



虹冠電子工業股份有限公司
Champion Microelectronic Corporation

Specialized in Integrated High Efficient Switching Power Management Solutions
高整合高效率交換型電源管理方案之專業 I.C. 設計



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GENERAL DESCRIPTION

The CM3842/43 are fixed frequency current-mode PWM controllers specially designed for OFF-Line switching power supply and DC-to-DC converters with a minimum number of external components. These devices feature a trimmed oscillator for precise duty cycle control, a temperature compensated reference, high gain error amplifier, current sensing comparator, and high current totem pole output which is suitable for driving MOSFETs.

The under voltage lock-out (U.V.L.O.) is designed to operated with 200 μ A typ. start-up current, allowing an efficient bootstrap supply voltage design. The U.V.L.O. thresholds for the CM3842 are 16V (on) and 10V (off) which are ideal for off-line applications. The corresponding typical threshold for the CM3843 are 8.4V (on) and 7.6V (off). The CM3842/43 can operated within 100% duty cycle.

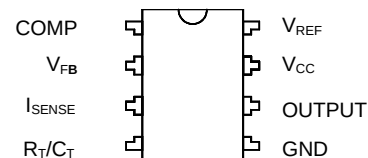
FEATURES

- ◆ Low Start-Up current (typ. 200 μ A)
- ◆ Optimized for Off-Line and DC-to-DC Converters
- ◆ Maximum Duty Cycle
- ◆ U.V.L.O. with Hysteresis
- ◆ Operating Frequency Up to 500KHz
- ◆ Internal Trimmed Bandgap Reference
- ◆ High Current Totem Pole Output
- ◆ Error Amplifier With Low Output Resistance
- ◆ Available in 8-Pin Plastic DIP and Surface Mount 8-Pin S.O.I.C.

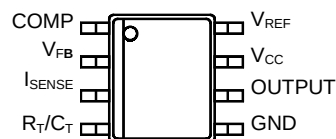
APPLICATIONS

- ◆ Off-line flyback or forward converters.
- ◆ DC-to-DC buck or boost converter.
- ◆ Monitor Power Supply

PIN CONFIGURATION



8-Pin PDIP
(Top View)



8-Pin S.O.I.C.
(Top View)

AVAILABLE OPTIONS

Device	Start-UP Voltage	Hysteresis	Max. Duty Cycle
CM3842	16V	6V	< 100%
CM3843	8.4V	0.8V	< 100%



