

USB Dedicated Charging Port Controller

FEATURES

- Supports USB DCP Shorting D+ Line to D- Line per USB Battery Charging Specification, Revision 1.2 (BC1.2)
- Supports Shorted Mode (Shorting D+ Line to D-Line) per Chinese Telecommunication Industry Standard YD/T 1591-2009
- Supports USB DCP Applying 2.7V on D+ Line and 2.7V on D- line
- Supports USB DCP Applying 1.2V on D+ and D- Lines
- Automatically Switch D+ and D- Lines Connections for an Attached Device
- Single USB Port Controller (TMI9130D)
- Dual USB Port Controller (TMI9130C)
- Operating Range: 4.5V to 5.5V
- Available in SOT23-6 Package

GENERAL DESCRIPTION

The TMI9130C and TMI9130D devices are USB dedicated charging port (DCP) controllers. An auto-detect feature monitors USB data line voltage, and automatically provides the correct electrical signatures on the data lines to charge compliant devices among the following dedicated charging schemes:

1. Divider 3 DCP, required to apply 2.7V and 2.7V on the D+ and D- Lines respectively (TMI9130C, TMI9130D)
2. BC1.2 DCP, required to short the D+ Line to the D- Line
3. Chinese Telecom Standard YD/T 1591-2009 Shorted Mode, required to short the D+ Line to the D- Line
4. 1.2V on both D+ and D- Lines

APPLICATIONS

- Vehicle USB Power Chargers
- AC-DC Adapters with USB Ports
- Other USB Chargers

TYPICAL APPLICATION

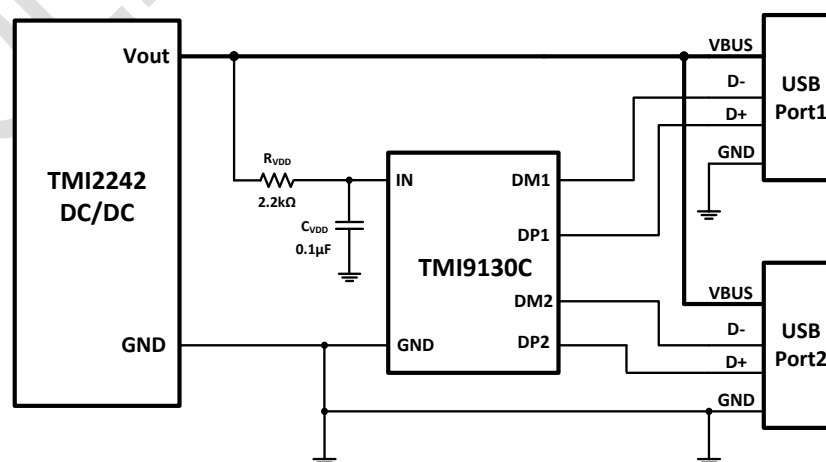
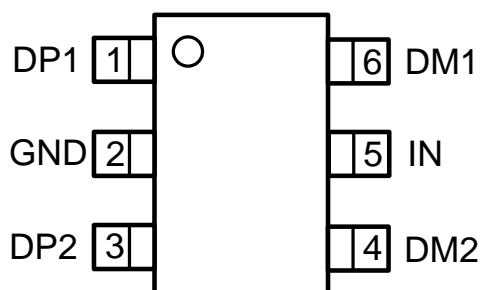


Figure 1. Basic Application Circuit (TMI9130C)

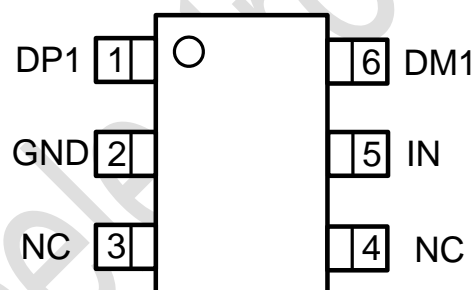
ABSOLUTE MAXIMUM RATINGS

Parameter	Min	Max	Unit
Input Supply Voltage	-0.3	7	V
DP1, DP2 output voltage, DM1, DM2 output voltage	-0.3	5.8	V
DP1, DP2 input voltage, DM1, DM2 input voltage	-0.3	5.8	V
Junction Temperature		150	°C
Storage Temperature Range	-65	150	°C
Lead Temperature		260	°C

PIN CONFIGURATION



TMI9130C
SOT23-6



TMI9130D
SOT23-6

Top Mark: TMI9130C: T24CXXX (T24C: Device Code, XXX: Inside Code)
TMI9130D: T24DXXX (T24D: Device Code, XXX: Inside Code)

Part Number	Package	Top Mark	Quantity/ Reel
TMI9130C	SOT23-6	T24CXXX	3000
TMI9130D	SOT23-6	T24DXXX	3000

TMI9130C and TMI9130D are Pb-free and RoHS compliant.

