

### ■ DESCRIPTION

The  $\overline{D+}/\overline{D-}$  monitors the Type-C Configuration Channel (CC) lines to determine when an USB device is attached. If a sink device is attached, the HM8312M applies power to VBUS through the P-MOSFET. When the sink device is removed, the switch will be turned off and discharge the VBUS to safe voltage.

Due to integrated auto-detect and auto-switch circuitry, the HM8312M can apply correct electrical signatures automatically on the USB data lines to charge compliant devices among Apple, Samsung and BC1.2 DCP modes.

The HM8312M can switch off P-MOSFET in order to protect the equipment when the supply power increased to 6.5V or the temperature of Type-C connector is up to limit setting by NTC resistor.

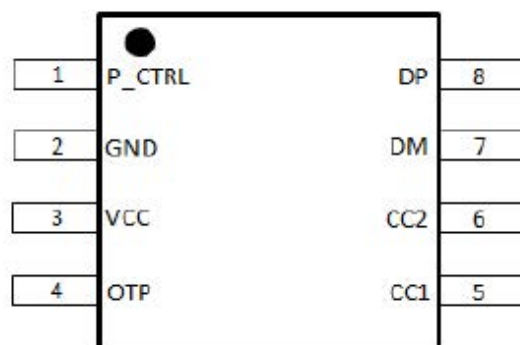
### ■ FEATURES

- Operating voltage range: 4.5V to 7V
- Over temperature protection in case dust contamination on Type-C connector
- Over voltage protection on input source
- UFP indicator for USB Type-C while sink attached
- USB Type-C Rev. 1.2 compliant source controller
  - Supports 3A current advertisement
- Supports smart detection on D+ and D- lines
  - Battery Charging specification BC1.2 for DCP
  - Chinese Telecommunication industrial standard YD/T 1591-2009
  - D+/D- option for Apple device 2.4A mode
  - D+/D- option for Samsung device
- 8KV HBM ESD rating on USB port pins
- Available in MSOP8 package

### ■ APPLICATIONS

- USB Wall Adapters
  - USB Car Chargers
  - Power Banks
  - USB Peripherals
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### TYPICAL APPLICATION



PIN	NAME	IP TYPE	DESCRIPTION
1	P_CTRL	Input	Control the gate of PMOS, while sink attached, P_CTRL being low
2	GND	Power	Ground of chip
3	VCC	Power	Input pin with 4.7μF capacitor to ground
4	OTP	Input	Over temperature protection
5	CC1	I/O	CC1 pin connected to Type-C connector directly
6	CC2	I/O	CC2 pin connected to Type-C connector directly
7	DP	I/O	D+ pin connected to Type-C connector directly
8	DM	I/O	D- pin connected to Type-C connector directly

### ORDER/MARKING INFORMATION

Order Information	Top Marking
<p>HM8312 M X</p> <p>Product Number</p> <p>Package M: MSOP8</p> <p>Packing R: Tape Reel</p>	<p>YY: Year (15=2015, 16=2016,...)</p> <p>WW: Weekly (01-54)</p>

## ■ ABSOLUTE DC MAXIMUM RATINGS (at $T_A = 25^{\circ}\text{C}$ )

Characteristics		Symbol	Rating	Unit
Supply voltage range		VCC	-0.3 ~ 10	V
Input voltage range (HC)		V <sub>IO</sub>	-0.3 ~ 6	V
While DPDM shorted, source current from DP to DM		I <sub>DPDM</sub>	10	mA
Electrostatic discharge	DP, DM, CC1, CC2	V(ESD)	8	KV
	Others		4	KV
Storage temperature		T <sub>stg</sub>	-45 ~ 125	°C

## ■ RECOMMENDED OPERATION CONDITIONS

Characteristics	Symbol	Rating	Unit
Supply voltage range	VCC	4.5 ~ 7	V
Free air temperature	T <sub>A</sub>	-40 ~ 85	°C

