

Electronic Marker for USB Type-C Cable

1 FEATURES

- **Passed USB-IF PD3.1 certification. TID number: 10394, XID number:0012380**
- **Support USB Type-C 2.2 and USB PD3.1**
- ◇ **Support SOP' and SOP'' communication**
- ◇ Adaptive engine of BMC receiver
- ◇ Embedded PHY
- ◇ Support Get_Manufacturer_Info
- ◇ Support Modal Operation
- ◇ **Support Get_Status, integrated internal temperature sensor for real-time acquisition of cable temperature**
- ◇ **Support EPR 240W Capable**
- **Support Thunderbolt 3 , Thunderbolt 4 Data Communication and USB 4.0 80G cable application**
- **High level of integration**
- ◇ Integrated VCONN diodes at both ends
- ◇ Integrated Ra at both ends and Ra automatic removal
- **Extremely low BOM cost**
- ◇ Low BOM cost
- **Flexible customization**
- ◇ Support programming protection, convenient to lock data after customization
- **Extremely low power consumption**
- **Power supply: 2.7V~5.8V**
- **ESD 8KV (VCONN1/2、CC pin)**
- **55 V High Voltage Tolerance on CC, VCONN1 and VCONN2 Pins VCONN/CC pins high withstand voltage 55V**
- **Package**
- ◇ DFN2x2-6L
- ◇ DFN2x2-8L
- ◇ WL-CSP-6B

2 APPLICATIONS

- USB Type-C Passive cable
- USB Type-C Active cable
- USB Type-C EPR 240W Capable cable
- USB Type-C Thunderbolt 3 , Thunderbolt 4 cable

3 DESCRIPTION

IP2133H is an electronic marker for USB Type-C cable which supports USB Type-C 2.2 and USB PD3.1. It provides a complete solution for C-C cable applications.

Support data programming, convenient to develop. Supports programming protection to ensure data security

IP2133H has a high level of integration and an extremely simplified BOM, which effectively reduces the size of the overall solution and reduces the BOM cost.

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4 Reversion History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision V1.0 (March 2023) to Revision V1.1	Page
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- Added USB-IF PD3.1 TID number.....1
-

Changes from Revision V1.1 (June 2023) to Revision V1.2	Page
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- Supplement package information.....18
-

Changes from Revision V1.2 (January 2024) to Revision V1.3	Page
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- Amend USB-IF PD3.1 TID number.....1
-

INJOINIC CORP.

5 Typical Application Schematic

5.1 Passive Cable

5.1.1 Plan A

Passive Cable : Electronically Marked Cable with VCONN connected through the cable

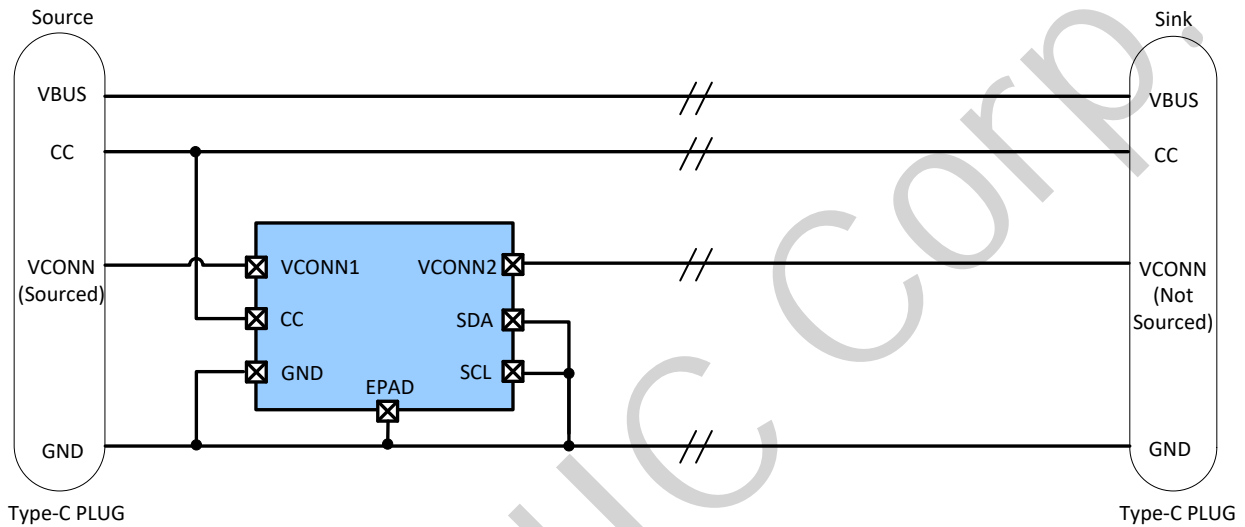


Figure 1 Passive Cable for Plan A Simplified Application Circuit

5.1.2 Plan B

Passive Cable : Electronically Marked Cable with SOP' at both ends(with VCONN not connected through the cable)

