

LL054BT2510C

List

List.....	1
Package outline.....	2
Features.....	2
Mechanical data.....	2
Maximum ratings	2
Electrical characteristics.....	3
Rating and characteristic curves.....	4~5
Pinning information.....	6
Marking.....	6
Suggested solder pad layout.....	6
Packing information.....	7
Reel packing.....	8
Suggested thermal profiles for soldering processes.....	8
High reliability test capabilities.....	9

LL054BT2510C

4-Channel Surface Mount Ultra Low Capacitance TVS For ESD Protection Array 5.0V

Features

- Package optimized for high-speed lines
- Ultra-small package (2.5mm x 1.0mm x 0.55mm)
- Protects four data lines
- Low capacitance : 0.4pF Typical (I/O to GND)
- IEC61000-4-2 (ESD) $\pm 27\text{kV}$ (Air), $\pm 20\text{kV}$ (Contact)
- IEC61000-4-2 (EFT) 40A (5/50ns) Cable discharge event (CDE)
- Low leakage current : $0.1\mu\text{A}$ @ V_{RWM} (Typical)
- Low clamping voltage
- Each I/O pin can withstand over 1000 ESD strikes for $\pm 8\text{kV}$ contact discharge
- Lead-free parts meet RoHS requirements
- Suffix "-H" indicates Halogen-free parts, ex. LL054BT2510C-H

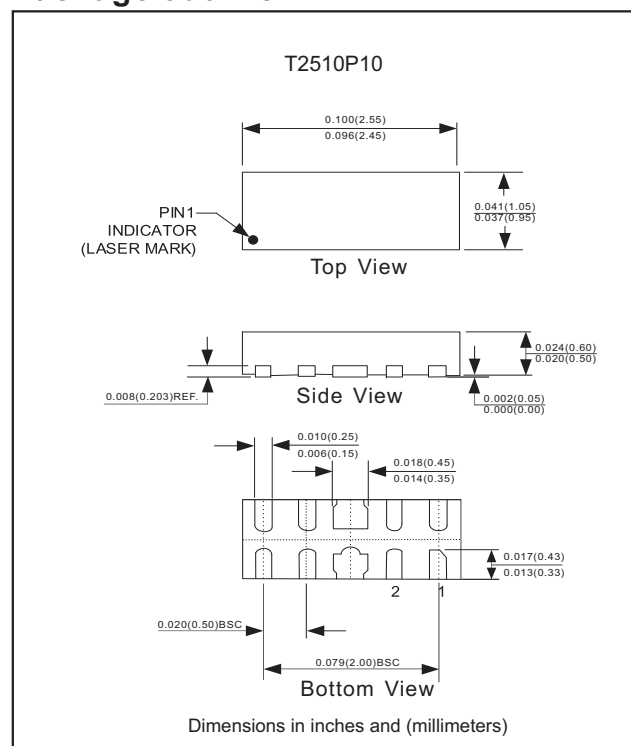
Applications

- Serial ATA
- MDDI Ports
- USB2.0 / 3.0 Power and data line protection
- High definition multi-media interface (HDMI 1.4/2.0)

Mechanical data

- Epoxy: UL94-V0 rated flame retardant
- Terminal: Matte tin plated
- Case : Molded plastic, DFN2510-10(T2510P10)
- Mounting Position : Any
- Weight: Approximated 0.004gram

Package outline



Maximum ratings (at $T_A = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak pulse current ($t_p = 8/20\mu\text{s}$)	I_{PP}	5	A
ESD per IEC 61000-4-2 (Contact)	V_{ESD}	± 20	kV
ESD per IEC 61000-4-2 (Air)		± 27	
Operating junction temperature range	T_{OPT}	-55 to +125	$^\circ\text{C}$
Storage temperature range	T_{STG}	-55 to +150	$^\circ\text{C}$