## ■ ELECTRICAL CHARACTERISTICS

Symbol	Descriptions	Test conditions	Min.	Typ.	Max.	Unit
I <sub>VIN</sub>		V <sub>EN</sub> =V <sub>CC</sub> =5V, no device attached		100		μA
I <sub>VIN_ON_ACTI</sub> V <sub>E</sub>		V <sub>EN</sub> =V <sub>CC</sub> =5V, CC1=5.1kΩ, OTP=12kΩ, in divider mode		500		μA
R <sub>GPO</sub>	GPO pull down resistance	V <sub>CC</sub> =5V		5		kΩ
V <sub>IH</sub>	High voltage	I=1mA	VCC-0.3			V
U <sub>UVLO</sub>	VCC UVLO threshold voltage	VCC rising		4		V
	VCC UVLO hysteresis	VCC falling hysteresis		0.3		V
V <sub>OVP</sub>	VCC OVP threshold voltage	VCC rising				
	VCC OVP hysteresis	VCC falling hysteresis				
I <sub>OTP</sub>	OTP Pin Source Current			130		μA
V <sub>OTP_DET</sub>	Over temperature threshold			0.9		V
	Over temperature threshold hysteresis			0.2		V

Symbol	Descriptions	Test conditions	Min.	Typ.	Max.	Unit
$T_{OTP\_DEB}$	OVP Temperature Deglitch time			138		$\mu s$
$I_{CC\_3A0}$	Detection current from CC		303	330	357	$\mu A$
$t_{ccdebounce}$	Time a port shall wait before it can determine sink is attached and P_CTRL goes to low			135		ms
<b>DIVIDER MODE</b>						
$V_{DP\_2V7}$	DP output voltage	$V_{IN}=5V$	TBD	2.7	TBD	V
$V_{DM\_2V7}$	DM output voltage	$V_{IN}=5V$	TBD	2.7	TBD	V
$R_{DP\_2V7}$	DP output resistance	$I_{DP}=-5\mu A$		26.4		k $\Omega$
$R_{DM\_2V7}$	DM output resistance	$I_{DM}=-5\mu A$		26.4		k $\Omega$
<b>1.2V/1.2V MODE</b>						
$V_{DP\_1V2}$	DP output voltage	$V_{IN}=5V$		1.2		V
$V_{DM\_1V2}$	DM output voltage	$V_{IN}=5V$		1.2		V
$R_{1V2\_GND}$	DP/ DM output resistance	$I_{DP}=-5\mu A$		80		k $\Omega$
<b>BC1.2 DCP MODE</b>						
$R_{short\_DPDM}$	DP and DM short resistance	$V_{DP}=0.8V, I_{DM}=1mA$		100		$\Omega$
$R_{DCP\_GND}$	Resistance between DP/DM and GND	$V_{DP}=0.8V$		650		k $\Omega$
$V_{DPL\_DETACH}$	Voltage on DP while device goes back to divider mode			0.33		V