PIN FUNCTIONS

Pin	Name		Function
	TMI9130C	TMI9130D	
1	DP1	DP1	Connected to the D+ line of USB connector, provide the correct voltage with attached portable equipment for DCP detection.
2	GND	GND	Ground connection
3	DP2	NC	Connected to the D+ line of USB connector, provide the correct voltage with attached portable equipment for DCP detection.
4	DM2	NC	Connected to the D- line of USB connector, provide the correct voltage with attached portable equipment for DCP detection.
5	IN	IN	Power supply. Connect a ceramic capacitor with a value of 0.1 μ F or larger value from the IN pin to GND or a RC filter from input power supply to IN pin to help filter input surge voltage during power on condition.
6	DM1	DM1	Connected to the D-line of USB connector, provide the correct voltage with attached portable equipment for DCP detection.

DEVICE OPTIONS

Device	Number of Controller	Charging Schemes (DCP_Auto) Divider 3 (D+ = 2.7V / D- = 2.7V)	1.2-V Mode (D+/D- Shorted and Bias to 1.2V)	BC1.2 And YD/T 1591-2009 Mode (D+/D- Shorted)
TMI9130C	Dual	Yes	Yes	Yes
TMI9130D	Single	Yes	Yes	Yes

ESD RATINGS

Items	Description	Value	Unit
V _{ESD}	Human Body Model for all pins	\pm 6000	V

JEDEC specification JS-001

RECOMMENDED OPERATING CONDITIONS

Items	Description	Min	Max	Unit
Voltage Range	IN	4.5	5.5	V
T _J	Operating Junction Temperature Range	-40	125	°C

ELECTRICAL CHARACTERISTICS

($V_{IN}=5V$, $T_A=25^{\circ}C$, unless otherwise noted.)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Under Voltage Lockout						
IN rising UVLO threshold voltage	V_{UVLO}		3.9	4.1	4.3	V
UVLO Hysteresis				100		mV
Supply Current						
IN supply current	I_{IN}	$4.5V \leq V_{IN} \leq 5.5V$		155	200	μA
BC 1.2 DCP Mode (Short Mode)						
DP1 and DM1 shorting resistance	R_{DPM_SHORT1}	$V_{DP1}=0.8V$, $I_{DM1}=1mA$		157	200	Ω
Resistance between DP1/DM1 and GND	R_{DCHG_SHORT1}	$V_{DP1}=0.8V$	350	656	1150	k Ω
Voltage threshold on DP1 (under which the device goes back to divider mode)	$V_{DPL_TH_DETACH1}$		310	330	350	mV
DP1 Hysteresis	$V_{DPL_TH_DETACH_HYS1}$			50		mV
DP2 and DM2 shorting resistance	R_{DPM_SHORT2}	$V_{DP2}=0.8V$, $I_{DM2}=1mA$		157	200	Ω
Resistance between DP2/DM2 and GND	R_{DCHG_SHORT2}	$V_{DP2}=0.8V$	350	656	1150	k Ω
Voltage threshold on DP2 (under which the device goes back to divider mode)	$V_{DPL_TH_DETACH2}$		310	330	350	mV
DP2 Hysteresis	$V_{DPL_TH_DETACH_HYS2}$			50		mV
Divider Mode						
DP1 output voltage	$V_{DP1_2.7V}$	$V_{IN} = 5V$	2.57	2.7	2.84	V
DM1 output voltage	V_{DM1_2V}	$V_{IN} = 5V$	2.57	2.7	2.84	V
DP1 output impedance	R_{DP1_PAD1}	$I_{DP1} = -5\mu A$	24	30	36	k Ω
DM1 output impedance	R_{DM1_PAD1}	$I_{DM1} = -5\mu A$	24	30	36	k Ω
DP2 output voltage	$V_{DP2_2.7V}$	$V_{IN} = 5V$	2.57	2.7	2.84	V
DM2 output voltage	V_{DM2_2V}	$V_{IN} = 5V$	2.57	2.7	2.84	V
DP2 output impedance	R_{DP2_PAD1}	$I_{DP2} = -5\mu A$	24	30	36	k Ω
DM2 output impedance	R_{DM2_PAD1}	$I_{DM2} = -5\mu A$	24	30	36	k Ω
1.2 V / 1.2 V Mode						
DP1 output voltage	$V_{DP1_1.2V}$	$V_{IN} = 5V$	1.12	1.2	1.28	V
DM1 output voltage	$V_{DM1_1.2V}$	$V_{IN} = 5V$	1.12	1.2	1.28	V
DP1 output impedance	R_{DP1_PAD2}	$I_{DP1} = -5\mu A$	80	100	130	k Ω
DM1 output impedance	R_{DM1_PAD2}	$I_{DM1} = -5\mu A$	80	100	130	k Ω

