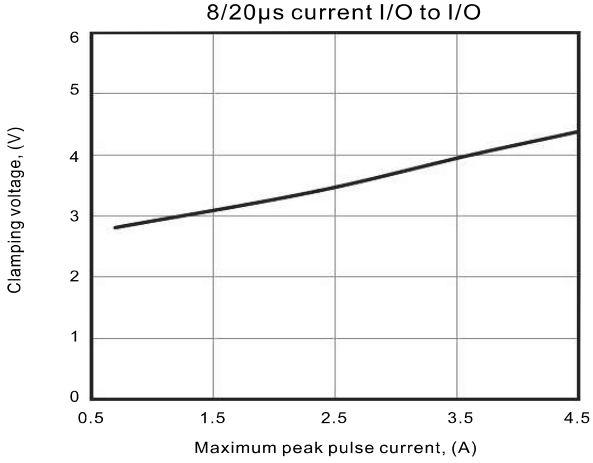
Rating and characteristic curves

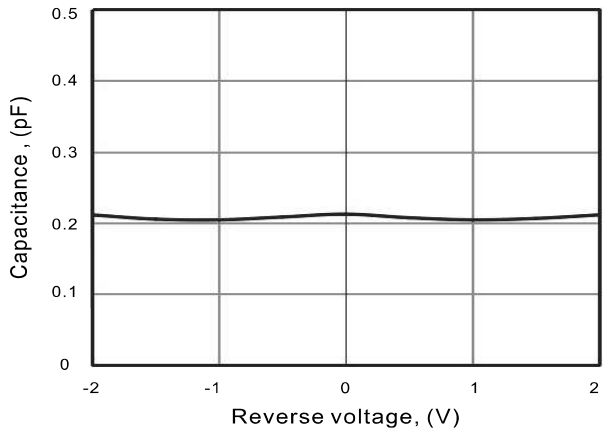
TLP Measurement of I/O to I/O



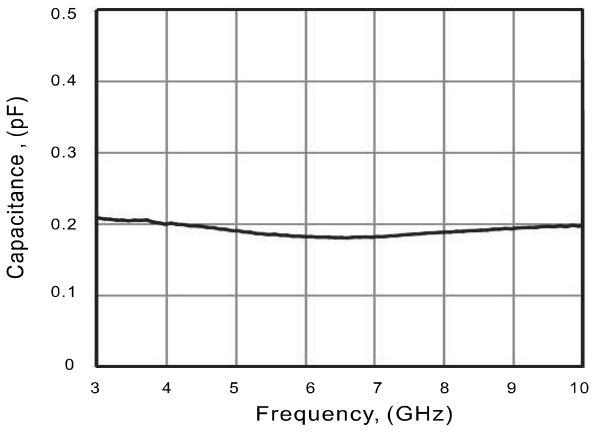
8/20μs current I/O to I/O



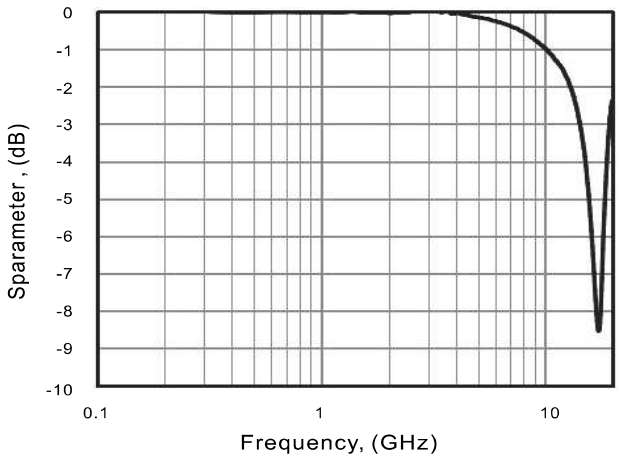
Capacitance vs. Reverse voltage of I/O of I/O



Capacitance vs. Frequency of I/O of I/O



Insertion loss



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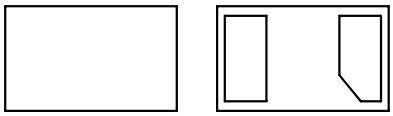
Pinning information

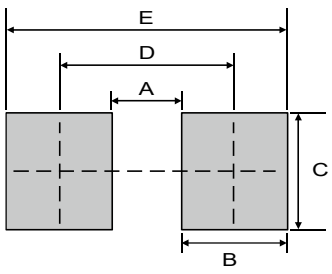
Pin	Simplified outline	Symbol
Bi-directional	 Top view Bottom view	

Marking

Type number	Marking code
LL02BT0603	2X

* "2" is part number, fixed.
"X" is the internal code.