## ■ TYPICAL APPLICATION CIRCUIT

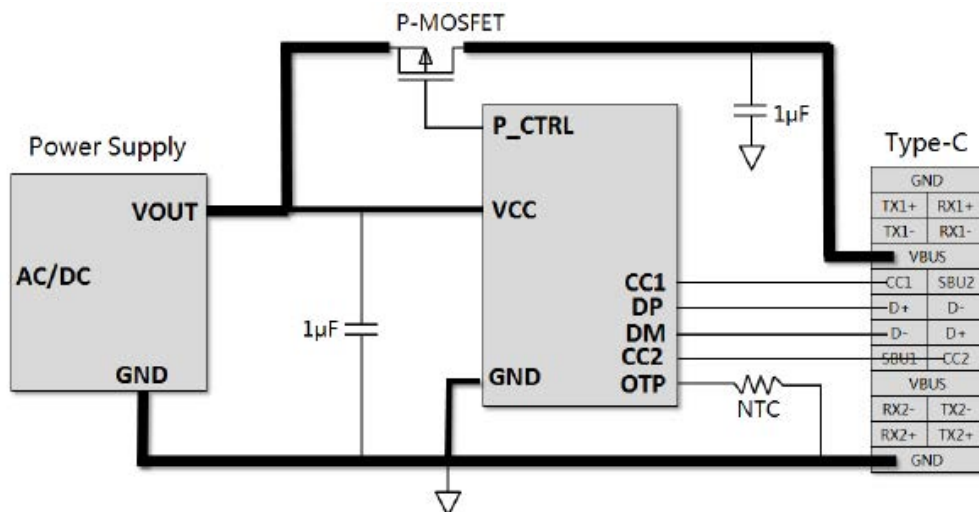
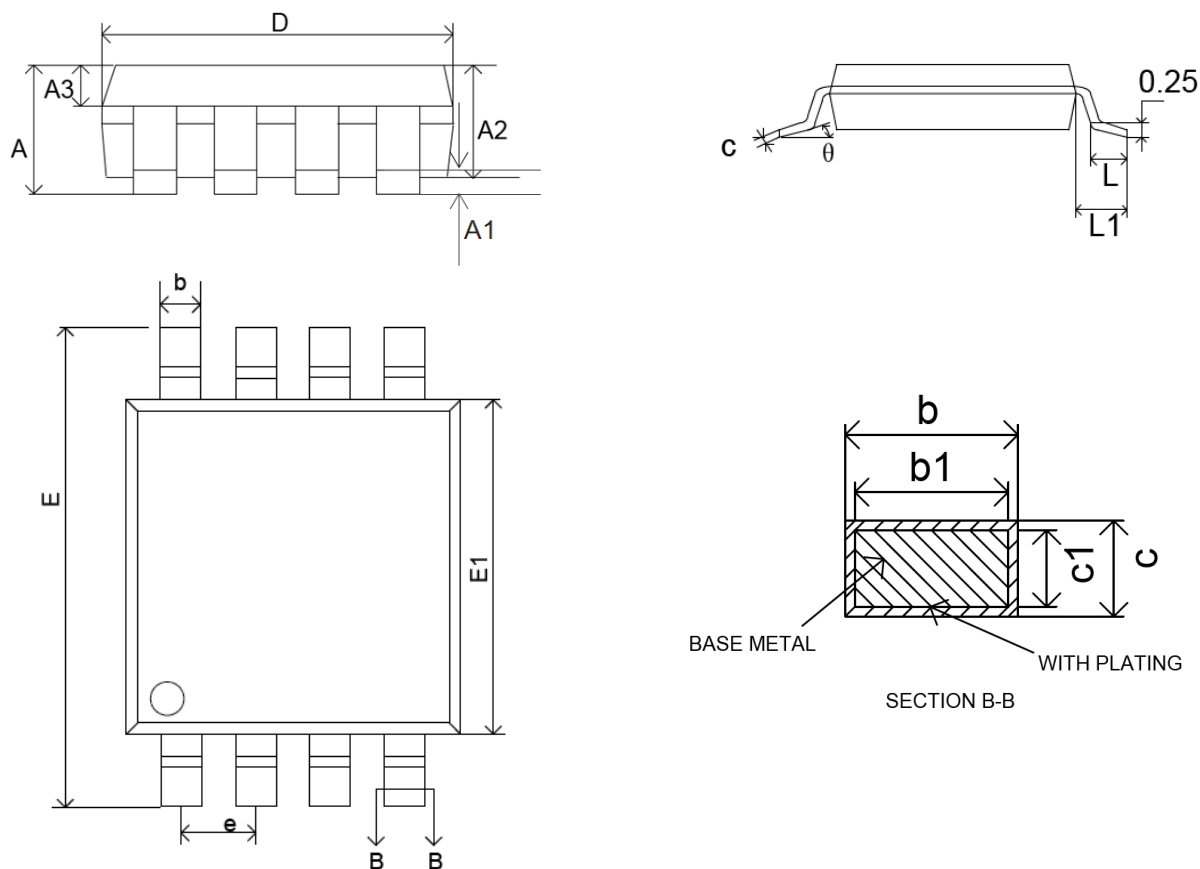