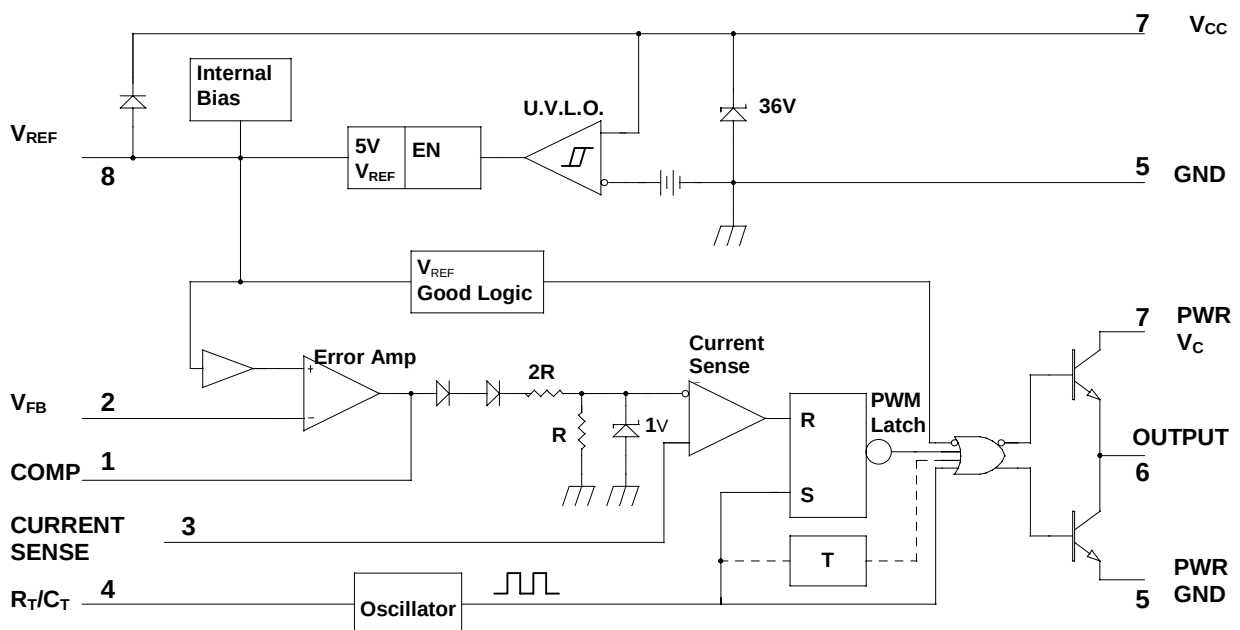
CM3842/3843

CURRENT MODE PWM CONTROLLER

ORDERING INFORMATION

Part Number	Temperature Range	Package
CM3842/43CP	0°C to 70°C	8-Pin PDIP(P08)
CM3842/43CS	0°C to 70°C	8-Pin SOIC(S08)

BLOCK DIAGRAM



Note 1 :V_{CC} and PWR V_C are internally connected for 8 pin packages.

Note 2 :PWR GND and GND are internally connected for 8 pin packages.

Note 3 :U.V.L.O. is 16V for 3842 and 8.4V for 3843.

Note 4 :Hysteresis is 6V for 3842 and 0.8V for 3843.



CM3842/3843

CURRENT MODE PWM CONTROLLER

ABSOLUTE MAXIMUM RATINGS

Supply voltage, V_{CC}	35V
Output current, I_O	$\pm 1A$
Analog inputs, V_I	-0.3V to 6.3V
Error amp output sink current, $I_{SINK(EA)}$	10mA
Power dissipation ($T_A = 25^\circ C$), P_D	1W
Maximum junction temperature T_J	150°C
Storage temperature range	-65°C to 150°C
Lead temperature (soldering, 10 seconds)	260°C
Note 5: Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of the specified terminal.	

THERMAL DATA

PDIP PACKAGE:	
Thermal Resistance-Junction to Ambient, θ_{JA}	95°C/W
SOIC PACKAGE:	
Thermal Resistance-Junction to Ambient, θ_{JA}	165°C/W
Junction Temperature Calculation: $T_J = T_A + (P_D \times \theta_{JA})$. The θ_{JA} numbers are guidelines for the thermal performance of the device/pc-board system. All of the above assume no ambient airflow.	



CM3842/3843

CURRENT MODE PWM CONTROLLER

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Recommended Operating			Units
		Min.	Typ.	Max.	
Supply Voltage	V_{CC} / V_C			30	V
Input Voltage	$V_{I,R_T/C_T}$	0		5.5	V
	$V_{I,I_{SENSE}/V_{REF}}$				
Output Voltage	V_O , Output	0		30	V
Supply Current	I_{CC}			25	mA
Average Output Current	I_O			200	mA
Reference Output Current	$I_{O(REF)}$			-20	mA
Timing Capacitor	C_T	1			nF
Oscillator Frequency	f_{OSC}		100	500	KHz
Operating Free-air Temperature	T_A	0		70	°C

ELECTRICAL CHARACTERISTICS

Unless otherwise specified, these specifications apply over the operating ambient temperature for CM384X with $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$; $V_{CC} = 15\text{V}$ (note 7); $R_T = 10\text{K}$; $C_T = 3.3\text{nF}$. Low duty cycle pulse testing techniques are used which maintains junction and case temperatures equal to the ambient temperature.

