

Data Sheet

Type Description : Universal USB Charger ID with Qualcomm® Quick Charge™ 2.0/3.0 and FCP

Product Name : EST5398B

Reversion : V1.0

Reversion Date : May, 2016

Page : 9 Pages



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LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify EST for any damages resulting from such improper use or sales.

GENERAL DESCRIPTION

The EST5398B is low-cost USB Dedicated Charger Identification Circuit IC which is so smart to recognize most of the mainstream handheld devices. It allows devices to draw current as much as using as the original adapter. The EST5398B can support most of the USB Battery Charging Specification world-wide including BC1.2, Hisillicon FCP (Fast Charging Protocol), Apple® charging spec (for i-Pad & i-Phone) and spec for Samsung Galaxy Tab. Apple Inc. has upgraded its charger output capacity for tablets to 12W output (maximum 2.4A @ 5V). By setting the USB data pins (D+/D-) to the required voltage levels, the charging devices

will recognize their required voltage levels, and starts to draw the suitable current to charge.

The EST5398B also supports USB high-voltage dedicated charging port (HVDCP) interface IC for the Qualcomm Quick Charge™ 2.0 specification, and also compatible with Qualcomm® Quick Charge™ 3.0 Specification. Quick Charge 3.0 employs Intelligent Negotiation for Optimum Voltage (INOV), an algorithm which allows your portable device to determine what power level to request at any point in time, enabling optimum power transfer while maximizing efficiency. It also supports wider voltage options, allowing a mobile device to dynamically adjust to the ideal voltage level supported by that specific device.

Specifically, Quick Charge 3.0 offers a more granular range of voltages: 200mV increments, from 3.6V to 20V. That way your phone can target one of dozens of power levels. The EST5398B supports the full output voltage range of either Class A or Class B. The EST5398B automatically detects whether a connected Powered Device is QC 3.0/2.0 capable before enabling output voltage adjustment. If a Powered Device not compliant to QC 3.0/2.0 is detected the EST5398B disable the output voltage adjustment to ensure the safe operation with legacy 5V.

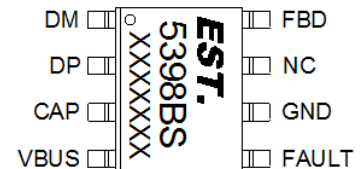
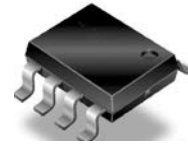
The EST5398B supports over voltage protection (OVP) and internal discharge function. When the output voltage exceeds 20% tolerance of the requested voltage after 40µs or the discharge function is failed, the FAULT# pin will show the pull down signal for shutting down the external power IC. HVEN pin can disable high voltage such as FCP & QC2.0/3.0. The user could light up LED for high voltage protocol such as QC2.0/3.0 & FCP and could also change QC Class A or Class B via pin 2 HV_ST#.

The EST5398B is suitable for all charger products with USB interface. It provides enhanced ESD protection on the DP and DM with the SOP8L package. It requires minimum external components, which can reduce develop & production cost dramatically

FEATURE LIST

- Fully Supports Qualcomm® Quick Charge™ 3.0 (INOV) Specification.
Class A: 3.6V~12 V Output Voltage. Class B: 3.6V~ 20 V Output Voltage.
0.2V for each step.
- Compatible with Qualcomm® Quick Charge™ 2.0 (HVDCP) Specification.
Class A: 5 V, 9 V, 12 V Output Voltage. Class B: 5 V, 9 V, 12 V, and 20 V Output Voltage.
- Support YD/T 1591-2009 Charging Spec.
- Support 2.4A Apple® Devices Fast Charging.
- Support Hisillicon FCP fast charging protocol.
Default 5V~9V, 0.5V/step & 12V. 5V/9V/12V.
- USB Battery Charging Specification Revision 1.2 (BC 1.2) Compatible.
Automatic USB DCP shorting D+ to D- line. Default 5V mode operation.
- Low power consumption.
- Support over voltage protection (OVP) and internal discharge function by FAULT# pin.
- Support HVEN pin can disable high voltage such as FCP & QC2.0/3.0.
- Support HV_ST# Pin for lighting indicator when get into QC 2.0/3.0 Specification.
- Support HV_ST# Pin to select QC3.0/2.0 Specification Class A (default) or Class B.
- High ESD Protection on DP/DM.
- Support Samsung Galaxy tab Devices Charging.

