LT0514TL

Ultra-Low Capacitance ESD Protection Device

Features

- Transient protection for high-speed data lines
  - IEC 61000-4-2 (ESD) ±27kV (Air)
  - ±17kV (Contact)
  - IEC 61000-4-4 (EFT) 40A (5/50 ns)
  - Cable Discharge Event (CDE)
- Small package (2.9mm ⊔ 2.8mm ⊔ 1.4mm)
- Protects four data lines
- Low capacitance: 0.3pF Typical (I/O-I/O)
- Low leakage current: 0.1uA@V_{RWM} (Typical)
- Low clamping voltage
- Each I/O pin can withstand over 1000 ESD strikes for ±8kV contact discharge

Description

LT0514TL is an ultra-low capacitance Transient Voltage Suppressor (TVS) designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces. With typical capacitance of 0.3pF only, LT0514TL is designed to protect parasitic -sensitive system against over-voltage and over-current transient events. It complies with IEC61000-4-2(ESD) ,Level 4 (±15kV air,±8kV contact discharge),IEC 61000-4-4 (electrical fast transient - EFT) (40A,5/50ns) , very fast charged divice model (CDM)ESD and cable вшысрфкпу умуте(CBE),etc.

LT0514TL user small SOT23-6L package. Each LT0514TL device can protect four high-speed data lines. The combined features of low capacitance, small size and high ESD robustness make LT0514TL ideal for high-speed data ports and high-frequency lines (e.g., HDMI & DVI) applications. The low clamping voltage of the LT0514TL guarantees a minimum stress on the protected IC.

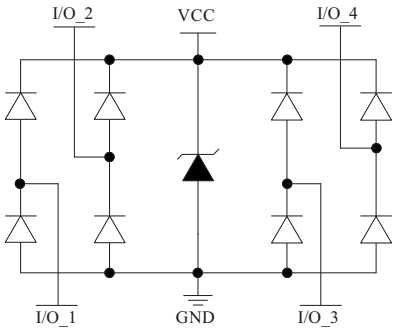
Applications

- Serial ATA
- PCI Express
- Desktops, Servers and Notebooks
- MDDI Ports
- USB 2.0/3.0 Power and Data Line Protection
- Display Ports
- High Definition Multi-Media Interface (HDMI)
- Digital Visual Interfaces (DVI)

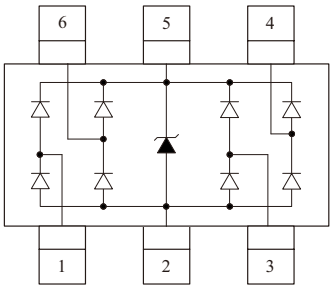
Mechanical Characteristics

- SOT23-6L package
- Flammability Rating: UL 94V-0
- Packaging: Tape and Reel

Circuit Diagram



Pin Configuration



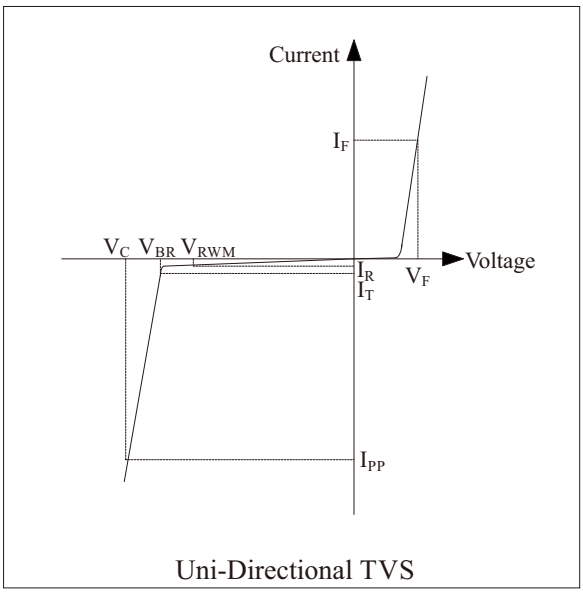
SOT23-6L
(Top View)

