

# TS801/TS802 USB Type-C PD3.0 eMarker

## DESCRIPTION

TS801/TS802 is a USB Type-C eMarker for Cable ID applications. It is compliant with USB Type-C Specification Revision 1.4 and USB Power Delivery 3.0 Specification.

TS801/TS802 can directly support structured VDM identity discovery instructions in USB-PD applications through SOP' instructions, allowing hosts with DFP interfaces to know exactly the characteristics of the cable. The built-in OTP can be programmed through CC line.

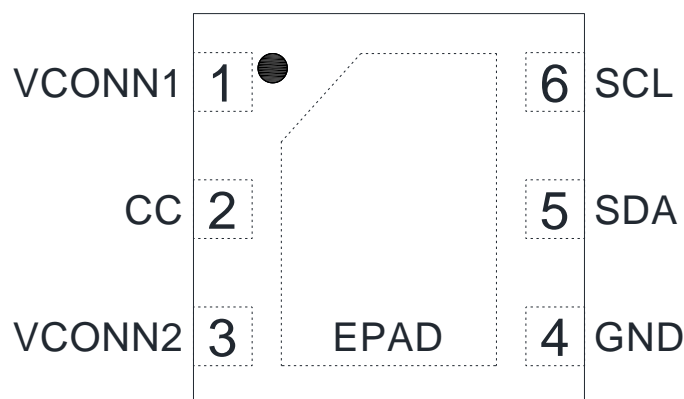
TS801/TS802 operates over a wide supply range of 2.75V to 5.75V. It is rated over the -40 °C to +85 °C temperature range.

## APPLICATION

- USB Type-C Cable

## PACKAGE

- DFN-6L (2x2x0.5)