PIN CONFIGURATION



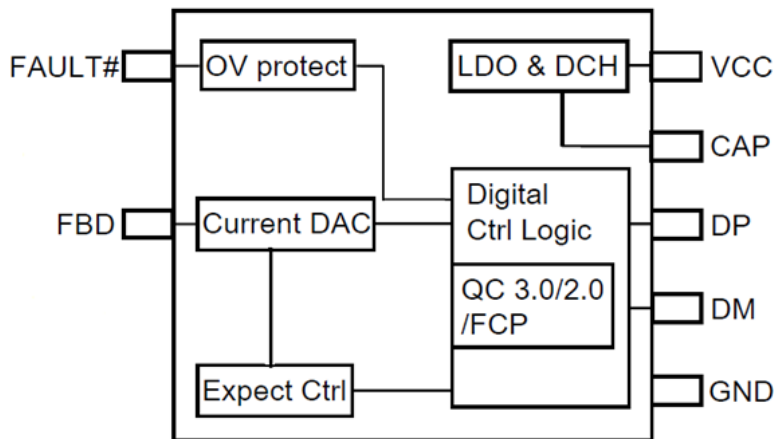
SOP-8L

ORDERING INFORMATION

Part Number	Package Type	Production Flow
EST5398BS	SOP-08L	-40°C to +85°C*

*Design Guarantee: The device is guaranteed to meet the specifications from 0°C to 70°C. Specifications over the -40°C to 85°C operating temperature range are assured by design, characterization and correlation with the statistical process controls.

BLOCK DIAGRAM



PIN DESCRIPTION

Pin No.	Pin Name	Type	Description
1	DM	AIO	USB negative data-channel to external USB device.
2	DP	AIO	USB positive data-channel to external USB device.
3	CAP	AO	Internal Power 3.0V, connect this pin with 0.1uF capacitor directly to GND.
4	VCC	P	Power Supply; Maximum: 24V.
5	FAULT#	OD	FAULT# signal pin. Below two conditions lead this pin to be activated: Over voltage protection, OVP: The output voltage exceeds 20% tolerance of the requested voltage. Internal Discharge Function: During the high to low voltage's request, the output voltage exceeds 20% tolerance of the requested voltage. This FAULT# status is clear when CAP pin is < 2.0V. ※If this function does not required, please leave this pin floating.
6	GND	P	Ground.
7	NC	--	---
8	FBD	OD	Feedback Drive Pin or current control pin (2uA/step) for setting the correct charging voltage along with the external power chip.

- OD - Open-drain output pin
- IN - Input pin
- AIO - Analog Input/Output pin
- P - Power



ELECTRICAL CHARACTERISTICS REQUEST

Absolute Characteristics Request

PARAMETER	SYMBOL	RATINGS	UNIT
FAULT# , HV_ST# , HVEN,COMP_DIS, FBD , DM, DP Pin Voltage		-0.3 to 5	V
DM, DP, HVEN , COMP_DIS Pin Current		1	mA
CAP Pin Voltage		-0.3 to 5	V
CAP Pin Current		25	mA
VCC Pin Voltage		-0.3 to 25	V
VCC Pin Current		0.5	mA
Maximum junction temperature (plastic package)	Tj	+150	°C
Maximum storage temperature	TSTO	-65 ~ +150	°C
Moisture Sensitivity Level	MSL	LEVEL 3	
Operating Temperature*		-40 to +85	°C
Maximum lead temperature (soldering 10s)		+260	°C

Note: If ICs are stressed beyond the limits listed in the “absolute maximum ratings”, they may be permanently destroyed. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

***Design Guarantee:** The device is guaranteed to meet the specifications from 0 over the -40 with the statistical process controls.