Absolute Maximum Rating

Symbol	Parameter	Value	Units
V_{ESD}	ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	±27 ±17	kV
T_{OPT}	Operating Temperature	-55/+125	°C
T_{STG}	Storage Temperature	-55/+150	°C

Electrical Characteristics (T = 25°C)

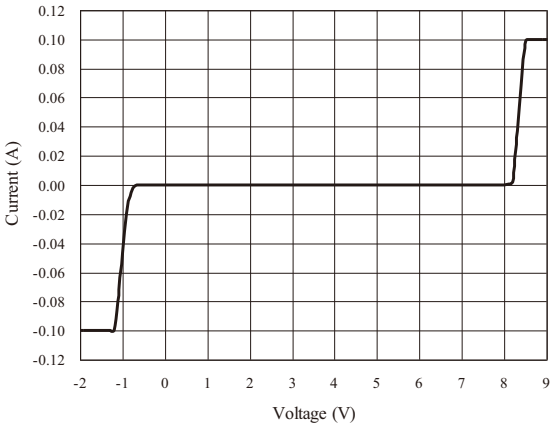
Symbol	Parameter
V_{RWM}	Nominal Reverse Working Voltage
I_R	Reverse Leakage Current @ V_{RWM}
V_{BR}	Reverse Breakdown Voltage @ I_T
I_T	Test Current for Reverse Breakdown
V_C	Clamping Voltage @ I_{PP}
I_{PP}	Maximum Peak Pulse Current
C_{ESD}	Parasitic Capacitance
V_R	Reverse Voltage
f	Small Signal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



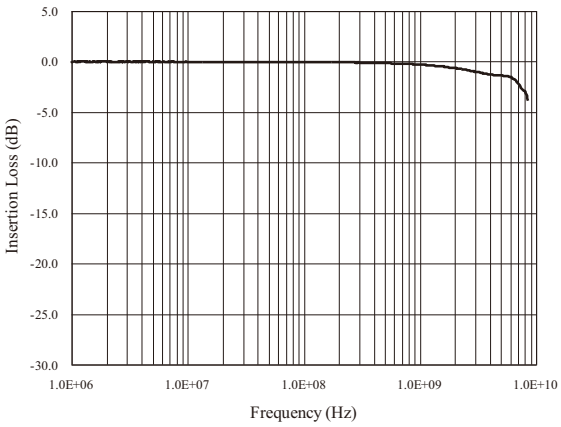
Uni-Directional TVS

Symbol	Test Condition	Minimum	Typical	Maximum	Units
V_{RWM}				5.0	V
I_R	V_{RWM} = 5V, T = 25°C Between I/O and GND		0.1	1.0	μA
V_{BR}	I_T = 1mA Between I/O and GND	6.0	8.0	10.0	V
V_C	I_{PP} = 1A, t_p = 8/20μs Between I/O and GND			12.0	V
C_{ESD}	V_R = 0V, f = 1MHz Between I/O and GND		0.6	0.8	pF
C_{ESD}	V_R = 0V, f = 1MHz Between I/O and I/O		0.3	0.4	pF