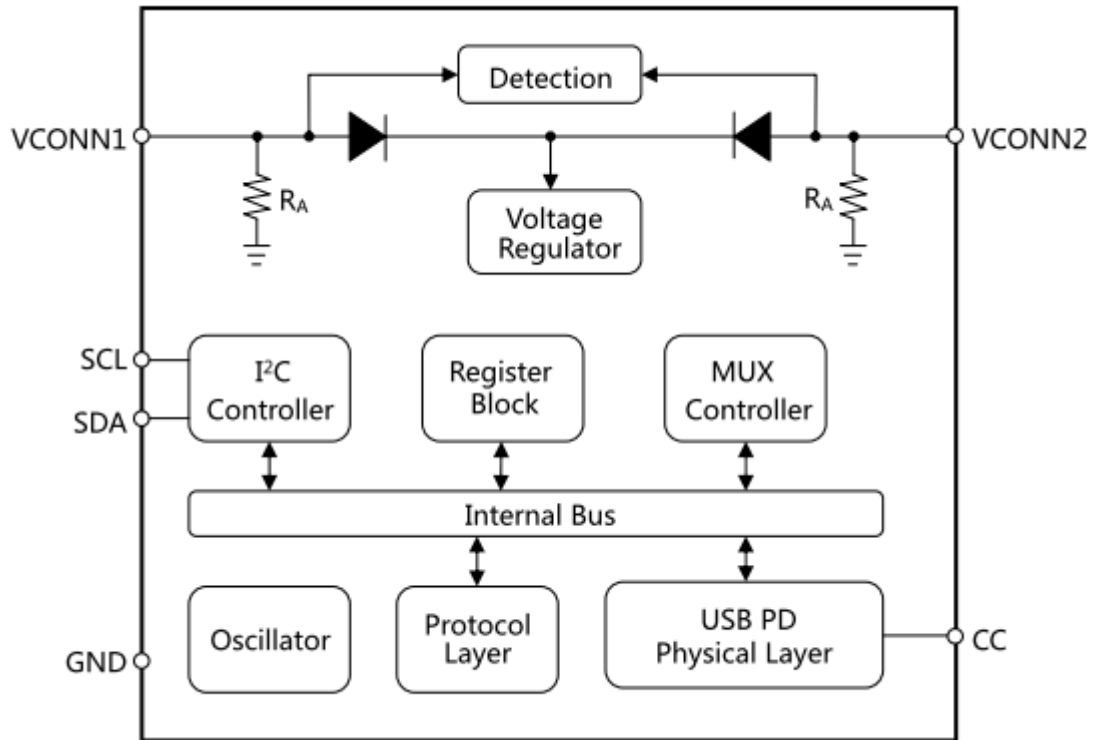


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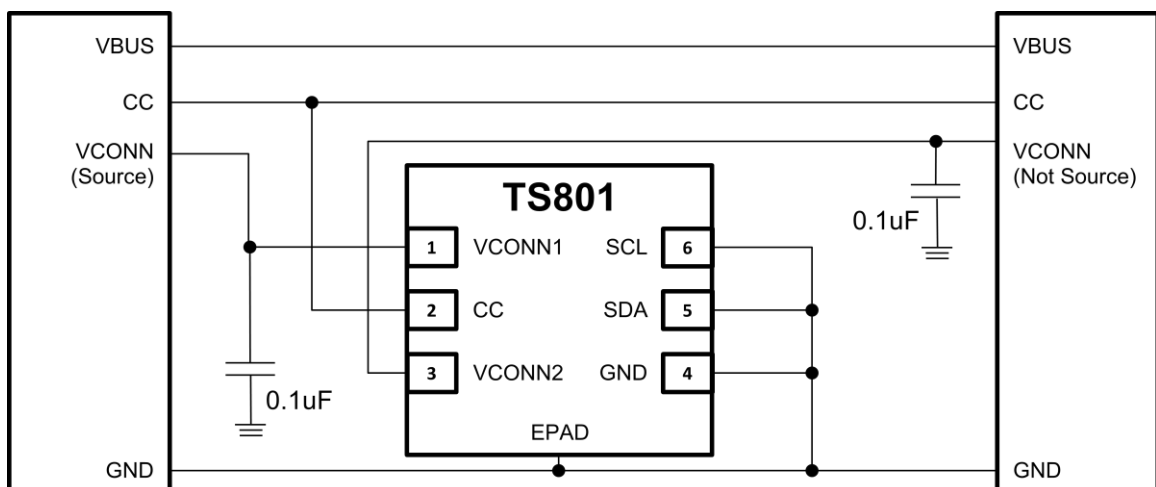
PIN No.	NAME	DESCRIPTION
1	VCONN1	VCONN Input Power Pin1
2	CC	USB Type-C CC line input and output.
3	VCONN2	VCONN Input Power Pin2
4	GND	Ground
5	SDA	Test Pin, please connect to ground
6	SCL	Test Pin, please connect to ground
	EPAD	Ground

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## BLOCK DIAGRAM



## TYPICAL APPLICATION CIRCUIT



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## ABSOLUTE MAXIMUM RATING (T<sub>A</sub>=25°C, unless otherwise specified)

PARAMETER	RATINGS
VCONN1 / VCONN2 / CC	-0.5V to 7V
SDA, SCL, CC to GND	-0.5V to 3.6V
Storage Temperature	-65°C to 150°C
Operation Temperature	-40°C to 85°C
ESD HBM – CC / VCONN1 / VCONN2	± 8KV
ESD HBM – SDA / SCL	± 5KV

Note 1: Stress above conditions may cause permanent damage to the device. Functional operation of this device should be restricted to the conditions described.

## THERMAL DATA

PARAMETER	θ <sub>JA</sub>	θ <sub>Jc</sub>	UNIT
DFN-6L (2mm x 2mm)	45.5	11.7	°C/W

Note 1: θ<sub>JA</sub> is the natural convection junction to ambient thermal resistance.

Note 2: θ<sub>Jc</sub> is the junction to case thermal resistance.

Note 3: About thermal factors, T<sub>A</sub> is the concerned ambient temperature, and

$$\theta_{CA} = \theta_{JA} - \theta_{JC}$$

$$T_J = \theta_{JA} * P_D + T_A$$

$$T_C = \theta_{CA} * P_D + T_A$$

## DISCOVER IDENTITY

The Discover Identity Command ACK sent back by the Responder Shall contain an ID Header VDO, a Cert Stat VDO, a Product VDO and the Product Type VDOs defined by the Product Type as shown in below figure.

