

Description

The AP3768 is a high performance AC/DC power supply controller for battery charger and adapter applications. The device uses Pulse Frequency Modulation (PFM) method to build discontinuous conduction mode (DCM) flyback power supplies.

The AP3768 provides accurate constant voltage, constant current (CV/CC) regulation without requiring an opto-coupler and secondary control circuitry. It also eliminates the need of loop compensation circuitry while maintaining stability. The AP3768 achieves excellent regulation and high average efficiency, yet meets the requirement for no-load consumption less than 30mW.

The AP3768 has the built-in programmable cable voltage drop compensation function, which makes it flexible to accommodate various cables with different gauges and lengths.

The AP3768 is available in SO-8 package.

Features

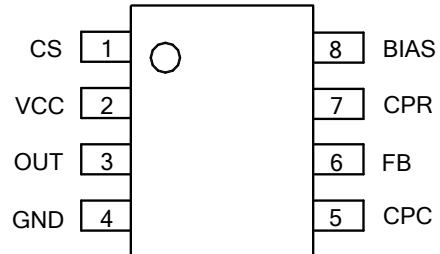
- Primary Side Control for Eliminating Opto-coupler and Secondary CV/CC Control Circuitry
- 30mW No-load Input Power
- Programmable Output Cable Voltage Drop Compensation
- Proprietary CC Tightening Technique to Achieve Vertical CC Profile
- Compensation for External Component Temperature Variations
- Flyback Topology in DCM Operation
- Random Frequency Adjustment to Reduce System EMI
- Built-in Soft Start
- Over Voltage Protection
- Short Circuit Protection
- SO-8 Package
- **Totally Lead-free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com/quality/lead_free.html 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.

Pin Assignments

(Top View)

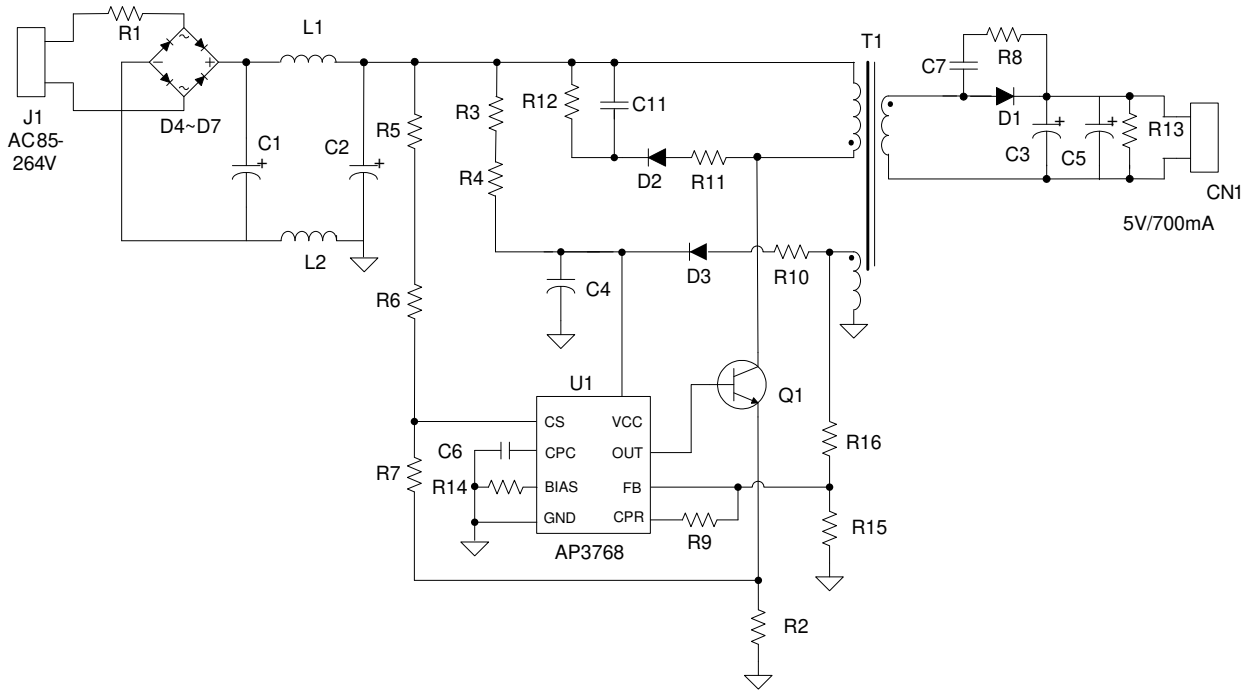


SO-8

Applications

- Adapter/Chargers for Cell/Cordless Phones, PDAs, MP3 and Other Portable Apparatus
- LED Driver
- Standby and Auxiliary Power Supplies