Voltage Sweeping of I/O to GND

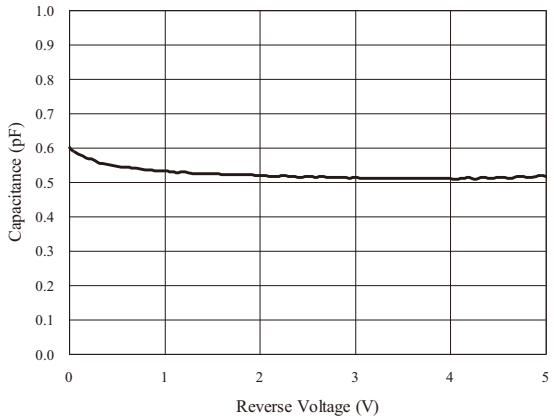


Insertion Loss S21 of I/O to GND

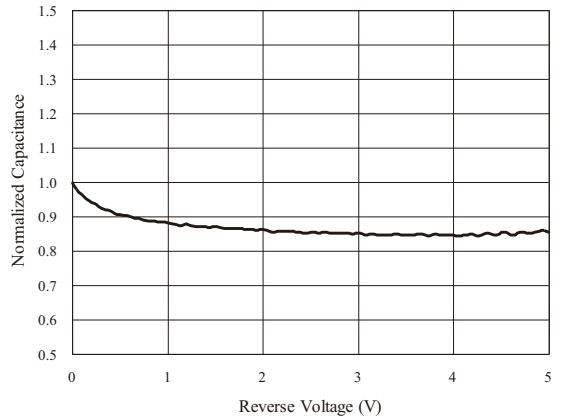


Capacitance *vs.* Voltage of I/O to GND (f = 1MHz)

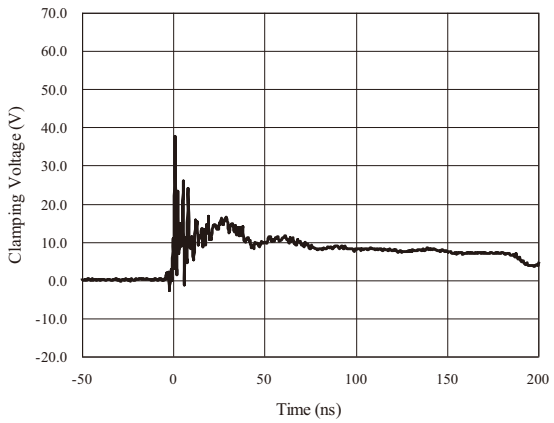
Capacitance *vs.* Reverse Voltage



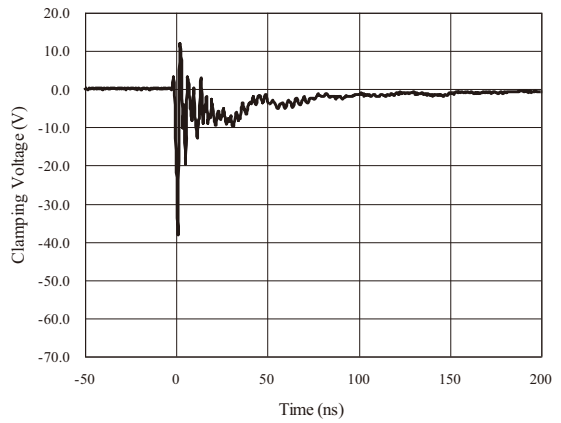
Normalized Capacitance *vs.* Reverse Voltage



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)



Application Information

Pin Connection in PCB

LT0514TL is capable to provide ESD protection for four data lines simultaneously. The pin connection is shown in Figure 1.

Four parallel data lines, from inner IC to I/O port connector, could connect to LT0514TL four I/O pins directly. Pin 2 of LT0514TL is the negative reference pin, which should connect to the GND of PCB. The connection wires should be as short as possible in order to minimize the parasitic inductance.

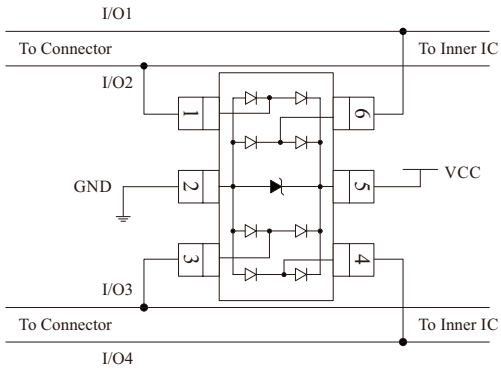


Figure 1 T0514TL pin connection in PCB

PCB Layout Guidelines

For optimum ESD protection and the whole circuit performance, the following PCB layout guidelines are recommended:

LT0514TL GND pin to the PCB GND rail path should be as short as possible. It could reduce the ESD transient return path to GND.