Header No. of Data Objects = 4-7 <sup>1</sup>	VDM Header	ID Header VDO	Cert Stat VDO	Product VDO	0..3 <sup>2</sup> Product Type VDO(s)
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1. Only Data objects defined in this specification can be sent as part of the Discover Identity Command.
  2. The following sections define the number and content of the VDOs for each Product Type.
- The Number of Data Objects field in the Message Header in the Discover Identity Command NAK and BUSY responses Shall be set to 1 since they Shall Not contain any VDOs.

# TS801/TS802 USB Type-C PD3.0 eMarker

## VDO Message

ID Header		
Bit (s)	Descriptions	Note
Bit [31]	USB communications capable as USB host: 0b: Otherwise	(Fixed)
Bit [30]	USB communications capable as a USB device: 0b: Otherwise	(Fixed)
Bit [29:27]	Product type (cable plug): 011b: Passive Cable	(Fixed)
Bit [26]	Modal operation supported: 0b: Otherwise	(Fixed)
Bit [25:23]	Product Type (DFP): Reserved, Shall Not be used	(Fixed)
Bit [22:21]	Connector Type: 11b: USB Type-C Plug	(Fixed)
Bit [20:16]	0: Reserved, shall not be used	(Fixed)
Bit [15:0]	16-bit unsigned integer. USB vendor ID (0x30AC)	(Fixed)
Cert Stat VDO		
Bit (s)	Descriptions	Note
Bit [31: 0]	32-bit unsigned integer, XID (0x00002714 = 10004)	(Fixed)
Product VDO		
Bit(s)	Descriptions	Note
Bit [31:16]	16-bit unsigned integer. USB Product ID (0x3001)	(Fixed)
Bit [15:0]	16-bit unsigned integer. bcdDevice (0x0000)	(Fixed)
Passive Cable VDO		
Bit(s)	Descriptions	Note
Bit [31:28]	Cable HW Version	0000b (Fixed)
Bit [27:24]	Cable Firmware Version	0000b (Fixed)
Bit [23:21]	VDO Version	Version number of the VDO (not this specification version): Version 1.0: 000b (Fixed)
Bit [20]	Reserved	0: Reserved, shall not be used (Fixed)
Bit [19:18]	USB Type-C plug to USB Type-C/Captive	00b: Reserved, Shall Not be used 10b: Type-C (Fixed)
Bit [17]	EPR Mode Capable	0: Reserved, shall not be used (Fixed)
Bit [16:13]	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) (Optional)

## TS801/TS802 USB Type-C PD3.0 eMarker

		0101b: 40ns to 50ns (~5m) 0110b: 50ns to 60ns (~6m) 0111b: 60ns to 70ns (~7m)	
Bit [12:11]	Cable Termination Type	00b: VCONN not required. Cable plugs that only support discover identity commands shall set these bits to 00b.	(Fixed)
Bit [10:9]	Maximum VBUS Voltage	Maximum Cable VBUS Voltage: 00b: 20V 01b: 30V 10b: 40V 11b: 50V	(Optional)
Bit [8:7]	Reserved	00b: Reserved, shall not be used	(Fixed)
Bit [6:5]	VBUS Current Handling Capability	00b: Reserved, shall not be used 01b: 3A 10b: 5A 11b: Reserved, shall not be used	(Optional)
Bit [4:3]	Reserved.	Shall be set to 0.	(Fixed)
Bit [2:0]	USB SuperSpeed Signaling support	000b: USB 2.0 only, no SuperSpeed support 001b: [USB 3.2] Gen1 010b: [USB 3.2] Gen1 and Gen2 See [USB Type-C 1.3] for definitions.	(Optional)

