

迴音處理器(Echo Processor with Music Mix, No External Components)

特性(FEATURES)

- 工作電壓(Operation range) : 4.5V ~ 5.5V.
- 無需外部元件(No external components.)
- 低電流(Low Supply Current.)
- 15段迴音遲延(delay time 40ms ~ 310ms, 20ms/step)
- 4種echo頻寬(4 echo bands)
- 可以與音樂混合(mixing with Music)
- 自動重置功能(Reset)
- I2C 控制介面(I2C control)
- 優異的電源雜訊抑制(Good PSRR)
- 封裝體積小

應用(APPLICATIONS)

- 卡拉OK混音設備(KARAOKE Mixer)。
- 電子音樂設備(Electronics Toy)。
- MSOP10封裝(Housed in MSOP10 package)。

功能描述(DESCRIPTION)

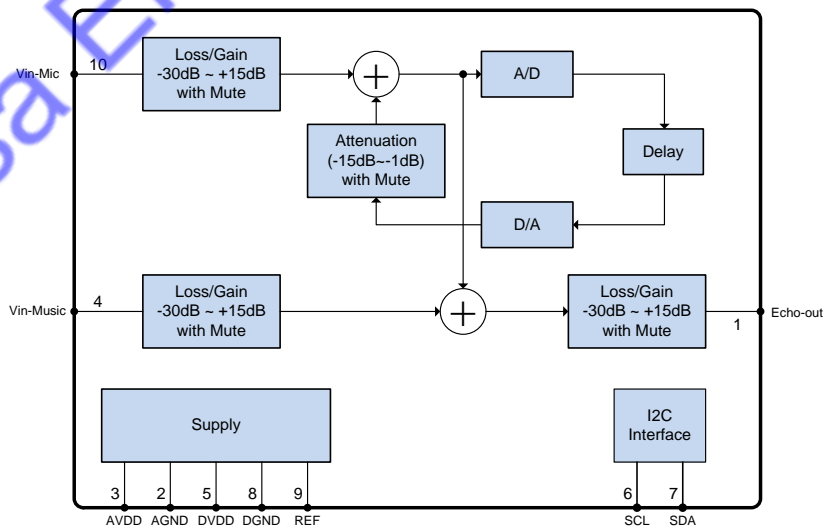
MS6300是一個CMOS製程的迴音音效處理器，無需外部元件。運用內建的ADC與DAC之間的數位延遲，從而達到迴音的效果。(MS6300 is an echo processor IC utilizing CMOS technology, without external components. By ADC and DAC with a digital delay, giving the echo effect.)

ADC前的抗混疊濾波器(AAF)與DAC後的平滑濾波器(SMF)使得經由MS6300所產生的迴音音效品質更趨細緻及真實。(To prevent aliasing distortion, an Anti-Aliasing Filter(AAF) is required before ADC. And a smoothing filter(SMF) is required after DAC to suppress the sidebands. These make the echo with good quality.)

抗混疊濾波器(AAF)與平滑濾波器(SMF)有4種頻寬可以調整。(Four lowpass bands(AAF and SMF) can be adjusted.)

聲音、音樂的輸入音量調整，迴音與音樂混合的輸出音量調整，以及15段迴音遲延長短與迴音回授的衰減，都可以以I2C控制。(The volumes of the voice input、the music input, and the output can be adjusted by I2C. 15 time echo delays and echo feedback attenuations are also controlled by I2C.)

方塊圖(BLOCK DIAGRAM)



腳位配置(PIN CONFIGURATION)

符號(Symbol)	腳位(Pin)	描述(Description)
Echo-OUT	1	輸出(Echo out)
AGND	2	類比接地(Analog ground)
AVDD	3	類比電源(Analog Vdd)
Vin-Music	4	音樂輸入(Music in)
DVDD	5	數位電源(Digital Vdd)
SCL	6	I2C時脈輸入(SCL)
SDA	7	I2C控制資料輸入(SDA)
DGND	8	數位接地(Digital ground)
REF	9	參考電壓 (1/2VDD)
Vin-Mic	10	麥克風輸入(Voice in)

訂購資訊(ORDERING INFORMATION)

封裝形式 Package	產品編號 Part number	封裝正印 Packaging Marking	運送包裝 Transport Media
10-Pin MSOP (lead free)	MS6330MGTR	6330G	3.5k Units Tape and Reel
10-Pin MSOP (lead free)	MS6330MGU	6330G	80 Units Tube

最大容許規格(ABSOLUTE MAXIMUM RATINGS)

