

Description

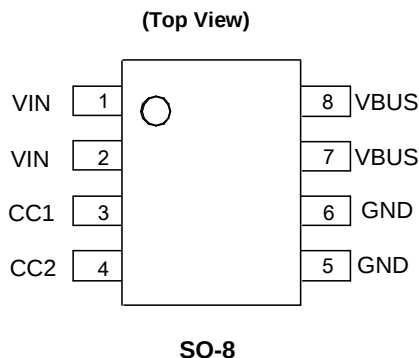
The AP43761 is a USB Type-C controller with 3A current capability advertised. The Chip integrates an auto-detect feature that detects the attachment or detachment of USB Type-C ports, establishes Downstream Facing Port (DFP) and Upstream Facing Port (UFP) roles between two USB Type-C ports. The Chip controls VBUS power delivery via integrated PMOSFET when UFP is attached or detached.

The AP43761 is available in SO-8 package.

Features

- Detect the Attachment and Detachment of USB Type-C Port
- Integrated PMOSFET for Power Delivery
- 3A Current Capability Advertisement
- Under- Voltage Lock Output Protection
- Over Voltage Protection
- Over Temperature Protection
- Ambient Operating Temperature: -40°C to +85°C
- Available in SO-8 package
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Pin Assignments

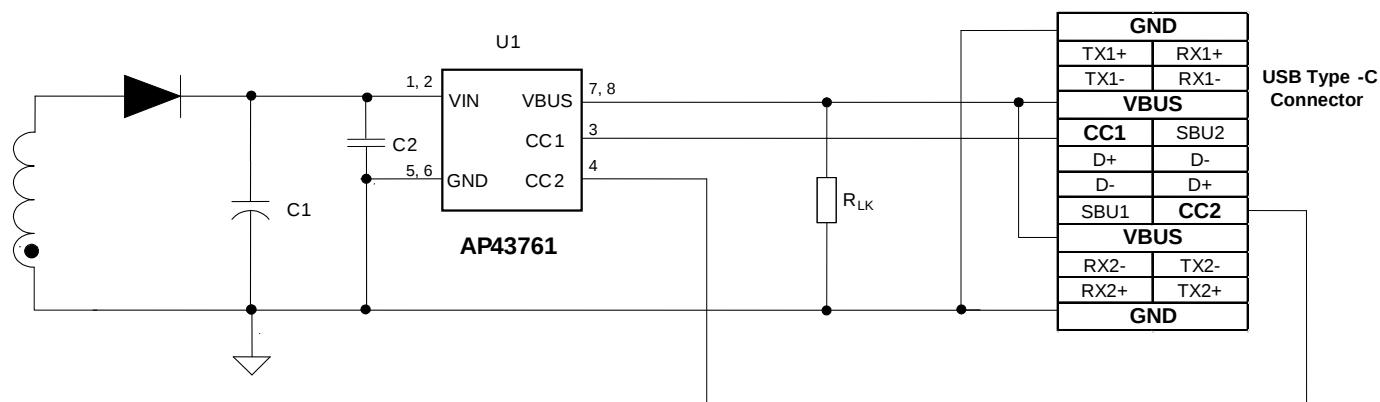


Applications

- USB Type-C Chargers/Adaptors
- Mobile Chargers
- Power Adapters
- AC-DC Adapters

