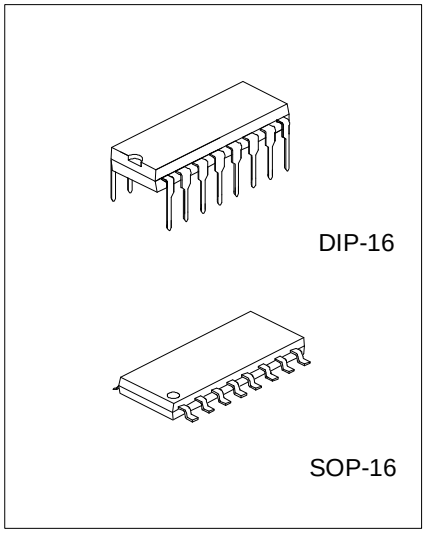
# VOLTAGE MODE PWM CONTROL CIRCUITS




## DESCRIPTION

The DP8600C 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, the device offers the systems engineer the flexibility to tailor the power supply control circuitry to its application.

The DP8600C contains an error amplifier,current-limiting amplifier, an on-chip adjustable oscillator, a dead time control comparator,pulse-steering control flip-flop,a 5-volt ,1% precision supply regulator,and output control circuits.

The error amplifier exhibits a common-mode Voltage range from -0.3V to VCC-2V.The current-limit amplifier exhibits a common-mode Voltage range from -0.3V to 3V with an offset Voltage of approximately 80 mV in series with the inverting input to ease circuit design requirements. 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 RT(pin 6) to the reference output and providing a sawtooth Input to CT(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 being pulsed twice during push-pull operation.

## FEATURES

* 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 control Over Total Range
* Circuit architecture Allows easy Synchron - Ization
* Undervoltage Lockout

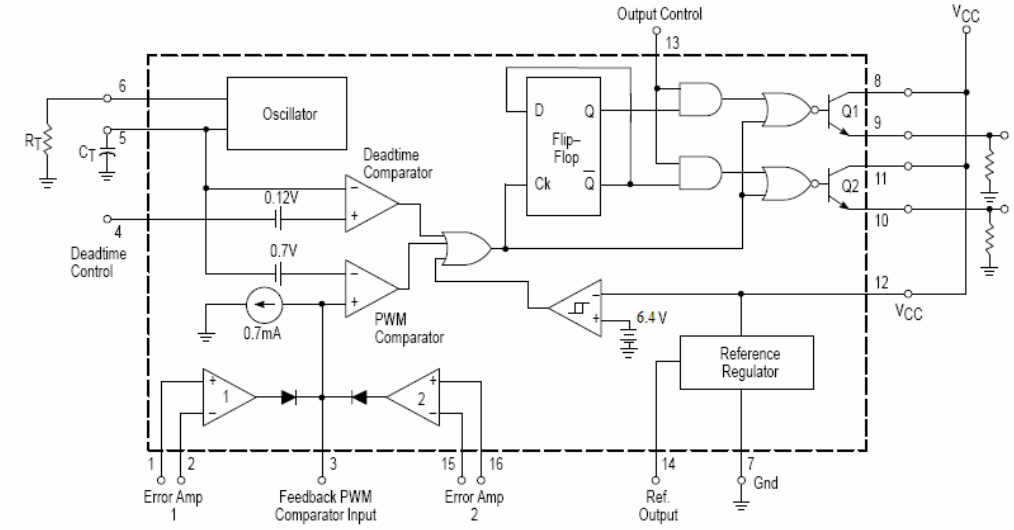
## ABSOLUTE MAXIMUM RATINGS

(Unless otherwise noted ,all is over operating free-air temperature Range)

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Supply Voltage(note 1) | Vcc | 40 | V |
| Amplifier Input Voltage | Vi | Vcc+0.3 | V |
| Collector Output Voltage | Vo | 41 | V |
| Collector Output Current | Ico | 250 | mA |
| Continuous total dissipation at(or for below) 25℃ free air temperature(note 2) | PD | 1000 | mW |
| Operating Temperature Range | Topr | -20 to 85 | °C |
| Storage Temperature Range | Tstg | -65 to 150 | °C |
| lead Temperature 1.6mm from case for 60 sec. | Tcase | 300 | °C |

note1: All voltage values,except differential voltages are with respect to the network ground terminal.
note 2:For operation above 25°C free-air temperature,The dissipation derates with 9.2mW/°C.

BLOCK DIAGRAM




This device contains 46 active transistors.

