PULSE-WIDTH-MODULATION CONTROL CIRCUITS AZ496

General Description

The AZ496 is a voltage mode pulse width modulation switching regulator control circuit designed primarily for power supply control.

The AZ496 consists of a reference voltage circuit, two error amplifiers, an on-chip adjustable oscillator, a dead-time control (DTC) comparator, a pulse-steering control flip-flop, and an output control circuit. The precision of voltage reference (V_{REF}) is improved up to ± 1% through trimming and this provides a better output voltage regulation. The AZ496 provides for push-pull or single-ended output operation, which can be selected through the output control.

The PWM IC is specially designed for half bridge converter and can simplify the drive circuit.

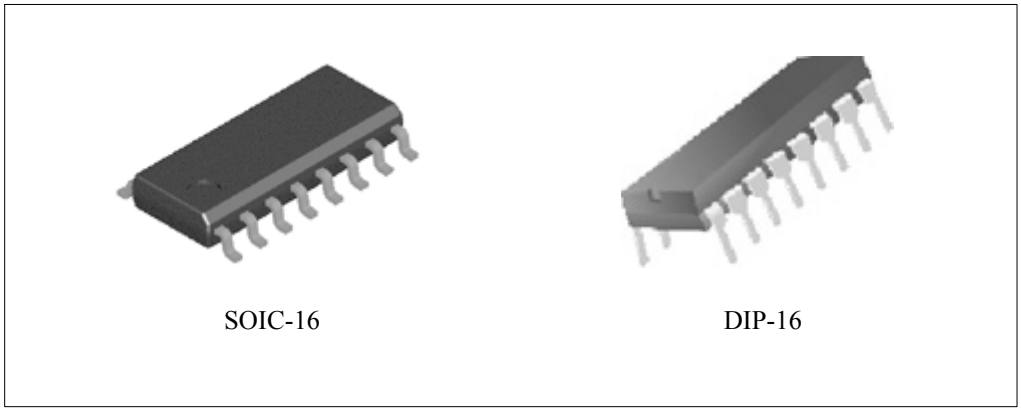
The AZ496 is available in SOIC-16 and DIP-16 packages.

Features

- Stable 4.95V Reference Voltage Trimmed to ±1.0% Accuracy
- Uncommitted Output TR for 100mA Sink or Source Current
- Single-end or Push-pull Operation Selected by Output Control
- Internal Circuitry Prohibits Double Pulse at Either Output
- Complete PWM Control Circuit with Variable Duty Cycle
- On-Chip Oscillator with Master or Slave Operation

Applications

- SMPS
- Back Light Inverter
- Charger



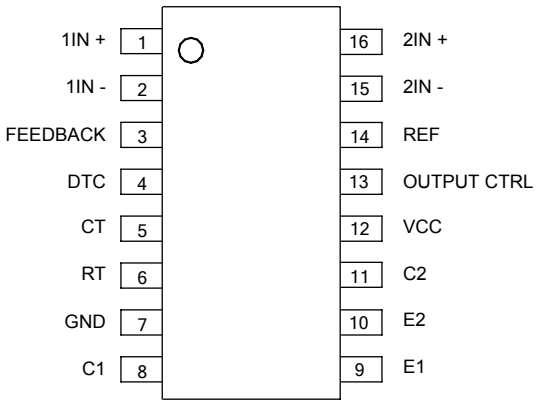
SOIC-16 DIP-16

Figure 1. Package Types of AZ496

PULSE-WIDTH-MODULATION CONTROL CIRCUITS AZ496

Pin Configuration

M Package
(SOIC-16)



P Package
(DIP-16)

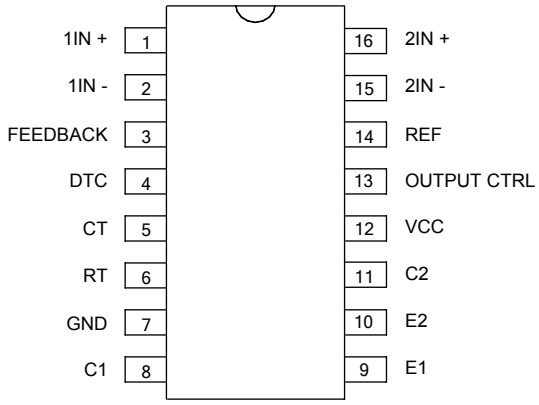


Figure 2. Pin Configuration of AZ496 (Top View)

