Description

The AS358/358A/358B consists of two independent, high gain and internally frequency compensated operational amplifiers, they are specifically designed to operate from a single power supply. Operation from split power supply is also possible and the low power supply current drain is independent of the magnitude of the power supply voltages. Typical applications include transducer amplifiers, DC gain blocks and most conventional operational amplifier circuits.

The AS358/358A/358B series is compatible with industry standard 358. The AS358A has more stringent input offset voltage than the AS358.

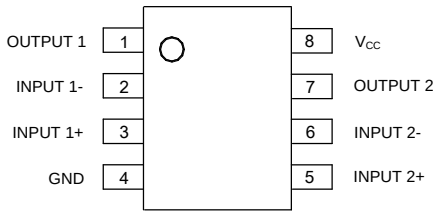
The AS358 is available in PDIP-8, TDIP-8, SO-8, TSSOP-8 and MSOP-8 packages, the AS358A is available in PDIP-8 and SO-8 packages and AS358B is available in TSSOP-8 package.

Features

- Internally Frequency Compensated for Unity Gain
- Large Voltage Gain: 100dB (Typical)
- Low Input Bias Current: 20nA (Typical)
- Low Input Offset Voltage: 2mV (Typical)
- Low Supply Current: 0.5mA (Typical)
- Wide Power Supply Voltage:
  - Single Supply: 3V to 36V
  - Dual Supplies: ±1.5V to ±18V
- Input Common Mode Voltage Range Includes Ground
- Large Output Voltage Swing: 0V to V_{CC} -1.5V
- Lead-Free Packages: SO-8, PDIP-8 and TSSOP-8
  - **Totally Lead-Free; RoHS Compliant (Notes 1 & 2)**
- Lead-Free Packages, Available in “Green” Molding Compound: SO-8, PDIP-8, TDIP-8, TSSOP-8 and MSOP-8
  - **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
  - **Halogen and Antimony Free. “Green” Device (Note 3)**

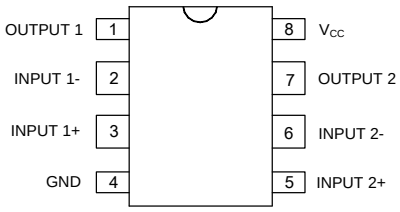
Pin Assignments

(Top View)



(SO-8/TSSOP-8/MSOP-8)

(Top View)



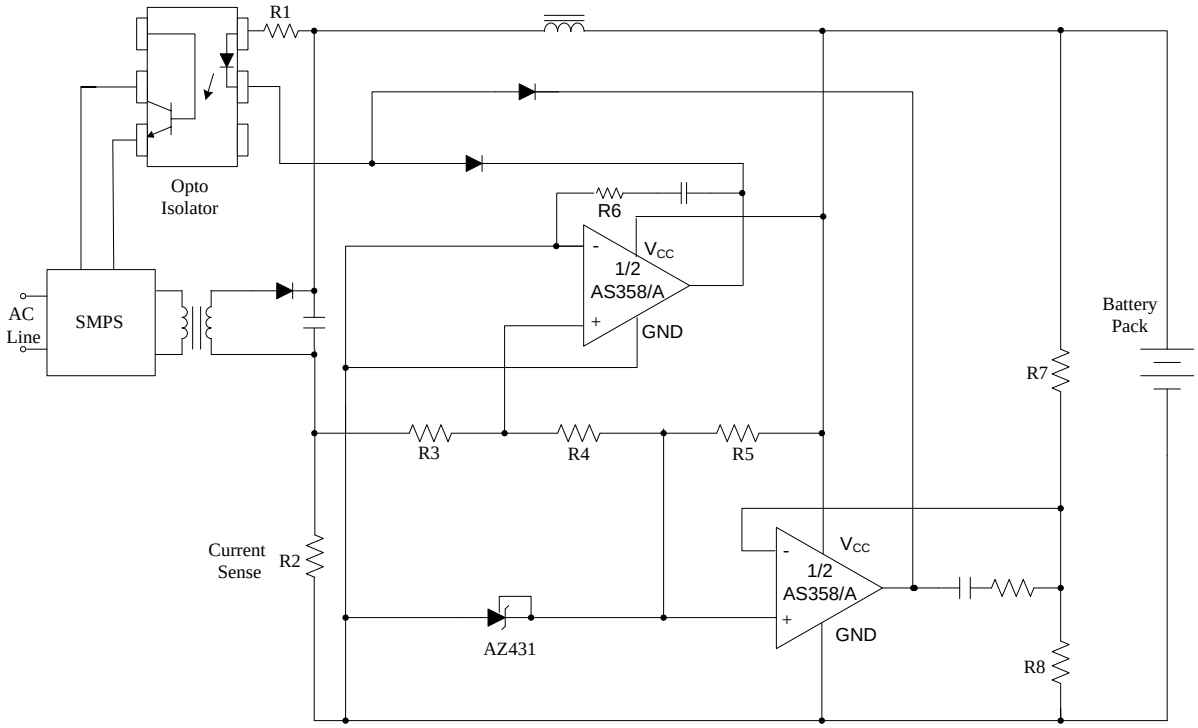
(PDIP-8/TDIP-8)

Applications

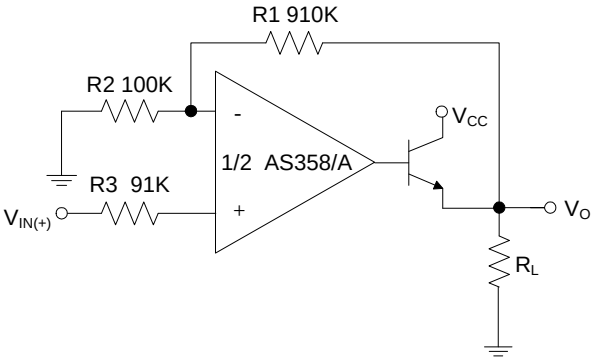
- Battery Charger
- Cordless Telephone
- Switching Power Supply

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.

