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 1.2V on D+ and D– Lines
- Automatically Switch D+ and D- Lines Connections for an Attached Device
- Single USB Port Controller
- Operating Range: 4.5V to 5.5V
- Available in SOT23-5 Package

APPLICATIONS

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

GENERAL DESCRIPTION

The TMI9130E 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 (SEL=IN or floated SEL);
2. Divider 2 DCP, required to apply 2.7V and 2.0V on the D+ and D- Lines respectively (SEL=GND);
3. BC1.2 DCP, required to short the D+ Line to the D– Line
4. Chinese Telecom Standard YD/T 1591-2009 Shorted Mode, required to short the D+ Line to the D– Line
5. 1.2V on both D+ and D– Lines

TYPICAL APPILCATION

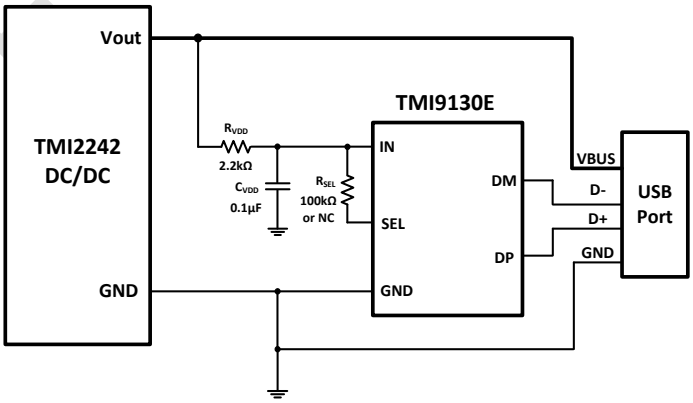


Figure 1. 2.4A Application Circuit with SEL pulling high or SEL floating

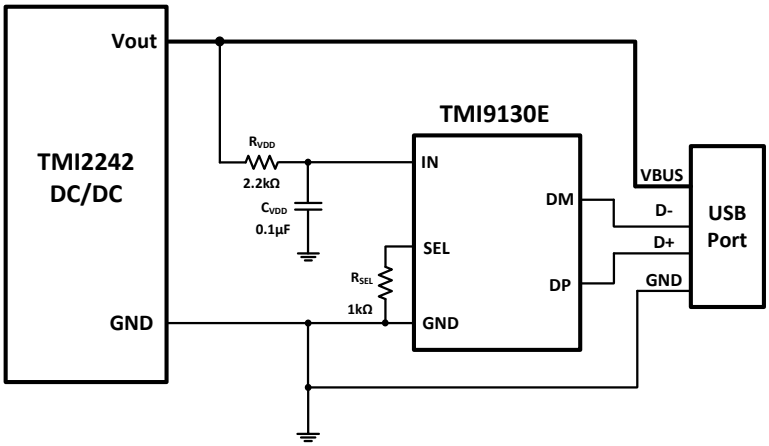
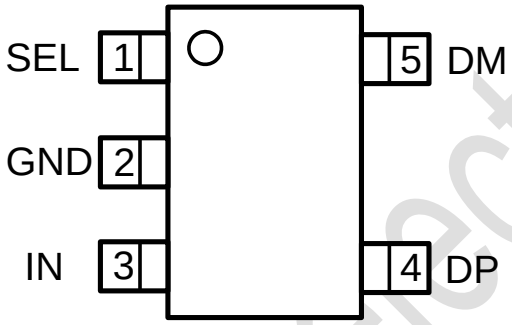


Figure 2. 2.1A Application Circuit with SEL pulling down

ABSOLUTE MAXIMUM RATINGS

Parameter	Min	Max	Unit
Input Supply Voltage	-0.3	7	V
DP output voltage, DM output voltage, SEL	-0.3	5.8	V
Junction Temperature		150	°C
Storage Temperature Range	-65	150	°C
Lead Temperature		260	°C

PIN CONFIGURATION



SOT23-5

Top Mark: T24EXXX (T24E: Device Code, XXX: Inside Code)

Part Number	Package	Top Mark	Quantity/ Reel
TMI9130E	SOT23-5	T24EXXX	3000

TMI9130E devices are Pb-free and RoHS compliant

PIN FUNCTIONS

Pin	Name	Function
1	SEL	Work mode selection with 1μA pull up current. Keeping SEL pin floating is the same as pulling SEL up to VIN with divider 3 DCP, 2.4A charging scheme. Pulled SEL pin to GND, the device enters divider 2 DCP, 2.1A charging scheme.
2	GND	Ground connection
3	IN	Power supply. Connect a ceramic capacitor with a value of 0.1μF 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.
4	DP	Connected to the D+ line of USB connector, provide the correct voltage with attached portable equipment for DCP detection.
5	DM	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 (SEL=IN or floated SEL) Divider 3 (D+/D– = 2.7V/2.7V)	Charging Schemes (SEL=GND) Divider 2 (D+/D– = 2.7V/2V)	1.2-V Mode (D+/D– Shorted and Bias To 1.2V)	BC1.2 And YD/T 1591-2009 Mode (D+/D– Shorted)
TMI9130E	Single	Yes	Yes	Yes	Yes