符號 Symbol	參數 Parameter	額定值 Rating	單位 Unit
VDD	工作電壓(Supply Voltage)	6.5	V
V _{ESD}	抗靜電處理(Electrostatic Handling)	-3000 to 3000	V
T _{STG}	儲存溫度(Storage Temperature Range)	-65 to 150	°C
T _A	工作環境溫度(Operating Ambient Temperature Range)	-40 to 85	°C
T _J	最大接合溫度(Maximum Junction Temperature)	120	°C
T _S	焊接溫度, 10秒(Soldering Temperature, 10 seconds)	260	°C
R _{THJA}	接面熱阻(空氣) Thermal Resistance from Junction to Ambient in Free Air MSOP10	165.9	°C/W

電氣特性(ELECTRICAL CHARACTERISTICS)

($T_a=25^{\circ}\text{C}$, $V_{DD}=5\text{V}$, $f=1\text{kHz}$, refer to the application circuit; unless otherwise specified)

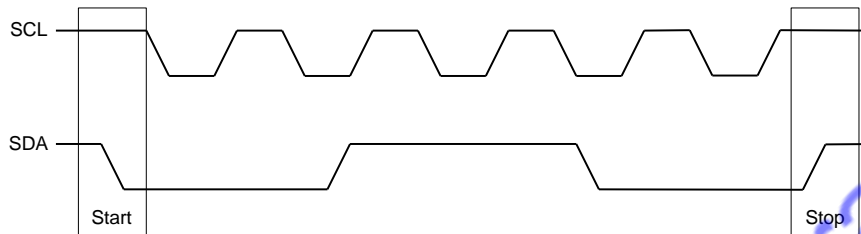
符號 Symbol	參數 Parameter	測試條件 Conditions	最小值 Min	額定值 Typ	最大值 Max	單位 Unit
I_Q	靜態電流 Quiescent Current	$V_{IN}=0\text{V}$	-	7	10	mA
PSRR	電源漣波拒斥比 Power Supply Rejection Ratio	$C_{REF} = 1\mu\text{F}$, $f = 100\text{Hz}$	-	-40	-30	dB
R_{IN}	輸入阻抗 Input Resistance	$V_{IN}\text{-Music}$	80	110	140	k Ω
		$V_{IN}\text{-Mic}$	80	110	140	k Ω
$V_{O\text{MAX}}$	最大輸出電壓振幅 Maximum Output Voltage Swing	$(\text{THD+N})/S < 10\%$	4	4.5	-	V _{pp}
THD+N	總諧波失真 Total Harmonic Distortion Plus Noise	$V_o = 2\text{Vpp}$	-	-70	-60	dB
			-	0.03	0.1	%
S/N	訊號雜訊比 Signal-to-Noise Ratio		-	-90	-80	dB
I²C 匯流排輸入(Bus Input)						
V_{IH}	輸入高準位 Bus High Input Level		2	-	-	V
V_{IL}	輸入低準位 Bus Low Input Level		-	-	0.8	V

I²C匯流排描述(I²C BUS DESCRIPTION)

開始與結束條件(Start and Stop Conditions)

當SCL設定在高準位、且SDA由”高準位”轉變為”低準位”時；則表示序列”開始”，而當SCL在高準位且SDA由低準位上升到高準位時；則序列結束。請參考下列時序圖。

(A start condition is activated when the SCL is set to HIGH and SDA shifts from HIGH to LOW state. The stop condition is activated when SCL is set to HIGH and SDA shifts from LOW to HIGH state. Please refer to the timing diagram below.)

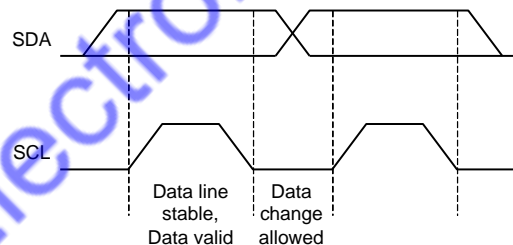


SCL：串列時序輸入線(Serial Clock Line), SDA：串列資料輸入線(Serial Data Line)

資料確認 (Data Validity)

當CLK (SCL) 訊號在“高準位”時，資料線 (SDA) 上的資料才會被視為正確且穩定的資料。而只有當CLK訊號在“低準位”時，資料線才可做高、低準位的切換。請參閱下圖：

(A data on the SDA line is considered valid and stable only when the SCL signal is in HIGH state. The HIGH and LOW states of the SDA line can only change when the SCL signal is LOW. Please refer to the figure below.)



位元組格式 (Byte Format)

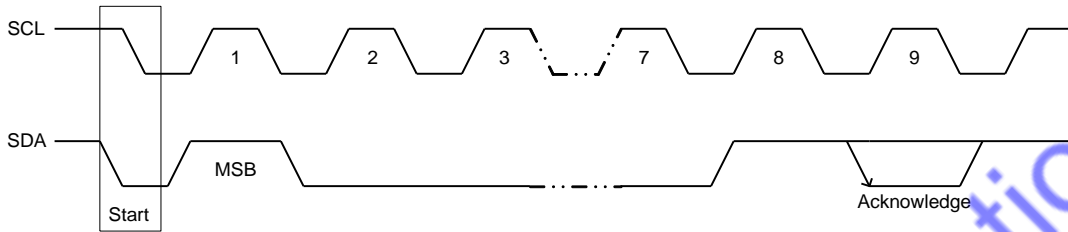
每一個傳輸到資料線的位元組(byte)有八個位元(bit)，每一位元組後面需有一“認可”位元，且以最大符號位元(MSB)為首的方式傳送出去。

(Every byte transmitted to the SDA line consists of 8 bits. Each byte must be followed by an acknowledge bit. The MSB is transmitted first.)