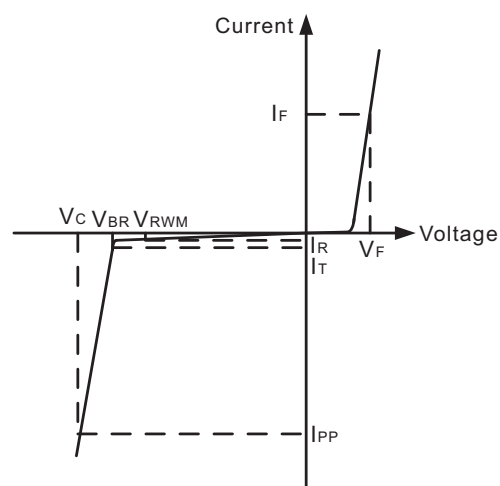
LL054BT2510C

Electrical characteristics (at $T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit
Nominal reverse working voltage		V_{RWM}			5.0	V
Reverse leakage current	$V_{RWM}=5.0\text{V}$ (Between I/O and GND)	I_R		0.1	1.0	μA
Reverse breakdown voltage	$I_T=1\text{mA}$ (Between I/O and GND)	V_{BR}	6.0	8.0	10.0	V
Clamping voltage	$I_{PP}=1\text{A}$, $t_p=8/20\mu\text{s}$ (Between I/O and GND)	V_C			12	V
Clamping voltage	$I_{PP}=8.0\text{A}$, $t_p=100\text{ns}$ (Note 1)	V_C		14		V
	$I_{PP}=16.0\text{A}$, $t_p=100\text{ns}$ (Note 1)			20		
Dynamic resistance	IEC61000-4-2 0-6kV (Contact, I/O to GND)	R_{dyn}		0.9		Ω
Parasitic capacitance	$V_R=0\text{V}$, $f=1\text{MHz}$ (Between I/O and GND)	C_{ESD}		0.4	0.5	pF
	$V_R=0\text{V}$, $f=1\text{MHz}$ (Between I/O and I/O)			0.2	0.25	

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

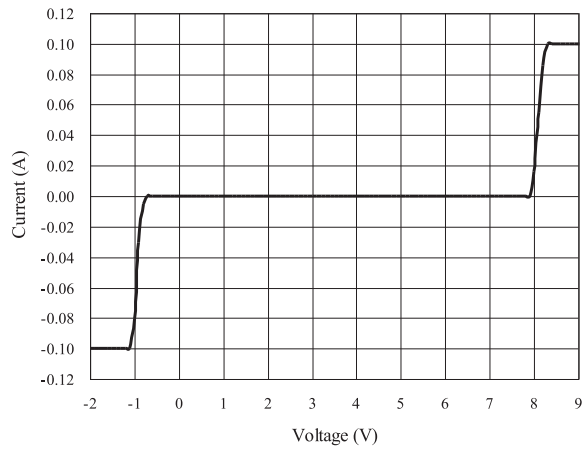
Symbol	Parameter
V_{RWM}	Nominal Reverse Working Voltage
I_R	Reverse Leakage Current @ V_{RWM}
V_{BR}	Reverse Breakdown Voltage @ I_T
I_T	Test Current for Reverse Breakdown
V_C	Clamping Voltage @ I_{PP}
I_{PP}	Maximum Peak Pulse Current
C_{ESD}	Parasitic Capacitance
V_R	Reverse Voltage
f	Small Signal Frequency
I_F	Forward Current
V_F	Forward Voltage @ I_F