The vias connecting T0514TL VCC & GND pins to the PCB VCC & GND should be wide. Place LT0514TL as close to the connector port as possible. It could reduce the parasitic inductance and restrict ESD coupling into adjacent traces.

Avoid running critical signals near board edges.

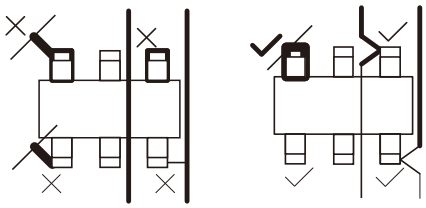
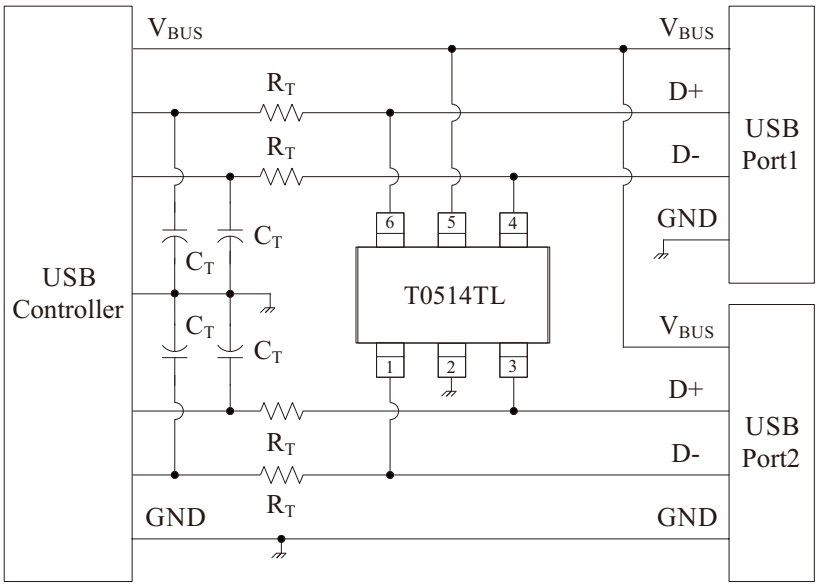
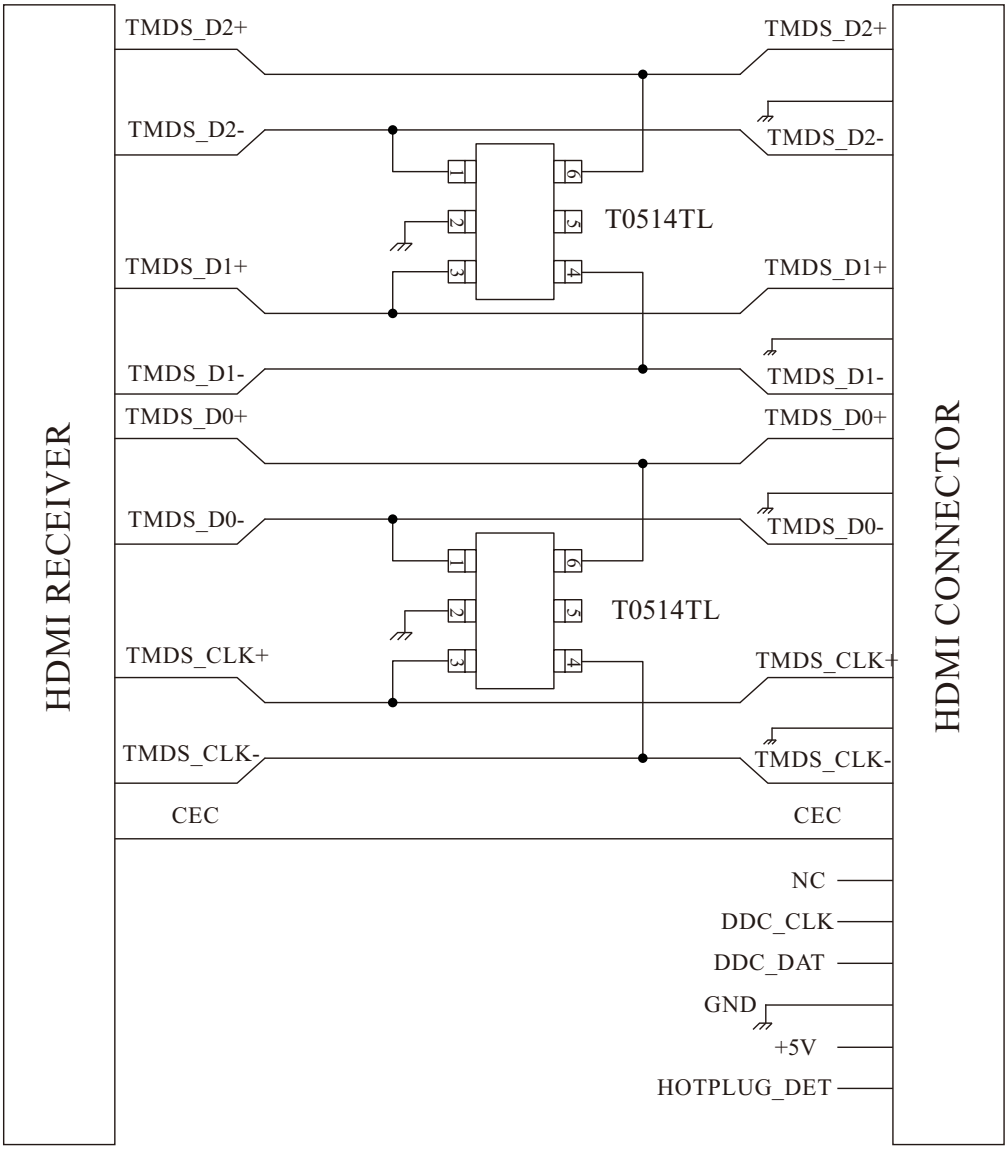