C to 70
 C to 85

DC and AC electrical characteristics

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
POWER SUPPLY						
Operating power supply	V _{CC}		3.6		24	V
Supply current	I _{CC}	V _{CC} = 5V		160		uA
ANALOG SWITCH						
Analog signal range	V _{DP} , V _{DM}		0		5	V
On Resistance of DP/DM short	R _{SHORT}	DP=1V, DM=20Kohm		20	40	Ω
HVDCP/ HVDCP+(Continuous mode)						
20V output inhibit threshold	V _{INH}		V _{CAP} -0.3			V
Data detect voltage	V _{DAT_REF}		0.25	0.325	0.4	V
Output voltage selection reference	V _{SEL_REF}	2.0V reference for selecting voltage	1.8	2	2.2	V
Data line leakage	R _{DAT_LKG}			450		KΩ



D- pull down resistance	R _{DM_DWN}			20		KΩ
D+ to D- resistance during DCP mode	R _{DCP_DAT}			20		Ω
D- low glitch filter time	T _{D-_L_GLITCH}		1			ms
D+ high glitch filter time	T _{GLITCH_BC_DONE}	After BC detection, HVDCP	1000	1250	1500	ms
Output Voltage Glitch Filter Time	T _{V_CHANGE}		20	40	60	ms
Continuous mode Glitch Filter Time	T _{GLITCH_CONT_CHANGE}		100		200	ms
Time for VBus to discharge to 5V	T _{UNPLUG}				500	ms
Time for Type-C VBus to discharge to 5V	T _{UNPLUG_C}				275	ms
Hisilicon FCP Protocol						
FCP input high voltage	V _{FCP_IH}		1.4			V
FCP input low voltage	V _{FCP_IL}				1.0	V
FCP output high voltage	V _{FCP_OH}		0.85*3			V
FCP output low voltage	V _{FCP_OL}				0.4	V

TOP MARKING SPECIFICATION



- ← EST Logo
- ← Device Name
- ← XXXX : Trace Code
- Y : Year
- XX : Weeks



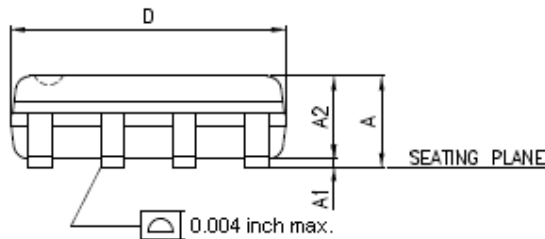
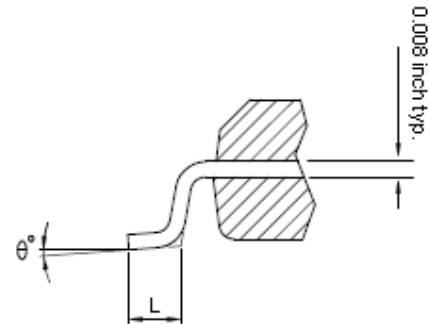
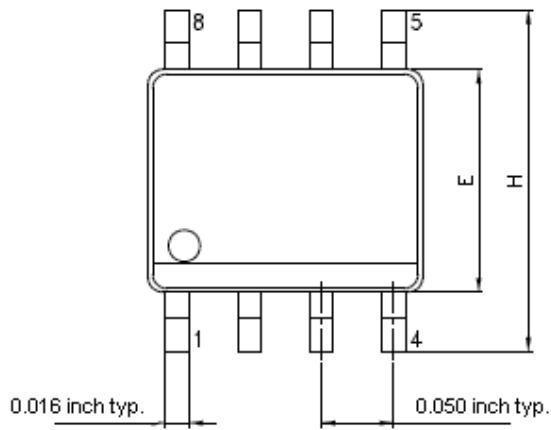
CAUTION

This integrated circuit has been designed carefully in the ESD protection ability. Failure to observe proper handling and installation procedures may cause damage. Recommend that all integrated circuits should be handled with appropriate precautions.