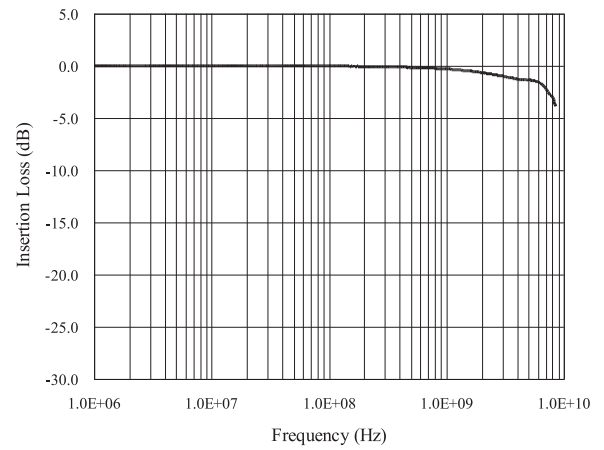
Uni-Directional TVS

Rating and characteristic curves(LL054BT2510C)

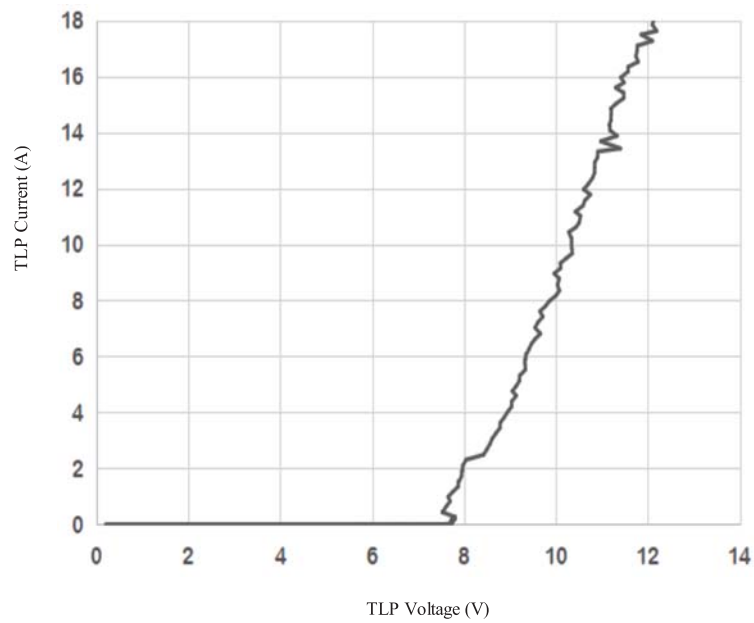
Voltage Sweeping of I/O to GND



Insertion Loss S21 of I/O to GND

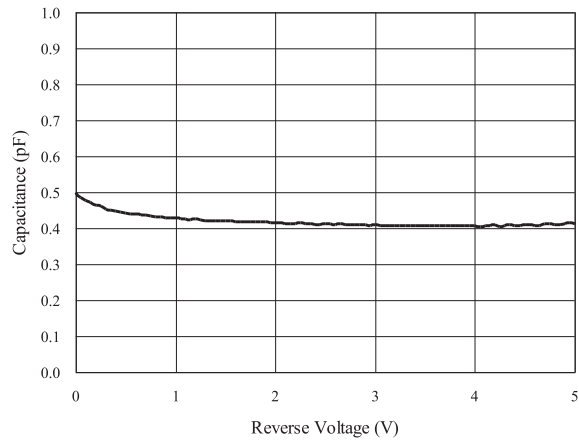


TLP Measurement of I/O to GND

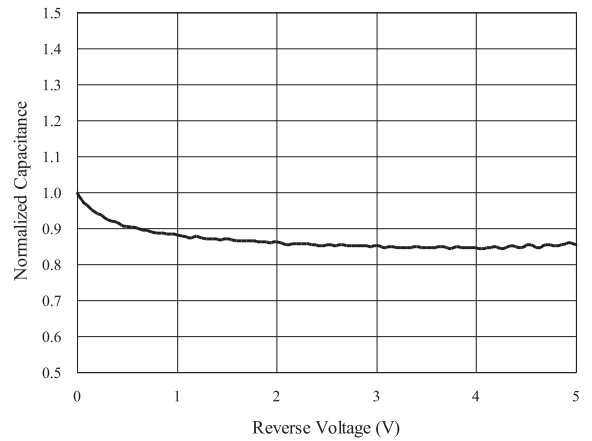


Rating and characteristic curves(LL054BT2510C)