Figure 2 T0514TL Layout Guideline

Universal Serial Bus ESD Protection



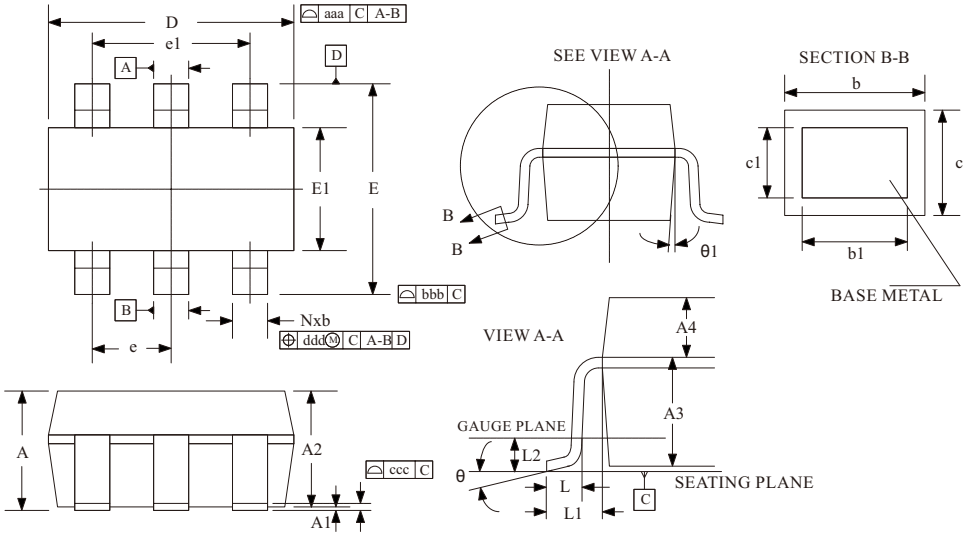
Application Information (continued)