RECOMMENDED OPERATING CONDITIONS

| Characteristic | Symbol | Values | | Unit |
|---|---|---|---|---|
| | | min | max | |
| Supply Voltage | Vcc | 7 | 36 | V |
| Amplifier Input Voltage | Vi | -0.3 | Vcc-2 | V |
| Collector Output Voltage | Vo | | 40 | V |
| Collector Output Current(each Transistor) | Ic | | 200 | mA |
| Current into feedback | If | | 0.3 | mA |
| Timing capacitor | CT | 0.47 | 10000 | nF |
| Timing Resistor | RT | 1.8 | 500 | kΩ |
| Oscillator frequency | fosc | 1 | 300 | kHz |
| Operating free-air temperature | Ta | 0 | 70 | °C |

ELECTRICAL CHARACTERISTICS
(Over recommended operating free-air temperature range,VCC=15V,f=1kHz,Unless otherwise specified)

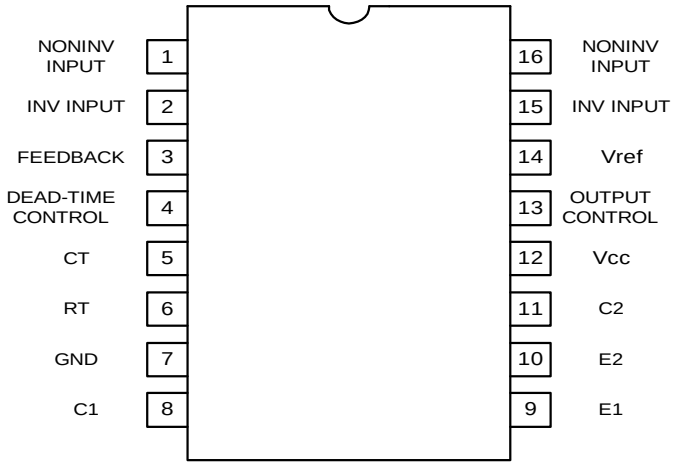
| Characteristic | | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Reference Section** | | | | | | |
| Output voltage | | Io=1mA | 4.9 | 5 | 5.1 | V |
| Input regulation | | Vcc=7V to 36V | | 2 | 25 | mV |
| Output Regulation | | Io=1 to 10mA | | 1 | 15 | mV |
| Output Voltage change with Temperature | | ΔTA=MIN to MAX(note 2) | | 0.2 | 1 | % |
| Short-circuit output Current | | Vref=0 | | 35 | | mA |
| Characteristic | | Test Conditions | Min | Typ | Max | Unit |
| **Oscillator section** | | | | | | |
| Frequency | | CT=0.01μF,RT=120kΩ | | 10 | | kHz |
| Standard Deviation of Frequency | | All Values of Vcc CT,RT,TA constant | | 10 | | % |
| Frequency Change with Voltage | | Vcc=7V to 36V,Ta=25°C | | 0.1 | | % |
| Frequency Change with temperature | | CT=0.01μF,RT=12kΩ,ΔTA= MIN to MAX | | | 12 | % |
| **Amplifier Section** | | | | | | |
| Input offset Voltage | Error | Vo(pin 3)=2.5V | | 2 | 10 | mV |
| Input offset Current | | Vo(pin 3)=2.5V | | 25 | 250 | nA |
| Input bias Current | | Vo(pin 3)=2.5V | | 0.2 | 1 | μA |
| Common-mode Input Voltage Range | Error | Vcc=7V to 36 V | -0.3 to Vcc-2 | | | V |
| Open-Loop Voltage Amplification | | ΔVo=3V, Vo=0.5V to 3.5V | 70 | 95 | | dB |
| Unity-Gain Bandwidth | | | | 800 | | kHz |
| Common-Mode Rejection ratio | Error | Vcc=36V,TA=25°C | 65 | 80 | | dB |
| output sink current(pin 3) | | VID=-15mV to -5V V(pin 3)=0.5V | 0.3 | 0.7 | | mA |
| Output source Current(pin 3) | | VID=15mV to -5V V(pin 3)=3.5V | -2 | | | mA |
| **Output Section** | | | | | | |
| Collector off-state current | | VCE=40V,Vcc=36V | | 2 | 100 | μA |
| Emitter off-state Current | | VCC=VC=36V,VE=0 | | | -100 | μA |
| Collector -emitter Saturation Voltage | Common -emitter | VE=0,Ic=200mA | | 1.1 | 1.3 | V |
| | Emitter-Follower | Vc=15V,IE=-200mA | | 1.5 | 2.5 | |
| Output Control input Current | | Vi=Vref | | | 3.5 | mA |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Dead Time Control Section** | | | | | | |
| Input bias (pin 4) | | Vi=0 to 5.25V | | -2 | -10 | μA |
| Maximum duty cycle,each output | | VI(pin 40=0 | 45 | | | % |
| Input threshold Voltage(pin 4) | | Zero duty Cycle | | 3 | 3.3 | V |
| | | Maximum duty cycle | 0 | | | |
| **PWM comparator Section** | | | | | | |
| Input Threshold Voltage(pin 3) | | Zero Duty cycle | | 4 | 4.5 | V |
| Input sink current (pin 3) | | Vpin 3= 0.7V | 0.3 | 0.7 | | mA |
| **Total Device** | | | | | | |
| Standby supply current | Vcc=15V | pin 6 at Vref,all other Inputs and outputs open | | 6 | 10 | mA |
| | Vcc=40V | | | 9 | 15 | |
| Average supply current | | Vpin 4=2V | | 7.5 | | mA |
| **Switching Characteristics,Ta=25**°C | | | | | | |
| Output Voltage rise time | | Common-emitter configuration | | 100 | 200 | ns |
| Output Voltage fall time | | | | 25 | 100 | ns |
| Output Voltage rise time | | Emitter-follower configuration | | 100 | 200 | ns |
| Output Voltage fall time | | | | 40 | 100 | ns |