# TS801/TS802 USB Type-C PD3.0 eMarker

## ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
BMC Signal (Test Condition: VCONN = 3V to 5.5V)					
Bit Rate	$f_{\text{BitRate}}$	270	300	330	Kbps
Maximum difference between the bit rate during the part of the packet following the Preamble and the reference bit rate.	$\rho_{\text{BitRate}}$	---	---	0.25	%
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	---	---	$\mu\text{s}$
Time before the start of the first Bit of the Preamble when the transmitter shall start driving the line.	$t_{\text{StartDrive}}$	-1	---	1	$\mu\text{s}$
BMC Common Normative (Test Condition: VCONN = 3V to 5.5V)					
Time to cease driving the line after the end of the last bit of the Frame.	$t_{\text{EndDriveBMC}}$	---	---	23	$\mu\text{s}$
Fall Time	$t_{\text{Fall}}$	300	---	---	ns
Rise Time	$t_{\text{Rise}}$	300	---	---	ns
Time to cease driving the line after the final high to low transition	$t_{\text{HoldLowBMC}}$	1	---	---	$\mu\text{s}$
Voltage Swing	$V_{\text{Swing}}$	1.05	1.125	1.2	V
Transmitter Output Impedance	$Z_{\text{Driver}}$	33	---	75	$\Omega$
Transmit Low Voltage		-75	---	75	mV
BMC Receiver Normative (Test Condition: VCONN = 3V to 5.5V)					
Cable Termination	$R_A$	800	---	1200	$\Omega$
Receiver Input Impedance	$Z_{\text{BmcRx}}$	1	---	---	M $\Omega$
Time Window for Detecting Bus Non-idle	$t_{\text{TransitionWindow}}$	12	---	20	$\mu\text{s}$
Number to Count to Detect Bus Non-idle	$n_{\text{Count}}$	3	---	---	
Time constant of a single pole filter to limit broad-band noise ingress	$t_{\text{RxFilter}}$	100	---	---	ns
General Parameters					
VCONN1/VCONN2 Voltage	$V_{\text{CONN}}$	2.75	5	5.75	V

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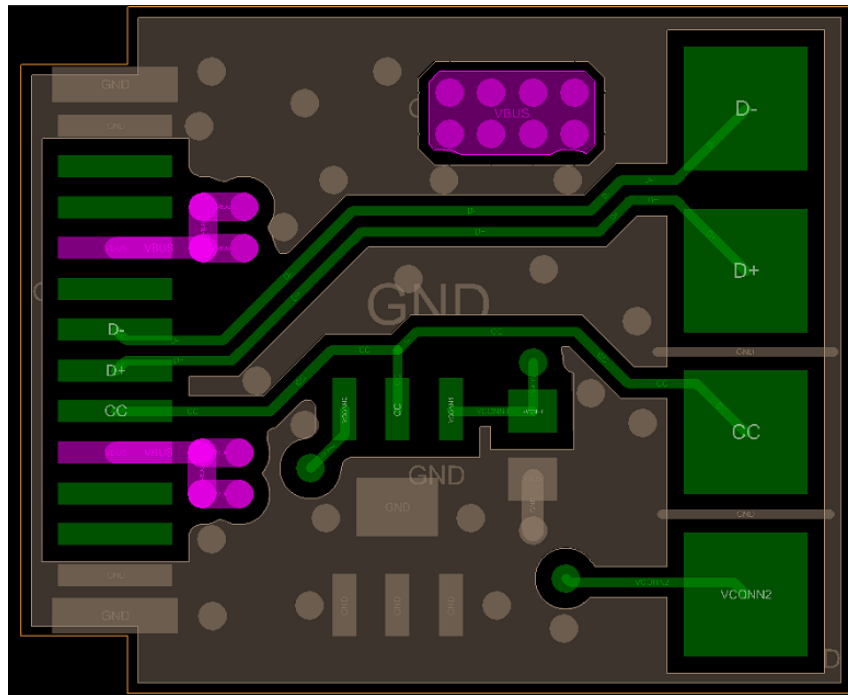
Operation Current (VCONN = 5V)	$I_{OP}$	---	4	---	mA
Standby current (VCONN = 5V)	$I_{standby}$	---	1.6	---	mA
Operating Junction Temperature	$T_J$	-40	---	125	°C
Operating Ambient Temperature	$T_A$	-40	---	85	°C