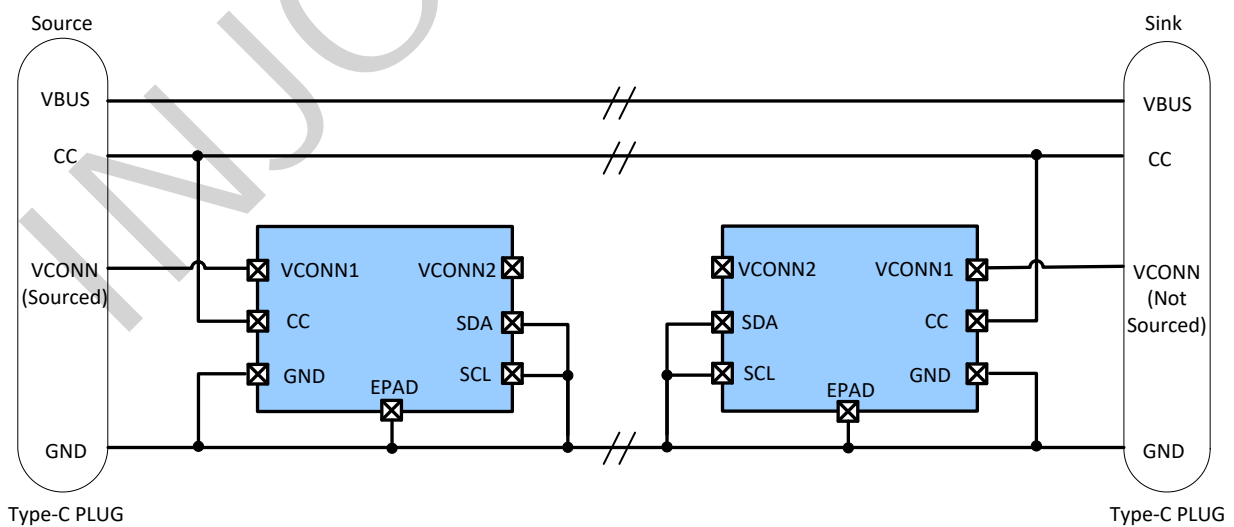


Figure 2 Passive Cable for Plan B Simplified Application Circuit

5.2 Active Cable

Active Cable : Marked Cable with SOP' at near end and SOP'' at far end

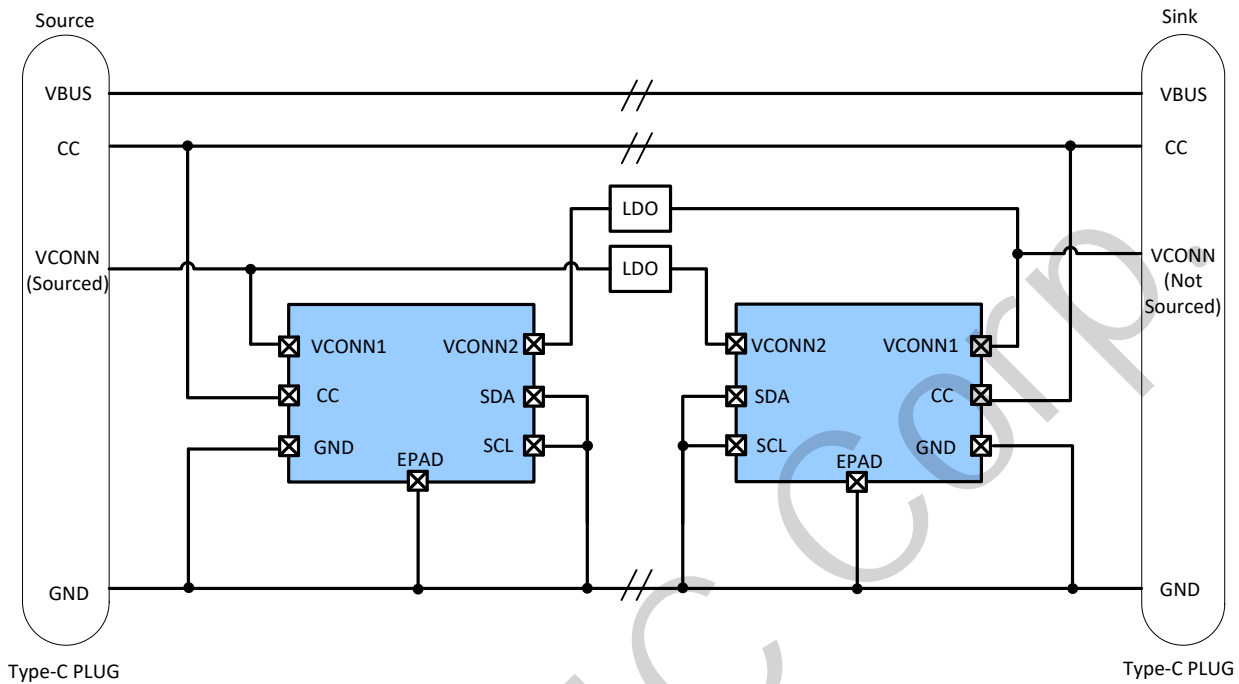


Figure 3 Active Cable Simplified Application Circuit

6 IP2133H Comparison Table

IC Part No.	Features	Package
IP2133	USB2.0/USB3.2,Gen1/Gen2,cable	DFN-6L
IP2133_EPR	USB2.0/USB3.2,Gen1/Gen2,EPR Mode Capable cable	DFN-6L
IP2133T	USB2.0/USB3.2,Gen1/Gen2,cable	DFN-8L
IP2133T_EPR	USB2.0/USB3.2,Gen1/Gen2,EPR Mode Capable cable	DFN-8L
IP2133H	USB2.0/USB3.2,Gen1/Gen2,USB4.0,EPR Mode Capable cable	DFN-6L
IP2133TH	USB2.0/USB3.2,Gen1/Gen2,USB4.0,EPR Mode Capable cable	DFN-8L
	USB2.0/USB3.2,Gen1/Gen2,USB4.0,EPR Mode Capable cable	WL-CSP-6B

7 Pin Configuration And Function

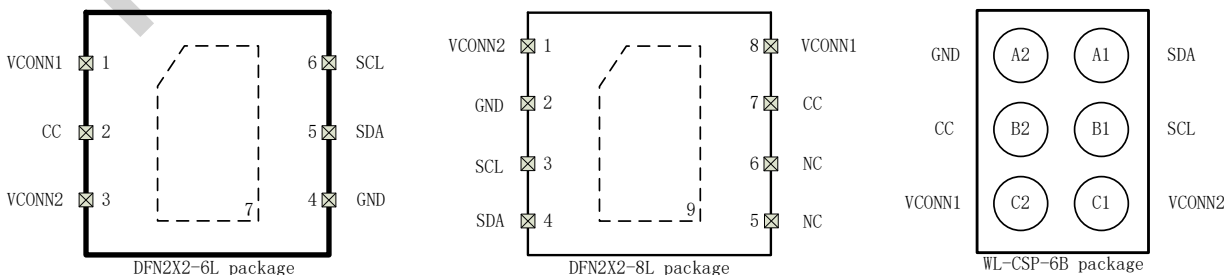


Figure 4 IP2133H Pin Diagram

7.1 PIN Description

Pin number			Pin name	Pin description
DFN2X2-6L	DFN2X2-8L	WL-CSP-6B		
1	8	C2	VCONN1	VCONN power Supply 1
2	7	B2	CC	USB Type-C configuration channel
3	1	C1	VCONN2	Power supply
4	2	A2	GND	Ground
5	4	A1	SDA	I2C data
6	3	B1	SCL	I2C clock
7	9	-	EPAD	Exposed Pad

8 Functional Block Diagram

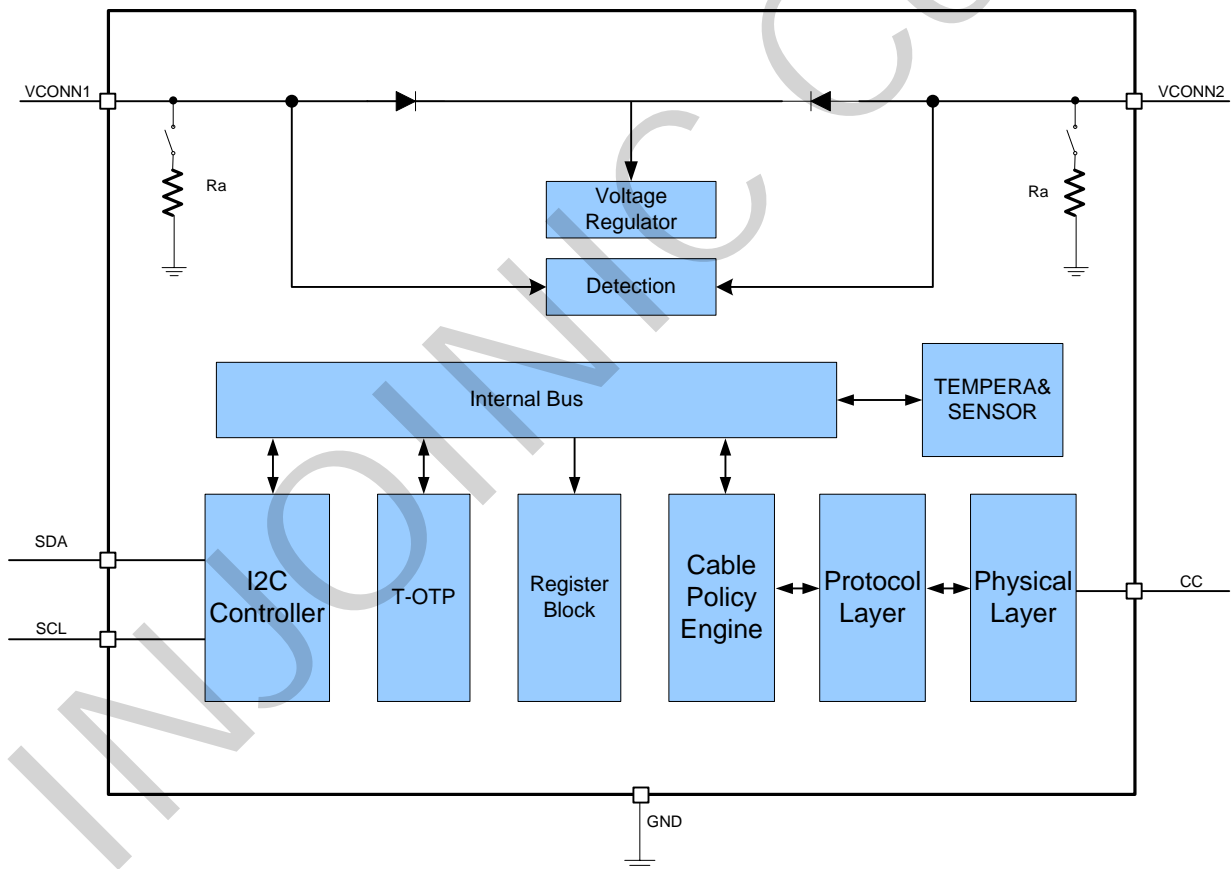


Figure 5 Functional Block Diagram

9 Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
VCONN1 Input Voltage Range	VCONN1	-0.3 ~ 55	V
VCONN2 Input Voltage Range	VCONN2	-0.3 ~ 55	V
CC Input Voltage Range	CC	-0.3 ~ 55	V

SDA Input Voltage Range	SDA	-0.3 ~ 10	V
SCL Input Voltage Range	SCL	-0.3 ~ 10	V
Junction Temperature Range	T _J	-40 ~ 150	°C
Storage Temperature Range	T _{stg}	-60 ~ 150	°C
Lead Temperature (Soldering, 10sec.)	T _s	260	°C
Package Thermal Resistance	T _A	-40~120	°C
Package Thermal Resistance	θ _{JA}	90	°C/W
Human Body Model VCONN1, VCONN2 and CC Pin	ESD	8	KV

* Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to Absolute Maximum Rated conditions for extended periods may affect device reliability.

