

Description

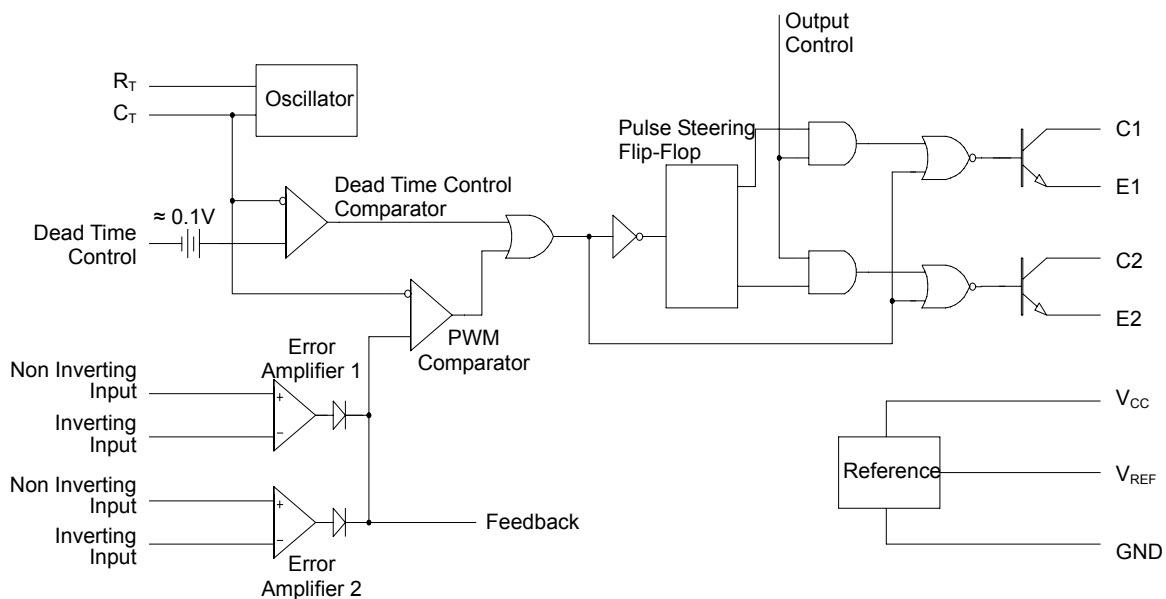
The KA7500 incorporate on a single monolithic chip all the functions required in the construction of a pulse-width-modulation control circuit. Designed primarily for power supply control, these devices offer the systems engineer the flexibility to tailor the power supply control circuitry to his application.

The KA7500 contains an error amplifier, an on-chip adjustable oscillator, a dead-time control comparator, pulse-steering control flipflop, a 5-volt, 1% precision regulator, and output-control circuits. The error amplifier exhibits a common-mode voltage range from -0.3 volts to $V_{CC} - 2$ volts. The dead-time control comparator has a fixed offset that provides approximately 5% dead time when externally altered. The on-chip oscillator may be bypassed by terminating R_T (pin 6) to the reference output and providing a sawtooth input to C_T (pin 5), or it may be used to drive the common circuits in synchronous multiple-rail power supplies. The uncommitted output transistors provide either common-emitter or emitter-follower output capability. Each device provides for push-pull or single-ended output operation, which may be selected through the output-control function. The architecture of these devices prohibits the possibility of either output being pulsed twice during push-pull operation.

Features

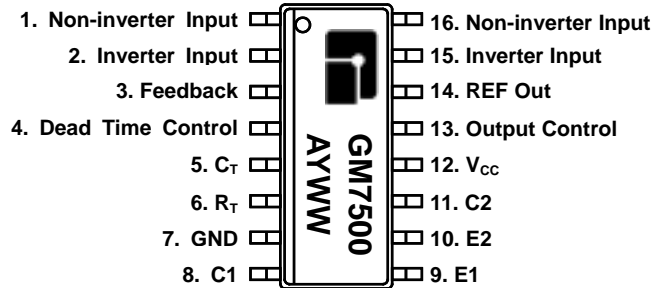
- ◆ High Current totem Pole Output Stage
- ◆ Complete PWM Power Control Circuitry
- ◆ Uncommitted Outputs for 200 mA Sink or Source Current
- ◆ Output Control Selects Single-Ended or Push-Pull Operation
- ◆ Internal Circuitry Prohibits Double Pulse at Either Output
- ◆ Variable Dead-Time Provides Control over Total Range
- ◆ Internal Regulator Provides a Stable 5-V Reference Supply, 1%
- ◆ Circuit Architecture Allows Easy synchronization