Typical Applications Circuit

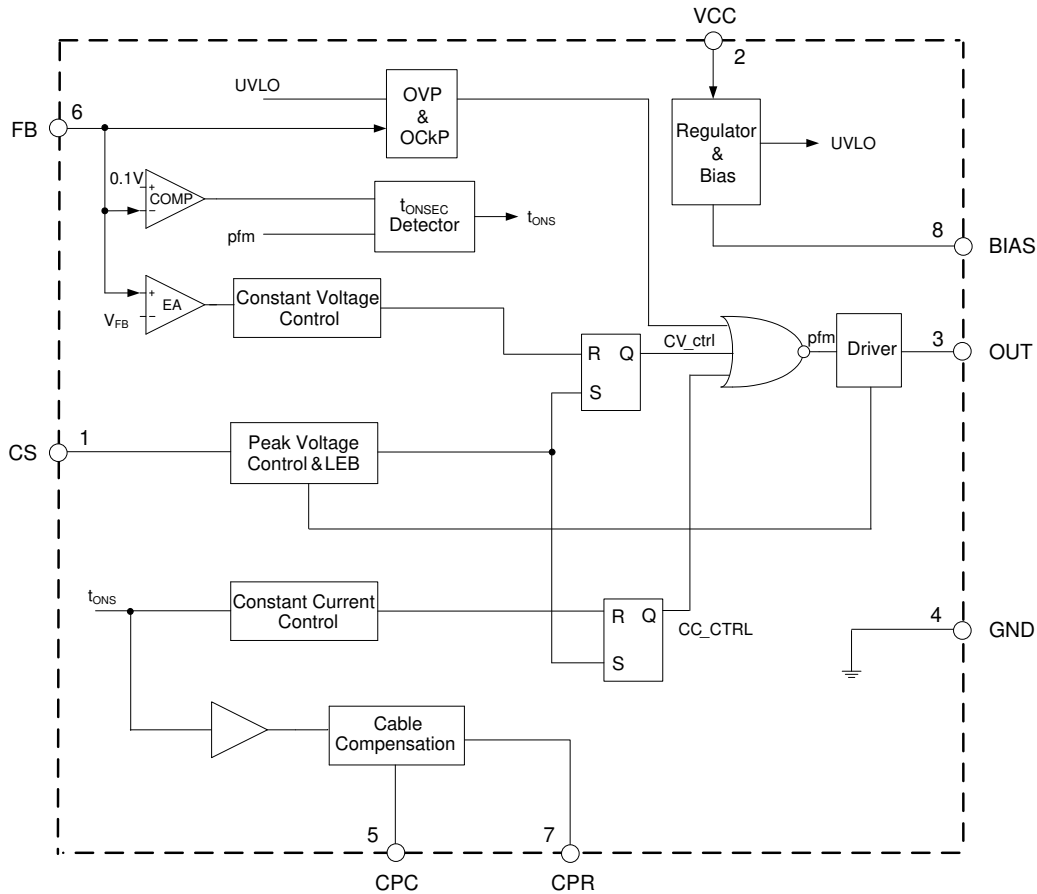


5V/0.7A Output for Battery Charger of Mobile Phone

Pin Descriptions

Pin Number	Pin Name	Function
1	CS	The primary current sense
2	VCC	Supply voltage
3	OUT	This pin drives the base of external power NPN switch
4	GND	Ground
5	CPC	This pin connects a capacitor for output cable compensation
6	FB	The voltage feedback from the auxiliary winding
7	CPR	Connects a resistor to FB pin for adjustable output cable compensation
8	BIAS	This pin sets the bias current inside AP3768 with an external resistor to GND

Functional Block Diagram



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Absolute Maximum Ratings (Note 4)