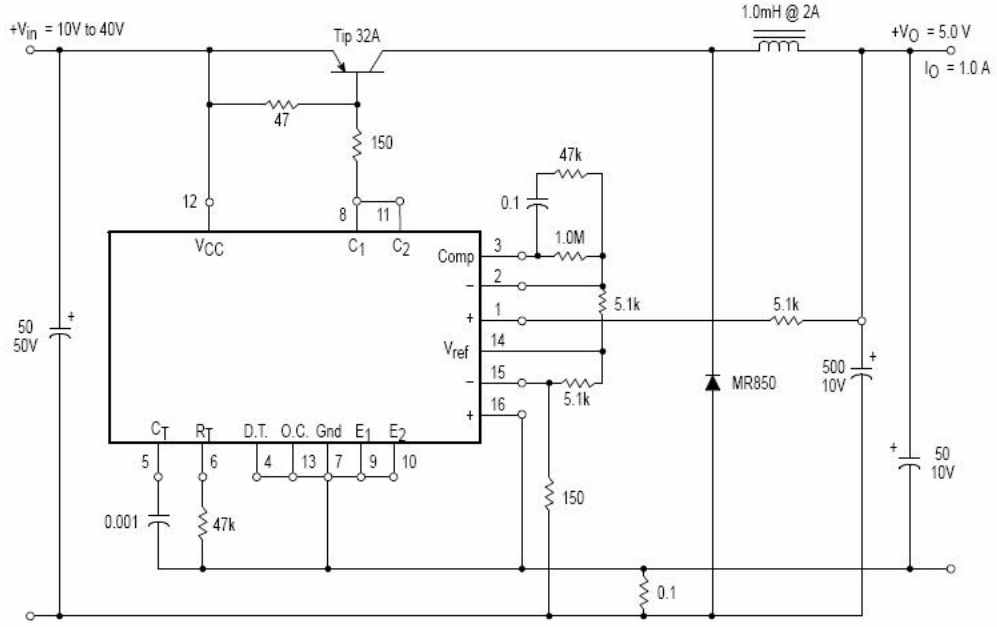
note 1:All typical Values except for temperature coefficient are at Ta=25°C.
note 2:For conditions shown as MIN or MAX, use appropriate value under recommended operating conditions.
note 3:Duration of the short-circuit should not exceed one second.
note 4:Standard deviation is a measure of the statistical distribution the mean as derived from the formula :