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

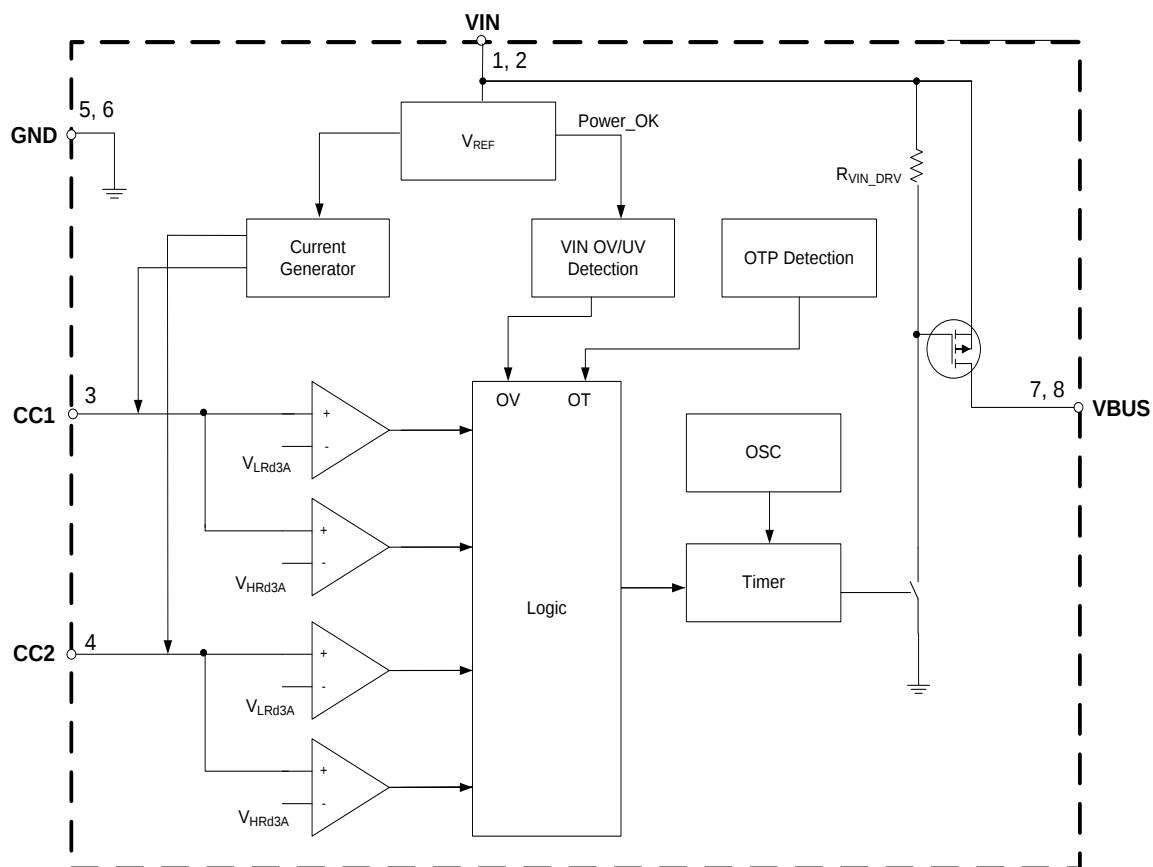
Typical Applications Circuit



Pin Descriptions

Pin Number	Pin Name	Function
1, 2	VIN	Connected to DFP output voltage as IC power supplier and integrated PMOSFET input
3	CC1	Type-C Configuration Channel
4	CC2	Type-C Configuration Channel
5, 6	GND	Ground Return
7, 8	VBUS	Connected to Type-C connector VBUS pins

Functional Block Diagram



Absolute Maximum Ratings (Note 4)

Symbol	Parameter	Rating	Unit
$V_{IN}/V_{BUS}/V_{CC1}/V_{CC2}$	VIN/ VBUS/CC1/CC2 Voltage	-0.3 to 7	V
T_J	Operating Junction Temperature	-40 to +150	°C
T_{STG}	Storage Temperature	-65 to +150	°C
T_{LEAD}	Lead Temperature (Soldering, 10 sec)	+300	°C
θ_{JA}	Thermal Resistance (Junction to Ambient)	165	°C/W
ESD	ESD (Human Body Model)	8000	V
	ESD (Machine Model)	400	V

Note 4. Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Electrical Characteristics ($V_{IN} = 5V$, $T_A = +25^\circ C$, unless otherwise specified.)