* Voltages are referenced to GND unless otherwise noted.

10 Recommended Operating Conditions

Parameters	Symbol	Min.	Typ.	Max.	Unit
VCONN1 Input Voltage Range	VCONN1	2.7	5	5.8	V
VCONN2 Input Voltage Range	VCONN2	2.7	5	5.8	V
CC Input Voltage Range	CC	3	-	5.5	V
SDA Input Voltage Range	SDA	3	-	4	V
SCL Input Voltage Range	SCL	3	-	4	V
Ambient Temperature	T _A	-40	-	105	°C

* Devices' performance cannot be guaranteed when working beyond those Recommended Operating Conditions.

11 Electrical Characteristics

Unless otherwise specified, T_A=25°C, 4.5V ≤ VCONN1/2 ≤ 5.5V

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Input Voltage	VCONN1/2	Supplied directly	2.75	5	5.75	V
Input UVLO Threshold	UVLO	Supplied directly	-	2.4	-	V
UVLO hysteresis	V _{UVLO_hys}	Supplied directly	0.1	0.2	0.3	V
Quiescent Current	I _Q	No load, VCONN1/2=5V	0.3	1.3	1.6	mA
Current at transmitting	I _{TX}	VCONN1/2=5V	0.4	1.75	3	mA
Current at receiving	I _{RX}	VCONN1/2=5V	0.4	1.1	1.6	mA
Cable termination	R _a	-	0.8	1	1.2	KΩ
Weaken termination	R _{weak}	-	18	21	24	KΩ
BMC TX PARAMETERS						
Bit Rate	f _{BitRate}	-	270	300	330	K
Maximum difference between the bitrate during the part of the packet following the Preamble and the reference bitrate.	P _{BitRate}	-	-	-	0.25	%

Time to cease driving the line after the end of the last bit of the Frame.	$t_{\text{EndDriveBMC}}$		-	-	23	us
Fall time (From 90% to 10% amplitude)	t_{Fall}		300	-	-	ns
Time to cease driving the line after the final high-to-low transition.	$t_{\text{HoldLowBMC}}$		1	-	-	us
Time from the end of last bit of a Frame until the start of the first bit of the next Preamble.	$t_{\text{InterFrameGap}}$		25	-	-	us
Rise time (From 10% to 90% amplitude)	t_{Rise}		300	-	-	ns
Time before the start of the first bit of the Preamble when the transmitter Shall start driving the line.	$t_{\text{StartDrive}}$		-1	-	1	us
Voltage Swing	v_{Swing}		1.05	1.125	1.2	V
OVP on CC, lower threshold	$V_{\text{OVP_CC_lo}}$	-	5	5.6	6	V
OVP on CC, upper threshold	$V_{\text{OVP_CC_up}}$	-	5	6	7	V
OVP on CC, hysteresis	$V_{\text{OVP_CC_hys}}$	-	0.1	0.2	0.5	V
OVP on VCONN1/2, lower threshold	$V_{\text{OVP_VCONN_lo}}$	-	5.5	6	6.5	V
OVP on VCONN1/2, upper threshold	$V_{\text{OVP_VCONN_up}}$	-	6.5	7	7.5	V
OVP on VCONN1/2, hysteresis	$V_{\text{OVP_VCONN_hys}}$	-	0.1	0.2	0.5	V

12 Function Description

12.1 SOP' and SOP'' communication

SOP' Communication is recognized by electronics in one Cable Plug, SOP'' Communication can also be supported when SOP' Communication is also supported. IP2133H supports SOP' and SOP'' communication. When no Contract or an Implicit Contract is in place (e.g., after a Power Role Swap or Fast Role Swap), only the Source port that is supplying VCONN is allowed to send packets to a Cable Plug (SOP') and is allowed to respond to packets from the Cable Plug (SOP') with a GoodCRC in order to discover the Cable Plug's characteristics. When an Explicit Contract is in place the VCONN Source (either the DFP or the UFP) can communicate with the Cable Plug(s) using SOP'/SOP'' Packets. During this phase, all communication with the Cable Plug is initiated and controlled by the VCONN Source which acts to prevent conflicts between SOP* Packets. The communication process is shown in the figure below:

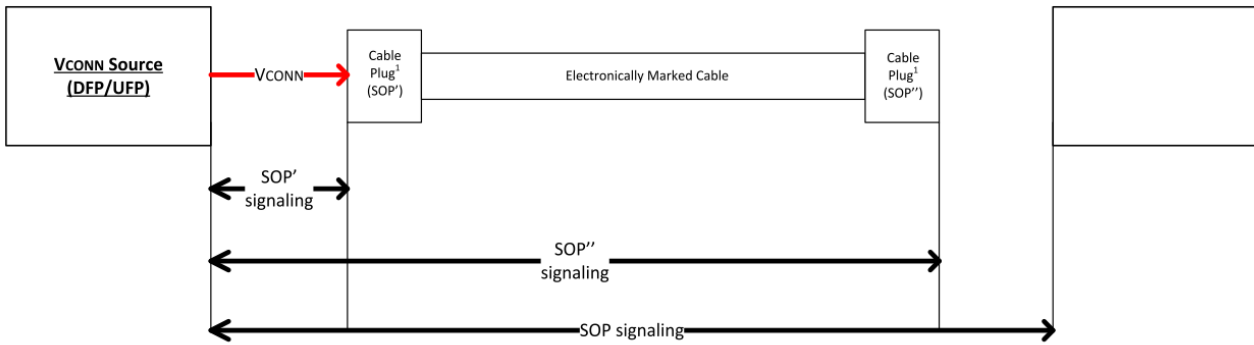


Figure 6 Example SOP' Communication between VCONN Source and Cable Plug(s)

12.2 PD Protocol and Message Supported

IP2133H will detect and respond to the received packets with below three ordered sets, Hard Reset, Cable Reset and SOP*. Their ordered sets are defined in the following table.

K-code Number	K-Code in code table		
	Layout Pad Reference	Layout Pad Reference	Layout Pad Reference
1	RST-1	RST-1	Sync-1
2	RST-1	Sync-1	Sync-1
3	RST-1	RST-1	Sync-3
4	RST-2	Sync-3	Sync-3

12.2.1 Hard Reset and Cable Reset

IP2133H will monitor for Hard Reset and Cable Reset signaling and reset when either of them is detected. IP2133H will perform the equivalent of a power cycle and return its power-up state.

12.2.2 Control Message

This chip will respond to the following control messages required for passive USB Type-C cable. Any messages except those in the table will be ignored by no action after returning the GoodCRC message.

	Message Header[4:0]	Message Type	Description
Transmitted Message	0 0001	GoodCRC	Be sent to acknowledge that the previous message was correctly received (i.e. had a good CRC)
	0 0011	Accept	Be sent to indicate that it has completed its Soft Reset.
Received Message	0 0001	GoodCRC	The sent message has been correctly received
	0 1101	Soft_Reset	Reset MessageIDCounter before sending the Accept Message response
	Others	N/A	Ignored

12.2.3 Data Message

This chip will respond to the following data messages required for passive USB Type-C cable. Any messages except those in the table will be ignored.