Parameter	Symbol	Test Conditions	CM384X			Units
			Min.	Typ.	Max.	
Reference Section						
Reference output Voltage	V _{REF}	T ₁ = 25 °C. I _{REF} = 1mA	4.9	5.0	5.1	V
Line Regulation		12V ≤ V _{CC} ≤ 25V.T ₁ = 25 °C		6	20	mV
Load Regulation		1mA ≤ I _{REF} ≤ 20mA		6	25	mV
Short Circuit Outout Current	I _{SC}	T ₁ = 25 °C	-30	-100	-180	mA
Oscillator Section						
Oscillation Frequencyv	f	T ₁ = 25 °C	47	52	57	KHz
Frequency Change with Voltage		12V ≤ V _{CC} ≤ 25V		0.2	1.0	%
Frequency Change with Temperature (note 8)		T _{MIN} ≤ T _A ≤ T _{MAX}		5		%
Peak-to-peak Amplitude At R _T /C _T	V _{OSC}			1.7		V
Current Sense Section						
Gain (note 9 & 10)	A _{V(OI)}		2.85	3.00	3.15	V/V
Maximum Input Signal (note 9)	V _{I(MAX)}	COMP = 5V				0.9
Power Supply Rejection Ratio (note 9)	PSRR	12V ≤ V _{CC} ≤ 25V (note 9)		70		dB
Input Bias Current	I _{BIAS}			-3.0	-10	uA

ELECTRICAL CHARACTERISTICS (Continued)

Error Amplifier Section						
Input Bias Current	I _{I(AS)}			-0.1	-2	μA
Input Voltage	V _{I(FA)}	COMP = 2.5V	2.42	2.50	2.58	V
Open Loop Voltage Gain	G _{VO}	2V ≤ V _O ≤ 4V	65	90		dB
Unity Gain Bandwidth (note 8)	UGBW	T ₁ = 25 °C	0.7	1		MHz
Power Supply Rejection Ratio	PSRR	12V ≤ V _{CC} ≤ 25V	60	70		dB
Output Sink Current	I _{SINK}	V _{ER} = 2.7V. COMP = 1.1V	2	7		mA
Output Source Current	I _{SOURCE}	V _{ER} = 2.3V. COMP = 5.0V	-0.5	-1.0		mA
High Output Voltage	V _{OH}	V _{ER} = 2.3V. R _L = 15KΩ to GND	5	6		V
Low Output Voltage	V _{OL}	V _{ER} = 2.7V. R _L = 15KΩ to V _{REF}		0.7	1.1	V
Output Section						
Output Low Level	V _{OL}	I _{SINK} = 20mA		0.1	0.4	V
		I _{SINK} = 200mA		1.4	2.2	
Output High Level	V _{OH}	I _{SOURCE} = 20mA	13	13.5		V
		I _{SOURCE} = 200mA	12	13.0		
Rise Time (note 8)	t _r	T ₁ = 25 °C. C _L = 1nF		50	150	ns
Fall Time (note 8)	t _f	T ₁ = 25 °C. C _L = 1nF		50	150	ns
Under-Voltage Lockout Section						
Start Threshold	V _{TH(ST)}	CM3842	14.5	16.0	17.5	V
		CM3843	7.8	8.4	9.0	
Min. Operating Voltage		CM3842	8.5	10	11.5	V
		CM3843	7.0	7.6	8.2	
PWM Section						
Maximum Duty Cycle		CM3842/43	94	97	100	%
Minimum Duty Cycle					0	%
Total Standby Current						
Startup Current		CM3842	30	0.2	0.35	mA
		CM3843		0.5	1.0	
Operating Supply Current	I _{CC}	V _{ER} = I _{SENSE} = 0V		14	17	mA
Zener Voltage	V _Z	I _{CC} = 25mA	35			V
note 7: Adjust V _{CC} above the start threshold before setting at 15V						
note 8: These parameters, although guaranteed, are not 100% tested in production prior to shipment						
note 9: Parameters are measured at trip point of latch with V _{FB} = 2V						
note 10: Gain is measured between I _{SENSE} and COMP with the input changing from 0V to 0.8V						