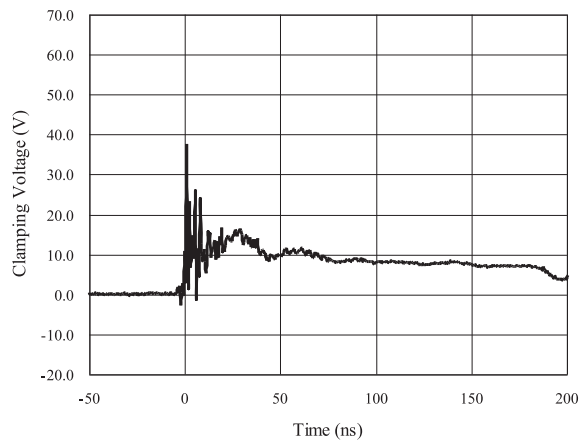
Capacitance vs. Reverse Voltage



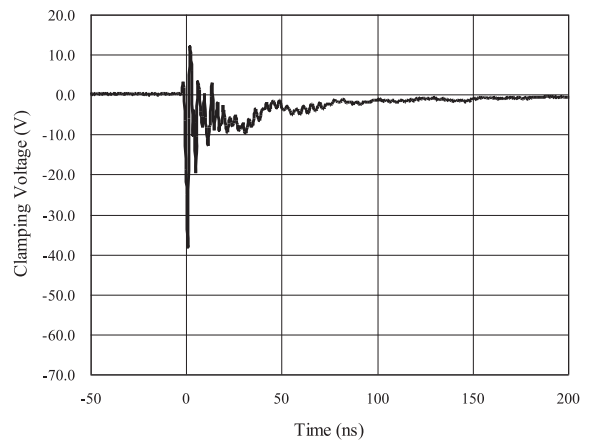
Normalized Capacitance vs. Reverse Voltage



ESD Clamping of I/O to GND
(+8kV Contact per IEC 61000-4-2)



ESD Clamping of I/O to GND
(-8kV Contact per IEC 61000-4-2)



LL054BT2510C

Pinning information

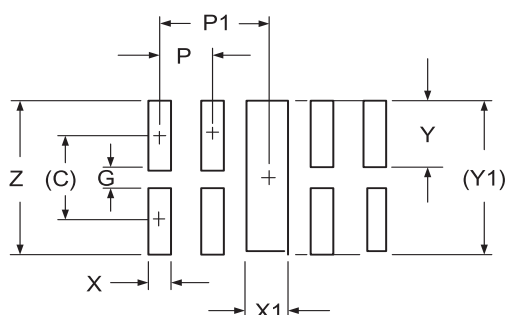
Pin Configuration	Simplified outline	Circuit Diagram