Functional Block Diagram



Marking Information and Pin Configurations (Top View)

SO16 and DIP16



A: Assembly / Test site code
Y: Year
WW: Week

Ordering Information

Ordering Number	Package	Shipping
GM7500S16T	SO16	50 Units/Tube
GM7500S16R	SO16	2500 Units/Reel
GM7500D16T	DIP16	25 Units/Tube

Absolute Maximum Ratings

PARAMETER	RATINGS	UNITS
Supply Voltage	41	V
Amplifier input voltage	VCC + 0.3	A
Collector output voltage	41	V
Collector output current	250	mA
Operating Ambient Temperature Range	- 40 to 125-	°C
Storage Temperature	- 65 to 150	°C
Lead Temperature (soldering 10 sec.)	260	°C

* Maximum Package Power Dissipation Limits must be observed.

Recommended Operating Conditions

PARAMETER	SYMBOL	RATINGS		UNITS
		MIN	MAX	
Supply Voltage	V _{CC}	7	40	V
Amplifier input voltage	V _i	- 0.3	V _{CC} - 2	A
Collector output voltage	V _o		40	V
Collector output current (each transistor)			200	mA
Current into feedback terminal			0.3	
Timing Capacitor	C _T	0.0047	10	μF
Timing Resistor	R _T	1.8	500	kΩ
Oscillator frequency		1	200	kHz
Operating free air temperature	T _A	0	70	°C

Parameter Measurement Information

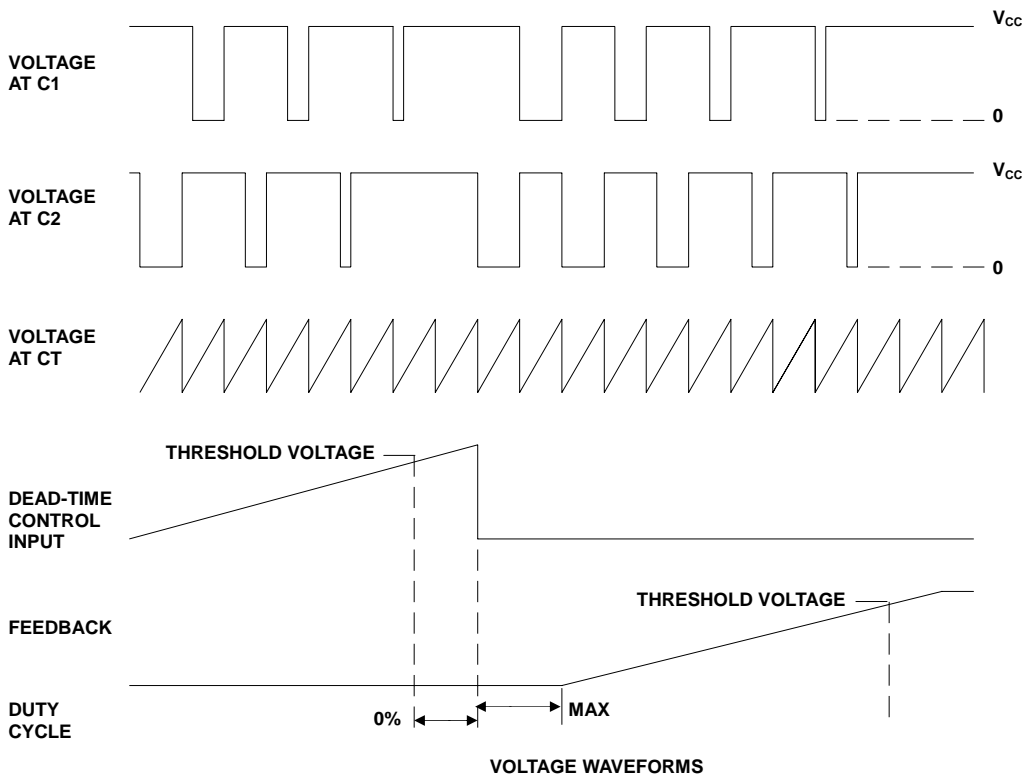
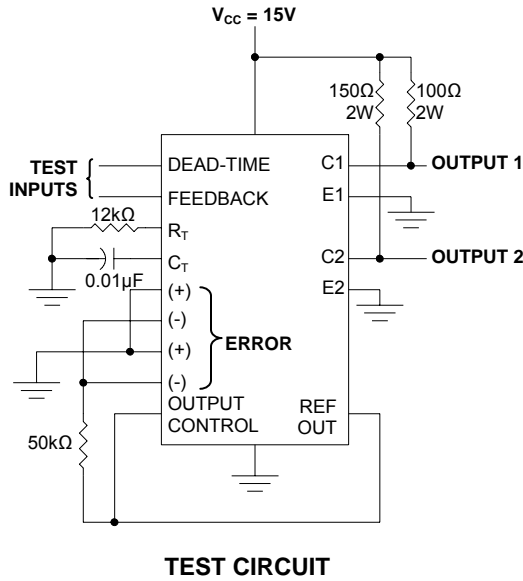


