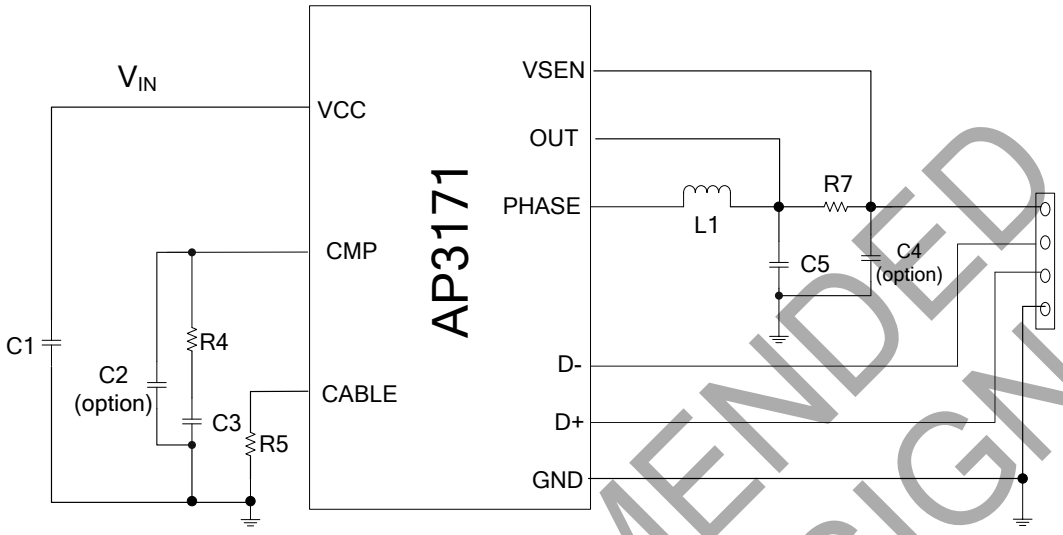
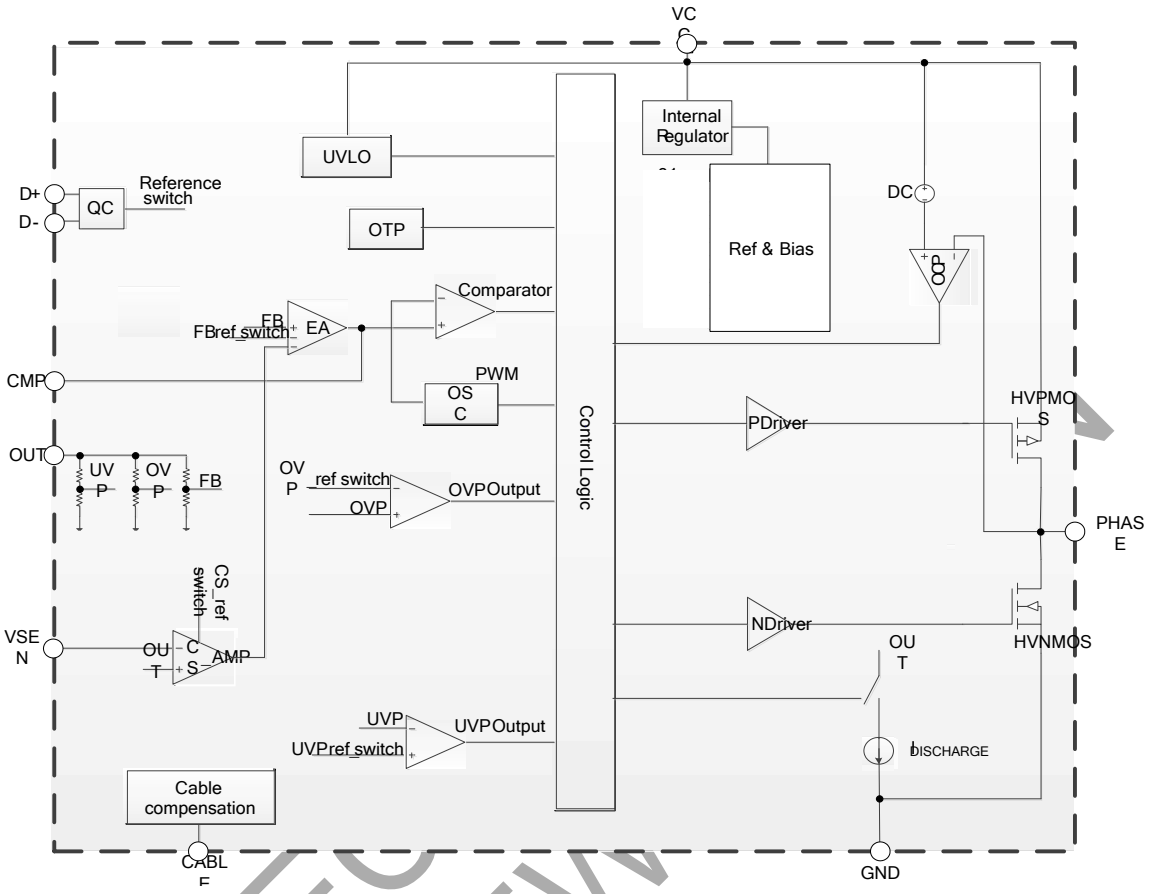
Typical Applications Circuit