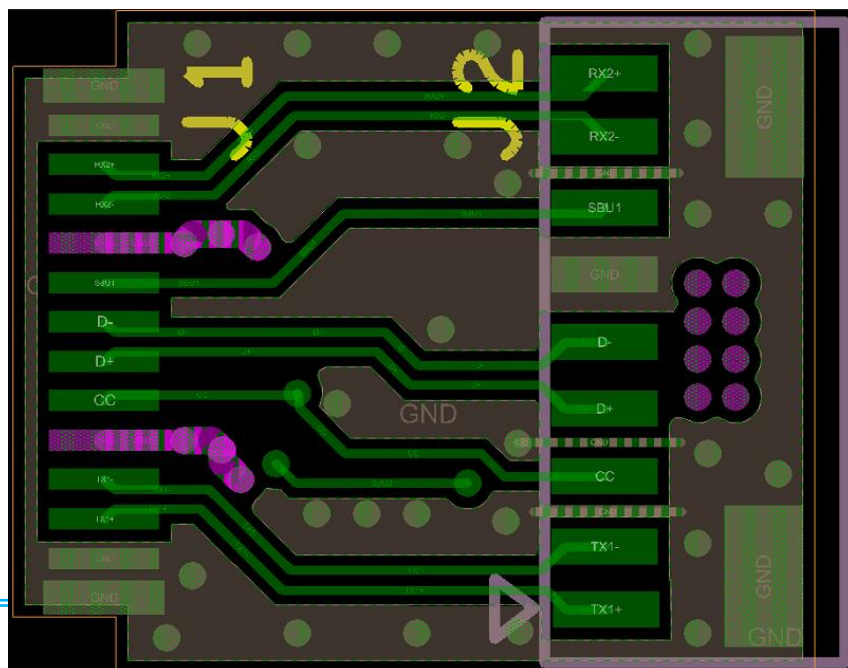
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## PCB Layout Reference