	Message Header[4:0]	Message Type	Description
Transmitted Message	N/A		
Received Message	0 0011	BIST	Including BIST Carrier Mode and BIST Test Data
	0 1111	Vendor_Defined	See below section
	Others	N/A	Ignored

12.2.4 Discover Identity

- Discover Identity

Discover Identity command is used to identify the VCONN Source power cable plug, the command format is as follows:

Header No. of Data Objects = 4-7 ¹	VDM Header	ID Header VDO	Cert Stat VDO	Product VDO	0..3 ² Product Type VDO(s)

- ID Header

The ID Header VDO contains information corresponding to the Power Delivery Product. The fields in the ID Header VDO shall be as defined in Table.

Bit(s)	Description
B31	USB Communications Capable as USB Host: <ul style="list-style-type: none"> • Shall be set to one if the product is capable of enumerating USB Devices. • Shall be set to zero otherwise
B30	USB Communications Capable as a USB Device: <ul style="list-style-type: none"> • Shall be set to one if the product is capable of being enumerated as a USB Device. • Shall be set to zero otherwise
B29...27	Product Type (UFP): <ul style="list-style-type: none"> • 000b – Undefined • 001b – PDUSB Hub • 010b – PDUSB Peripheral • 011b – PSD • 100b – Reserved, Shall Not be used. • 101b – Alternate Mode Adapter (AMA) • 110b – VCONN-Powered USB Device (VPD) • 111b – Reserved, Shall Not be used. Product Type (Cable Plug): <ul style="list-style-type: none"> • 000b – Undefined • 001b...010b – Reserved, Shall Not be used. • 011b – Passive Cable • 100b – Active Cable • 101b...111b – Reserved, Shall Not be used.
B26	Modal Operation Supported: <ul style="list-style-type: none"> • Shall be set to one if the product supports Modal Operation. • Shall be set to zero otherwise
B25...23	Product Type (DFP): <ul style="list-style-type: none"> • 000b – Undefined • 001b – PDUSB Hub • 010b – PDUSB Host • 011b – Power Brick • 100b – Alternate Mode Controller (AMC) • 101b...111b – Reserved, Shall Not be used.
B22...16	Reserved. Shall be set to zero.
B15...0	16-bit unsigned integer. USB Vendor ID

- **Cert Stat VDO**

The Cert Stat VDO shall contain the XID assigned by USB-IF to the product before certification in binary format. The fields in the Cert Stat VDO shall be as defined in Table:

Bit(s)	Description	Reference
B31...0	32-bit unsigned integer, XID	Assigned by USB-IF

- **Product VDO**

The Product VDO contains identity information relating to the product. The fields in the Product VDO Shall be as defined in Table.

Bit(s)	Description	Reference
B31...16	16-bit unsigned integer. USB Product ID	[USB 2.0]/[USB 3.2]
B15...0	16-bit unsigned integer. bcdDevice	[USB 2.0]/[USB 3.2]

- **Passive Cable VDO**

A Passive Cable has a USB Plug on each end at least one of which is a Cable Plug supporting SOP' Communication. A Passive Cable Shall Not incorporate data bus signal conditioning circuits and hence has no concept of Super Speed Directionality. A Passive Cable Shall include a VBUS wire and Shall only

respond to SOP' Communication. Passive Cables Shall support the Structured VDM Discover Identity Command and Shall return the Passive Cable VDO in a Discover Identity Command ACK as shown in Table.

Bit(s)	Field	Description
B31...28	HW Version	0000b...1111b assigned by the VID owner
B27...24	Firmware Version	0000b...1111b assigned by the VID owner
B23...2B	VDO Version	Version Number of the VDO (not this specification Version): <ul style="list-style-type: none"> Version 1.0 = 000b Values 001b...111b are Reserved and Shall Not be used
B20	Reserved	Shall be set to zero.
B19...18	USB Type-C® plug to USB Type-C®/Captive	00b = Reserved, Shall Not be used 01b = Reserved, Shall Not be used 10b = USB Type-C® 11b = Captive
B17	EPR Mode Capable	0b - Cable is not EPR Mode Capable 1b = Cable is EPR Mode Capable
B16...13	Cable Latency	0000b- Reserved, Shall Not be used. 0001b - <10ns (~1m) 0010b - 10ns to 20ns (~2m) 0011b - 20ns to 30ns (~3m) 0100b - 30ns to 40ns (~4m) 0101b - 40ns to 50ns (~5m) 0110b - 50ns to 60ns (~6m) 0111b - 60ns to 70ns (~7m) 1000b - > 70ns (>~7m) 1001b1111b Reserved, Shall Not be used be used. Includes latency of electronics in Active Cable
B12...11	Cable Termination Type	00b = V_{CONN} not required. Cable Plugs that only support <i>Discover Identity</i> Commands Shall set these bits to 00b. 01b = V_{CONN} required 10b...11b = Reserved, Shall Not be used
B10...9	Maximum VBUSVoltage2	Maximum Cable V_{BUS} Voltage: 00b - 20V 01b - 30V ¹ (Deprecated) 10b - 40V ¹ (Deprecated) 11b - 50V
B8...7	Reserved	Shall be set to zero.
B6...5	Vbus Current Handling Capability	00b = Reserved, Shall Not be used. 01b = 3A 10b = 5A 11b = Reserved, Shall Not be used.
B4...3	Reserved	Shall be set to zero.
B2...0	USB Highest Speed	000b = [USB2.0] only, no SuperSpeed support 001b = [USB 3.2] Gen1 010b = [USB 3.2]/[USB4] Gen2 011b = [USB4] Gen3 100b = [USB4] Gen4 101b...111b = Reserved, Shall Not be used

¹ Values no longer allowed. When present the field **Shall** be interpreted as if it was 00b.
² EPR Sinks with a captive cable **Shall** report 50V.

- Active Cable VDO

An Active Cable has a USB Plug on each end at least one of which is a Cable Plug supporting SOP' Communication. An Active Cable Shall incorporate data bus signal conditioning circuits and May have a concept of Super Speed Directionality on its Super Speed wires. An Active Cable May include a VBUS wire.

Active VDO1:

Bit(s)	Field	Description
B31...28	HW Version	0000b...1111b assigned by the VID owner
B27...24	Firmware Version	0000b...1111b assigned by the VID owner
B23...21	VDO Version	Version Number of the VDO (not this specification Version): <ul style="list-style-type: none"> Version 1.3 = 011b Values 000b, 100b...111b are Reserved and Shall Not be used
B20	Reserved	Shall be set to zero.
B19...18	USB Type-C® plug to USB Type-C®/Captive	00b = Reserved, Shall Not be used 01b = Reserved, Shall Not be used 10b = USB Type-C® 11b = Captive
B17	EPR Mode Capable	0b - Cable is not EPR Mode Capable 1b = Cable is EPR Mode Capable
B16...13	Cable Latency	0000b - Reserved, Shall Not be used. 0001b - <10ns (~1m) 0010b - 10ns to 20ns (~2m) 0011b - 20ns to 30ns (~3m) 0100b - 30ns to 40ns (~4m) 0101b - 40ns to 50ns (~5m) 0110b - 50ns to 60ns (~6m) 0111b - 60ns to 70ns (~7m) 1000b -1000ns (~100m) 1001b -2000ns (~200m) 1010b - 3000ns (~300m) 1011b1111b Reserved, Shall Not be used. Includes latency of electronics in Active Cable
B12...11	Cable Termination Type	00b...01b = Reserved, Shall Not be used 10b = One end Active, one end passive, V _{CONN} required 11b = Both ends Active, V _{CONN} required
B10...9	Maximum V _{bus} Voltage ²	Maximum Cable V _{bus} Voltage: 00b - 20V 01b - 30V ¹ (Deprecated) 10b - 40V ¹ (Deprecated) 11b-50V
B8	SBU Supported	0 = SBU connections supported 1 = SBU connections are not supported
B7	SBU Type	When SBU Supported = 1 this bit Shall be Ignored When SBU Supported = 0: 0 = SBU is passive 1 = SBU is active

Bit(s)	Field	Description
B6...5	V _{BUS} Current Handling Capability	When V _{BUS} Through Cable is "No", this field shall be <i>Ignored</i> . When V _{BUS} Through Cable is "Yes": 00b = USB Type-C® Default Current 01b = 3A 10b = 5A 11b = Reserved, Shall Not be used.
B4	V _{BUS} Through Cable	0 = No 1 = Yes
B3	SOP™ Controller Present	0 = No SOP™ controller present 1 = SOP™ controller present
B2...0	USB Highest Speed	000b = [USB2.0] only, no SuperSpeed support 001b = [USB3.2] Gen1 010b = [USB 3.2]/ [USB4] Gen2 011b = [USB4] Gen3 100b = [USB4] Gen4 101b...111b = Reserved, Shall Not be used
¹ Values no longer allowed. When present the field shall be interpreted as if it was 00b. ² EPR Sinks with a captive cable shall report 50V.		