Output Function Control Table

Signal for Output Control	Output Function
V_I = GND	Single-ended or parallel output
V_I = V_{REF}	Normal push-pull operation

Functional Block Diagram

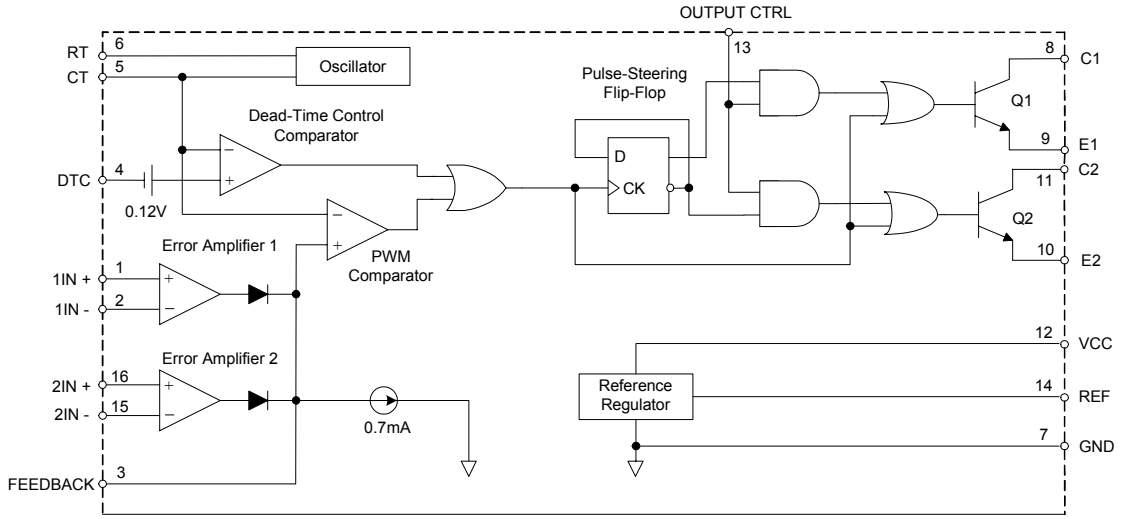
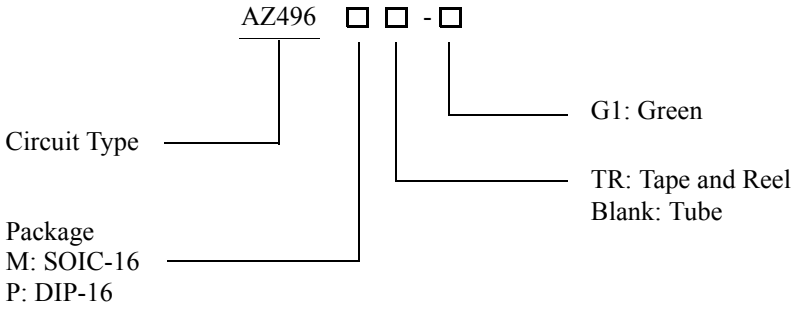


Figure 3. Functional Block Diagram of AZ496

Ordering Information



Package	Temperature Range	Part Number	Marking ID	Packing Type
SOIC-16	-40 to 85°C	AZ496M-G1	AZ496M-G1	Tube
		AZ496MTR-G1	AZ496M-G1	Tape & Reel
DIP-16		AZ496P-G1	AZ496P-G1	Tube

BCD Semiconductor's products, as designated with "G1" suffix in the part number, are RoHS compliant and Green.

Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value		Unit
Supply Voltage (Note 2)	V_{CC}	40		V
Amplifier Input Voltage	V_I	-0.3 to V_{CC} + 0.3		V
Collector Output Voltage	V_O	40		V
Collector Output Current	I_O	150		mA
Package Thermal Impedance (Note 3)	θ_{JA}	SOIC-16	73	°C/W
		DIP-16	67	
Lead Temperature 1.6mm from case for 10 seconds	T_{LEAD}	260		°C
Storage Temperature Range	T_{STG}	-65 to 150		°C
ESD rating (Machine Model)		200		V

Note 1: 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.
Note 2: All voltage values are with respect to the network ground terminal.
Note 3: Maximum power dissipation is a function of $T_J(max)$, θ_{JA} and T_A. The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(max) - T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.

Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	V_{CC}	7	15	36	V
Collector Output Voltage	V_{C1}, V_{C2}		30	36	V
Collector Output Current (Each Transistor)	I_{C1}, I_{C2}			100	mA
Amplifier Input Voltage	V_I	0.3		V_{CC} - 2	V
Current Into Feedback Terminal	I_{FB}			0.3	mA
Reference Output Current	I_{REF}			10	mA
Timing Capacitor	C_T	0.00047	0.001	10	μF
Timing Resistor	R_T	1.8	30	500	KΩ
Oscillator Frequency	f_{osc}	1.0	40	100	KHz
PWM Input Voltage (Pin 3, 4, 14)		0.3		5.3	V
Operating Free-Air Temperature	T_A	-40		85	°C

Electrical Characteristics

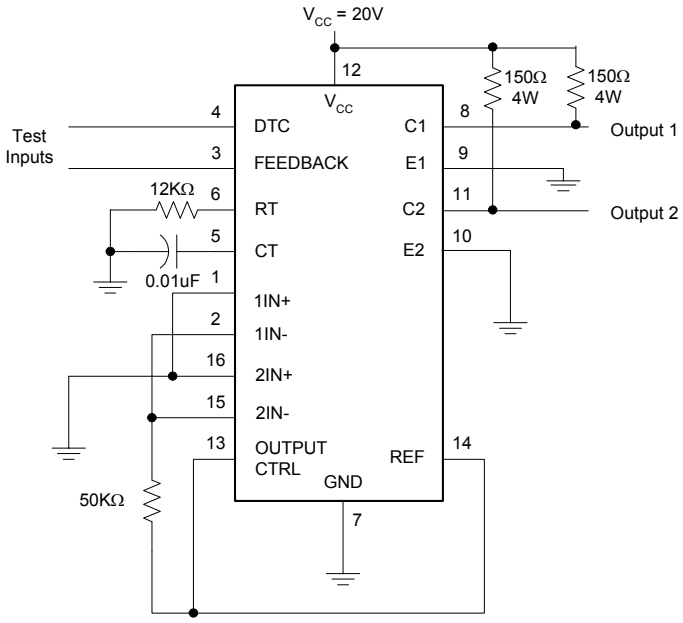
T_A=25°C, V_{CC}=20V, f=10KHz unless otherwise noted.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reference Section						
Output Reference Voltage	V_{REF}	I_{REF}=1mA	4.90	4.95	5.0	V
		I_{REF}=1mA, T_A= -40 to 85°C	4.85	4.95	5.05	V
Line Regulation	R_{LINE}	V_{CC}=7V to 36V		2	25	mV
Load Regulation	R_{LOAD}	I_{REF}=1mA to 10mA		1	15	mV
Short-Circuit Output Current	I_{SC}	V_{REF}=0V	10	35	50	mA
Oscillator Section						
Oscillator Frequency	f_{OSC}	C_T=0.001μF, R_T=30KΩ,		40		kHz
		C_T=0.01μF, R_T=12KΩ	9.2	10	10.8	
		C_T=0.01μF, R_T=12KΩ, T_A= -40 to 85°C	9.0		12	
Frequency Change with Temperature	Δf/ΔT	C_T=0.01μF, R_T=12KΩ, T_A=-40 to 85°C			1	%
Dead-Time Control Section						
Input Bias Current	I_{BIAS}	V_{CC}=15V, V4=0 to 5.25V		-2	-10	μA
Maximum Duty Cycle	D(MAX)	V_{CC}=15V, V4=0V, Pin 13=V_{REF}	45			%
Input Threshold Voltage	V_{ITH}	Zero Duty Cycle		3	3.3	V
		Maximum Duty Cycle	0			
Error-Amplifier Section						
Input Offset Voltage	V_{IO}	V3=2.5V		2	10	mV
Input Offset Current	I_{IO}	V3=2.5V		25	250	nA
Input Bias Current	I_{BIAS}	V3=2.5V		0.2	1	μA
Common-Mode Input Voltage Range	V_{CM}	V_{CC}=7V to 36V	-0.3		V_{CC}-2	V
Open-loop Voltage Gain	G_{VO}	V_O=0.5V to 3.5V	70	95		dB
Unity-Gain Bandwidth	BW			650		kHz
Common-Mode Rejection Ratio	CMRR		65	80		dB
Output Sink Current (Feedback)	I_{SINK}	V_{ID}= -15mV to -5V, V3= 0.7V	-0.3	-0.7		mA
Output Source Current (Feedback)	I_{SOURCE}	V_{ID}=15mV to 5V V3=3.5V	2			mA