Layout Top View for HDMI Interface with LT0514TL

Package Outline

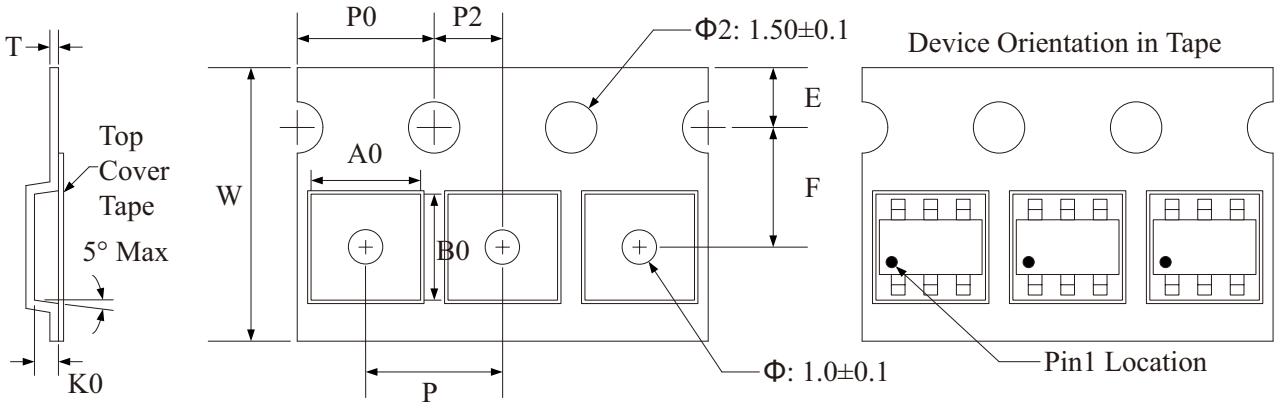
SOT23-6L package



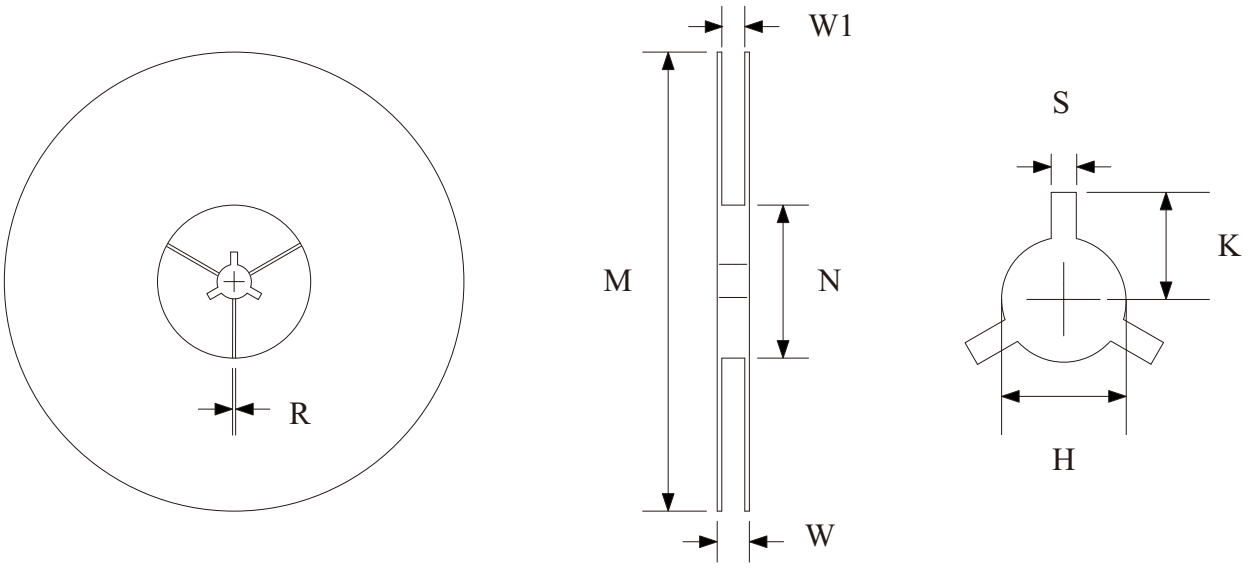
Package Dimensions (Controlling dimensions are in millimeters)