FIGURE 1. OPERATIONAL TEST CIRCUIT AND WAVEFORMS

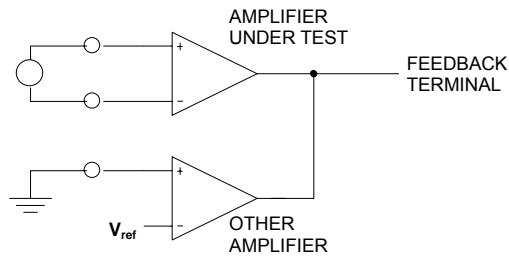


FIGURE 2. AMPLIFIER CHARACTERISTICS

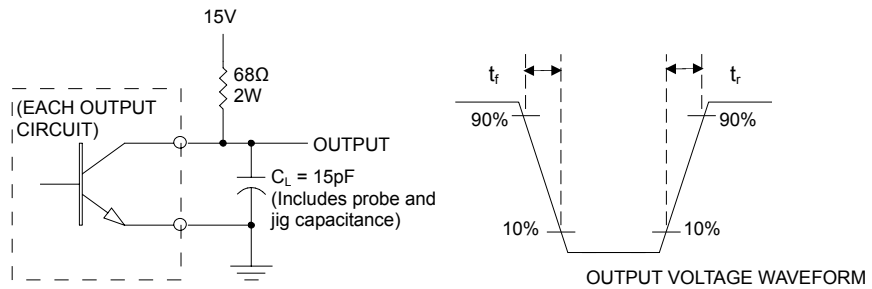


FIGURE 3. COMMON-EMITTER CONFIGURATION

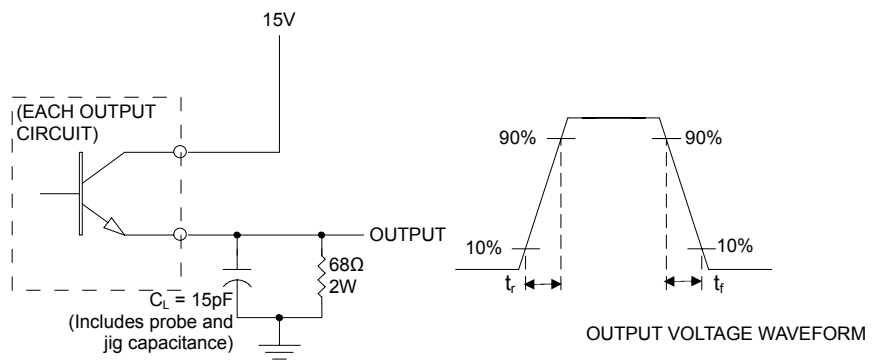


FIGURE 42. EMITTER-FOLLOWER CONFIGURATION

Electrical Characteristics ($T_A = 0^\circ\text{C}$ to 70°C , $V_{CC}=15\text{V}$, $f = 10\text{kHz}$, unless otherwise specified)