Active VDO2:

Bit(s)	Field	Description
B31...24	Maximum Operating Temperature	The maximum internal operating temperature in °C. It might or might not reflect the plug's skin temperature.
B23...16	Shutdown Temperature	The temperature, in °C, at which the cable will go into thermal shutdown so as not to exceed the allowable plug skin temperature.
B15	Reserved	shall be set to zero.
B14...12	U3/CLd Power	000b: >10mW 001b: 5-10mW 010b: 1-5mW 011b: 0.5-1mW 100b: 0.2-0.5mW 101b: 50-200µW 110b: <50µW 111b: Reserved, Shall Not be used
B11	U3 to U0 transition mode	0b: U3 to U0 direct 1b: U3 to U0 through U3S
B10	Physical connection	0b = Copper 1b = Optical
B9	Active element	0b = Active Redriver 1b = Active Retimer
B8	USB4* Supported	0b = [USB4] supported 1b = [USB4] not supported
B7...6	USB 2.0 Hub Hops Consumed	Number of [USB 2.0] 'hub hops' cable consumes. Shall be set to 0 if USB 2.0 not supported.
B5	USB 2.0 Supported	0b = [USB 2.0] supported 1b = [USB 2.0] not supported
B4	USB 3.2 Supported	0b = [USB 3.2] SuperSpeed supported 1b = [USB 3.2] SuperSpeed not supported
B3	USB Lanes Supported	0b = One lane 1b = Two lanes
B2	Optically Isolated Active Cable	0b = No 1b = Yes
B1	USB4* Asymmetric Mode Supported	0b = No 1b = Yes shall be set to 0 if asymmetry is not supported.
B0	USB Gen	0b = Gen 1 1b = Gen 2 or higher Note: see VDO1 USB Highest Speed for details of Gen supported.

12.2.5 Get_Status

The Get_Status Message is sent by a Port using SOP to request the Port Partner's present status. The Port Partner Shall respond by returning a Status Message. A Port that receives an Alert Message indicates that the Source or Sink's Status has changed and Should be re-read using a Get_Status Message.

The Get_Status Message May also be sent to an Active Cable to get its present status using SOP'/SOP''. The Active Cable Shall respond by returning a Status Message.

A Status Message, sent in response to a Get_Status Message to SOP' or SOP'', enables a Source or Sink to get the present status of the Cable's Cable Plug(s). Typically, a Get_Status Message will be used by the USB Host and/or USB Device to manage the Cable's Cable Plug(s) temperature. The Status Message returns a 2-byte Status Data Block (SDB) whose format Shall be as shown in the following table. SOP' /SOP'' Status Message:



SOP'/SOP'' Status Data Block:

Offset (Byte)	Field	Value	Description						
0	Internal Temp	Unsigned Int	Cable Plug's internal temperature in °C. 0 = feature not supported 1 = temperature is less than 2°C. 2...255 = temperature in °C.						
1	Flags	Bit field	<table border="1"> <thead> <tr> <th>Bit</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Thermal Shutdown</td> </tr> <tr> <td>1...7</td> <td><i>Reserved and Shall</i> be set to zero</td> </tr> </tbody> </table>	Bit	Description	0	Thermal Shutdown	1...7	<i>Reserved and Shall</i> be set to zero
Bit	Description								
0	Thermal Shutdown								
1...7	<i>Reserved and Shall</i> be set to zero								

12.3 Mode Operation

IP2133H supports mode operation and supports Mode Enter/Exit commands. IP2133H can support 40Gbps mode operation and 3 SVID mode operations. It can be applied to Thunderbolt 3, Thunderbolt 4 cable and DP cable. And it is convenient for customers to customize flexibly.

13 Application Schematic

13.1 USB 2.0 Cable Application Schematic

IP2133H support USB Type-C 2.1 protocol. It also supports low BOM cost. No capacitor is needed between VBUS and GND. It can save PCB Layout space.

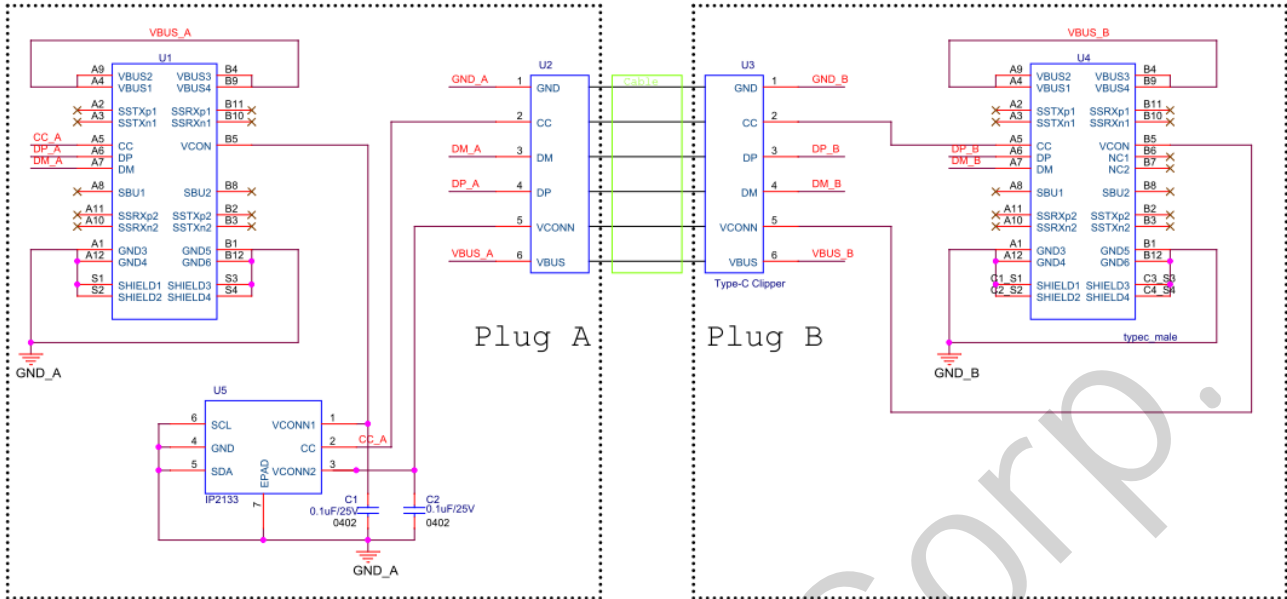


Figure 7 IP2133H USB2.0 Cable reference schematic

13.2 USB3.2 Cable Application Schematic

When IP2133H is used as a USB 3.2 cable, a 10nF capacitor needs to be connected between VBUS and GND, and the capacitor withstand voltage is above 63V.