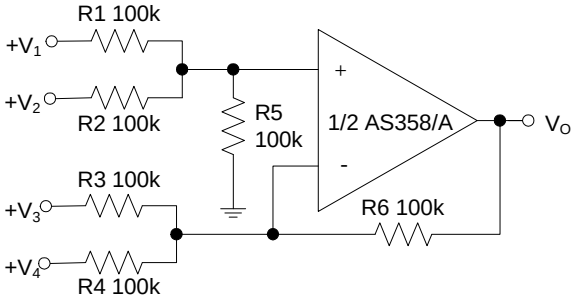
Typical Applications Circuit



Battery Charger

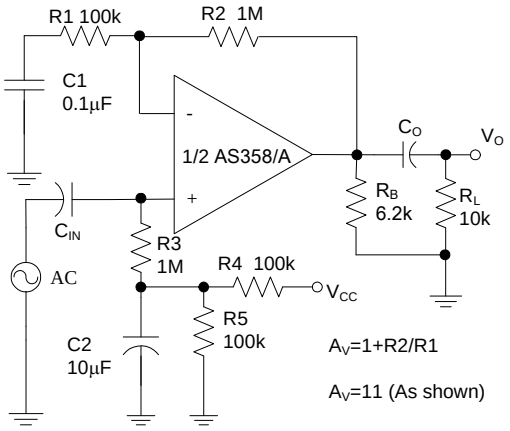


Power Amplifier

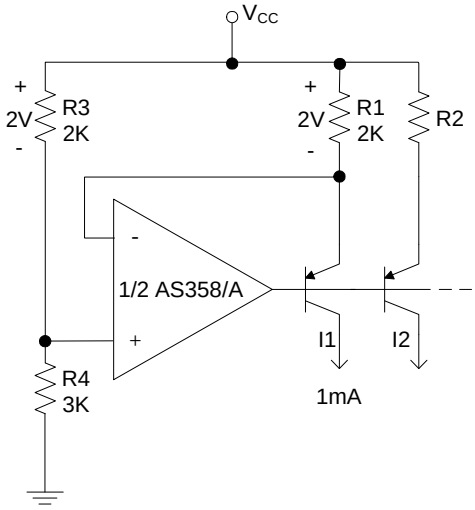


DC Summing Amplifier

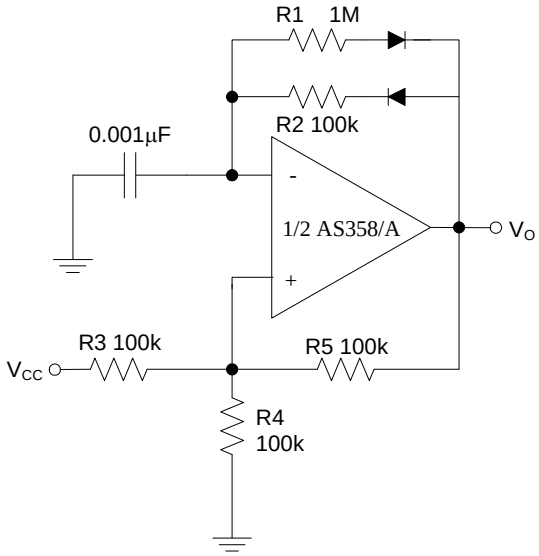
Typical Applications Circuit (Cont.)



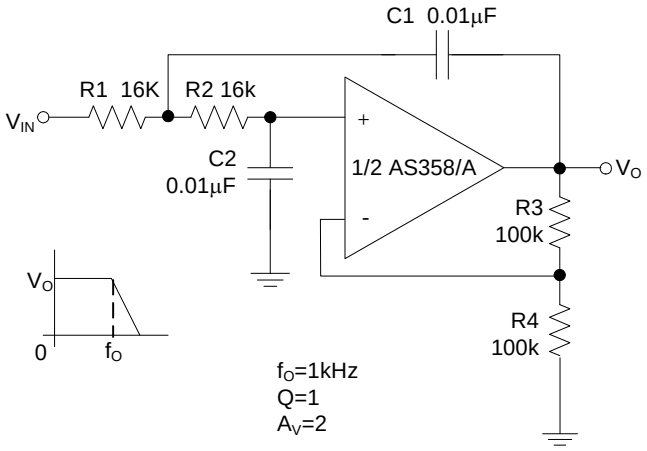
AC Coupled Non-Inverting Amplifier



Fixed Current Sources

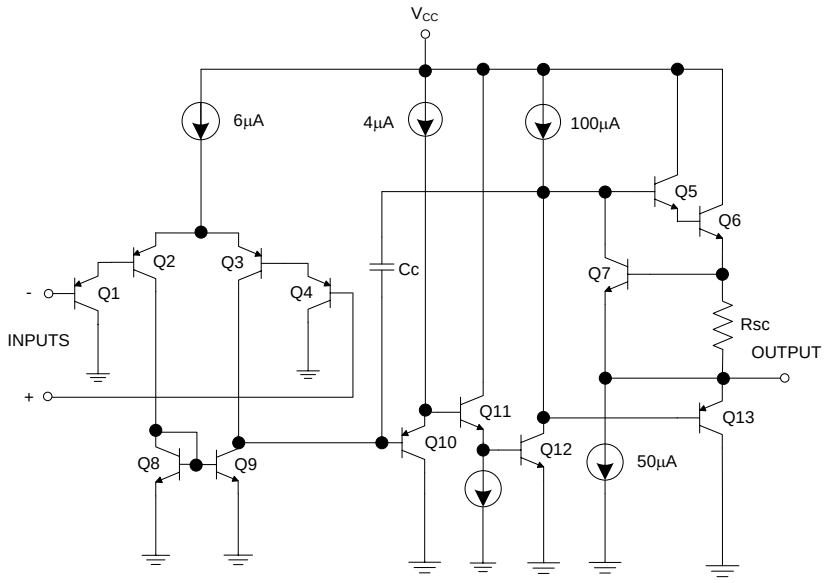


Pulse Generator



DC Coupled Low-Pass Active Filter

Functional Block Diagram



Absolute Maximum Ratings (Notes 4 & 5)

Symbol	Parameter	Rating		Unit
V_{CC}	Power Supply Voltage	40		V
V_{ID}	Differential Input Voltage	40		V
V_{IC}	Input Voltage	-0.3 to 40		V
P_D	Power Dissipation (T_A = +25°C)	PDIP-8	830	mW
		SO-8	550	
		TSSOP-8	500	
		MSOP-8	470	
T_J	Operating Junction Temperature	+150		°C
T_{STG}	Storage Temperature Range	-65 to +150		°C
T_{LEAD}	Lead Temperature (Soldering, 10 Seconds)	+260		°C

Notes: 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. ESD sensitivity.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	3	36	V
T_A	Ambient Operating Temperature Range	-40	+85	°C

Electrical Characteristics (Limits in standard typeface are for T_A = +25°C, **bold** typeface applies over -40°C to +85°C (Note 6), V_{CC} = 5V, GND = 0V, unless otherwise specified.)