Symbol	Parameters	Conditions	Min	Typ	Max	Unit
STARTUP AND UVLO SECTION						
V_{TH_ST}	V_{CC} Startup Threshold	–	3.4	3.7	4.0	V
$V_{OPR(MIN)}$	V_{CC} Minimal Operating Voltage	–	2.7	3.0	3.3	V
STANDBY CURRENT SECTION						
I_{CC}	Operating Current	CC1/CC2 Open	–	90	–	μA
Controller SECTION						
V_{LRd3A}	Low Voltage Threshold Used to Distinguish Rd Attached or Detached for 3A Advertisement	–	0.75	0.8	0.85	V
V_{HRd3A}	High Voltage Threshold Used to Distinguish Rd Attached or Detached for 3A Advertisement	–	2.45	2.60	2.75	V
I_{Rd3A}	CC1/CC2 Current Source for 3A Advertisement	–	304	330	356	μA
$t_{CC_DEBOUNCE}$	Port Attachment Detection Debounce Time	–	100	150	200	ms
$t_{PD_DEBOUNCE}$	Port Detachment Detection Debounce Time	–	10	15	20	ms
PMOSFET SECTION						
R_{SWITCH_ON}	Switch Turn-on Resistance	$V_{IN}=4.5V$, $I_{BUS}=4A$	–	–	15	m Ω
V_{DRVL}	PMOSFET Low Driving Voltage	–	0	–	0.5	V
R_{VIN_DRV}	Resister Between VIN And Internal Drive Pin	–	12	15	18	K Ω
Protection SECTION						
V_{OVP}	VIN Over Voltage Protection (OVP) Trigger Voltage	–	5.8	5.9	6.0	V
V_{HYS}	VIN OVP Hysteresis Voltage	–	–	0.3	–	V
T_{OTP}	OTP Trigger Temperature	–	–	+135	–	°C
T_{HYS}	OTP Hysteresis Temperature	–	–	+115	–	°C

Operation Description

Overall Introduction

The AP43761 provides configure channels CC (CC1 and CC2) to control VBUS output to USB Type-C port. CC1 and CC2, are used to detect attachment or detachment of USB Type-C port, establish or cancel the connection of DFP and UFP.

Configure Channels Control Logic

There is 330 μ A constant current generated on CC1/CC2 pin. When UFP with a specified resistance ($R_d = 5.1k\Omega$) to GND in CC pin is connected to DFP, about 1.683V voltage which is in the voltage range of V_{LRd3A} (0.8V) and V_{HRd3A} (2.6V) will be detected in one of CC pin of AP43761. After the valid $t_{CC_DEBOUNCE}$ time (150ms), the AP43761 will turn on the internal PMOSFET to delivery power via VBUS pin;

On the contrary, if no UFP is connected to DFP or other circumstances, none of the V_{CC1} and V_{CC2} voltage is in the voltage range of V_{LRd3A} (0.8V) and V_{HRd3A} (2.6V), After the valid $t_{PD_DEBOUNCE}$ time (15ms), the AP43761 will turn off the internal PMOSFET to prevent delivering power from VBUS pin.

Table 1. VBUS Output Logic

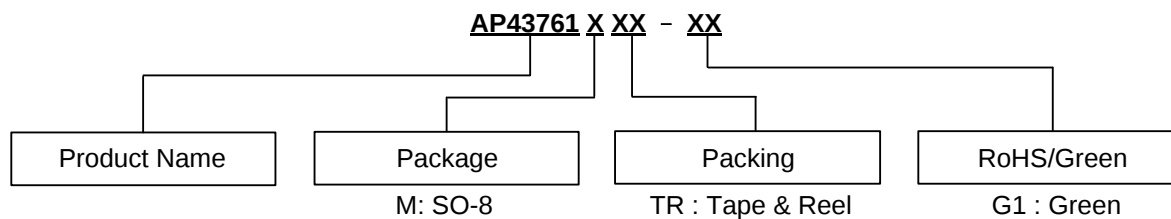
CC1 Voltage	CC2 Voltage	VBUS Output
$V_{LRd3A} < V_{CC1} < V_{HRd3A}$	Don't Care	ON
Don't Care	$V_{LRd3A} < V_{CC2} < V_{HRd3A}$	
$V_{CC1} < V_{LRd3A}$ or $V_{CC1} > V_{HRd3A}$	$V_{CC2} < V_{LRd3A}$ or $V_{CC2} > V_{HRd3A}$	OFF

When the internal PMOSFET of AP43761 is turned on, 3A current capacity can be achieved.