APPLICATION INFORMATION

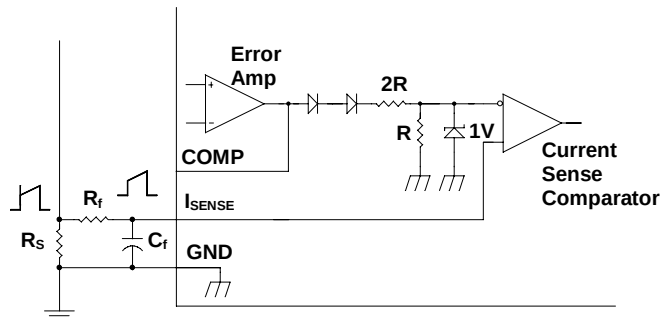


Fig. 1. Current Sense Circuit

Peak current (I_s) is set by: $I_{s(MAX)} = 1V/R_s$

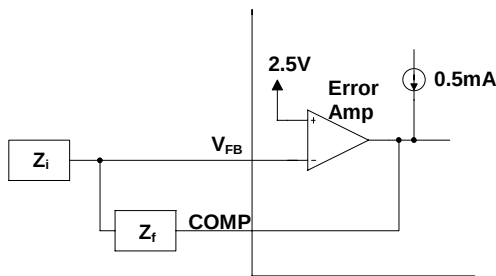


Fig. 2. Error Amplifier Configuration - the amplifier can source or sink up to 0.5mA

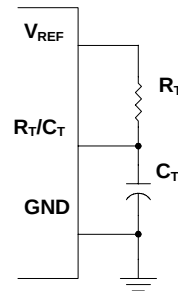


Fig. 3. Oscillator Section

For $R_T < 5K$, $f = \frac{1.72}{R_T C_T}$

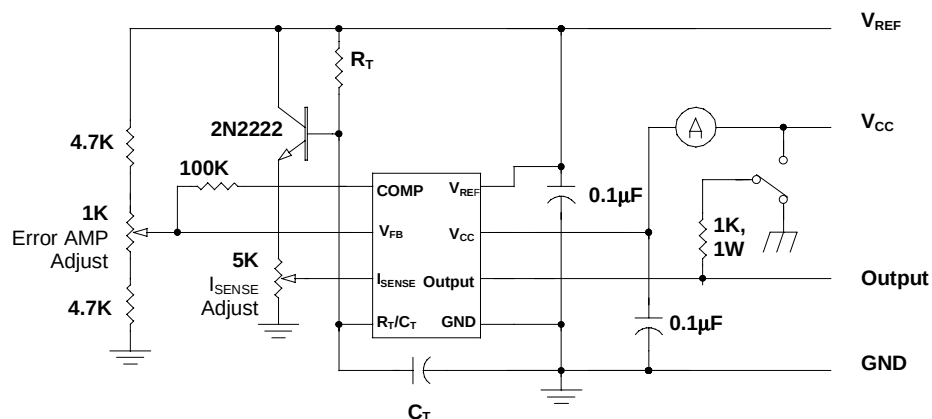


Fig. 4. Open-loop laboratory test fixture: Careful grounding techniques are necessary for high peak currents associated with capacitive loads. Timing and bypass capacitors should be connected to GND pin in a single point ground. The transistor and 5K potentiometer are used to sample the oscillator waveform and apply an adjustable ramp to the I_{SENSE} pin

APPLICATION INFORMATION (continued)

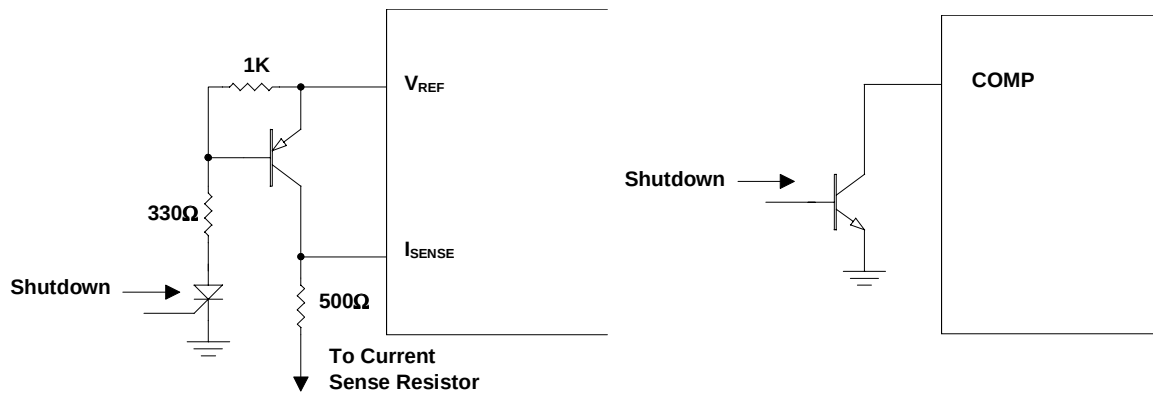


Fig. 5. Shutdown Techniques - there are two ways to shutdown the PWM controller: 1) raise the voltage at I_{SENSE} above 1V or, 2) pull the COMP below a voltage two diodes above ground.