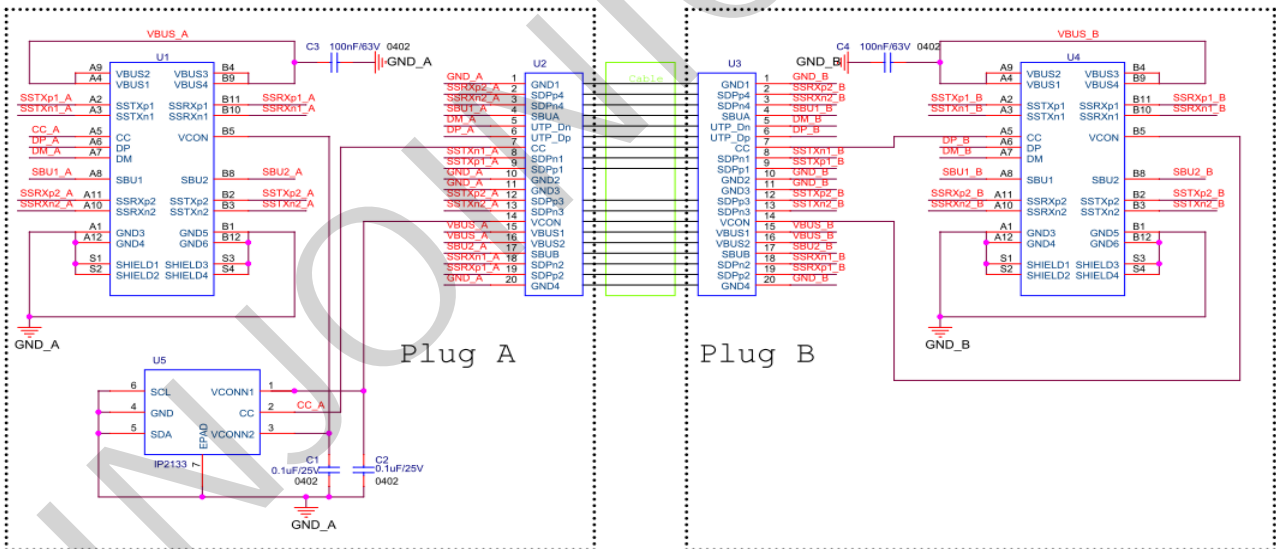


图 8 IP2133H USB3.2 Cable reference schematic

13.3 USB4.0 Cable Application Schematic

When IP2133H is used as a USB 4.0 cable, a 10nF capacitor needs to be connected between VBUS and GND, and the capacitor withstand voltage is above 63V.

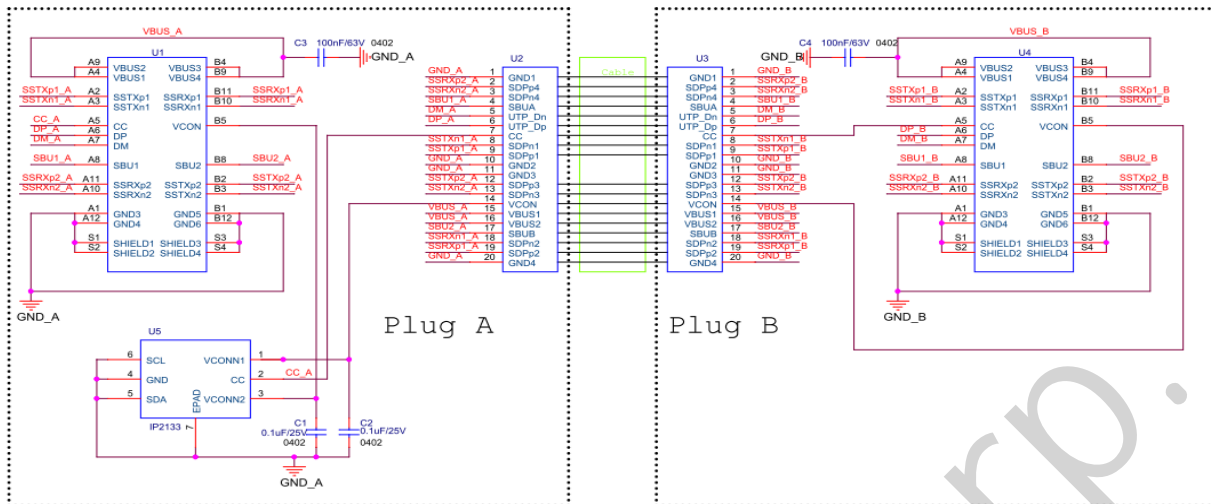


图 9 IP2133H USB4.0 Cable reference schematic

14 BOM

14.1 USB2.0 Cable Reference BOM

Part NO.	Name	Part description	Unit	NO.	Location
1	MLCC	0402 100nF 25V X5R	C1 C2	2	
2	USB Type-C Plug	N/A	U1 U4	2	
3	IC	DFN-6L E-Marker IP2133H	U5	1	

14.2 USB3.2 Cable Reference BOM

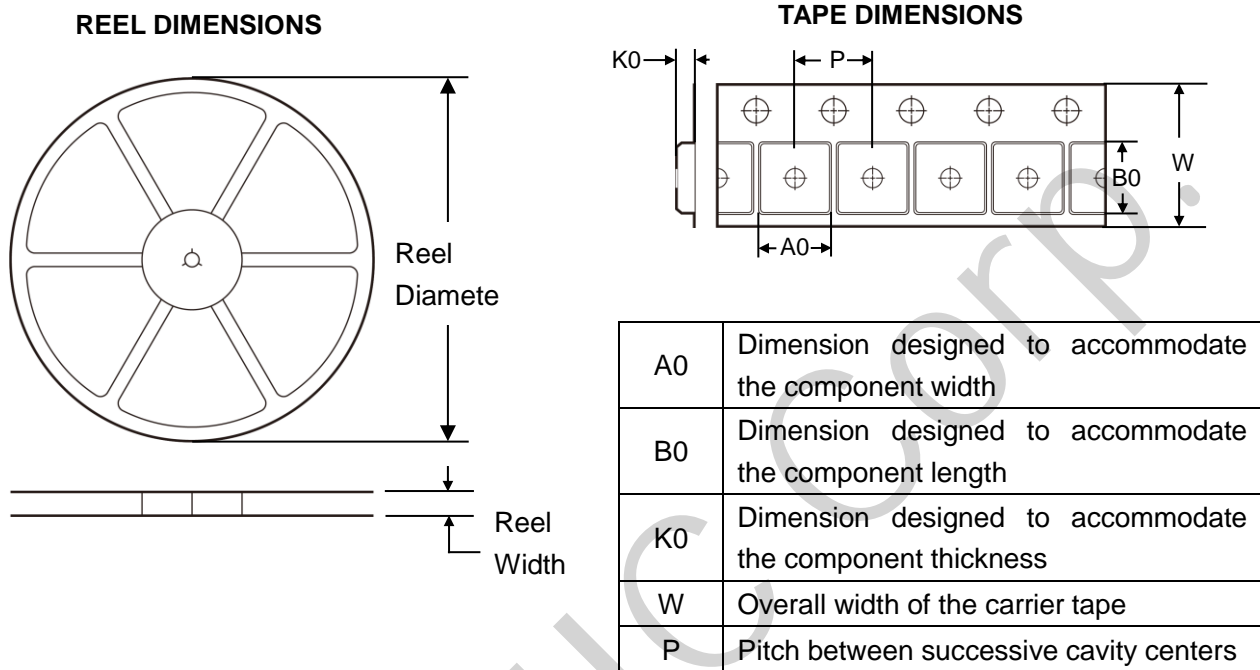
Part NO.	Name	Part description	Unit	NO.	Location
1	MLCC	0402 100nF 25V X5R	C1 C2	2	
2	MLCC	0402 100nF 63V X5R	C3 C4	2	
3	USB Type-C Plug	N/A	U1 U4	2	
4	IC	DFN-6L E-Marker IP2133H	U5	1	