Suggested solder pad layout



Size	T0603	
	(mm)	(inch)
A	0.15	0.006
B	0.23	0.009
C	0.30	0.012
D	0.38	0.015
E	0.61	0.024

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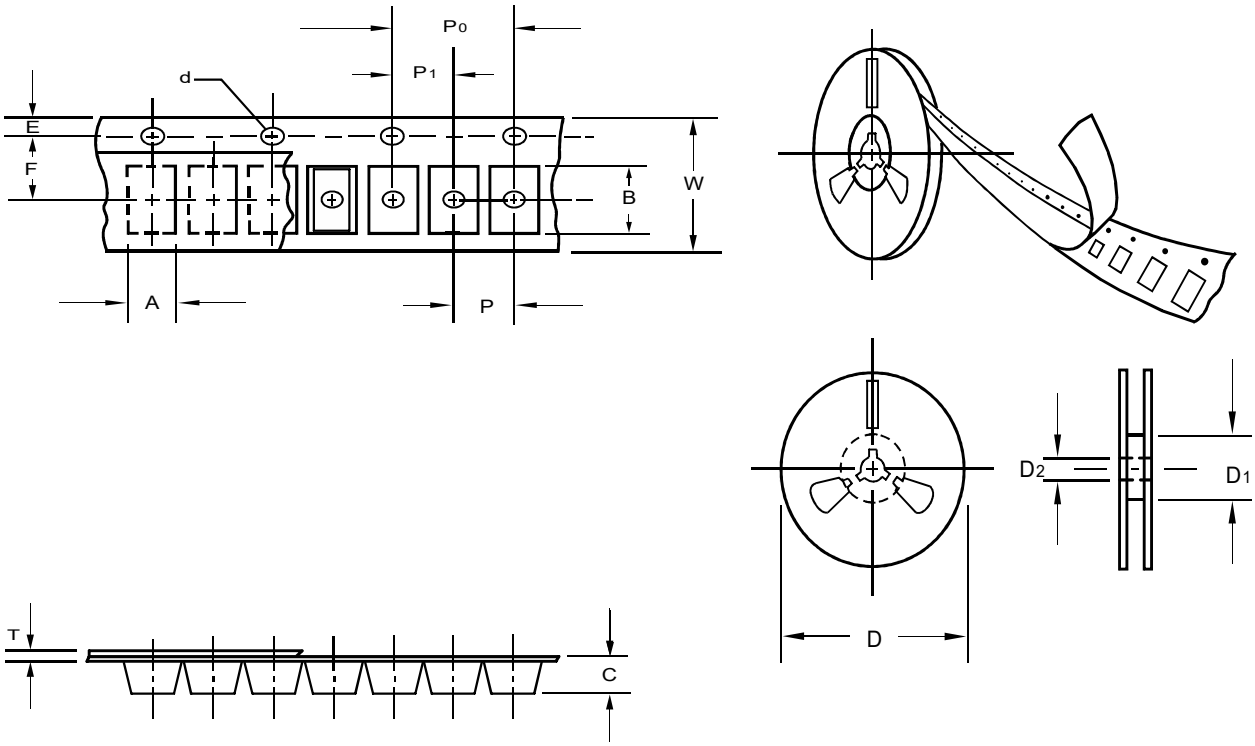
Packing information



unit:mm

Item	Symbol	Tolerance	DFN0603 (T0603)
Carrier width	A	0.1	0.37
Carrier length	B	0.1	0.67
Carrier depth	C	0.1	0.32
Sprocket hole	d	0.1	1.50
13" Reel outside diameter	D	2.0	-
13" Reel inner diameter	D_1	min	-
7" Reel outside diameter	D	2.0	178.0
7" Reel inner diameter	D_1	min	60.0
Feed hole diameter	D_2	0.5	13.5
Sprocket hole position	E	0.1	1.75
Punch hole position	F	0.1	3.5
Punch hole pitch	P	0.1	2.0
Sprocket hole pitch	P_0	0.1	4.0
Embossment center	P_1	0.1	2.0
Overall tape thickness	T	0.1	0.2
Tape width	W	0.3	8.0

Note:Devices are packed in accor dance with EIA standar RS-481-A and specifications listed above.