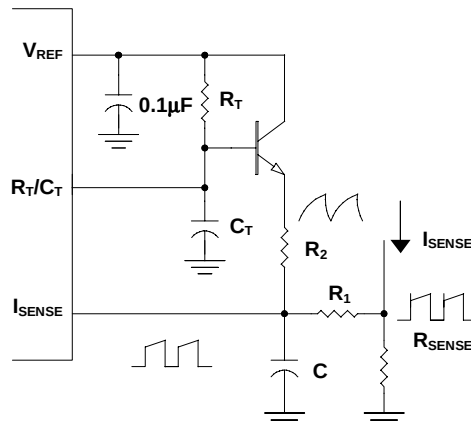
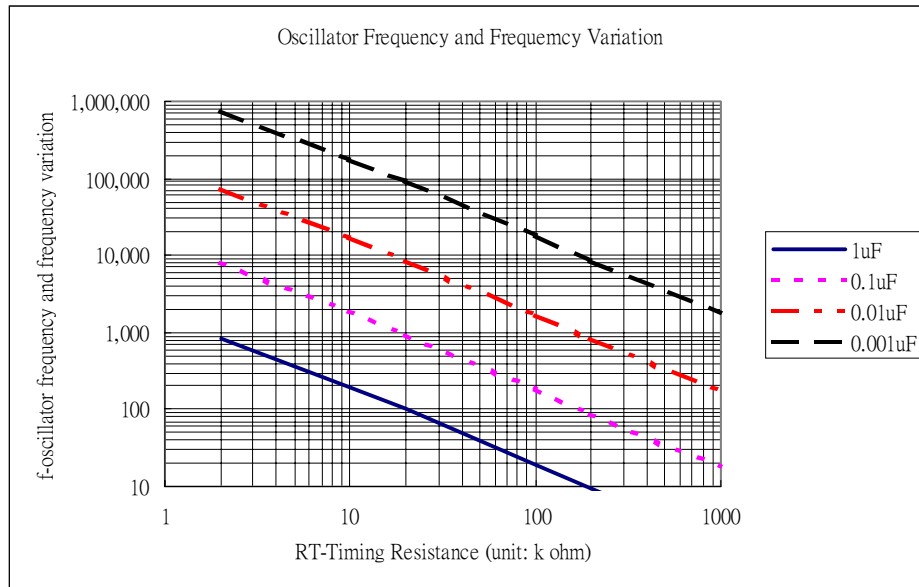
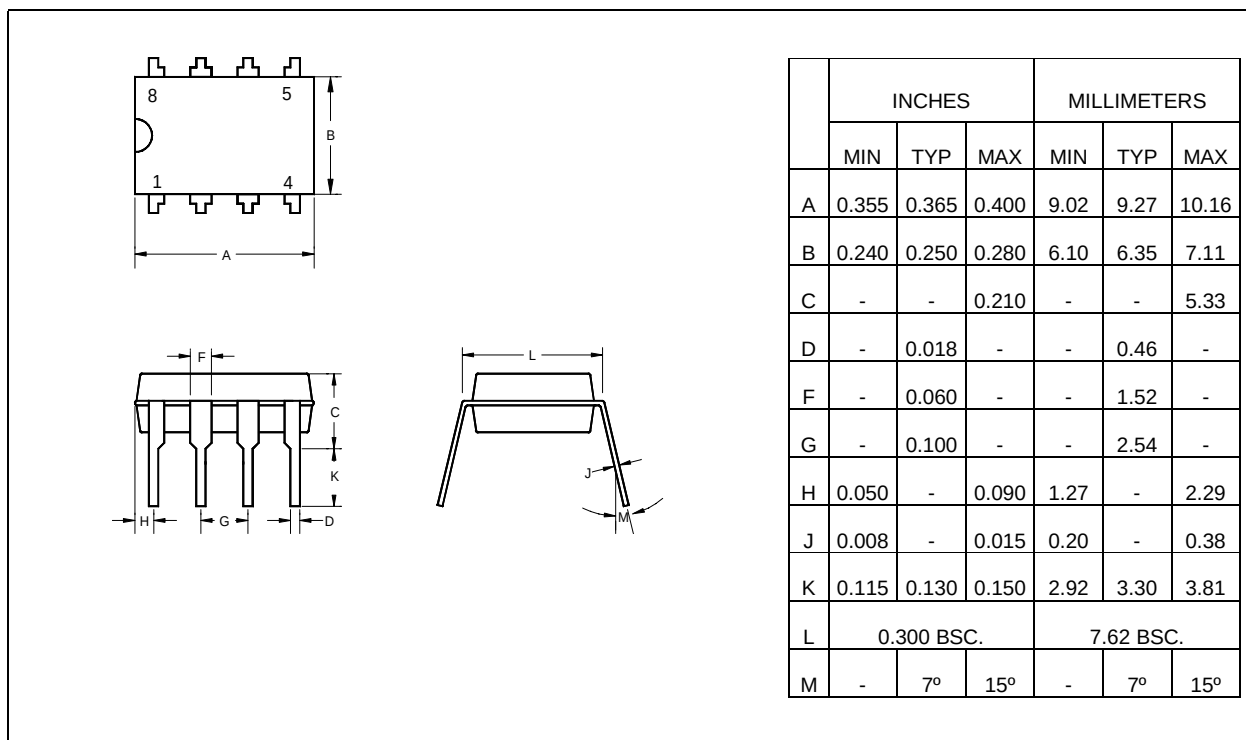