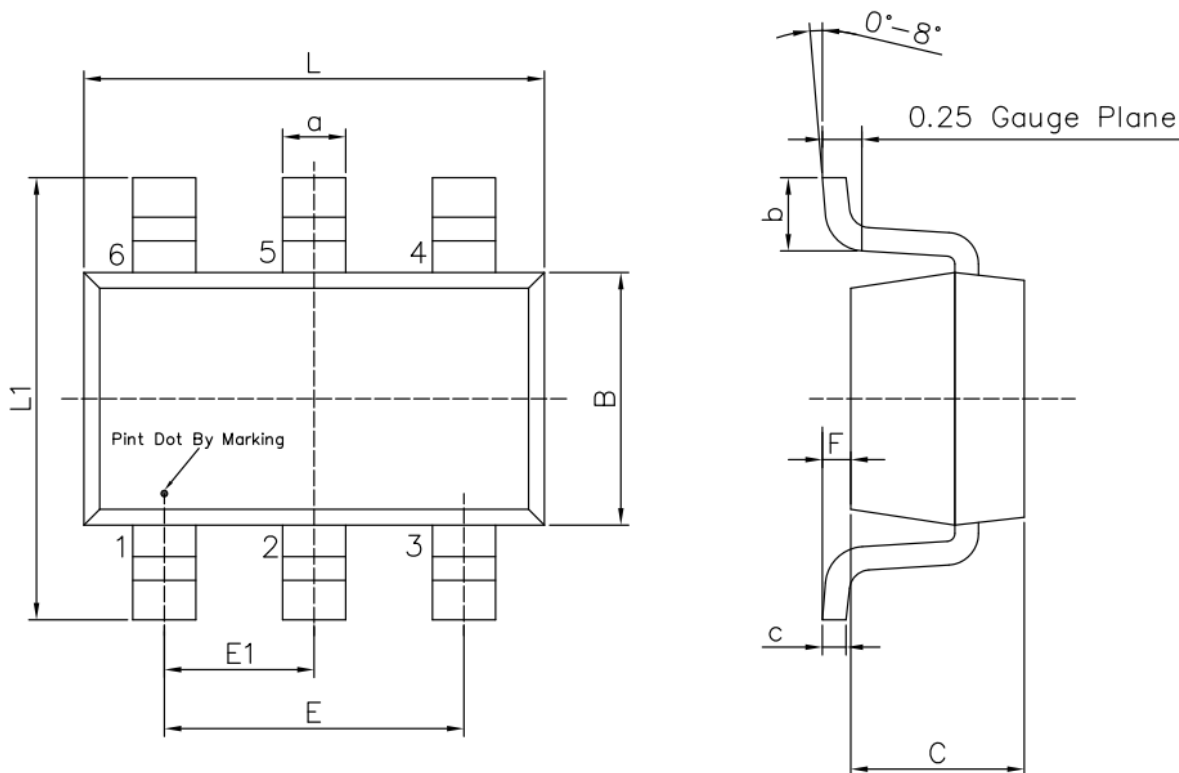
ELECTRICAL CHARACTERISTICS_(Continued)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
DP2 output voltage	$V_{DP2_1.2V}$	$V_{IN} = 5V$	1.12	1.2	1.28	V
DM2 output voltage	$V_{DM2_1.2V}$	$V_{IN} = 5V$	1.12	1.2	1.28	V
DP2 output impedance	R_{DP2_PAD2}	$I_{DP2} = -5\mu A$	80	100	130	k Ω
DM2 output impedance	R_{DM2_PAD2}	$I_{DM2} = -5\mu A$	80	100	130	k Ω