ESD RATINGS

Items	Description	Value	Unit
V_{ESD}	Human Body Model for all pins	±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

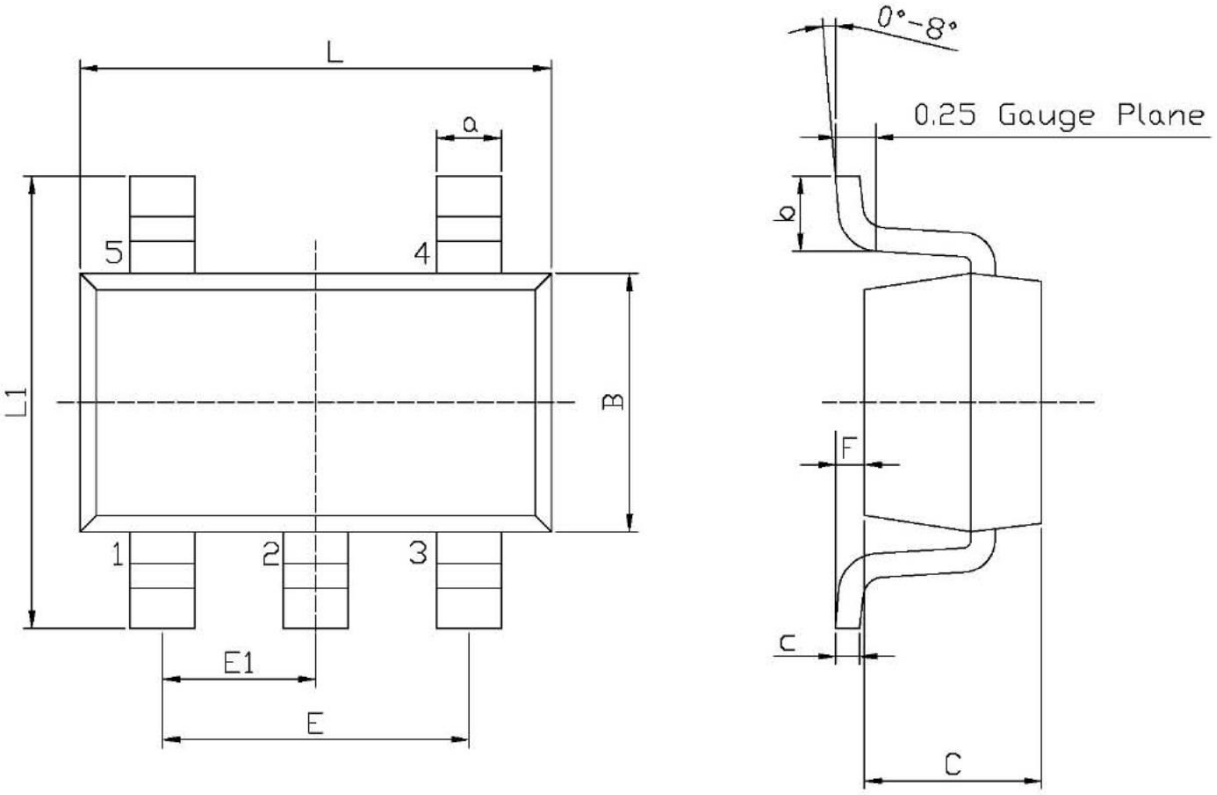
ELECTRICAL CHARACTERISTICS

(V_{IN}=5V, T_A=25°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 ≤ V_{IN} ≤ 5.5V		155	200	μA
BC 1.2 DCP Mode (Short Mode)						
DP and DM shorting resistance	R_{DPM_SHORT}	V_{DP}=0.8V, I_{DM}=1mA		157	200	Ω
Resistance between DP/DM and GND	R_{DCHG_SHORT}	V_{DP}=0.8V	350	656	1150	kΩ
Voltage threshold on DP (under which the device goes back to divider mode)	$V_{DPL\_TH\_DETACH}$		310	330	350	mV
DP Hysteresis	$V_{DPL\_TH\_DETACH\_HYS}$			50		mV
Divider Mode						
DP output voltage	$V_{DP\_2.7V}$	V_{IN} = 5V	2.57	2.7	2.84	V
DM output voltage	$V_{DM\_2.7V}$	V_{IN} = 5V, V_{SEL} = 5V	2.57	2.7	2.84	V
	V_{DM_2V}	V_{IN} = 5V, V_{SEL} = 0V	1.9	2.0	2.1	V
DP output impedance	R_{DP_PAD1}	I_{DP} = –5μA	24	30	36	kΩ