Bleeding Resistance Configuration

When the detachment of UFP is detected, AP43761 will turn off the internal PMOSFET to prevent delivering power from VBUS pin. In order to make sure that the VBUS voltage drops to vSafe0V (vSafe0V is VBUS "0 volts" as defined by the USB power delivery specification) within 650ms, a VBUS bleeding resistance (R_{LK}) is placed between VBUS and GND of USB Type-C port (see Typical Applications Circuit part). The minimum value of R_{LK} should be 72.4k Ω .

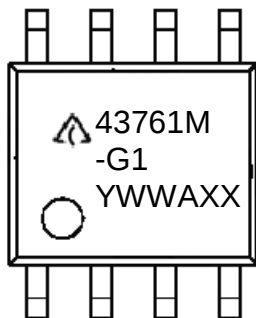
Ordering Information



Package	Temperature Range	Part Number	Marking ID	Packing
SO-8	-40 to +85°C	AP43761MTR-G1	43761M-G1	4000/Tape & Reel

Marking Information

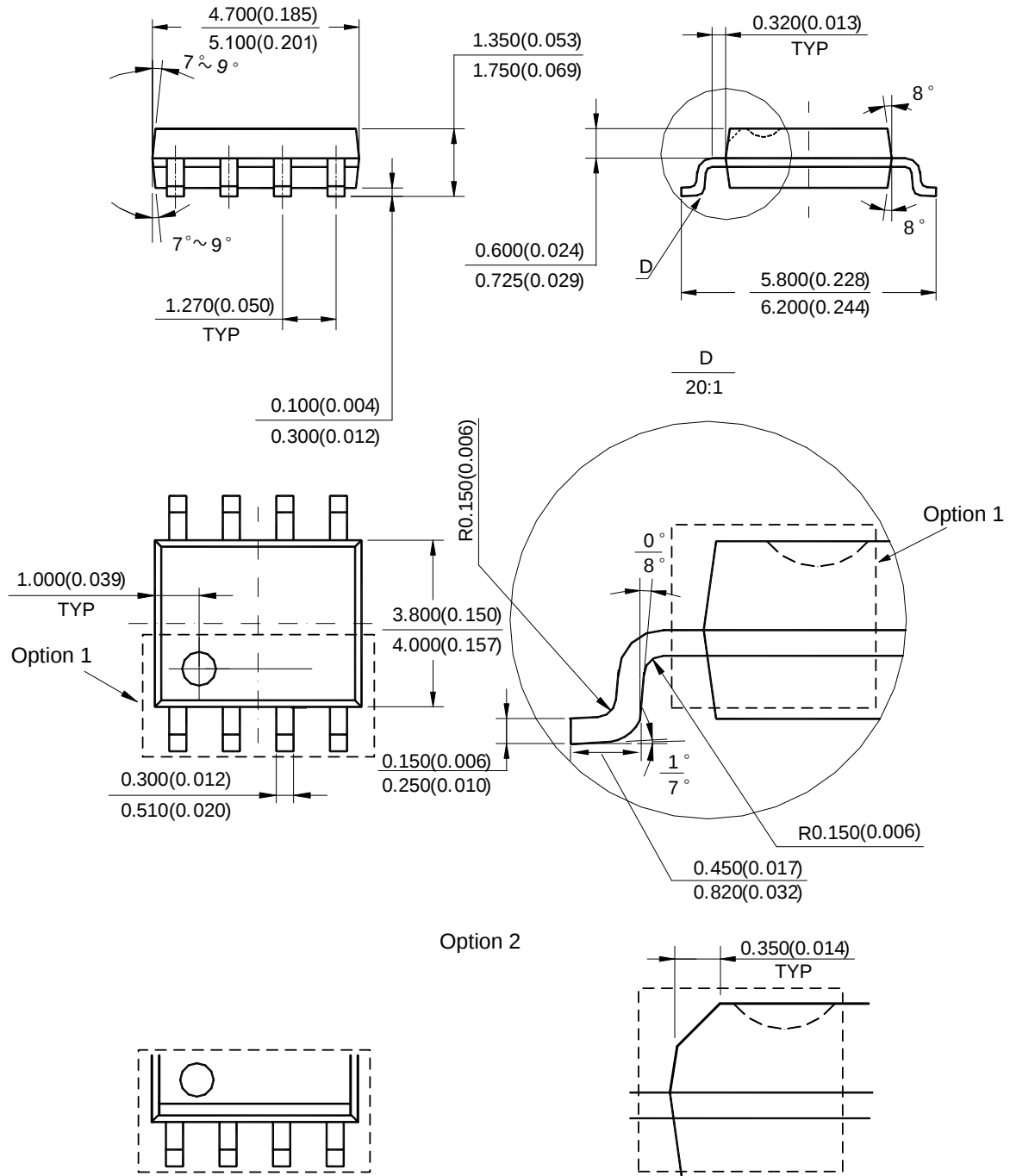
(Top View)