Figure 1. Typical application circuit

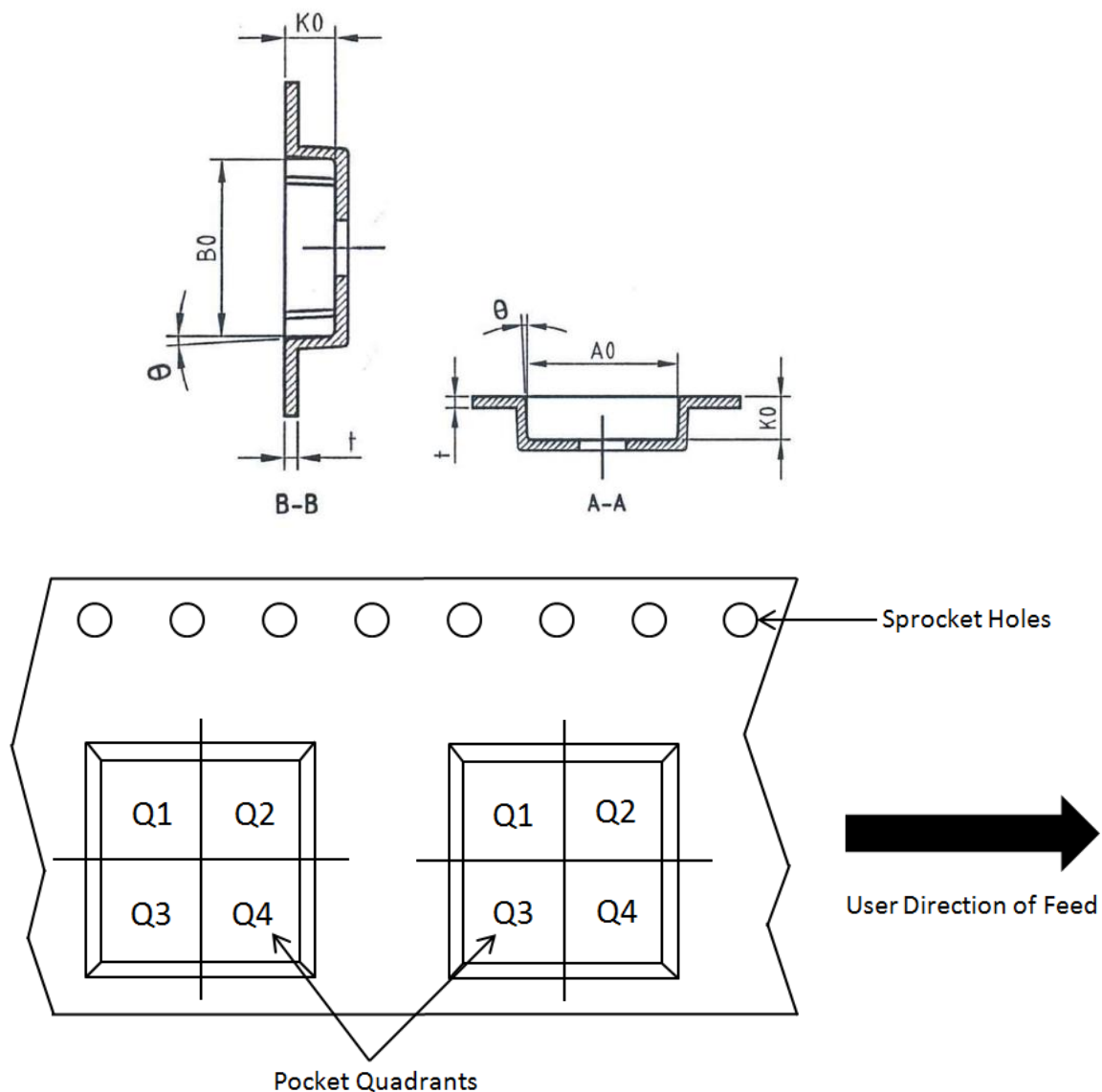
## PACKAGE INFORMATION

### MSOP8



Symbol	Dimensions In Millimeters		
	Min	NOM	Max
A	--	--	1.10
A1	0.05	--	0.15
A2	0.75	0.85	0.95
A3	0.30	0.35	0.40
b	0.28	--	0.36
b1	0.27	0.30	0.33
c	0.15	--	0.19
c1	0.14	0.15	0.16
D	2.90	3.00	3.10
E	4.70	4.90	5.10
E1	2.90	3.00	3.10
e	0.65BSC		
L	0.4	--	0.7
L1	0.95REF		
θ	0	--	8°

## ■ TAPE AND REEL INFORMATION



Device	W(mm)	P(mm)	A0 (mm)	B0(mm)	K0(mm)	t(mm)	θ (mm)	Pin1 Quadrant
HM8312M	8.00	4.00	3.25	3.25	1.25	0.30	3°TYP	Q1