Fig 6. Slope Compensation – To achieve duty cycles over 50% for some applications, the above slope compensation technique is suggested by resistively summing a fraction of the oscillator ramp with the current sense signal.

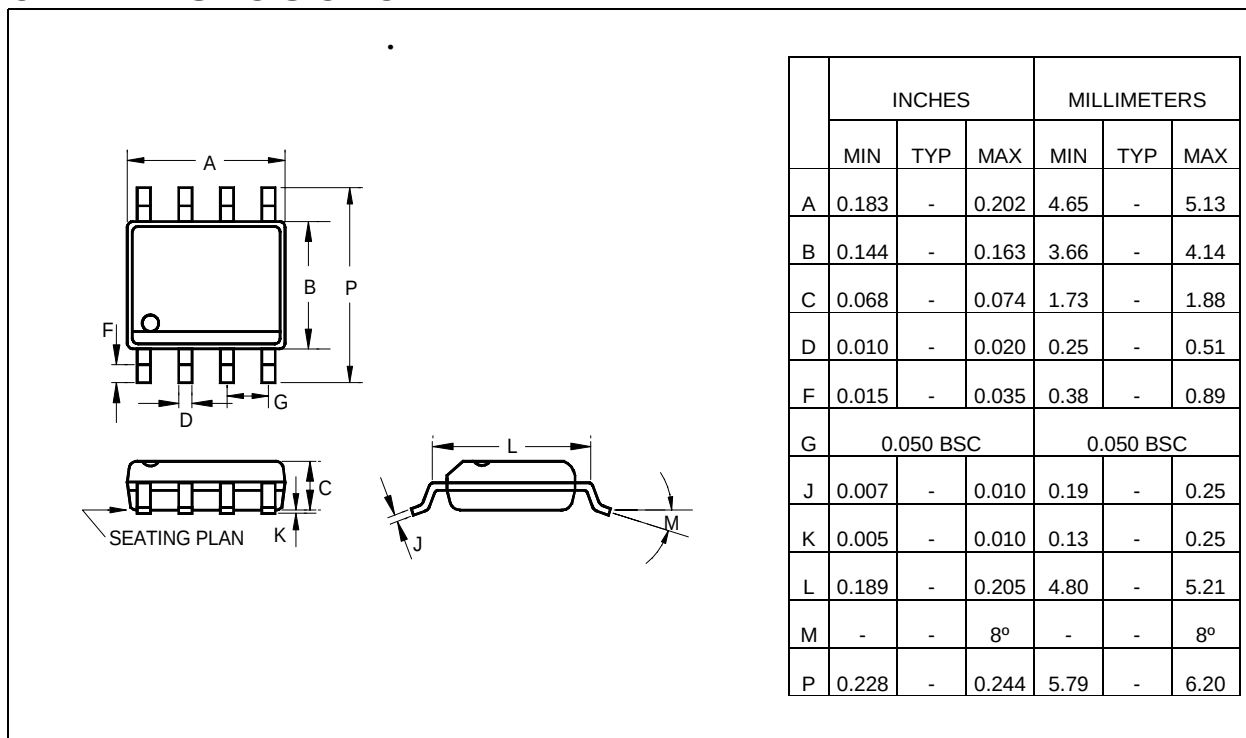
TYPICAL CHARACTERISTICS



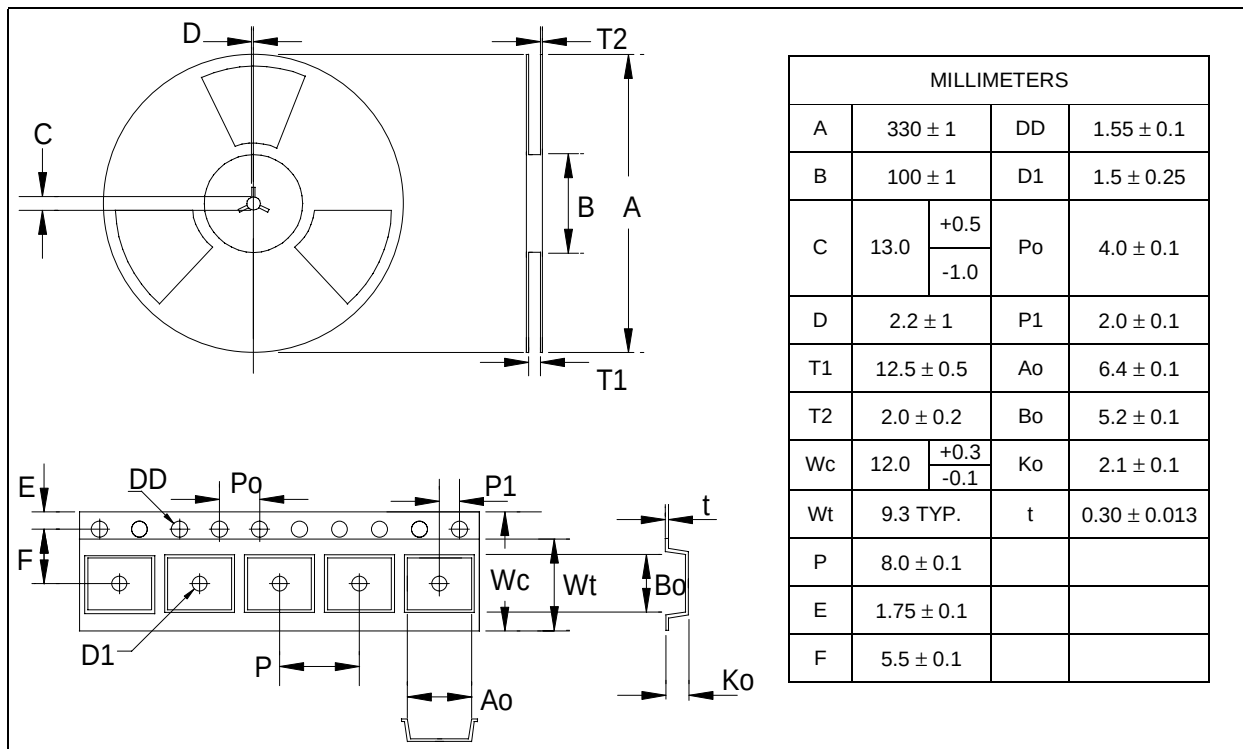
8-PIN PLASTIC DIP



8-PIN PLASTIC S.O.I.C



8-PIN PLASTIC S.O.I.C. CARRIER DIMENSIONS



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