14.3 USB4.0 Cable Reference BOM

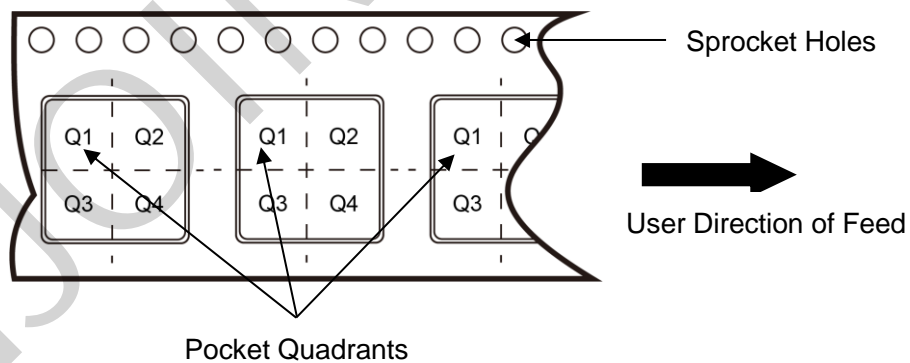
Part NO.	Name	Part description	Unit	NO.	Location
1	MLCC	0402 100nF 25V X5R	C1 C2	2	
2	MLCC	0402 100nF 63V X5R	C3 C4	2	
3	USB Type-C Plug	N/A	U1 U4	2	
4	IC	DFN-6L E-Marker IP2133H	U5	1	

15 PACKAGE INFORMATION

15.1 TAPE AND REEL INFORMATION



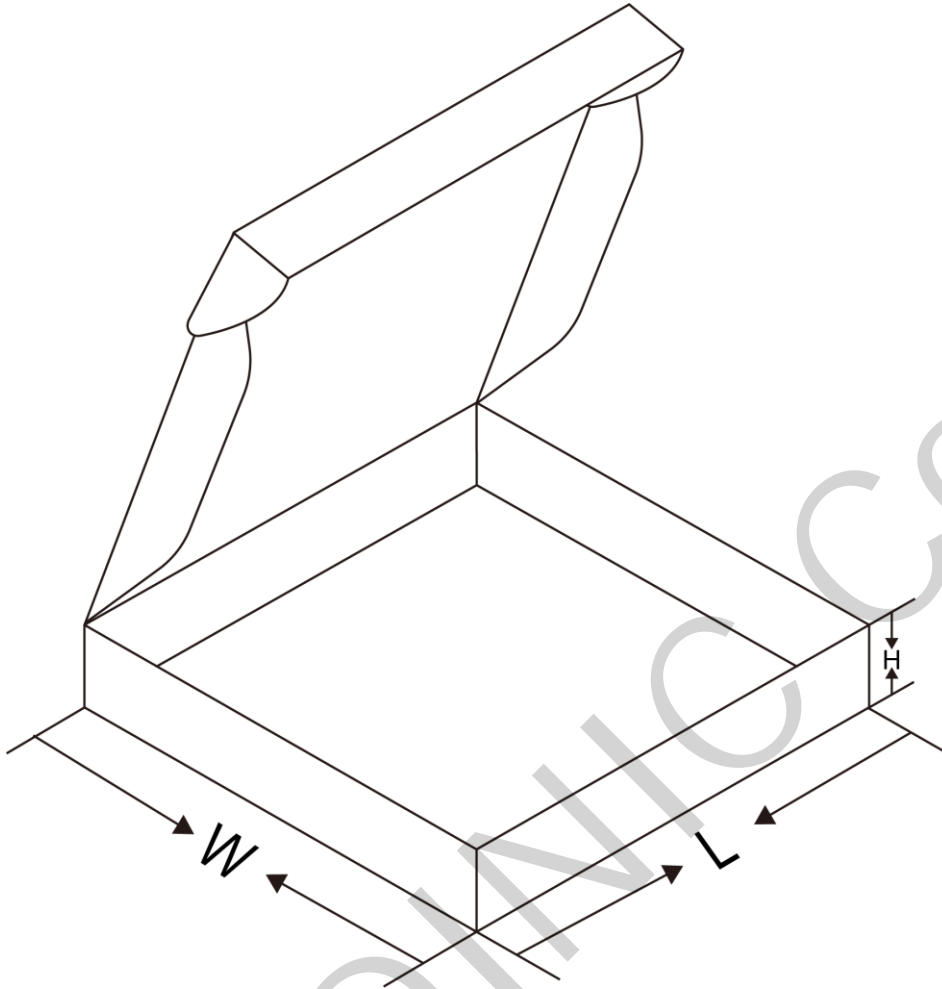
QUADRANT ASSIGNMENT FOR PIN 1 ORIENTATION IN TAPE



*All dimension are normal

IC Type	Package Type	Pins	Standard Pack Quantity	Reel Diameter (mm)	Reel Width (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P (mm)	W (mm)	Pin1 Quadrant
IP2133H	DFN-6L	6	3000k	180	8.6	2.15	2.15	0.88	4.00	8	Q1