Parameter	Rating	Unit
Voltage at VCC Pin to GND	-0.3 to 36	V
Voltage at CS, OUT to GND	-0.3 to 7	V
FB Input	-40 to 10	V
Output Current at OUT	Internally limited	A
Operating Junction Temperature	+150	°C
Storage Temperature	-65 to +150	°C
Lead Temperature (Soldering, 10s)	+300	°C
Thermal Resistance Junction-to-Ambient	190	°C/W
ESD (Machine Model)	200	V
ESD (Human Body Model)	2000	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.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V _{CC}	Power Supply Voltage	12	30	V
T _A	Ambient Temperature	-40	+85	°C

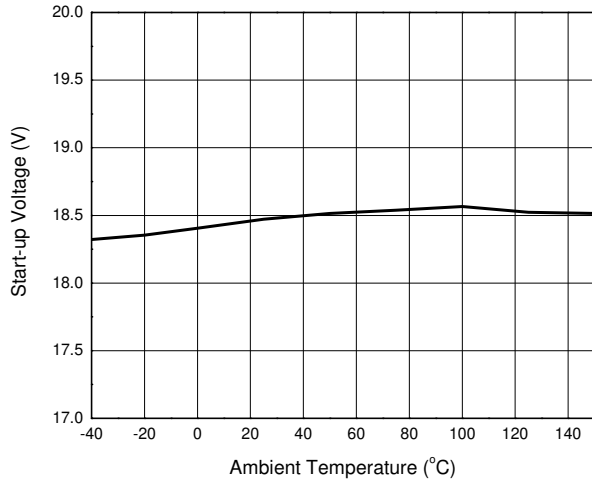
Electrical Characteristics (V_{CC}=15V, T_A=-40 to +85°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
UVLO SECTION						
V _{TH(ST)}	Start-up Threshold	-	17	18.5	21	V
V _{OPR(min)}	Minimal Operating Voltage	-	8.2	9.2	10.2	V
REFERENCE VOLTAGE						
V _{BIAS}	BIAS Pin Voltage	R _{BIAS} =200kΩ, After Turn On	1.0	1.1	1.2	V
STANDBY CURRENT SECTION						
I _{ST}	Start-up Current	V _{CC} =V _{TH(ST)} -0.5V, R _{BIAS} =200kΩ, Before start-up	-	-	0.6	μA
I _{CC(OPR)}	Operating Current	R _{BIAS} =200kΩ	-	390	480	μA
DRIVE OUTPUT SECTION						
I _{OUT}	OUT Maximum Current	Source R _{BIAS} =200kΩ	28	36	44	mA
CURRENT SENSE SECTION						
V _{CS}	Current Sense Threshold	-	490	513	535	mV
V _{CS(PRE)}	Pre-Current Sense	-	390	413	435	mV
-	Leading Edge Blanking	-	-	500	-	ns
FEEDBACK INPUT SECTION						
I _{FB}	Feedback Pin Input Leakage Current	V _{FB} =4V	1.8	2.4	3.0	μA
V _{FB}	Feedback Threshold	-	3.97	4.03	4.09	V
V _{FB(EN)}	Enable Turn-on Voltage	-	-2.0	-1.7	-1.4	V
OUTPUT VOLTAGE COMPENSATION SECTION						
V _{CPR}	CPR Voltage	D _{ONS} (t _{ONS} /t): from 55% to 0.02%	1.5	-	3.5	V
I _{CPR}	CPR Sink Current	-	-	-	200	μA
PROTECTION SECTION						
V _{FB(OVP)}	Over Voltage Protection	-	7	8	9	V