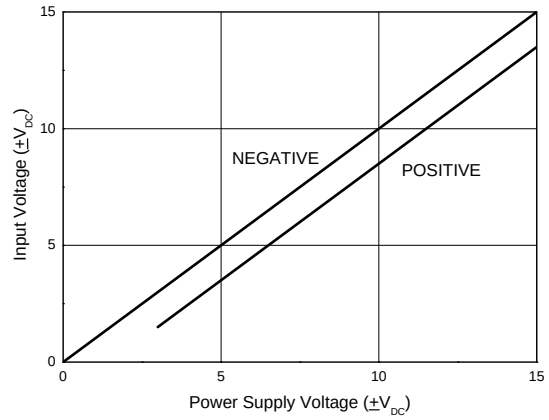
Symbol	Parameter		Conditions		Min	Typ	Max	Unit
V_{IO}	Input Offset Voltage		V_O = 1.4V, R_S = 0Ω, V_{CC} = 5V to 30V	AS358	—	2	5	mV
					—	—	**7**	
				AS358A	—	2	3	
					—	—	**5**	
				AS358B	—	—	2	
					—	—	**4**	
$\Delta V_{IO}/\Delta T$	Average Temperature Coefficient of Input Offset Voltage		T_A = -40°C to +85°C		—	7	—	µV/°C
I_{BIAS}	Input Bias Current		I_{IN}+ or I_{IN}-, V_{CM} = 0V		—	20	200	nA
					—	—	**200**	
I_{IO}	Input Offset Current		I_{IN}+ - I_{IN}-, V_{CM} = 0V		—	5	30	nA
					—	—	**100**	
V_{IR}	Input Common Mode Voltage Range (Note 7)		V_{CC} = 30V		0	—	V_{CC}-1.5	V
I_{CC}	Supply Current		T_A = -40°C to +85°C, R_L = ∞, V_{CC} = 30V		—	0.7	2	mA
			T_A = -40°C to +85°C, R_L = ∞, V_{CC} = 5V		—	0.5	1.2	
G_V	Large Signal Voltage Gain		V_{CC} = 15V, V_O = 1V to 11V, R_L ≥ 2kΩ		85	100	—	dB
					80	—	—	
CMRR	Common Mode Rejection Ratio		DC, V_{CM} = 0V to (V_{CC}-1.5)V		60	70	—	dB
					60	—	—	
PSRR	Power Supply Rejection Ratio		V_{CC} = 5V to 30V		70	100	—	dB
					60	—	—	
CS	Channel Separation		f = 1kHz to 20kHz		—	-120	—	dB
I_{SOURCE}	Output Current	Source	V_{IN}+ = 1V, V_{IN}- = 0V, V_{CC} = 15V, V_O = 2V		20	40	—	mA
					20	—	—	
I_{SINK}		Sink	V_{IN}+ = 0V, V_{IN}- = 1V, V_{CC} = 15V, V_O = 2V		10	15	—	mA
					5	—	—	
			V_{IN}+ = 0V, V_{IN}- = 1V, V_{CC} = 15V, V_O = 0.2V		12	50	—	µA
I_{SC}	Output Short Circuit Current to Ground		V_{CC} = 15V		—	40	60	mA
V_{OH}	Output Voltage Swing		V_{CC} = 30V, R_L = 2kΩ		26	—	—	V
					26	—	—	
			V_{CC} = 30V, R_L = 10kΩ		27	28	—	
					27	—	—	
V_{OL}			V_{CC} = 5V, R_L = 10kΩ		—	5	20	mV
					—	—	**30**	
θ_{JC}	Thermal Resistance (Junction to Case)		SO-8		—	17	—	°C/W
			TSSOP-8			47		
			MSOP-8			22		
θ_{JA}	Thermal Resistance (Junction to Ambient)		SO-8		—	115	—	
			TSSOP-8			209		
			MSOP-8			160		

Notes: 6. Limits over the full temperature are guaranteed by design, but not tested in production.

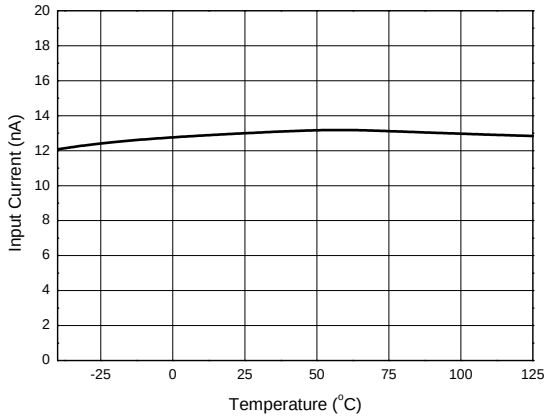
7. The input common-mode voltage of either input signal voltage should not be allowed to go negatively by more than 0.3V (at +25°C). The upper end of the common-mode voltage range is V_{CC}-1.5V (at +25°C), but either or both inputs can go to +36V without damages, independent of the magnitude of the V_{CC}.