PACKAGE OUTLINES

Small Outline Package
UNIT : inch

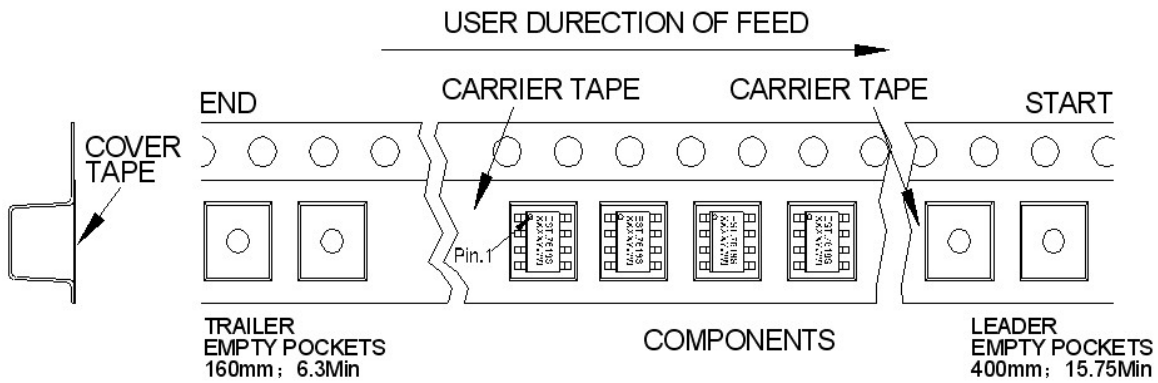
PACKAGE DIMENSIONS
SOP 8



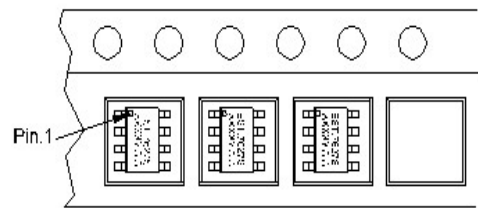
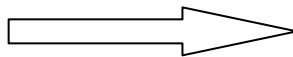
Symbols	Dimensions In Inches			Dimensions In millimeters		
	MIN.	NOR.	MAX.	MIN.	NOR.	MAX.
A	0.050	0.061	0.072	1.270	1.549	1.829
A1	0.000	-----	0.010	0.000	-----	0.254
A2	-----	-----	0.062	-----	-----	1.575
D	0.185	0.193	0.200	4.699	4.902	5.080
E	0.147	0.154	0.160	3.734	3.912	4.064
H	0.225	0.237	0.249	5.715	6.020	6.325
L	0.013	0.033	0.053	0.330	0.838	1.346
θ	0°	4°	8°	0°	4°	8°

Shipping packing :

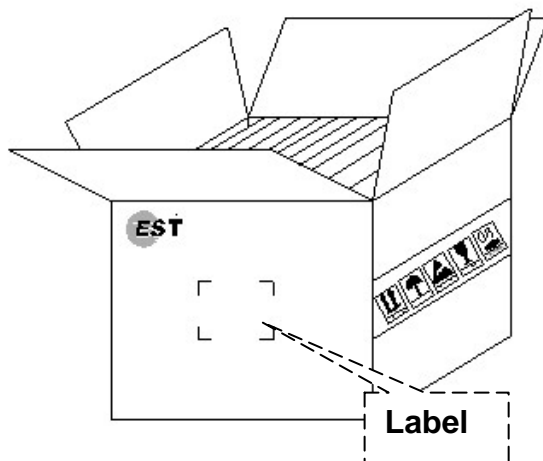
★SOP-8 tape & Reel:



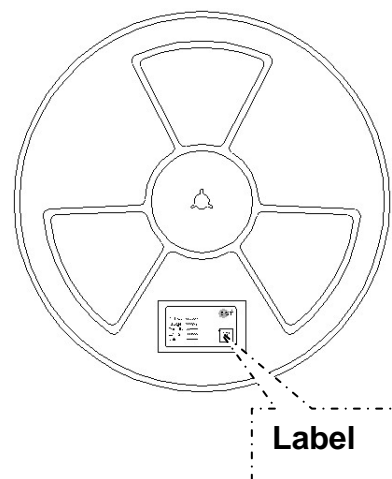
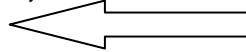
1Pc / device