$$\sigma = \sqrt{\frac{\sum_{n=1}^{N}(Xn-\bar{X})^2}{N-1}}$$

## PIN CONFIGURATIONS




## TYPICAL APPLICATION CIRCUIT



TEST CIRCUIT

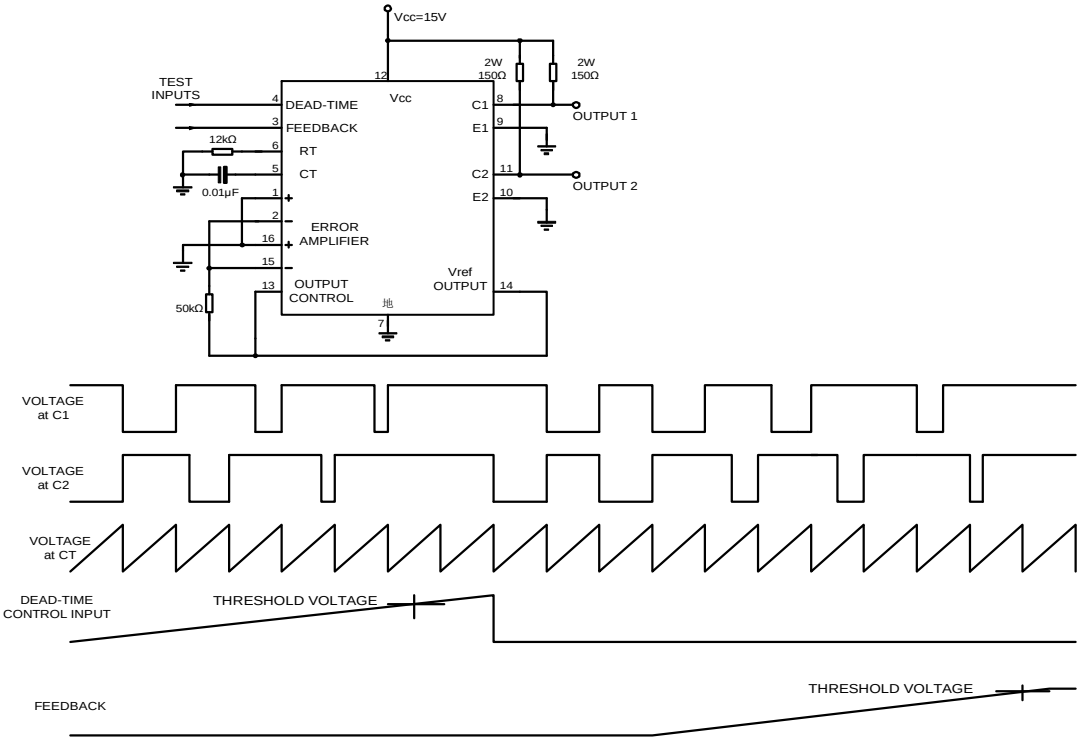



FIG 1. OPERATIONAL TEST CIRCUIT AND WAVEFORMS

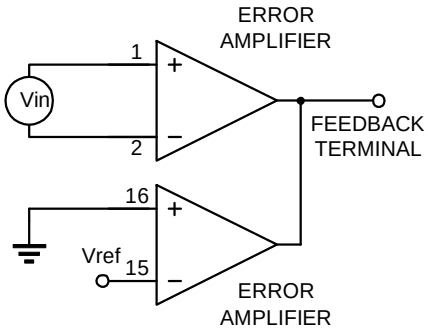



FIG 2. AMPLIFIER CHARACTERISTICS

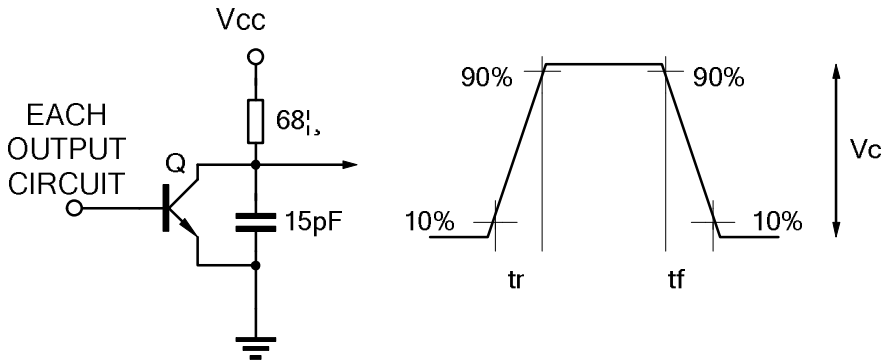