Performance Characteristics

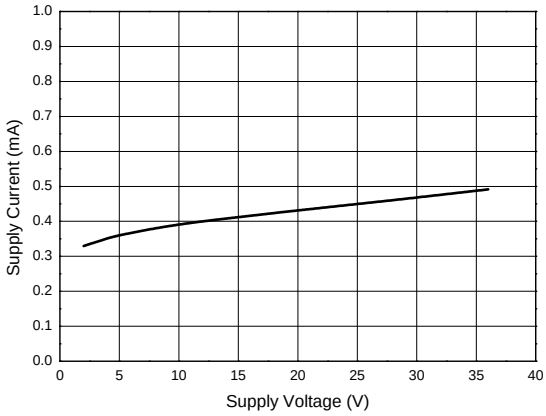
Input Voltage Range



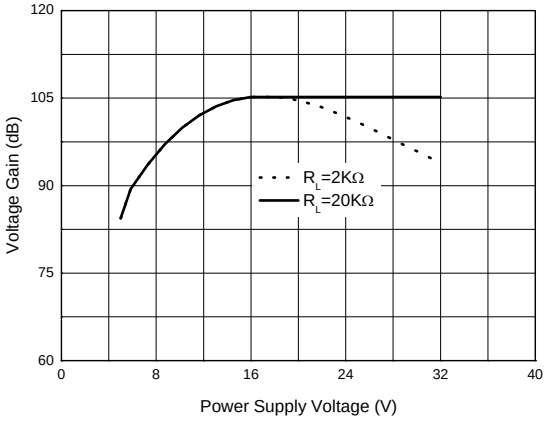
Input Current



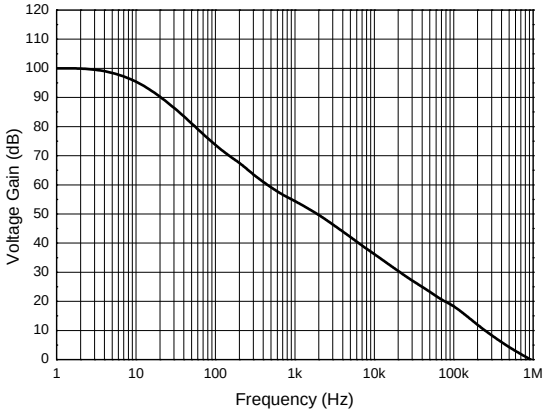
Supply Current



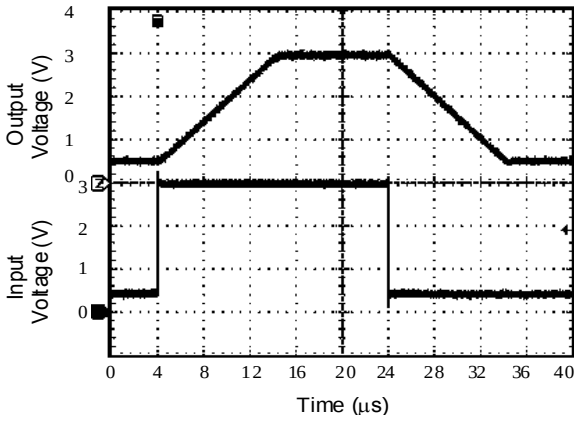
Voltage Gain



Open Loop Frequency Response

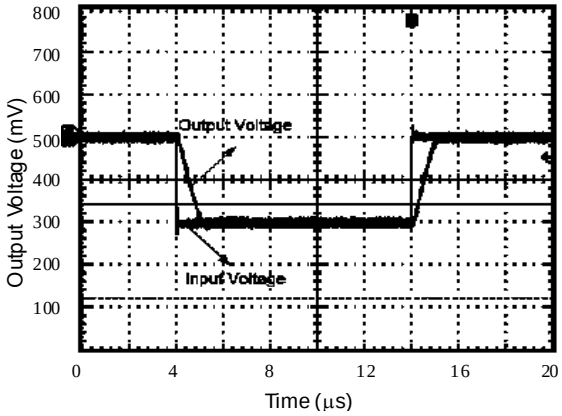


Voltage Follower Pulse Response

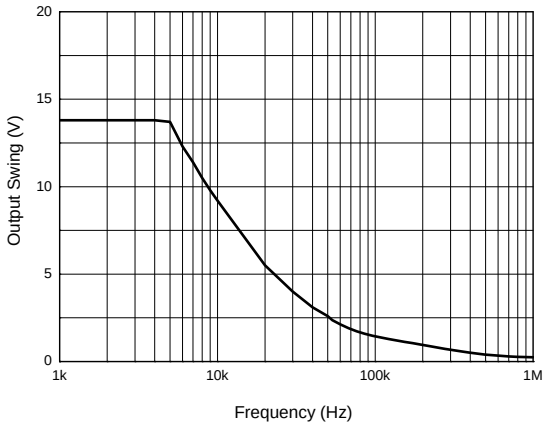


Performance Characteristics (Cont.)

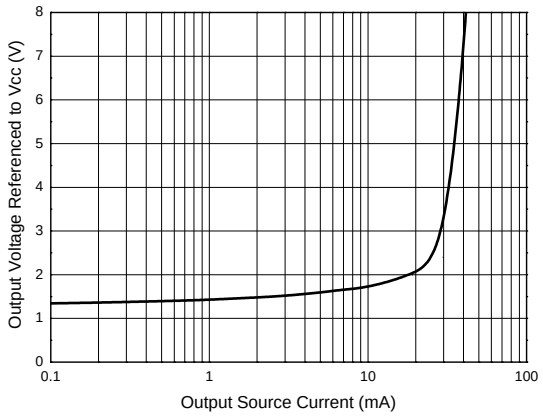
Voltage Follower Pulse Response (Small Signal)



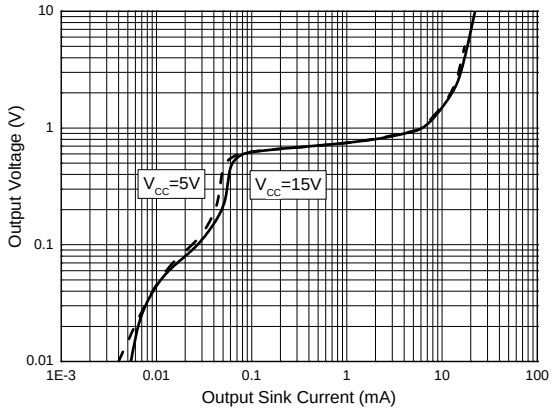
Large Signal Frequency Response



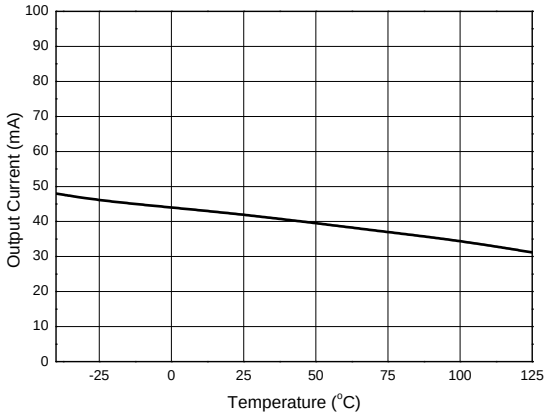
Output Characteristics: Current Sourcing



Output Characteristics: Current Sinking



Current Limiting



Ordering Information

AS358X XX XX - XX

Product Name	Product Version	Package	Packing	E1/G1
	A : AS358A B : AS358B Blank : AS358	M : SO-8 P : PDIP-8 PT : TDIP-8 G : TSSOP-8 MM : MSOP-8	TR : Tape & Reel Blank : Tube	E1 : RoHS Compliant G1 : RoHS Compliant and Green

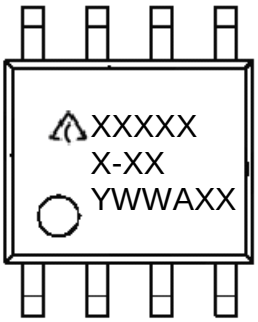
Part Number	Package (Note 9)	Temperature Range	RoHS Compliant Lead Free / Green	Marking ID	Packing	Status (Note 8)	Alternative
AS358M-E1	SO-8	-40°C to +85°C	Lead Free	AS358M-E1	100/Tube	End of Life	AS358MTR-G1
AS358M-G1			Green	AS358M-G1			
AS358MTR-E1			Lead Free	AS358M-E1	4000/Tape & Reel	NRND	AS358MTR-G1
AS358MTR-G1			Green	AS358M-G1		In Production	—
AS358AM-E1			Lead Free	AS358AM-E1	100/Tube	End of Life	AS358AMTR-G1
AS358AM-G1			Green	AS358AM-G1			
AS358AMTR-E1			Lead Free	AS358AM-E1	4000/Tape & Reel	NRND	AS358AMTR-G1
AS358AMTR-G1			Green	AS358AM-G1		In Production	—
AS358P-E1	PDIP-8	-40°C to +85°C	Lead Free	AS358P-E1	50/Tube	In Production	—
AS358P-G1			Green	AS358P-G1		In Production	—
AS358AP-E1			Lead Free	AS358AP-E1		In Production	—
AS358AP-G1			Green	AS358AP-G1		End of Life	—
AS358PT-G1	TDIP-8	-40°C to +85°C	Green	AS358PT-G1	50/Tube	In Production	—
AS358GTR-E1	TSSOP-8	-40°C to +85°C	Lead Free	EG3A	4000/Tape & Reel	NRND	AS358GTR-G1
AS358GTR-G1			Green	GG3A		In Production	—
AS358BGTR-G1			Green	GG3F		In Production	—
AS358MMTR-E1	MSOP-8	-40°C to +85°C	Lead Free	AS358MM-E1	3000/Tape & Reel	End of Life	AS358MMTR-G1
AS358MMTR-G1			Green	AS358MM-G1		In Production	—

Notes: 8. NRND: Not Recommended for New Design
9. For packaging details, go to our website at: https://www.diodes.com/design/support/packaging/diodes-packaging/.