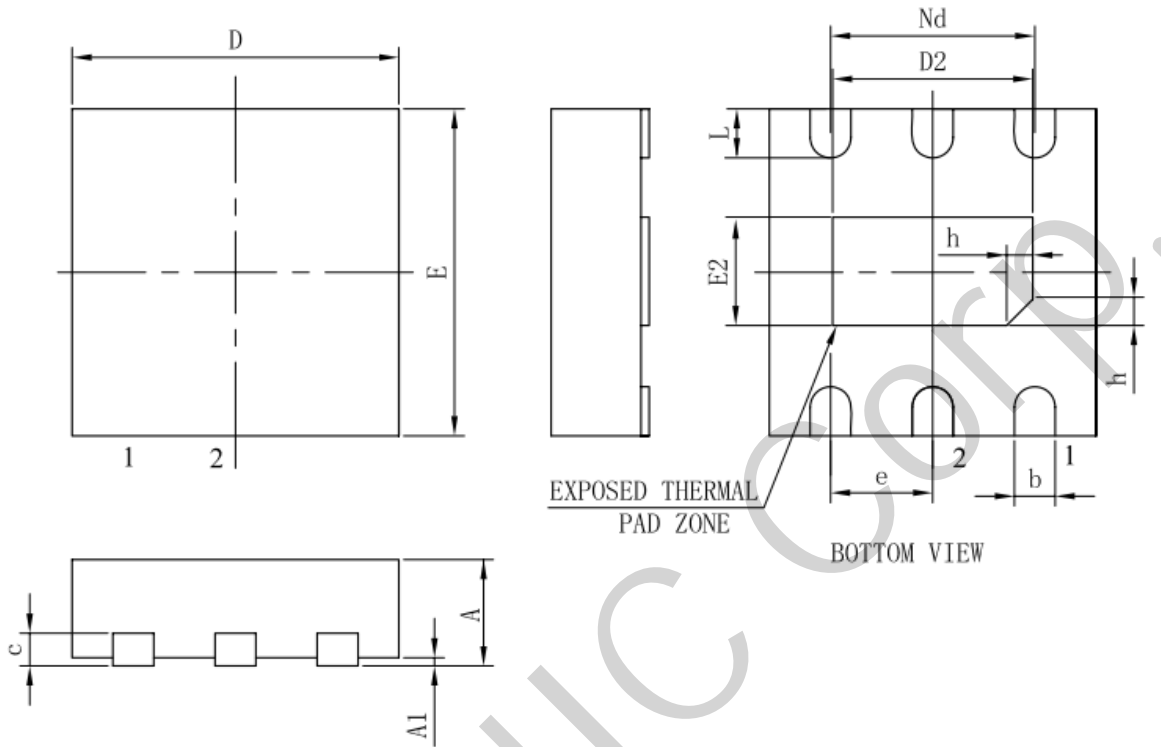
15.2 TAPE AND REEL BOX DIMENSION



*All dimension are normal

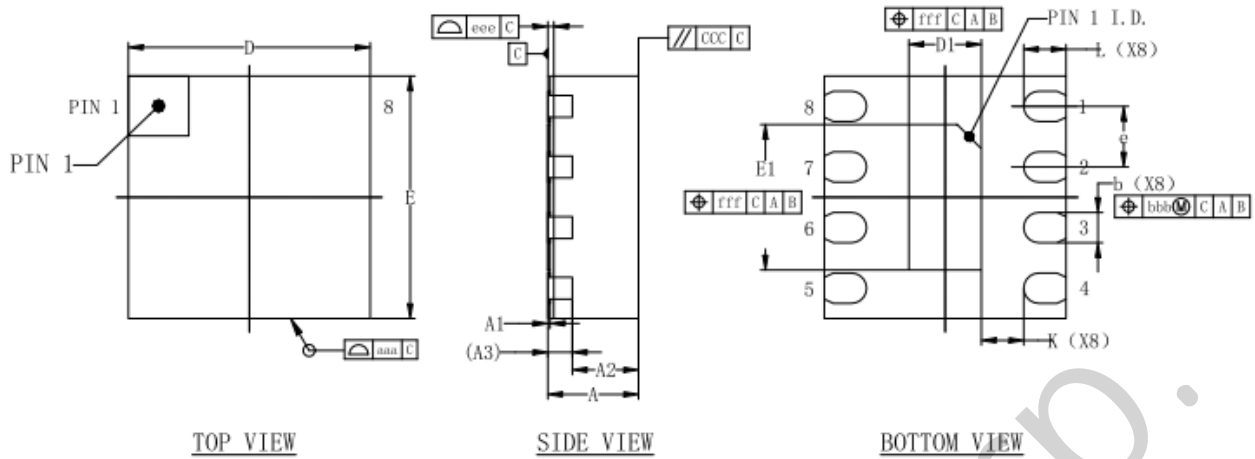
IC Type	Package Type	Pins	Standard Pack Quantity	Length(mm)	Width(mm)	Height(mm)
IP2133H	DFN-6L	6	3000k	210	210	210

15.3 PACKAGE INFORMATION



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	—	0.02	0.05
b	0.25	0.30	0.35
c	0.18	0.20	0.25
D	1.95	2.00	2.05
D2	1.00	1.23	1.45
e	0.65BSC		
Nd	1.30BSC		
E	1.95	2.00	2.05
E2	0.50	0.68	0.85
L	0.25	0.30	0.40
h	0.10	0.15	0.20
载体尺寸 (mil)	63*43		

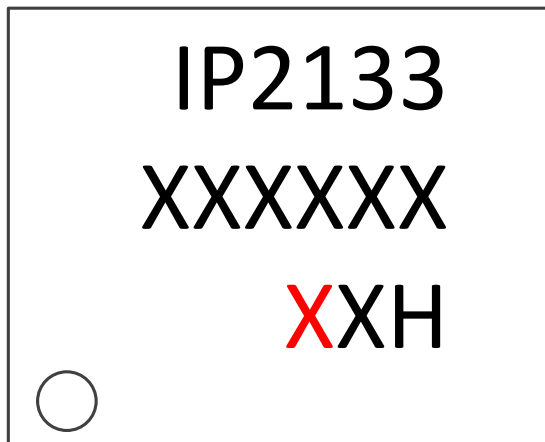
DFN2×2-6L Package



Item		Symbol	Minimum	Normal	Maximum
Body Size	X	D	2.0 BSC		
	Y	E	2.0 BSC		
Exposed Pad Size	X	D1	0.50	0.60	0.70
	Y	E1	1.10	1.20	1.30
Total Thickness		A	0.70	0.75	0.80
Stand Off		A1	0	0.02	0.05
Molding Thickness		A2		0.55	
LF Thickness		A3	0.203 REF		
Lead Width		b	0.20	0.25	0.30
Lead Length		L	0.30	0.35	0.40
Lead Pitch		e	0.5 BSC		
Lead tip to Exposed Pad		K	0.35 REF		
Package Edge Tolerance		aaa	0.10		
Lead Offset		bbb	0.10		
Molding Flatness		ccc	0.10		
Coplanarity		eee	0.05		
Exposed Pad Offset		fff	0.10		

DFN2x2-8L Package

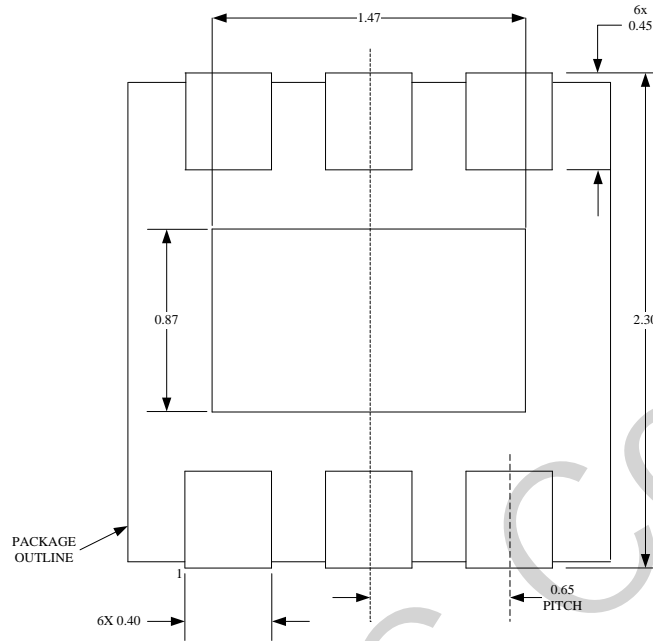
15.4 MARK DESCRIPTION



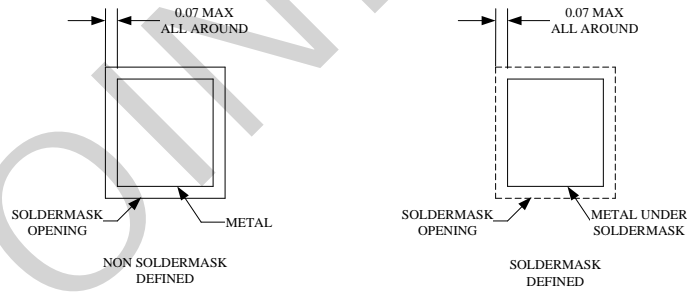
Description:

- (1) IP2133 —— Product Model
- (2) XXXXXX —— Manufacture Number
- (3) XXH —— X takes the last digit of the chip name, X takes the package factory code, H takes the last digit of the product model
- (4) ○ —— pin1 Location

15.5 LAND PATTERN LAYOUT EXAMPLE

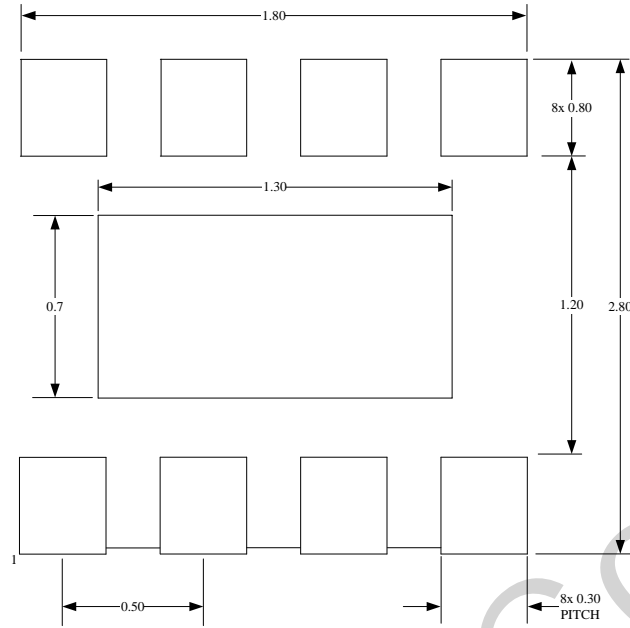


LAND PATTERN EXAMPLE

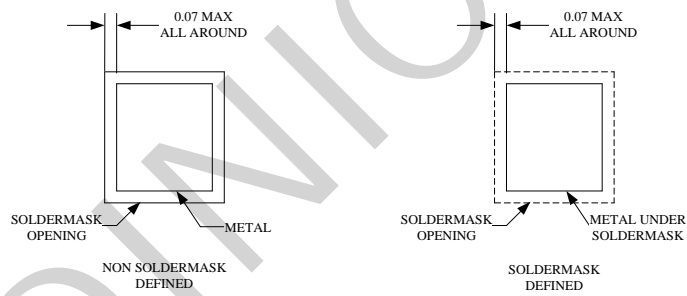


SOLEDR MASK DETAILS

DFN2x2-6L Package



DFN2x2-8L
LAND PATTERN EXAMPLE



SOLDER MASK DETAILS

DFN2x2-8L Package

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