Reference Section						
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	V_{ref}	$I_O = 1\text{mA}$	4.9	5.0	5.1	V
		$T_A = 25^\circ\text{C}$, $I_O = 1\text{mA}$	4.95	5.0	5.05	
Line Regulation	ΔV_{ref-V}	$7\text{V} \leq V_{CC} \leq 40\text{V}$		2	25	mV
Load Regulation	ΔV_{ref-I}	$1\text{mA} \leq I_O \leq 10\text{mA}$		1	15	mV
Short Circuit output Current	I_{SC}	$V_{ref} = 0$	10	35	50	mA
Oscillator Section (See Figure 1)						
Parameter	Test Conditions *		Min	Typ	Max	Unit
Frequency	$C_T = 0.01\mu\text{F}$, $R_T = 12\text{k}\Omega$, $T_A = 25^\circ\text{C}$		9.2	10	10.8	KHz
	$C_T = 0.01\mu\text{F}$, $R_T = 12\text{k}\Omega$		9.0	-	12	
Frequency Change with Temperature ****	$C_T = 0.01\mu\text{F}$, $R_T = 12\text{k}\Omega$, $\Delta T = \text{Min to Max}$			2		KHz
Amplifier Section (See Figure 2)						
Parameter	Symbol	Test Conditions *	Min	Typ	Max	Unit
Input Offset Voltage	V_{OFFSET}	$V_O (\text{pin } 3) = 2.5\text{V}$		2	10	mV
Input Offset Current	I_{OFFSET}	$V_O (\text{pin } 3) = 2.5\text{V}$		25	250	nA
Input Bias Current	I_{BIAS}	$V_O (\text{pin } 3) = 2.5\text{V}$		0.2	1	μA
Common Mode Input Voltage Range	CMRR	$V_{CC} = 7\text{V to } 40\text{V}$	-0.3 to $V_{CC} - 2$			V
Open-loop Voltage Amplification		$\Delta V_O = 3\text{V}$, $R_L = 2\text{k}\Omega$, $V_O = 0.5 \text{ to } 3.5\text{V}$	70	95		dB
Unity-gain Bandwidth				650		KHz
Output Section						
Parameter	Test Conditions *		Min	Typ	Max	Unit
Collector off-state Current	$V_{CE} = 40\text{V}$, $V_{CC} = 40\text{V}$			2	100	μA
Emitter off-state Current	$V_{CC} = V_C = 40\text{V}$, $V_E = 0\text{V}$				-100	μA
Collector-emitter Saturation Voltage	Common-Emitter	$V_E = 0$, $I_C = 200\text{mA}$		1.1	1.3	V
	Emitter -Follow	$V_C = 15\text{V}$, $I_E = -200\text{mA}$		1.5	2.5	
Output Control Input Current	$V_I = V_{ref}$				3.5	mA
Dead-time Control Section (See Figure 1)						
Parameter	Test Conditions *		Min	Typ	Max	Unit
Input Bias Current (pin 4)	$V_I = 0 \text{ to } 5.25\text{v}$			-2	-10	μA
Maximum Duty Cycle, each output	$V_I (\text{pin } 4) = 0$, O.C. = V_{ref}		45			%
Input Threshold Voltage (pin 4)	Zero duty cycle			3	3.3	V
	Maximum duty cycle		0			

Electrical Characteristics ($T_A = 0^\circ\text{C}$ to 70°C , $V_{CC}=15\text{V}$, $f = 10\text{kHz}$, unless otherwise specified)

Parameter	Condition	Min	Typ	Max	Unit
PWM Comparator Section (See Figure 1)					
Input Threshold Voltage (pin 3)	Zero Duty Cycle		4	4.5	V
Input Sink Current (pin 3)	$V(\text{pin 3}) = 0.7\text{V}$	0.3	0.7		mA
Switching Characteristics, $T_A = 25^\circ\text{C}$ Section (See Figure 1)					
Output Voltage Rise Time	Common-Emitter Configuration, See Figure 3		100	200	ns
Output Voltage Fall Time			25	100	
Output Voltage Rise Time	Emitter-Follower Configuration, See Figure 4		100	200	
Output Voltage Fall Time			25	100	