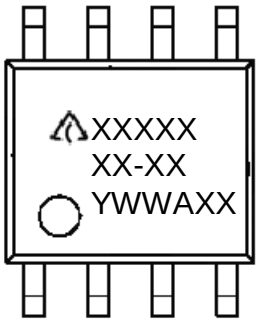
Marking Information

(1) SO-8

AS358



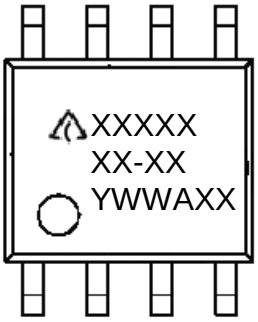
AS358A



First and Second Lines: Logo and Marking ID
Third Line: Date Code
Y: Year
WW: Work Week of Molding
A: Assembly House Code
XX: Internal Code

(2) MSOP-8

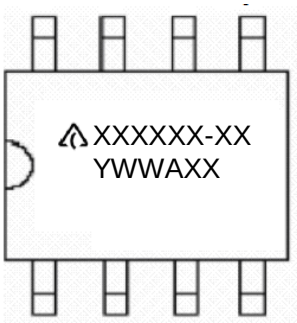
AS358



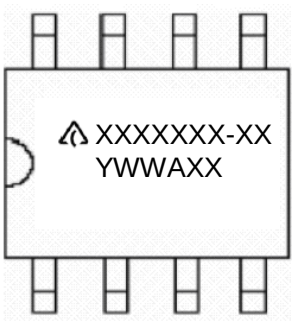
First and Second Lines: Logo and Marking ID
Third Line: Date Code
Y: Year
WW: Work Week of Molding
A: Assembly House Code
XX: Internal Code

(3) PDIP-8

AS358



AS358A

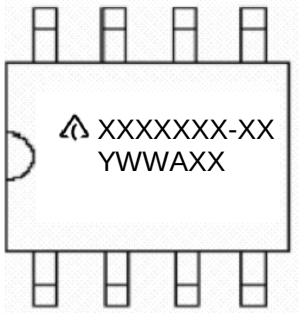


First Line: Logo and Marking ID
Second Line: Date Code
Y: Year
WW: Work Week of Molding
A: Assembly House Code
XX: Internal Code

Marking Information (Cont.)

(4) TDIP-8

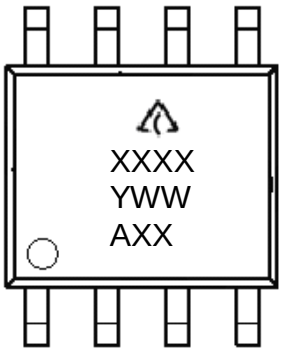
AS358



First Line: Logo and Marking ID
Second Line: Date Code
Y: Year
WW: Work Week of Molding
A: Assembly House Code
XX: Internal Code

(5) TSSOP-8

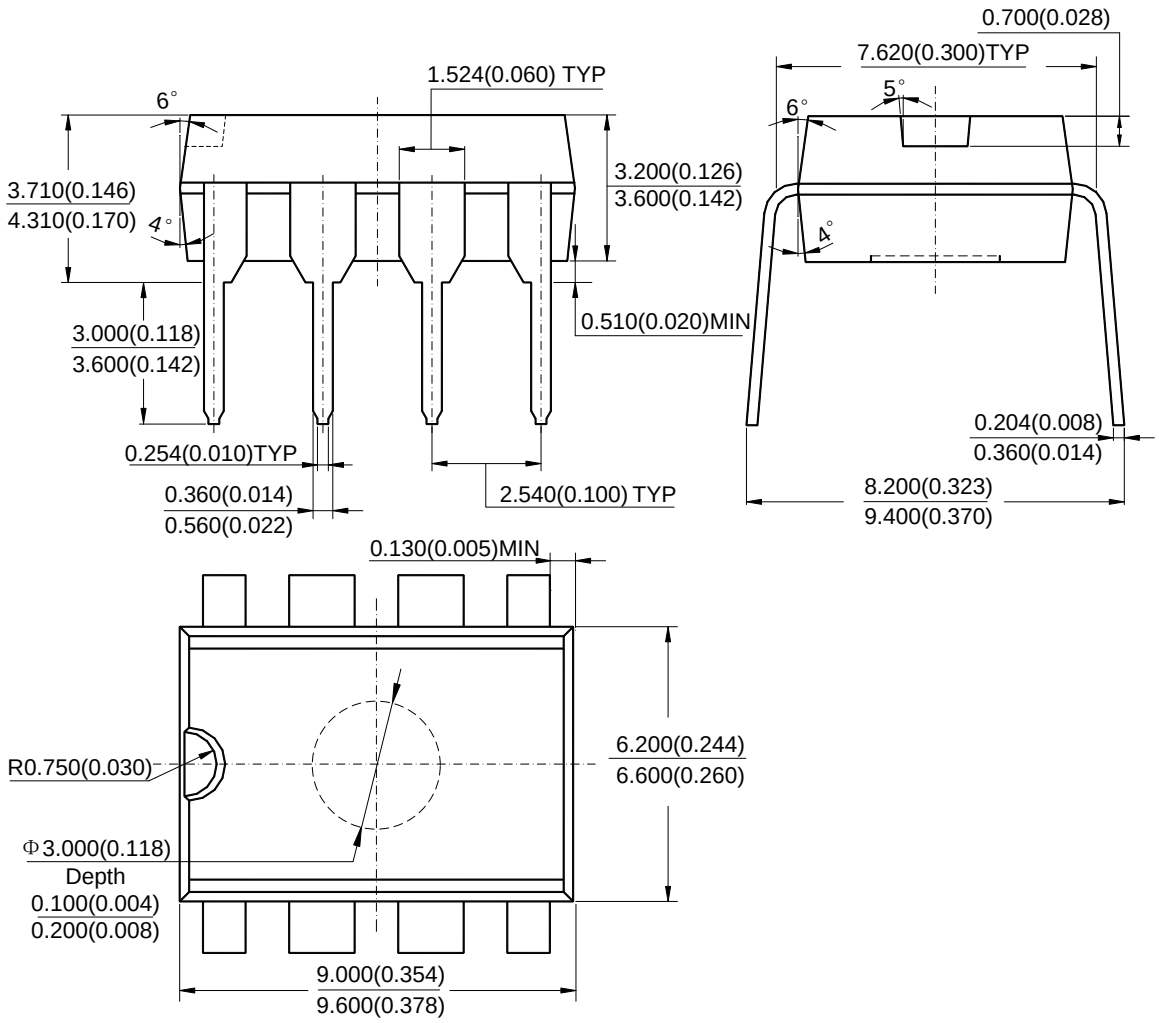
AS358/358B



First Line: Logo
Second Line: Marking ID
Third and Fourth Lines: Date Code
Y: Year
WW: Work Week of Molding
A: Assembly House Code
XX: Internal Code