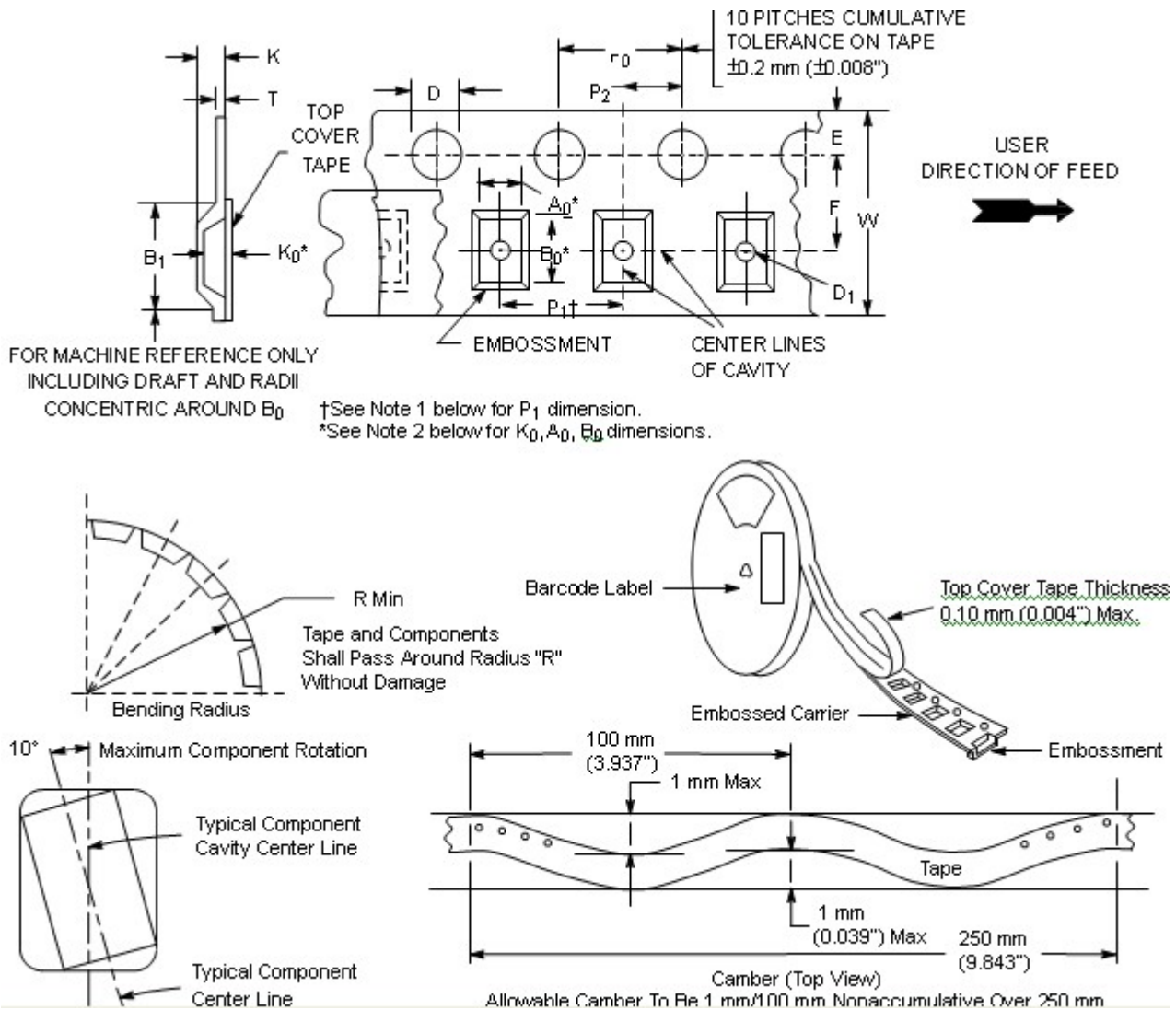
2500 devices / Reel



12 Reel / Carton
(30,000Pcs / Carton)



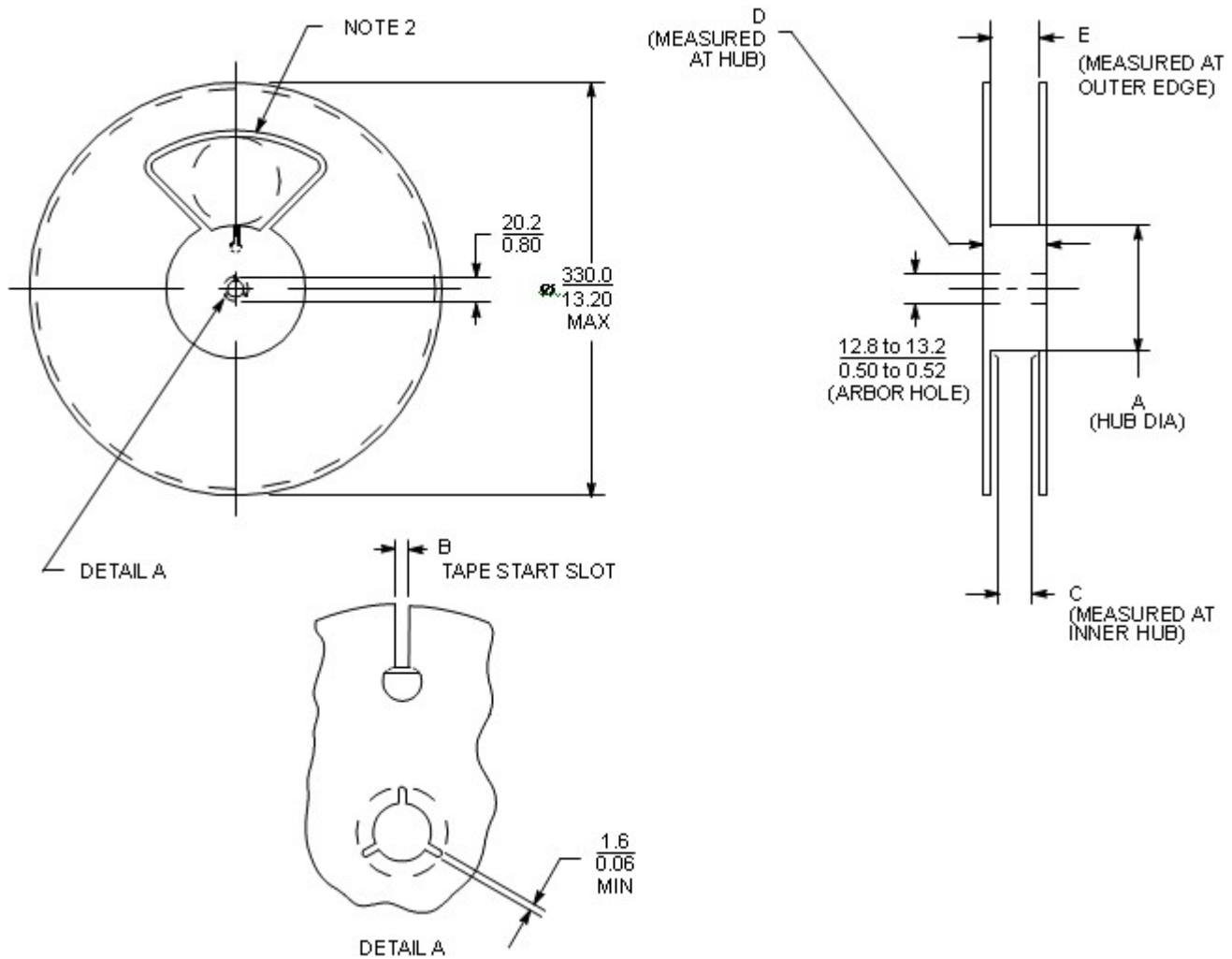
EMBOSSED TAPE AND REEL DATA CARRIER TAPE SPECIFICATIONS



DIMENSIONS

Tape	B ₁ Max (Note 1)	D	D ₁	E	F	K	P ₀	P ₂	R Min	T Max	W Max
8 mm	4.55 mm (0.1793)	1.5 + 0.1 mm - 0.0 (0.059 + 0.0043 - 0.0)	1.0 Min (0.0393) or 0.5 mm Min (0.0203)	1.75 ± 0.1 mm (0.069 ± 0.0043)	3.5 ± 0.05 mm (0.138 ± 0.0023)	2.4 mm Max (0.0943)	4.0 ± 0.1 mm (0.157 ± 0.0043)	2.0 ± 0.1 mm (0.079 ± 0.0023)	25 mm (0.983)	0.6 mm (0.0243)	8.3 mm (0.3273)
12 mm	8.2 mm (0.3233)		1.5 mm Min (0.0603)		5.5 ± 0.05 mm (0.217 ± 0.0023)	6.4 mm Max (0.2523)					12 ± 0.30 mm (0.470 ± 0.0123)
16 mm	12.1 mm (0.4763)		7.5 ± 0.10 mm (0.295 ± 0.0043)		7.9 mm Max (0.3113)	16.3 mm (0.6423)					