Pin Descriptions

Pin Number	Pin Name	Function
1	VCC	IC voltage supplier and input voltage for power conversion; Decoupling cap is required to be placed to this pin and GND pin as close as possible
2	CABLE	Connected to the external resistor to set the cable compensation value
3	D+	Connected to USB D+
4	D-	Connected to USB D-
5	OUT	Sense the output voltage; connected to the input of current sense resistor
6	VSEN	Sense the output current; connected to the output of current sense resistor
7	CMP	The EA output pin to compensate the loop
8	GND	Ground return for the power stage and controller
Exposed PAD	PHASE	Connected to the input of external output inductor

Functional Block Diagram



Absolute Maximum Ratings (Note 4)

Parameter	Symbol	Rating	Unit
Supply Voltage	V_{CC}	-0.3 to 42	V
Voltage From PHASE to GND	V_{PHASE}	-0.3 to 42	V
Voltage From OUT to GND	V_{OUT}	-0.3 to 20	V
Voltage on Other Separate Pins	–	-0.3 to 6	V
Thermal Resistance (Note 5)	θ_{JA}	63	°C/W
Operating Junction Temperature	T_J	-40 to +125	°C
Storage Temperature	T_{STG}	-65 to +150	°C
ESD (Human Body Model)	–	2000	V
ESD (Machine Model)	–	200	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.
5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1 square inch pad layout.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	10	40	V
T_A	Ambient Temperature	-40	+85	°C