(a) 6 pins charge board



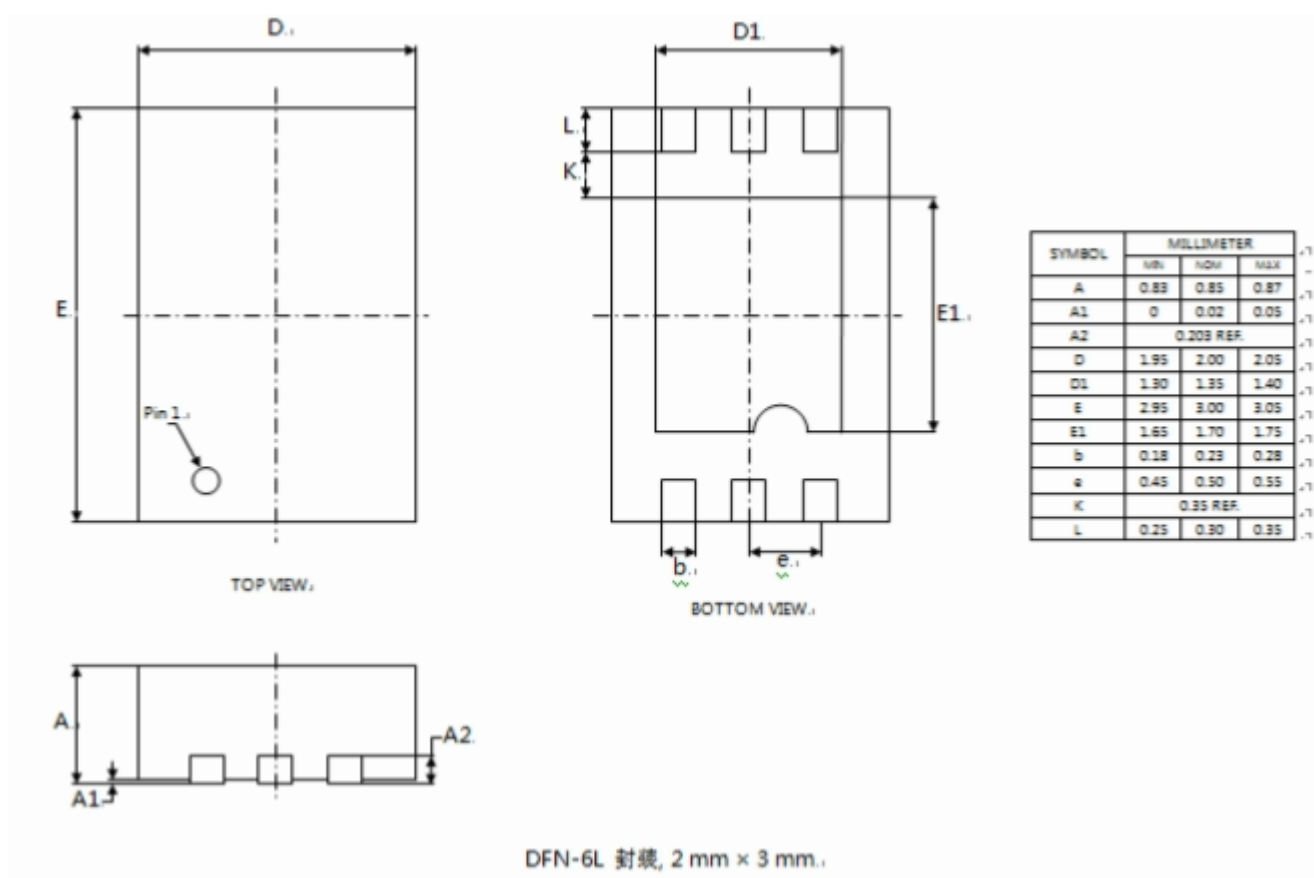
(b) 24 pins full-function board



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## PACKAGE INFORMATION

### ➤ DFN-6L (TS801)

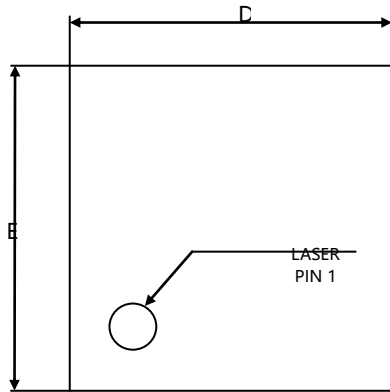


## Order Indication

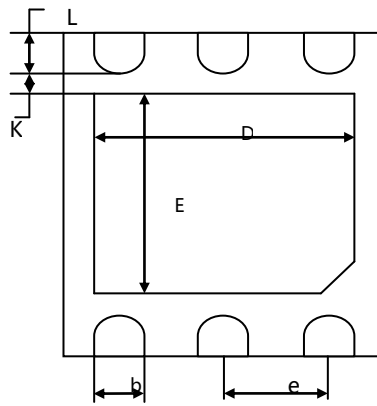
Serial No.	Description	Temperature	Package
TS801A	USB2.0, 1M~2M cable, 5A, VBUS=20V, DFN-6L package	-40°C to +85°C	Tape & Reel, 4000
TS801B	USB3.2 Gen 1, 1M~2M cable, 5A, VBUS=20V, DFN-6L package	-40°C to +85°C	Tape & Reel, 4000
TS801C	USB3.2 Gen 2, 1M~2M cable, 5A, VBUS=20V, DFN-6 L package	-40°C to +85°C	Tape & Reel, 4000

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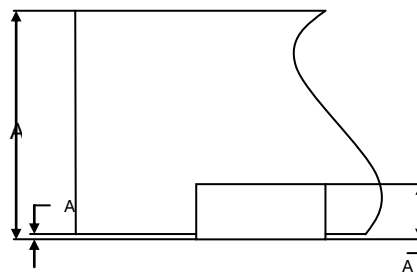
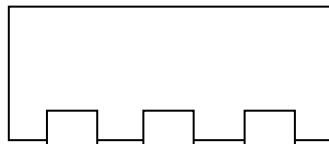
## DFN-6L (TS802)



TOP



BOTTOM VIEW



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.45	0.50	0.55
A1	0	0.02	0.05
A2	0.127 REF.		
b	0.25	0.3	0.35
D	1.95	2.00	2.05
D2	1.58	1.6	1.62
E	1.95	2.00	2.05
E2	1.28	1.3	1.32
e	0.65 REF.		
K	0.35 REF.		
L	0.2	0.25	0.3

DFN-6L 封装. 2 mm × 2 mm

## Order Indication

Serial No.	Description	Temperature	Package
TS802A	USB2.0, 1M~2M cable, 5A, VBUS=20V, DFN-6L package	-40°C to +85°C	Tape & Reel, 4000
TS802B	USB3.2 Gen 1, 1M~2M cable, 5A, VBUS=20V, DFN-6L package	-40°C to +85°C	Tape & Reel, 4000
TS802C	USB3.2 Gen 2, 1M~2M cable, 5A, VBUS=20V, DFN-6L package	-40°C to +85°C	Tape & Reel, 4000