			11.5 ± 0.1 mm (0.453 ± 0.0043)		11.9 mm Max (0.4683)	24.3 mm (0.9573)					

REEL DIMENSIONS



Reel	Tape	A		B		C		D	E
		Min	Max	Min	Max	Min	Max		
178.0 (7.01)	16.0 (0.63)		50.0 (1.97)	6.5 (0.26)	7.5 (0.30)	16.4 (0.65)	18.4 (0.72)	22.4 (0.88)	19.4 (0.76)
330.0 (12.99)	12.0 (0.47)	178.0 (7.01)		4.5 (0.18)	5.5 (0.22)	12.4 (0.49)	14.4 (0.57)	18.4 (0.72)	15.4 (0.61)
330.0 (12.99)	56.0 (2.20)	150.0 (5.91)		10.0 (0.39)	11.0 (0.43)	56.4 (2.22)	58.4 (2.30)	62.4 (2.46)	59.4 (2.34)
330.0 (12.99)	44.0 (1.73)	100.0 (3.94)		10.0 (0.39)	11.0 (0.43)	44.4 (1.75)	46.4 (1.83)	62.4 (2.46)	47.4 (1.87)
330.0 (12.99)	32.0 (1.26)	100.0 (3.94)		10.0 (0.39)	11.0 (0.43)	32.4 (1.28)	34.4 (1.35)	38.4 (1.51)	35.4 (1.39)
330.0 (12.99)	24.0 (0.94)	60.0 (2.36)		9.5 (0.37)	10.5 (0.41)	24.4 (0.96)	26.4 (1.04)	30.4 (1.51)	27.4 (1.08)