Electrical Characteristics (@ T_A = +25°C, V_{CC} = 16V, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Supply Voltage						
V_{ST}	Startup Voltage	–	8.4	8.7	9.0	V
–	UVLO	–	6.75	7.00	7.25	V
$I_{NO-LOAD}$	I_{CC} @ No-load Condition	–	–	2	–	mA
CV/CC Control						
V_{REF_12V}	Voltage Control Loop Reference	–	11.7	12.0	12.3	V
V_{REF_9V}		–	8.77	9.00	9.23	V
V_{REF_5V}		–	4.92	5.00	5.08	V
V_{CABLE}	Cable Compensation	R_{CABLE}=17.6k, R_{SENSE} = 27.27mΩ	–	400	–	mV
V_{CS_12V}	Current Control Loop Reference	–	41.0	45.0	49.0	mV
V_{CS_9V}		–	57.0	60.0	63.0	mV
V_{CS_5V}		–	57.6	60.0	62.4	mV
Internal MOSFET						
$R_{DS(ON)\_UP}$	High Side MOSFET $R_{DS(ON)}$	–	–	100	–	mΩ
$R_{DS(ON)\_LOW}$	Low Side MOSFET $R_{DS(ON)}$	–	–	45	–	mΩ
PWM And Oscillation						
f_S	Switching Frequency	–	–	120	–	kHz
D_{MAX}	Maximum Duty	–	–	95	–	%
I_{DIS}	Discharge Current@ OUT Pin	–	–	100	–	mA
Protection						
V_{OVP_5V}	Output OVP Threshold @5V	Note 6	5.63	5.80	5.97	V
V_{OVP_9V}	Output OVP Threshold @9V		10.13	10.44	10.75	V
V_{OVP_12V}	Output OVP Threshold @12V		13.51	13.92	14.33	V
V_{UVP_5V}	Output UVP Threshold @5V	–	3.13	3.30	3.47	V
V_{UVP_9V}	Output UVP Threshold @9V	–	5.63	5.94	6.24	V
V_{UVP_12V}	Output UVP Threshold @12V	–	7.51	7.92	8.33	V
I_{PK_MAX}	MOSFET Maximum I_{PEAK} Limitation	–	–	4.0	–	A
Internal OTP						
–	Internal OTP Trigger Temperature	–	–	+160	–	°C
–	Internal OTP Recovery Temperature	–	–	+140	–	°C
QC 2.0 protocol definition						
V_{DAT_REF}	Data Detect Voltage	–	0.25	0.325	0.40	V
V_{SEL_REF}	VSEL_REF (Reference for Selecting HVDCP Voltage)	–	1.8	2	2.2	V
$t_{GLITCH\_BC\_DONE}$	D+ High Glitch Filter Time	–	1	1.25	1.5	s
$t_{GLITCH\_DM\_LOW}$	D- Low Glitch Filter Time	Note 7	1	2.5	–	ms

Notes: 6. The value in table is only for I_O=0A. If I_O is not zero，the over voltage protection value needs to add cable compensation voltage.
7. Guaranteed by design.

Operation Description

Qualcomm QC 2.0 Protocol Operation

Decoder	V_{D+} (V)	V_{D-} (V)	Charger Output Voltage/Full Current Capability
Qualcomm Quick Charge 2.0 Protocol Class A: 5V, 9V, 12V	0.6	0.6	12V/1.5A
	3.3	0.6	9V/2A
	0.6	3.3	Keep Present V1/V2 Status Unchanged
	3.3	3.3	Keep Present V1/V2 Status Unchanged
	0.6 or 3.3	GND	5V/2A
	GND	0.6 or 3.3 or GND	5V/2A (Protocol Handshake Reset)

Constant Current Operation

The AP3171 can work in constant-current (CC) mode. The output current is sensed by a current sense resistor R_{SENSE}. As output current increases, the voltage drop across R_{SENSE} will be limited to a reference voltage (V_{CS}) to accomplish CC function. The default R_{SENSE} is 27.27mΩ to get the typical CC point of 110% full output current.

Cable Compensation

The cable compensation can be calculated as below:

$V_{CABLE}=I_O * R_{SENSE} * 129.5k/R_{CABLE}$

Ordering Information

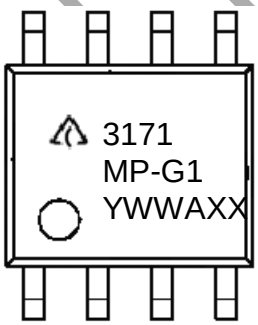
AP3171 XX XX – XX

Product Name	Package	Packing	RoHS/Green
	MP: SO-8EP	TR : Tape & Reel	G1 : Green

Package	Part Number	Marking ID	Packing
SO-8EP	AP3171MPTR-G1	3171MP-G1	4,000/Tape & Reel