TOLL Microelectronic

PACKAGE INFORMATION

SOT23-6



Unit: mm

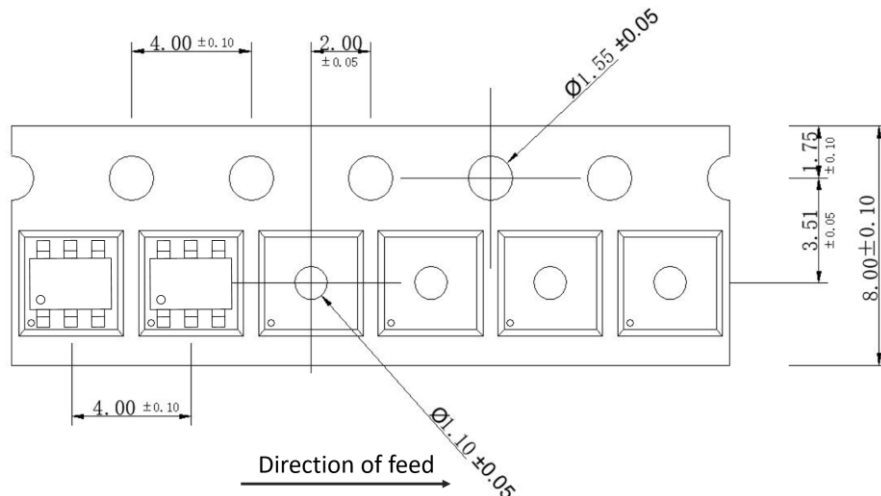
Symbol	Dimensions In Millimeters			Symbol	Dimensions In Millimeters		
	Min	Typ	Max		Min	Typ	Max
L	2.82	2.92	3.02	E1	0.85	0.95	1.05
B	1.50	1.60	1.70	a	0.35	0.425	0.50
C	0.90	1.10	1.30	c	0.10	0.15	0.20
L1	2.60	2.80	3.00	b	0.35	0.45	0.55
E	1.80	1.90	2.00	F	0	0.075	0.15

Note:

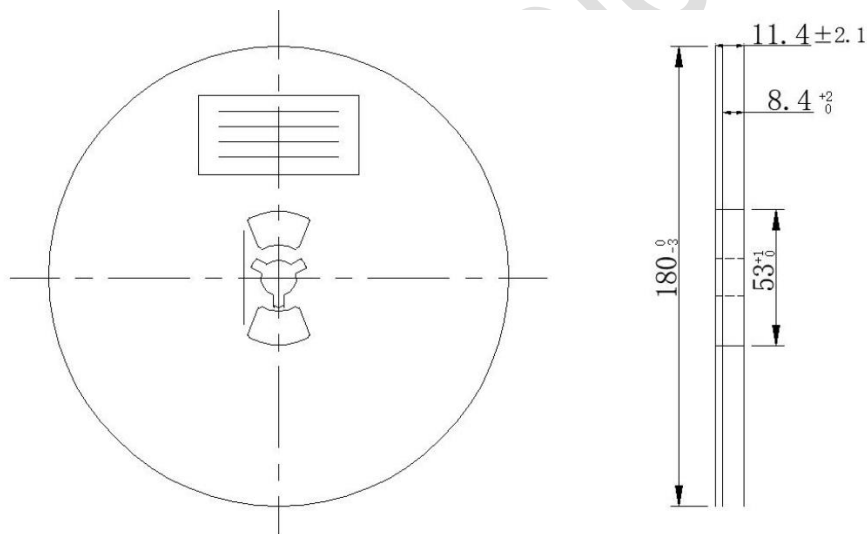
- 1) All dimensions are in millimeters.
- 2) Package length does not include mold flash, protrusion or gate burr.
- 3) Package width does not include inter lead flash or protrusion.
- 4) Lead popularity (bottom of leads after forming) shall be 0.10 millimeters max.
- 5) Pin 1 is lower left pin when reading top mark from left to right.

TAPE AND REEL INFORMATION

TAPE DIMENSIONS: SOT23-6



REEL DIMENSIONS: SOT23-6



Note:

- 1) All Dimensions are in Millimeter
- 2) Quantity of Units per Reel is 3000
- 3) MSL level is level 3.