330.0 (12.99)	16.0 (0.63)			6.5 (0.26)	7.5 (0.30)	16.4 (0.65)	18.4 (0.72)	22.4 (0.88)	19.4 (0.76)
330.0 (12.99)	12.0 (0.47)			4.5 (0.18)	5.5 (0.22)	12.4 (0.49)	14.4 (0.57)	18.4 (0.72)	15.4 (0.61)
330.0 (12.99)	8.0 (0.31)	50.0 (1.97)		2.5 (0.10)	3.5 (0.14)	8.4 (0.33)	9.9 (0.39)	14.4 (0.57)	10.9 (0.43)
178.0 (7.01)	12.0 (0.47)	50.0 (1.97)		4.5 (0.18)	5.5 (0.22)	12.4 (0.49)	14.4 (0.57)	18.4 (0.72)	15.4 (0.61)
178.0 (7.00)	8.0 (0.31)	50.0 (1.97)		2.5 (0.10)	3.5 (0.14)	8.4 (0.33)	9.9 (0.39)	14.4 (0.47)	10.9 (0.43)
330.0 (12.99)	8.0 (0.31)	50.0 (1.97)		4.0 (0.16)	5.0 (0.20)	8.4 (0.33)	9.9 (0.39)	14.4 (0.57)	10.9 (0.43)
178.0 (7.00)	8.0 (0.31)	50.0 (1.97)		4.0 (0.16)	5.0 (0.20)	8.4 (0.33)	9.9 (0.39)	14.4 (0.57)	10.9 (0.43)

EST.5398B

Universal USB Charger ID with Qualcomm® Quick Charge™ 2.0/3.0 and FCP



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