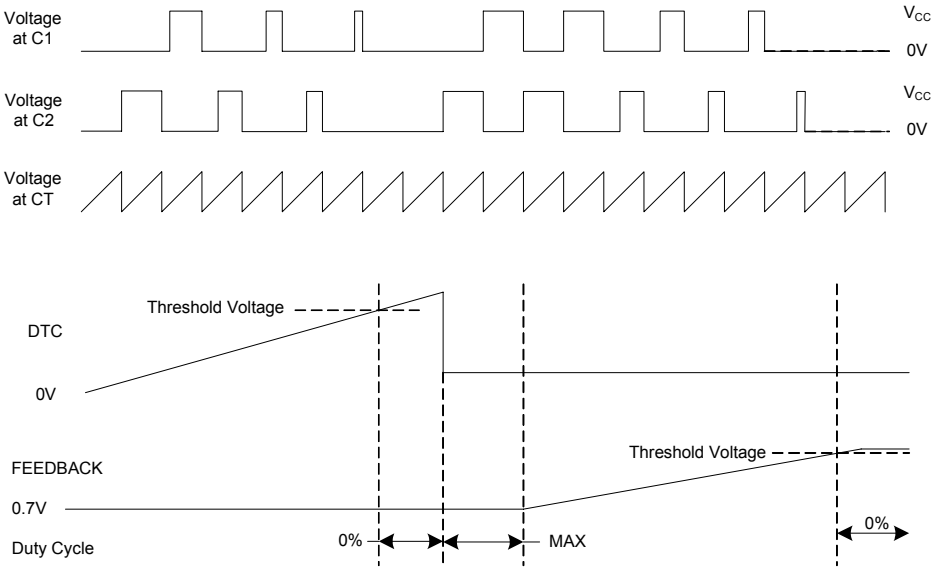
Electrical Characteristics (Continued)

Parameter		Symbol	Conditions	Min	Typ	Max	Unit
PWM Comparator Section							
Input Threshold Voltage		V_{ITH}	Zero duty cycle		4	4.5	V
Input Sink Current		I_{SINK}	V3 = 0.7V	-0.3	-0.7		mA
Output Section							
Output Saturation Voltage	Common Emitter	V_{CE} (SAT)	V_E = 0V, I_C =200mA		1.1	1.3	V
	Emitter Follower	V_{CC} (SAT)	V_{CC} = 15V, I_E = -200mA		1.5	2.5	
Collector Off-State Current		I_C (OFF)	V_{CE} = 36V, V_{CC}=36V		2	100	μA
Emitter Off-State Current		I_E(OFF)	V_{CC} = V_C = 36V, V_E = 0			-100	μA
Total Device							
Supply Current		I_{CC}	Pin 6 = V_{REF}, V_{CC}=15V		6	10	mA
Output Switching Characteristics							
Rise Time		t_R	Common Emitter Common Collector		120	200	ns
Fall Time		t_F	Common Emitter Common Collector		50	100	ns

Parametre Measurement information



Test Circuit



Voltage Waveforms

Figure 4. Operational Test Circuit and Waveforms

Parametre Measurement information (Continued)