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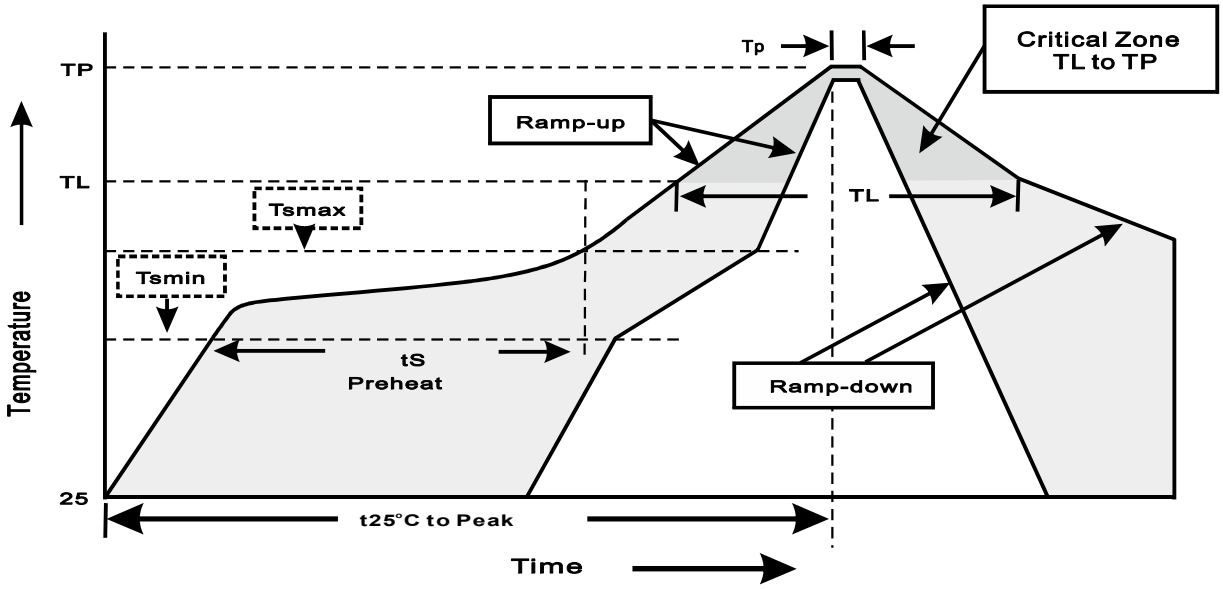
Reel packing

PACKAGE	REEL SIZE	REEL (pcs)	COMPONENT SPACING (m/m)	BOX (pcs)	INNER BOX (m/m)	REEL DIA, (m/m)	CARTON SIZE (m/m)	CARTON (pcs)
DFN0603 (T0603)	7"	10,000	4.0	100,000	183*123*183	178	382*257*387	800,000

Suggested thermal profiles for soldering processes

1.Storage environment: Temperature=5°C~40°C Humidity=55%±25%
2.Reflow soldering of surface-mount devices



3.Reflow soldering

Profile Feature	Soldering Condition
Average ramp-up rate(T_L to T_P)	<3°C/sec
Preheat -Temperature Min(Tsmin) -Temperature Max(Tsmax) -Time(min to max)(t_s)	 150°C 200°C 60~120sec
Tsmax to T_L -Ramp-upRate	<3°C/sec
Time maintained above: -Temperature(T_L) -Time(t_L)	 217°C 60~260sec
Peak Temperature(T_P)	255°C-0/+5°C
Time within 5°C of actual Peak Temperature(t_P)	10~30sec
Ramp-down Rate	<6°C/sec
Time 25°C to Peak Temperature	<6minutes