Marking

Type number	Marking code
LL054BT2510C	14SXXX

Notes 1: "14S" is part number, fixed
2: "XXX" is the identification number

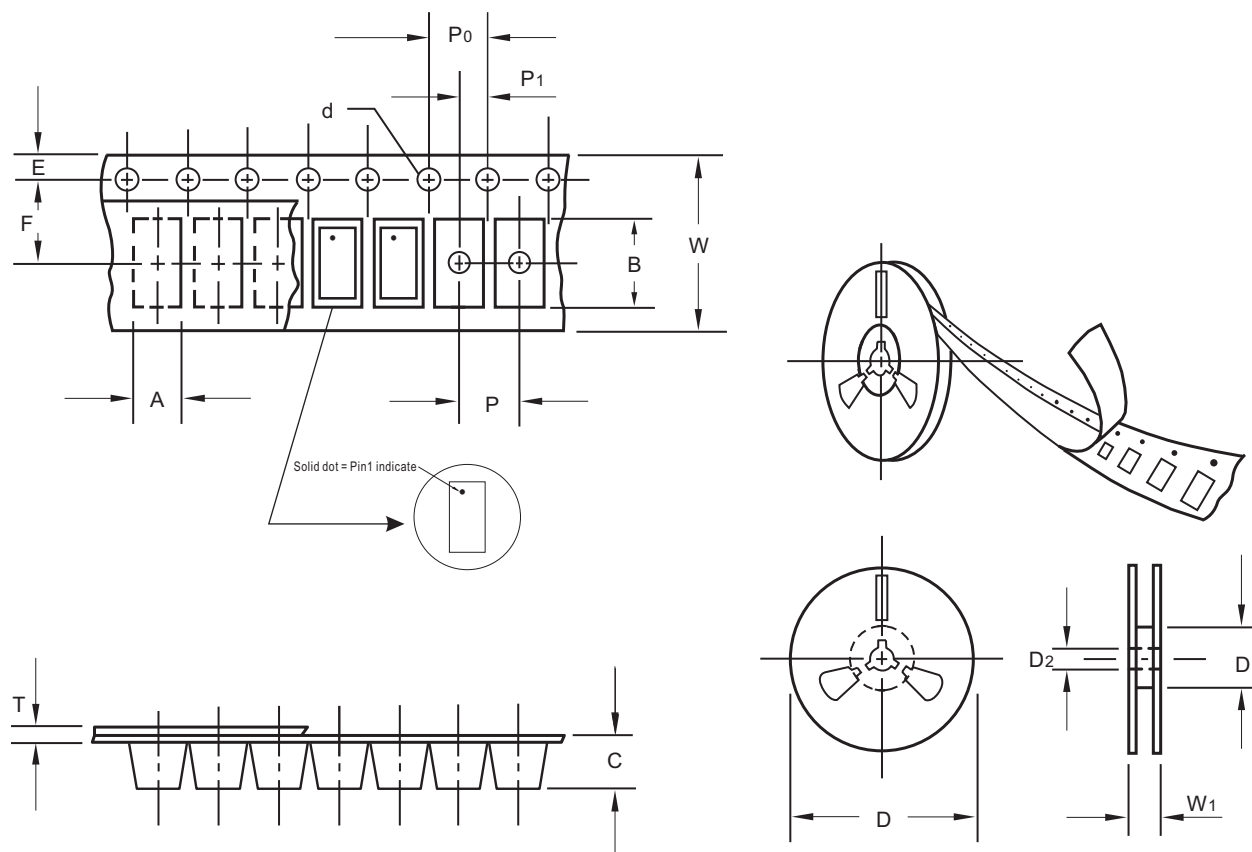
Suggested solder pad layout



DIMENSIONS		
DIM	INCHES	MILLIMETERS
C	(.034)	(0.875)
G	.008	0.20
P	.020	0.50
P1	.039	1.00
X	.010	0.25
X1	.018	0.45
Y	.027	0.675
Y1	(.061)	(1.55)
Z	.061	1.55

LL054BT2510C

Packing information



unit:mm

Item	Symbol	Tolerance	T2510P10
Carrier width	A	0.05	1.23
Carrier length	B	0.05	2.70
Carrier depth	C	0.05	0.70
Sprocket hole	d	0.1	1.50
7" Reel outside diameter	D	2.0	178.00
7" Reel inner diameter	D ₁	min	60.00
Feed hole diameter	D ₂	0.2	13.00
Sprocket hole position	E	0.1	1.75
Punch hole position	F	0.05	3.50
Punch hole pitch	P	0.1	4.00
Sprocket hole pitch	P ₀	0.1	4.00
Embossment center	P ₁	0.05	2.00
Overall tape thickness	T	0.02	0.25
Tape width	W	0.3	8.00
Reel width	W ₁	1.0	13.1

Note: Devices are packed in accordance with EIA standard RS-481-A and specifications listed above.