First and Second Lines: Logo and Marking ID
 Third Line: Date Code
 Y: Year
 WW: Work Week of Molding
 A: Assembly House Code
 XX: 7th and 8th Digits of Batch No.

Package Outline Dimensions (All dimensions in mm(inch).)

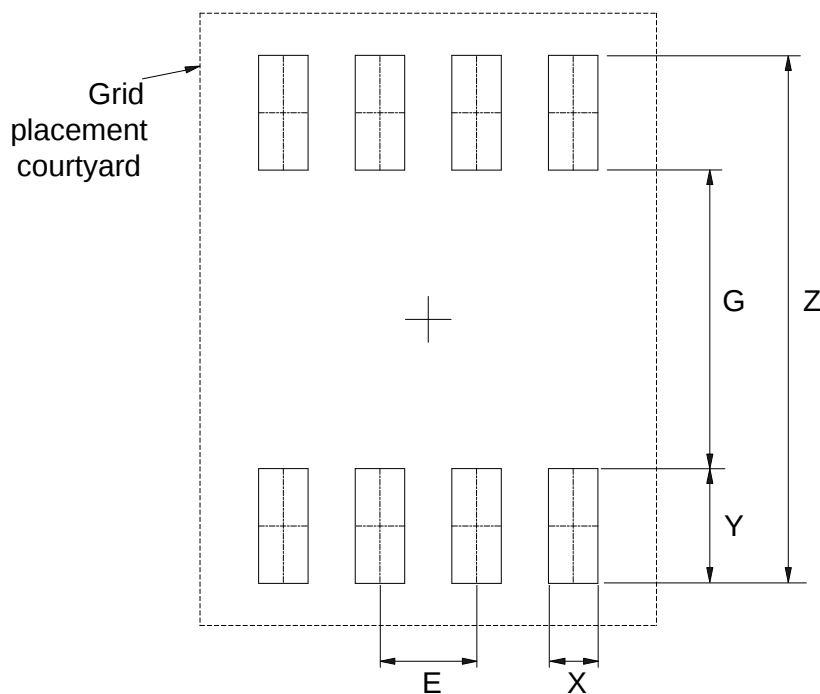
(1) Package Type: SO-8



Note: Eject hole, oriented hole and mold mark is optional.

Suggested Pad Layout

(1) Package Type: SO-8



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E (mm)/(inch)
Value	6.900/0.272	3.900/0.154	0.650/0.026	1.500/0.059	1.270/0.050

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