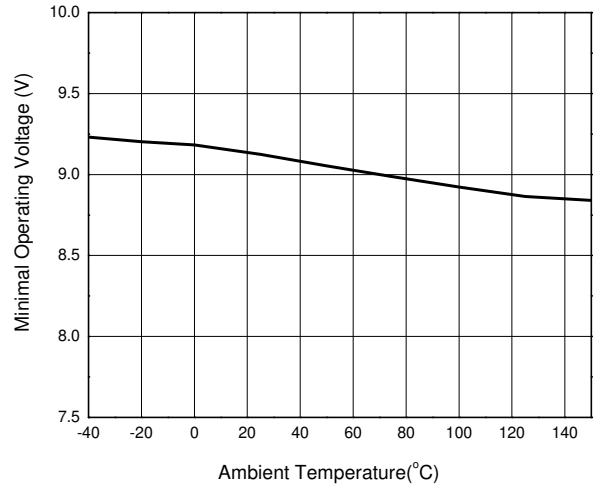
Performance Characteristics

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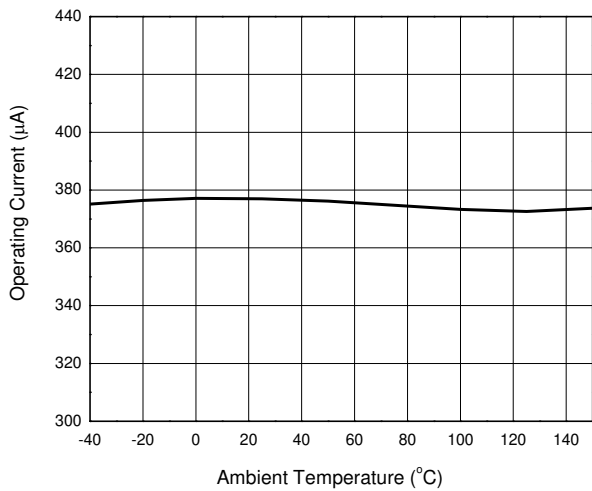
Start-up Voltage vs. Ambient Temperature



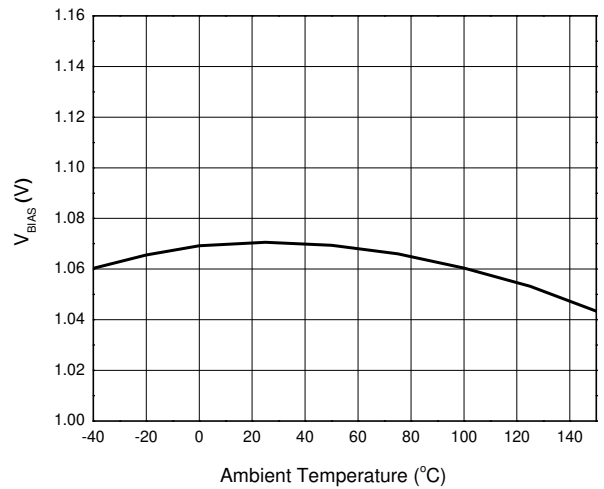
Minimal Operating Voltage vs. Ambient Temperature



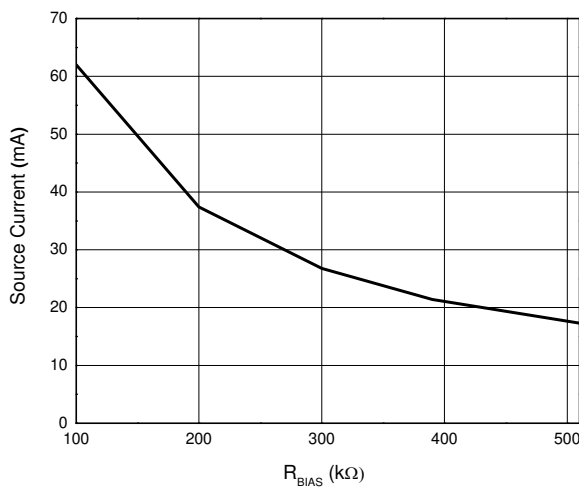
Operating Current vs. Ambient Temperature