Symbol	Dimensions (mm)			Dimensions (Inches)		
	Minimum	Typical	Maximum	Minimum	Typical	Maximum
A	—	—	1.450	---	---	0.057
A1	0.000	---	0.150	0.000	---	0.006
A2	0.900	1.200	1.300	0.035	0.047	0.012
A3	0.637	0.787	0.837	0.025	0.031	0.033
A4	0.263	0.413	0.463	0.010	0.016	0.018
b	0.300	---	0.500	0.012	---	0.020
b1	0.300	0.400	0.450	0.012	0.016	0.018
c	0.080	---	0.220	0.003	---	0.009
c1	0.080	0.130	0.200	0.003	0.005	0.008
D	2.90 BSC			0.114 BSC		
e	0.95 BSC			0.037 BSC		
e1	1.90 BSC			0.075 BSC		
E	2.80 BSC			0.110 BSC		
E1	1.60 BSC			0.063 BSC		
L	0.300	0.450	0.600	0.012	0.018	0.024
L1	0.600 REF			0.024 REF		
L2	0.250 BSC			0.010 BSC		
θ	0°	4°	8°	0°	4°	8°
θ1	5°	10°	15°	5°	10°	15°
aaa	0.150			0.006		
bbb	0.200			0.008		
ccc	0.100			0.004		
ddd	0.100			0.004		

Tape and Reel Specification

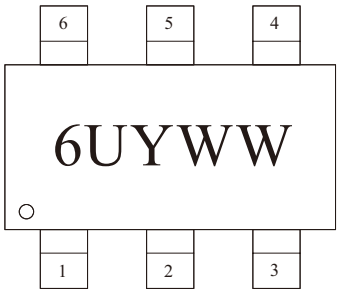


Symbol	W	A0	B0	K0	E	F	P	P0	P2	T
Dimensions (mm)	8.00+0.3 -0.1	3.23±0.05	3.17±0.05	1.37±0.05	1.75±0.1	3.5±0.05	4.0±0.1	4.0±0.1	2.0±0.05	0.25±0.02



Symbol	Reel Size	M	N	W	W1	H	S	K	R
Dimensions (mm)	Φ178	178.0±1.0	60.0±1.0	11.5±0.5	9.0±0.5	13.0±0.5	2.0±0.1	11.0±0.2	1.0±0.05

Marking Codes



Note:

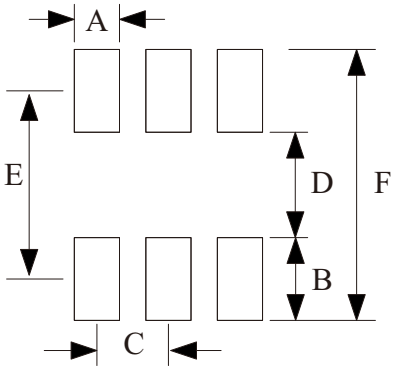
(1) "6U" is part number, fixed.

(2) "YWW" is date code. "Y" is the assembly year (2011 is "1"); while "WW" is the assembly week in a year.

Ordering Information

Part Number	Working Voltage	Quantity Per Reel	Reel Size
LT0514TL	5V	3,000	7 Inch

Footprint: SOT23-6L



Symbol	Dimensions	
	Millimeters	Inches
A	0.60	0.024
B	1.10	0.043
C	0.95	0.037
D	1.40	0.055
E	2.50	0.098
F	3.60	0.141