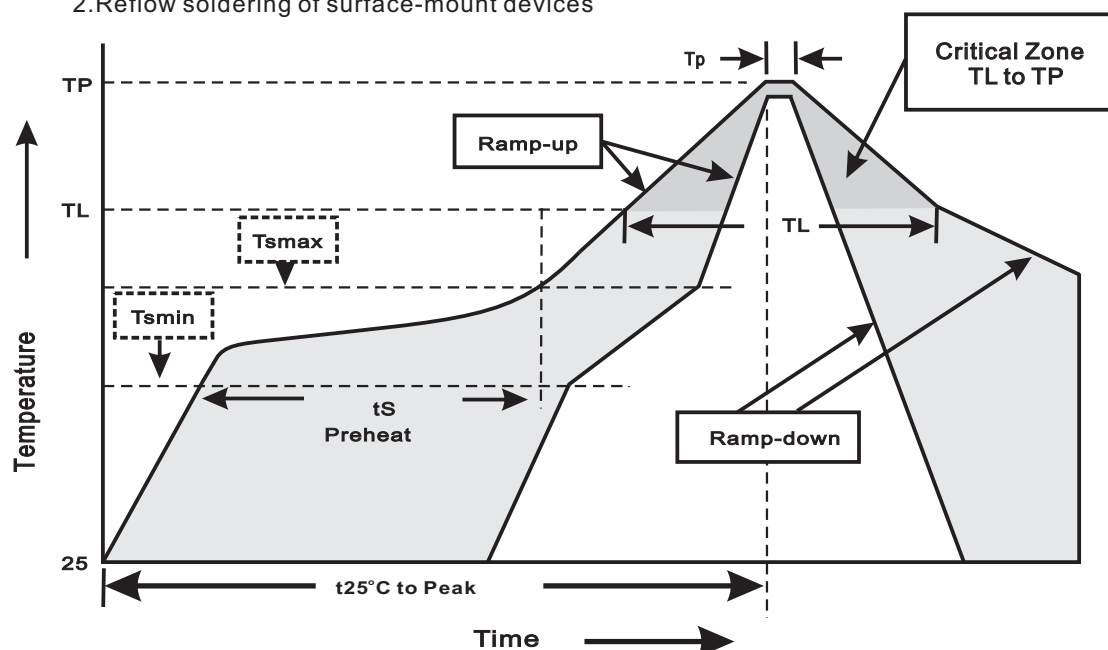
LL054BT2510C

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)
T2510P10	7"	3,000	4.0	30,000	183*123*183	178	382*257*387	240,000

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(T _{smmin}) -Temperature Max(T _{smmax}) -Time(min to max)(t _s)	150°C 200°C 60~120sec
T _{smmax} 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

LL054BT2510C

High reliability test capabilities

Item Test	Conditions	Reference
1. Solder Resistance	at $260 \pm 5^{\circ}\text{C}$ for $10 \pm 2\text{sec.}$	MIL-STD-750D METHOD-2031
2. Solderability	at $245 \pm 5^{\circ}\text{C}$ for 5 sec.	MIL-STD-202F METHOD-208
3. High Temperature Reverse Bias	$V_{\text{BR}} = V_{\text{BR Min}} * 80\%$ at $T_{\text{J}} = 125^{\circ}\text{C}$ for 168 hrs.	MIL-STD-750D METHOD-1038
4. Pressure Cooker	$15P_{\text{SIG}}$ at $T_{\text{A}} = 121^{\circ}\text{C}$ for 4 hrs.	JESD22-A102
5. Temperature Cycling	-55°C to $+125^{\circ}\text{C}$ dwelled for 30 min. and transferred for 5min. total 10 cycles.	MIL-STD-750D METHOD-1051
6. Humidity	at $T_{\text{A}} = 85^{\circ}\text{C}$, RH=85% for 1000hrs.	MIL-STD-750D METHOD-1021
7. High Temperature Storage Life	at 175°C for 1000 hrs.	MIL-STD-750D METHOD-1031