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

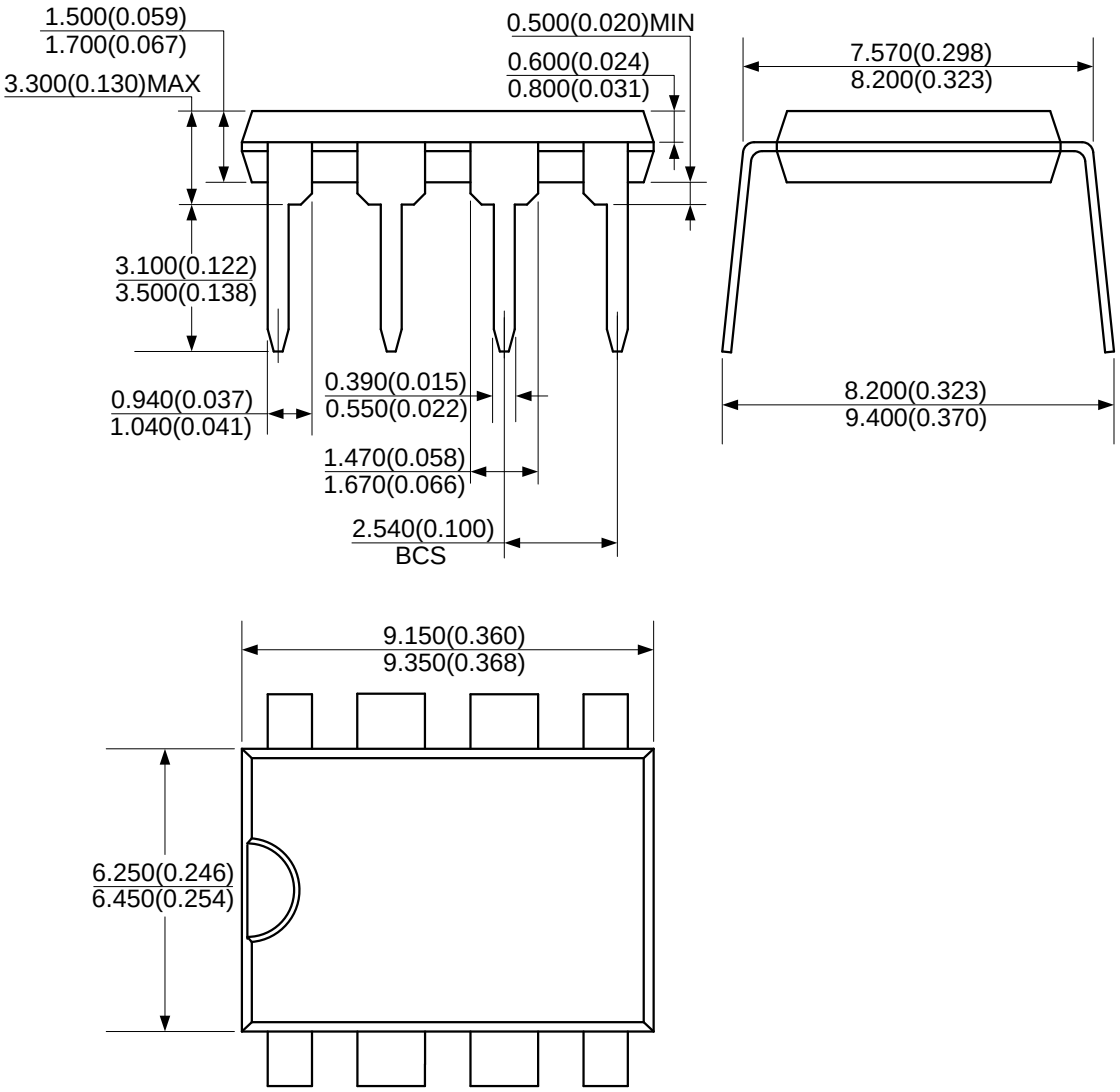
(1) Package Type: PDIP-8



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

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

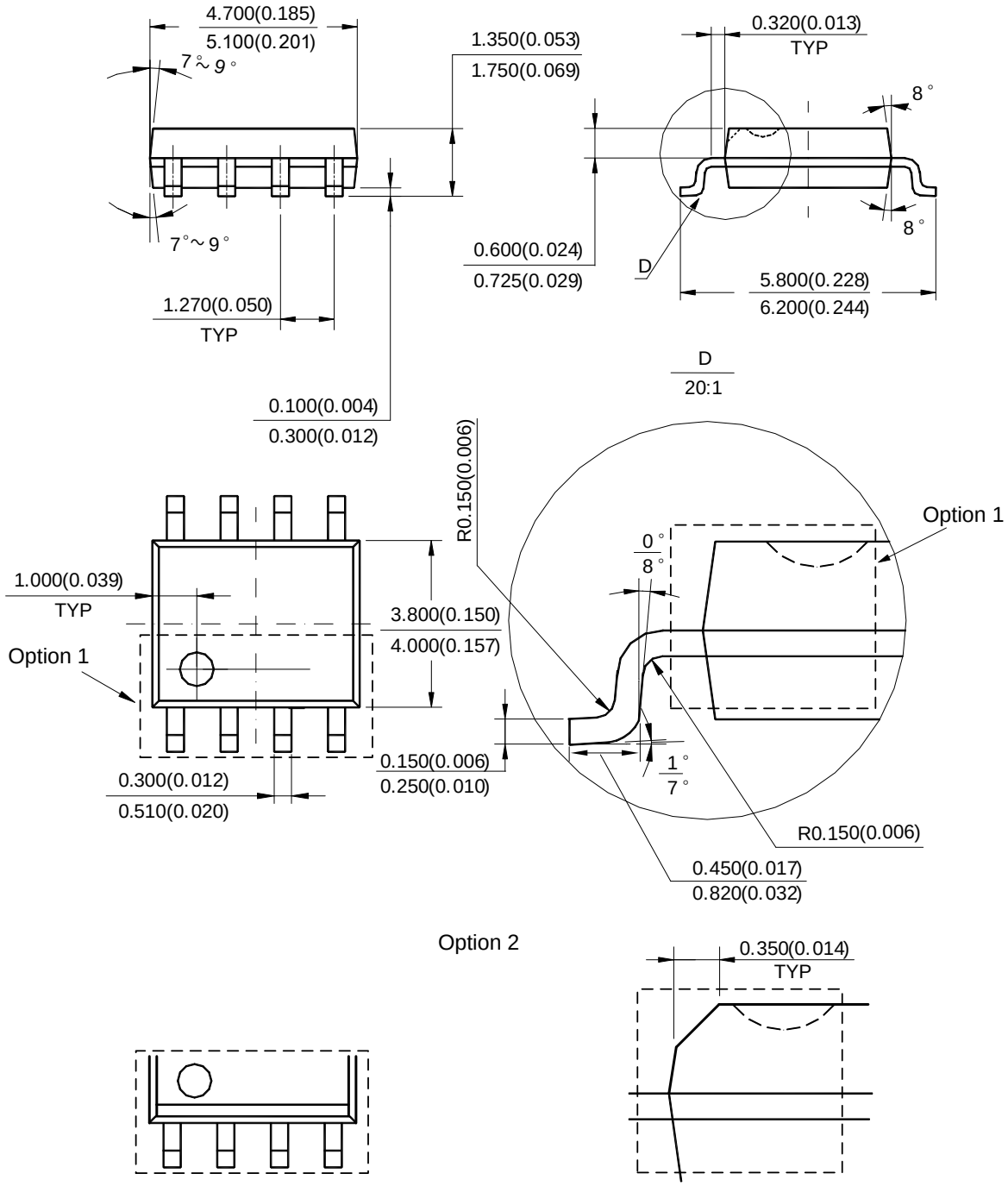
(2) Package Type: TDIP-8



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

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

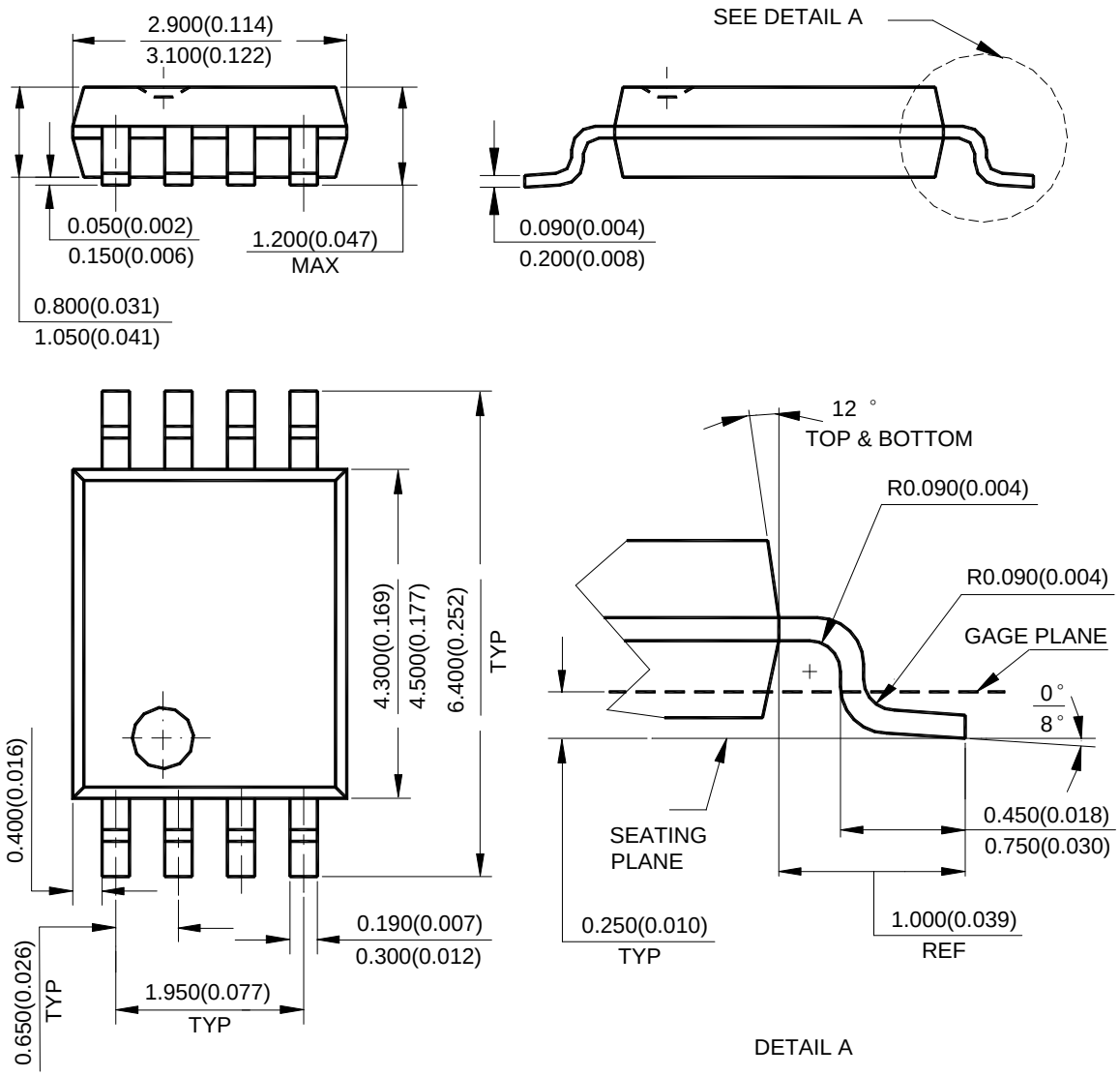
(3) Package Type: SO-8



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