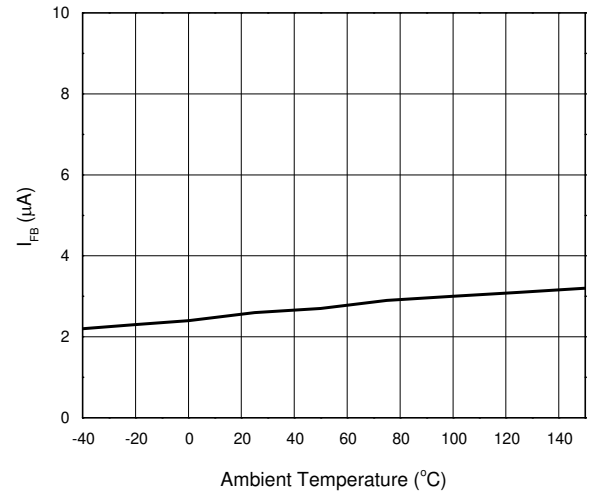
V_{BIAS} vs. Ambient Temperature



Source Current vs. R_{BIAS}

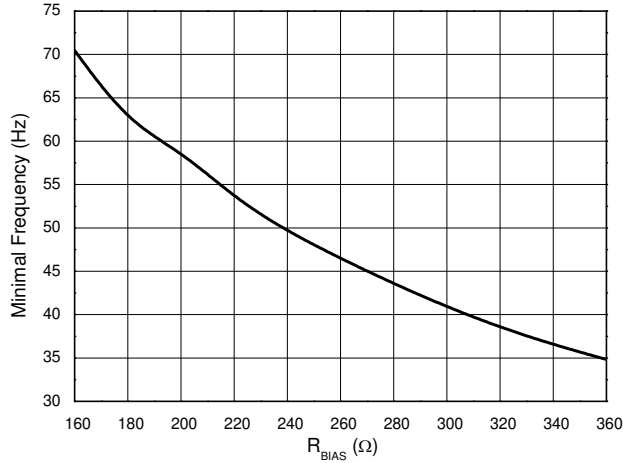


I_{FB} vs. Ambient Temperature

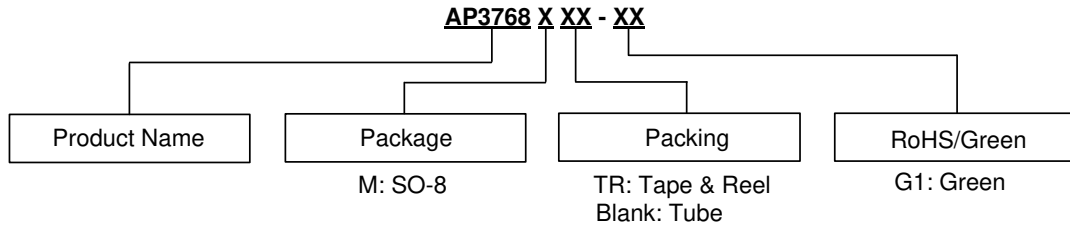


Performance Characteristics (Cont.)

Minimal Frequency vs. R_{BIAS}

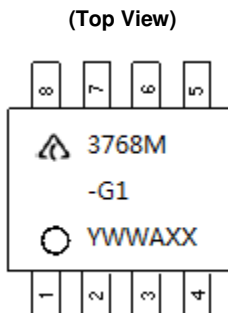


Ordering Information



Package	Temperature Range	Part Number	Marking ID	Packing
SO-8	-40 to +85°C	AP3768M-G1	3768M-G1	50/Tube
		AP3768MTR-G1	3768M-G1	4000/Tape & Reel