DM output impedance	R_{DM_PAD1}	I_{DM} = –5μA	24	30	36	kΩ
SEL pull up current	I_{SEL_PU}			1		μA
1.2V / 1.2V Mode						
DP output voltage	$V_{DP\_1.2V}$	V_{IN} = 5V	1.12	1.2	1.28	V
DM output voltage	$V_{DM\_1.2V}$	V_{IN} = 5V	1.12	1.2	1.28	V
DP output impedance	R_{DP_PAD2}	I_{DP} = –5μA	80	100	130	kΩ
DM output impedance	R_{DM_PAD2}	I_{DM} = –5μA	80	100	130	kΩ

PACKAGE INFORMATION

SOT23-5



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.

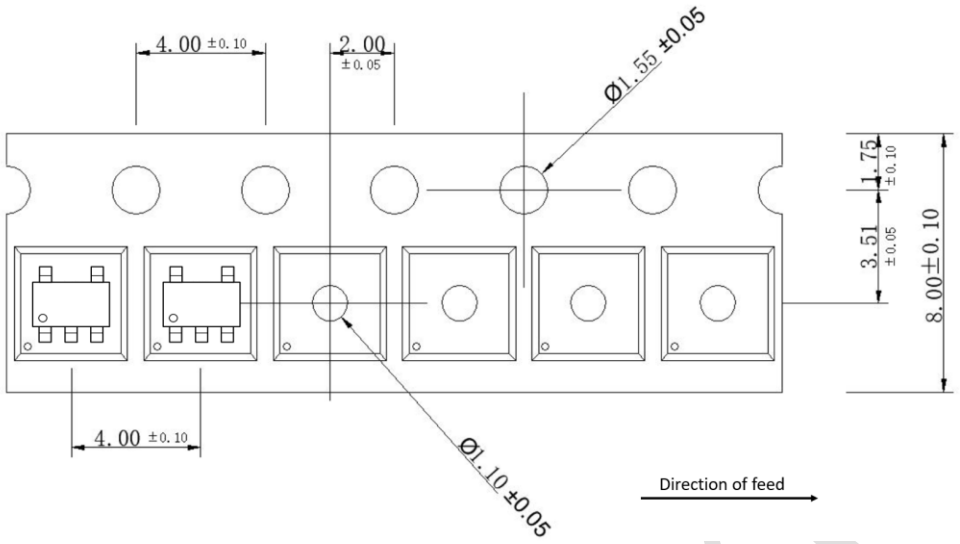
3) Package width does not include inter lead flash or protrusion.

4) Lead popularity (bottom of leads after forming) shall be 0.10 millimeters max.

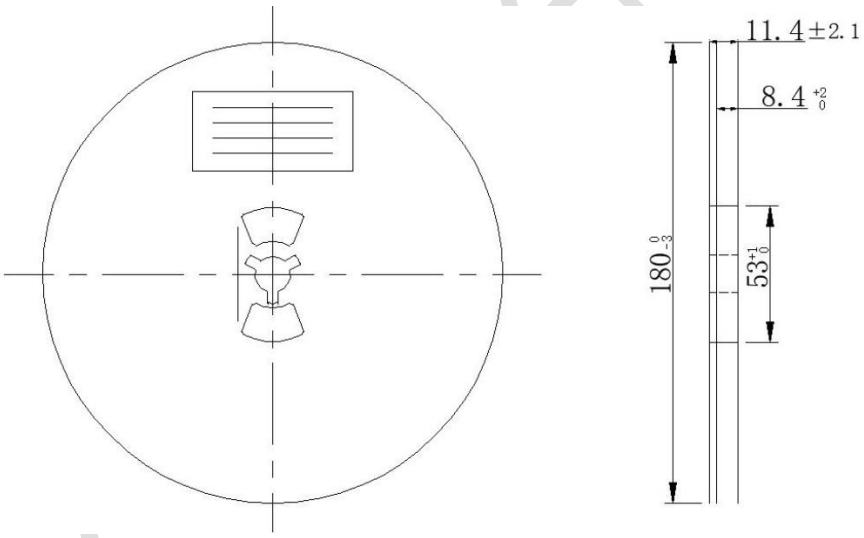
5) Pin 1 is lower left pin when reading top mark from left to right.

TAPE AND REEL INFORMATION

TAPE DIMENSIONS:



REEL DIMENSIONS:



Note:

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