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

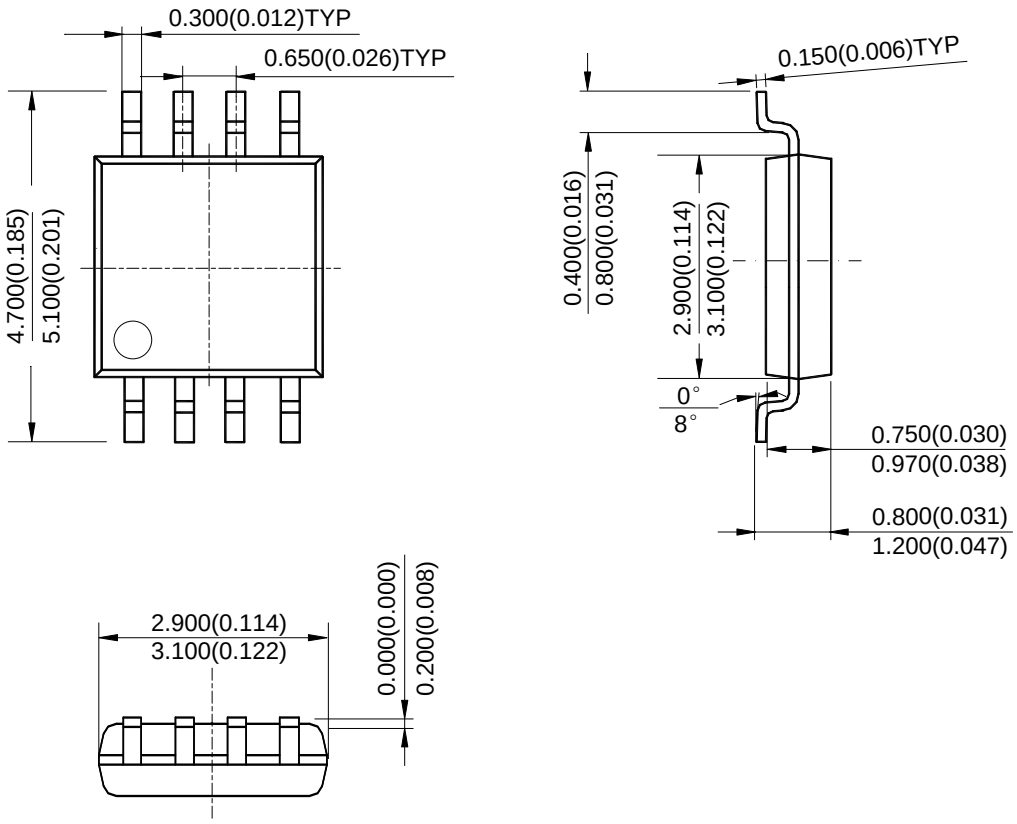
(4) Package Type: TSSOP-8



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

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

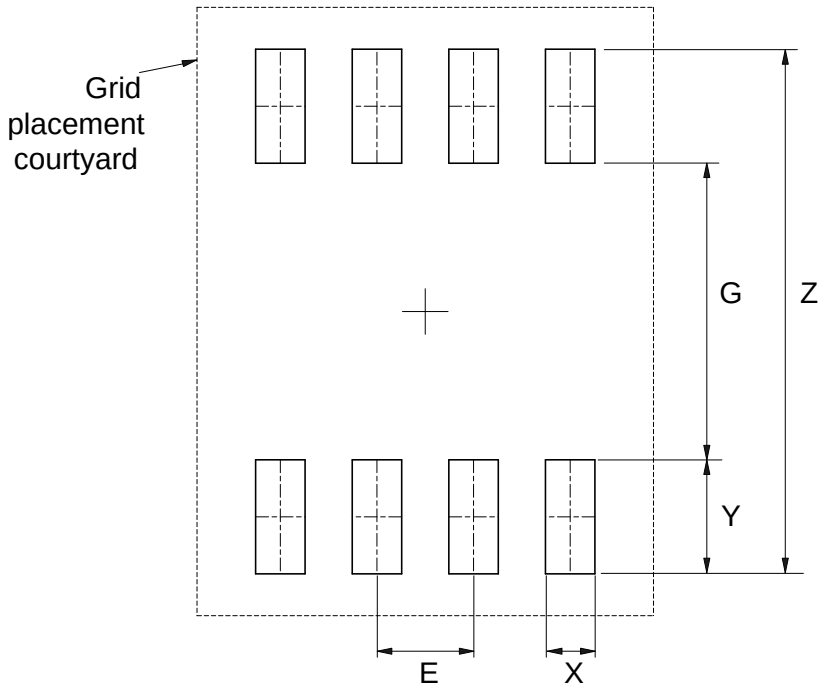
(5) Package Type: MSOP-8



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

Suggested Pad Layout

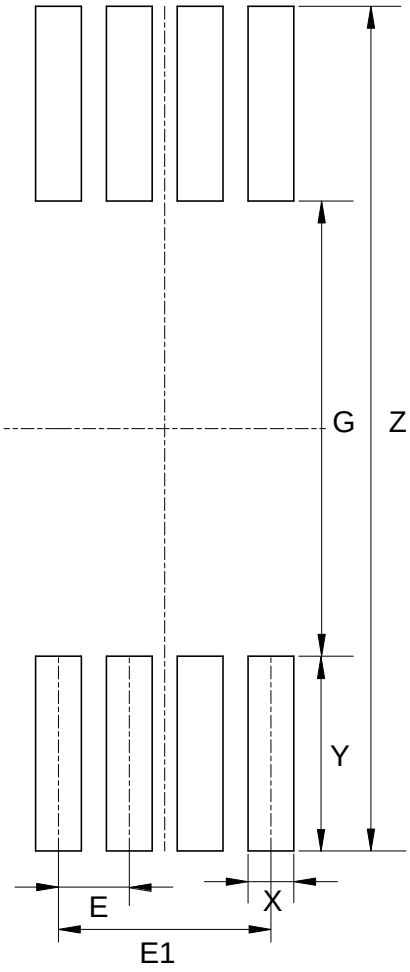
(1) Package Type: SO-8



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