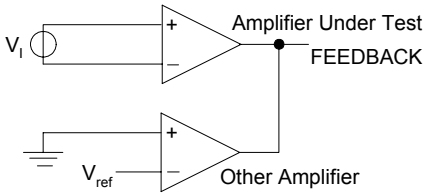
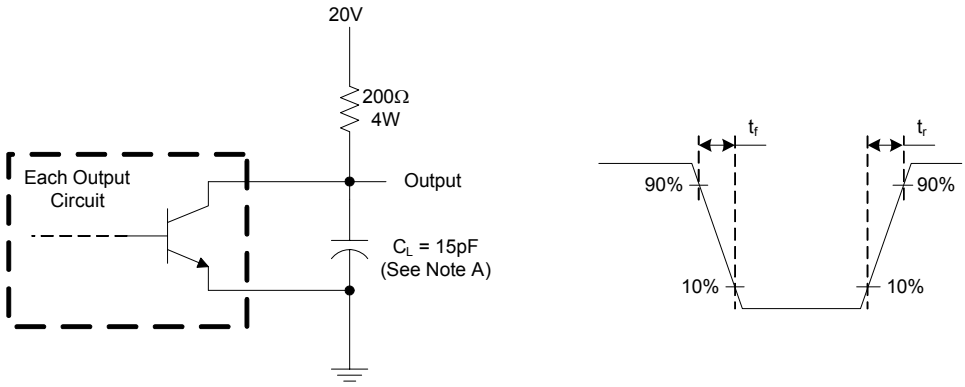
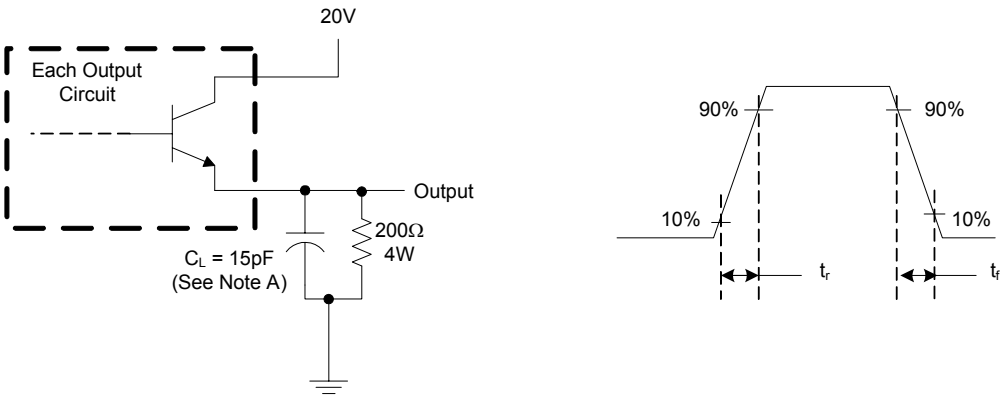


Figure 5. Error Amplifier Characteristics



Note A: C_L includes probe and jig capacitance.

Figure 6. Common-Emitter Configuration



Note A: C_L includes probe and jig capacitance.