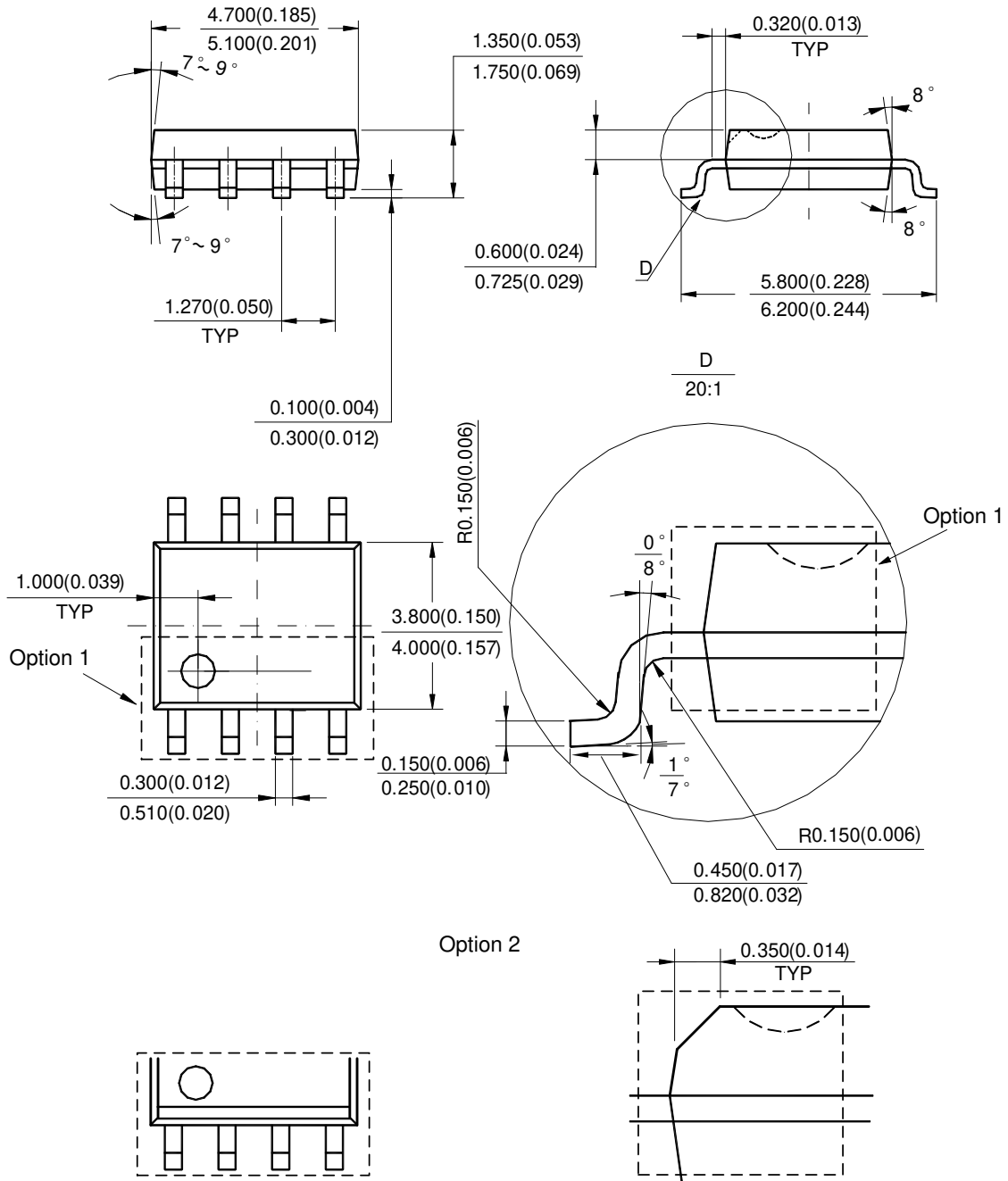
Marking Information



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

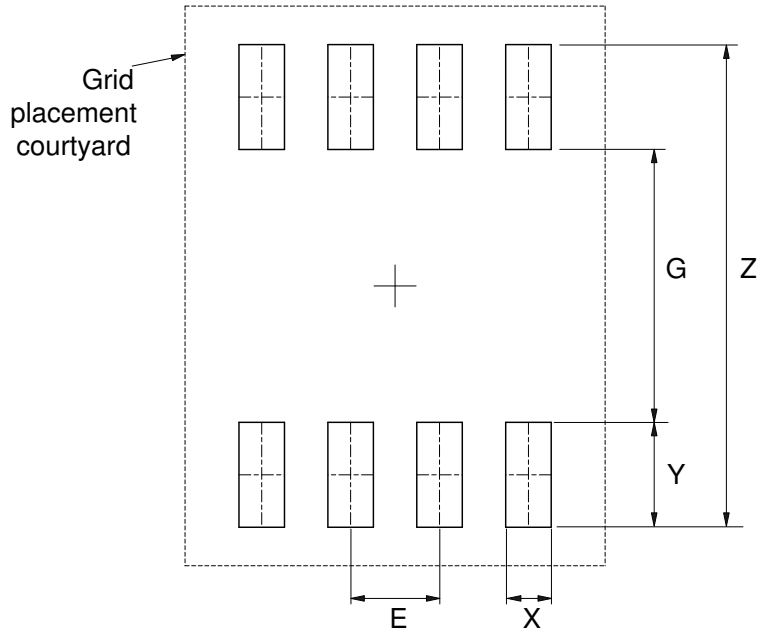


Note: Eject hole, oriented hole and mold mark is optional.

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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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