FIG. 3 COMMON-EMITTER CONFIGURATION

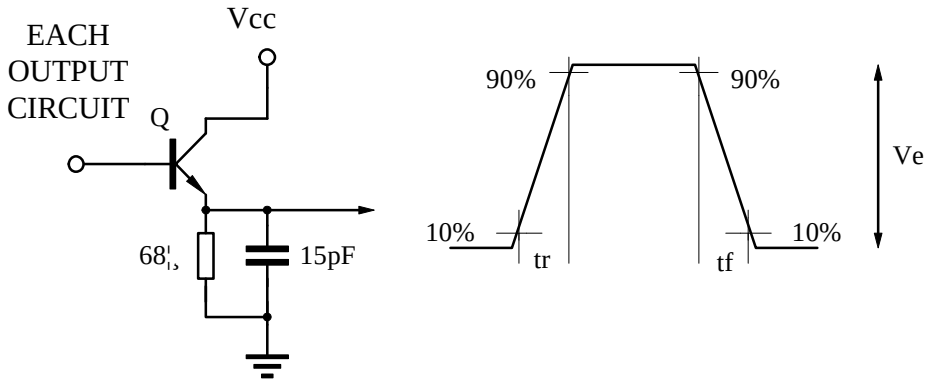



FIG. 4 EMITTER -FOLLOWER CONFIGURATION

TYPICAL PERFORMANCE CHARACTERISTICS

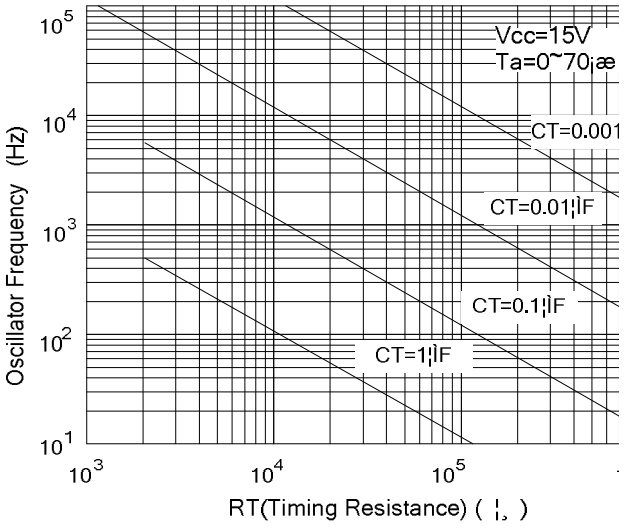



FIG 5.

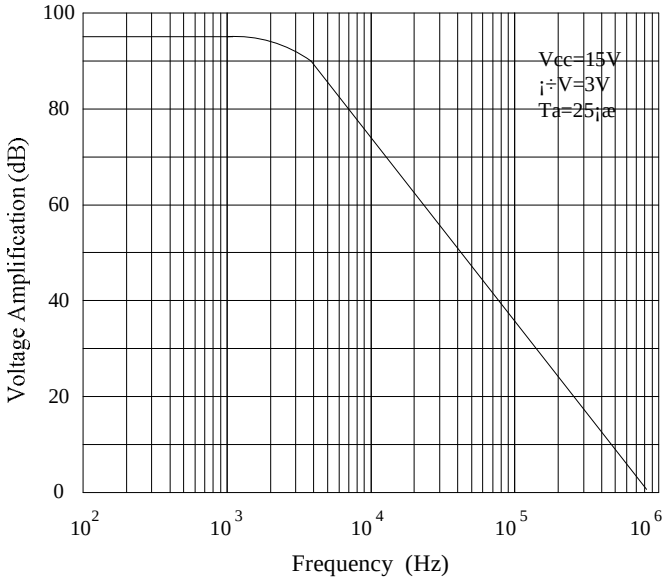
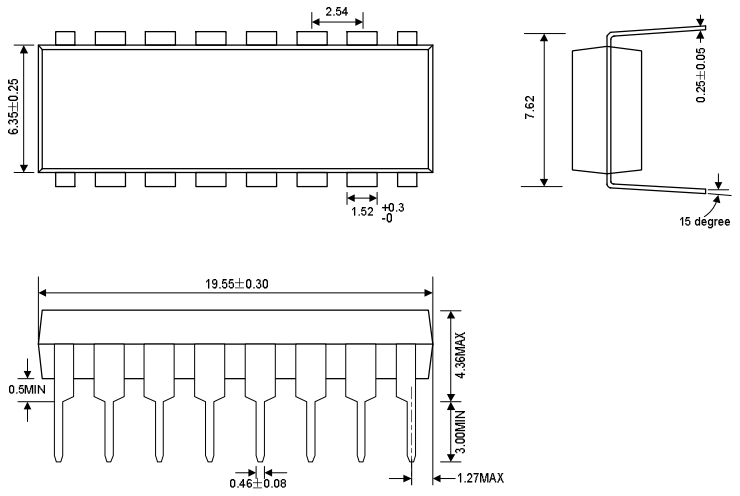



Fig.6

PACKAGE DIMENSIONS

DIP-16-300-2.54 Unit: mm




SOP-16-225-1.27 Unit: mm