Figure 7. Emitter-Follower Configuration

Typical Performance Characteristics

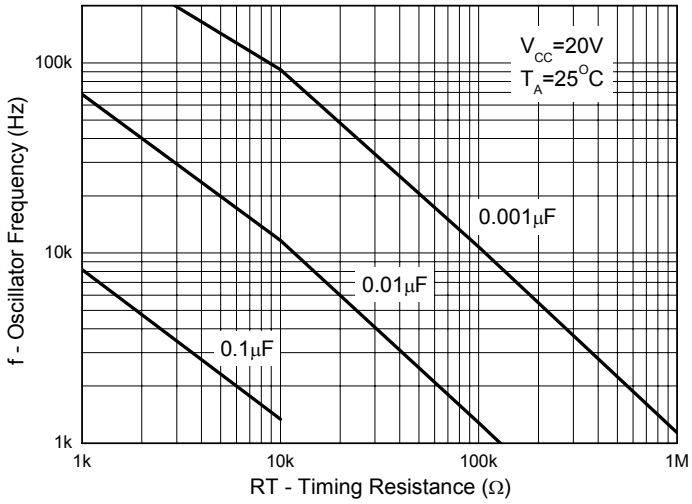


Figure 8. Oscillator Frequency vs. RT and CT

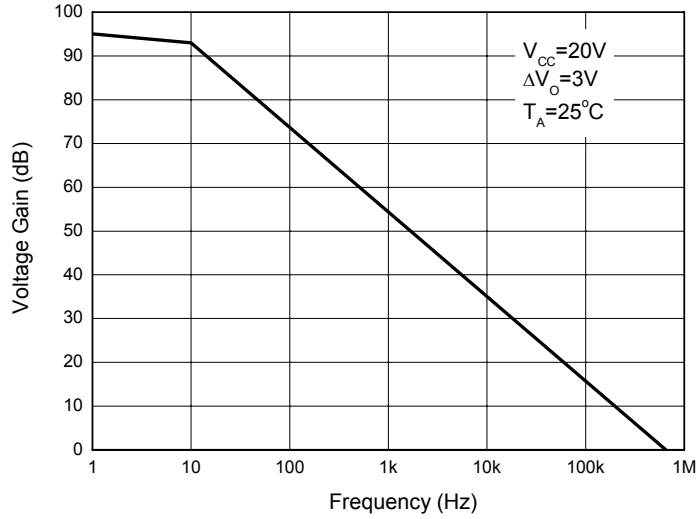


Figure 9. Error Amplifier Small-Signal Voltage Gain vs. Frequency

Typical Application

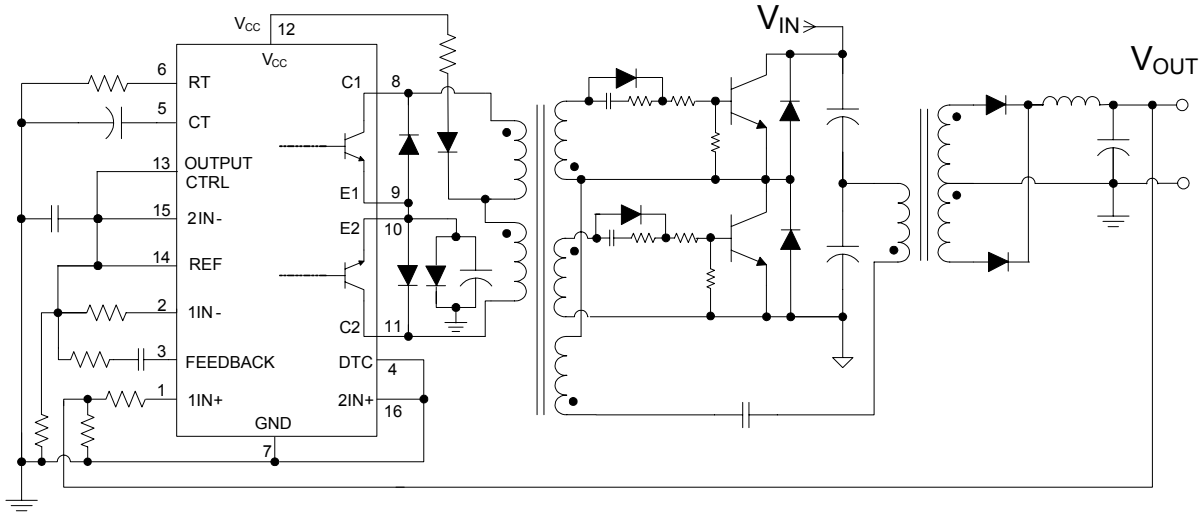
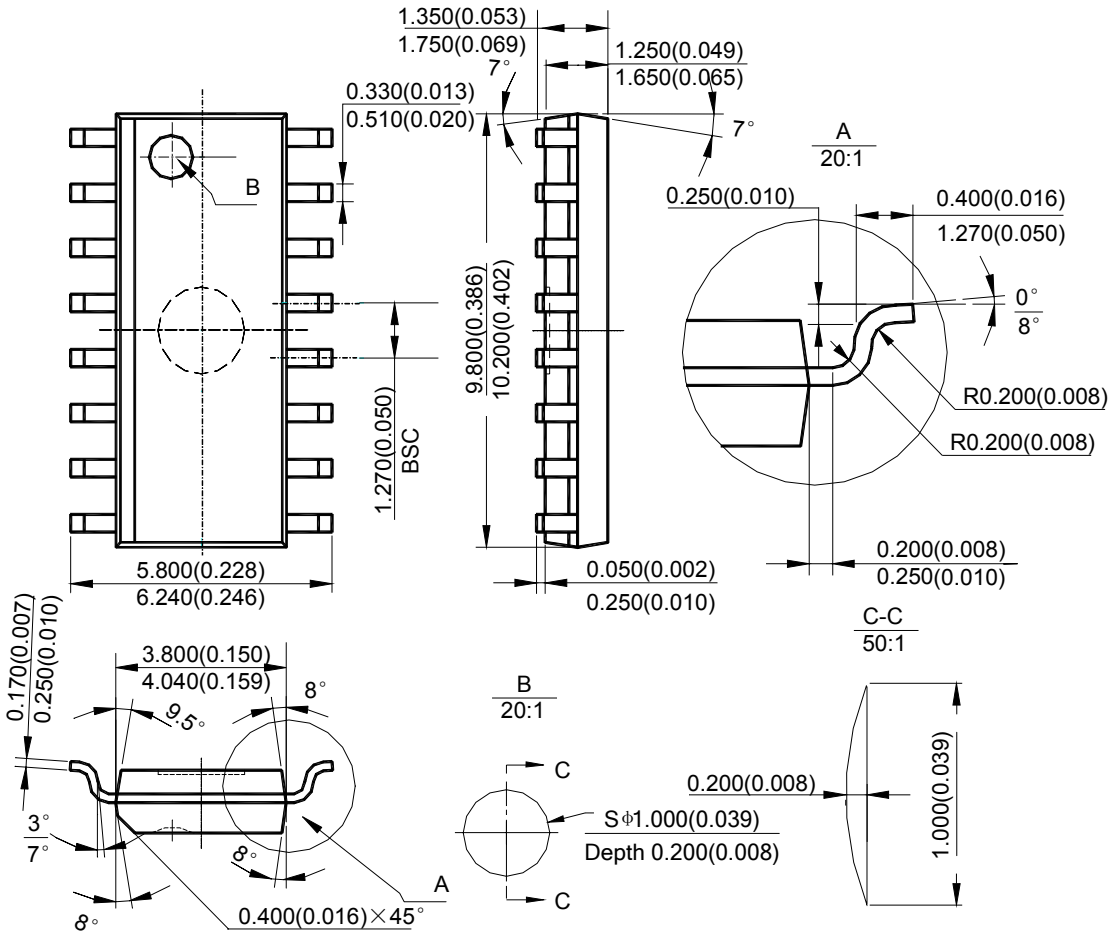