Suggested Pad Layout (Cont.)

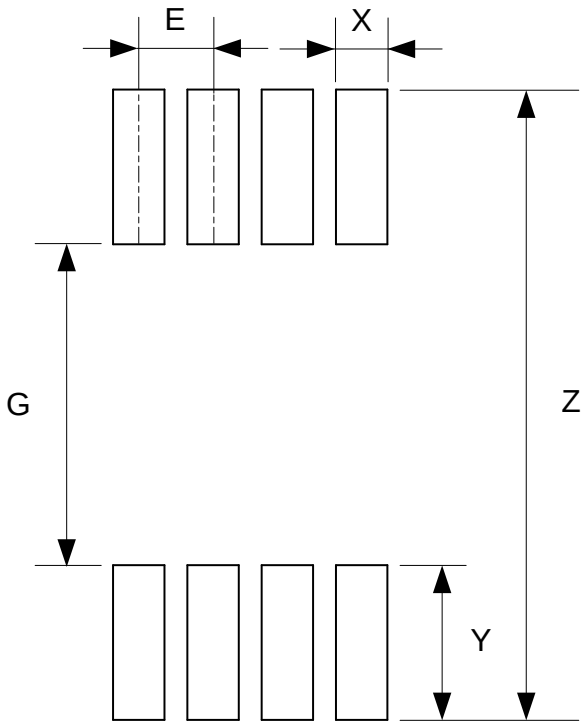
(2) Package Type: TSSOP-8



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E (mm)/(inch)	E1 (mm)/(inch)
Value	7.720/0.304	4.160/0.164	0.420/0.017	1.780/0.070	0.650/0.026	1.950/0.077

Suggested Pad Layout (Cont.)

(3) Package Type: MSOP-8



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E (mm)/(inch)
Value	5.500/0.217	2.800/0.110	0.450/0.018	1.350/0.053	0.650/0.026

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