* For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

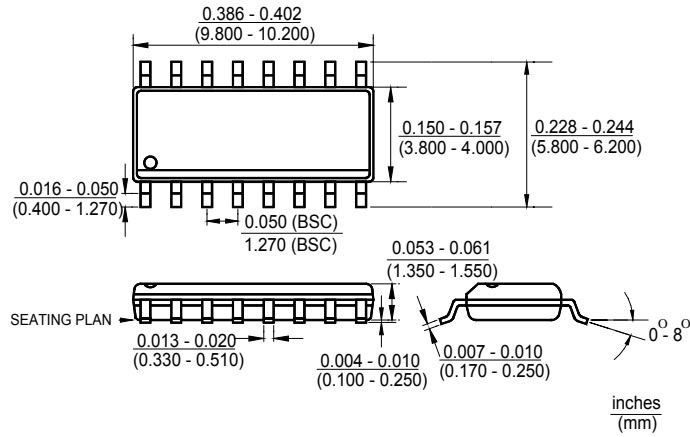
** All typical values except for parameter changes with temperature are at $T_A = 25^\circ\text{C}$

*** Duration of the short-circuit should not exceed one second

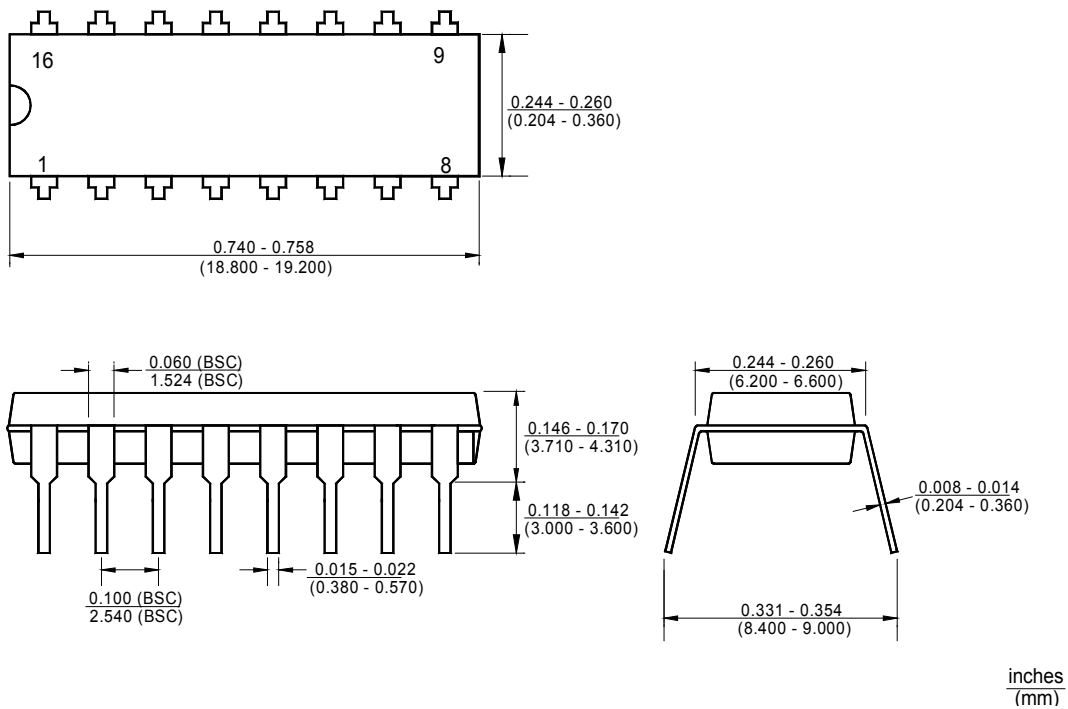
**** This is guaranteed where the marking code on the package surface is "A"

***** Temperature coefficient of timing capacitor and timing resistor not taken into account

Package Outline Dimensions – SO 16



Package Outline Dimensions – DIP 16



Ordering Number

GM 7500 S16 R

APM Gamma Micro	Circuit Type	Package Type S16: SO 16 D16: DIP 16	Shipping Type R: Taping & Reel T: Tube
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