Figure 10. Half Bridge Converter

Mechanical Dimensions

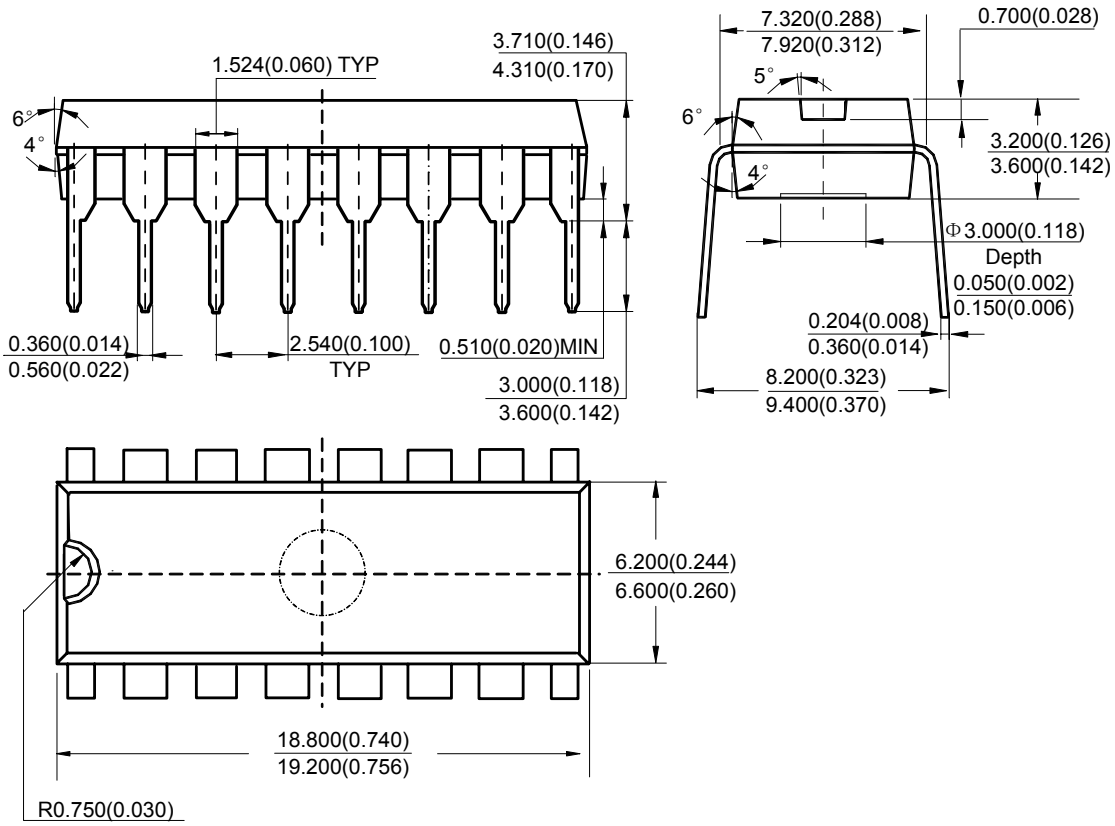
SOIC-16 **Unit: mm(inch)**



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

Mechanical Dimensions (Continued)

DIP-16 **Unit: mm(inch)**



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

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