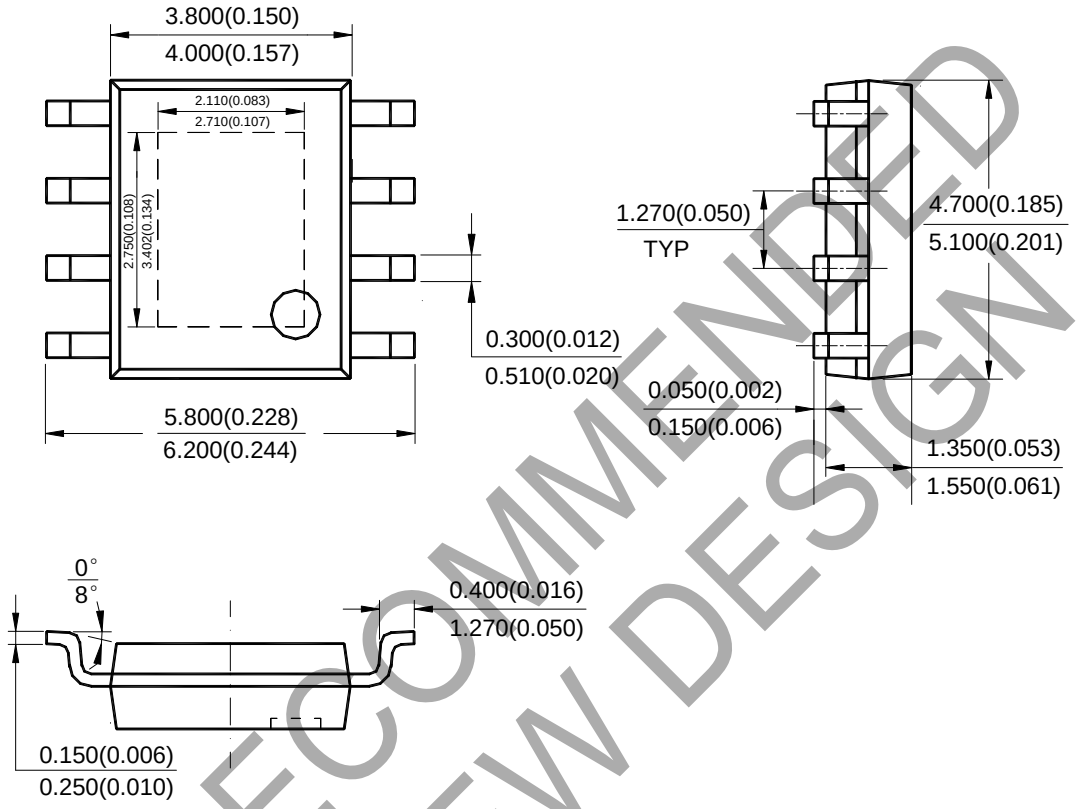
Marking Information

(Top View)



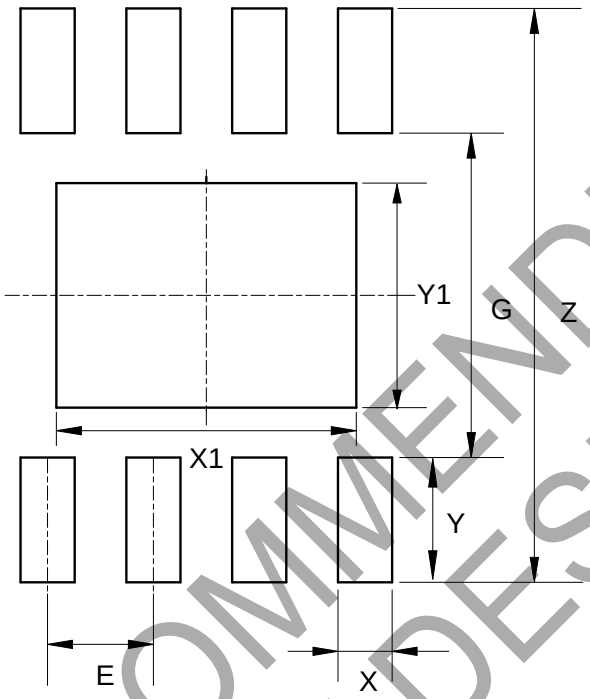
First and Second Lines: Logo and Marking ID
Third Line: Date Code
Y: Year
WW: Work Week of Molding
A: Assembly House Code
XX: 7th and 8th Digits of Batch No.

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



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

Suggested Pad Layout



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	X1 (mm)/(inch)	Y1 (mm)/(inch)	E (mm)/(inch)
Value	6.900/0.272	3.900/0.154	0.650/0.026	1.500/0.059	3.600/0.142	2.700/0.106	1.270/0.050

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