認可信號 (Acknowledge)

在第九個時脈時主體(微處理機)先將SDA設定為電阻性的高準位，若週邊設備(MS6300)認可此信號，則SDA將會被週邊設備拉至低準位，使SDA在此時脈中保持一穩定的低準位狀態。請參閱下圖：

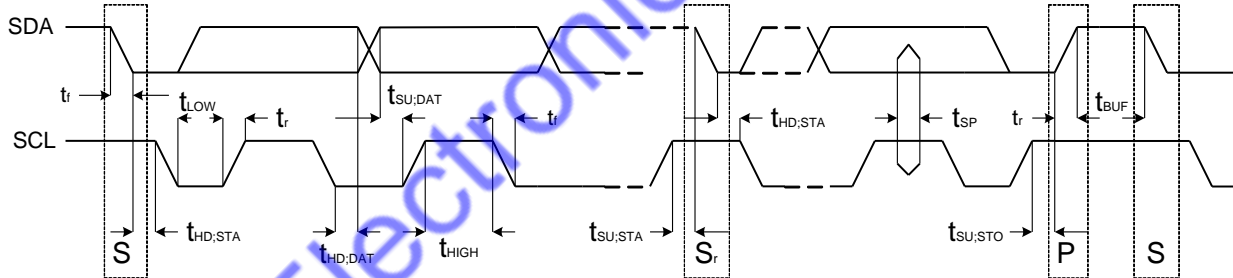
(During the Acknowledge clock pulse, the master (up) put a resistive HIGH level on the SDA line. The peripheral (audio processor) that acknowledges has to pull-down (LOW) the SDA line during the Acknowledge clock pulse so that the SDA line is in a stable LOW state during this clock pulse. Please refer to the diagram below.)



這個已被定址的設備在收到每一位元組(BYTE)後，即產生一“認可”的動作；否則在第九個時脈(CLOCK)的時間內SDA將會一直保持著高準位狀態。

(The audio processor that has been addressed has to generate an Acknowledge after receiving each byte, otherwise, the SDA line will remain at the HIGH level during the ninth (9th) clock pulse. In this case, the master transmitter can generate the STOP information in order to abort the transfer.)

SDA與SCL時序圖 (Timing of SDA and SCL Bus Lines)

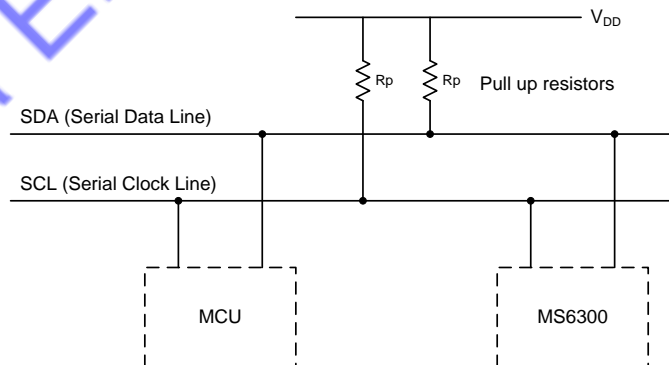


標準模式 (Standard Mode)

符號 Symbol	參數 Parameter	最小值 Min.	最大值 Max.	單位 Unit
f_{SCL}	SCL clock frequency	0	100	kHz
$t_{HD:STA}$	Hold time (repeated) START condition. After this period, the first clock pulse is generated	4.0	-	us
t_{LOW}	LOW period of the SCL clock	4.7	-	us
t_{HIGH}	HIGH period of the SCL clock	4.0	-	us
$t_{SU:STA}$	Set-up time for a repeated START condition	4.7	-	us
$t_{HD:DAT}$	Data hold time: For I ² C-bus devices	0	3.45	us
$t_{SU:DAT}$	Data-set-up time	250	-	ns
t_r	Rise time of both SDA and SCL signals	-	1000	ns
t_f	Fall time of both SDA and SCL signals	-	300	ns
$t_{SU:STO}$	Set-up time for STOP condition	4.0	-	us
t_{BUF}	Bus free time between a STOP and START condition	4.7	-	us
C_b	Capacitive load for each bus line	-	400	pF
V_{nL}	Noise margin at the LOW level for each connected device (including hysteresis)	$0.1V_{DD}$	-	V
V_{nH}	Noise margin at the HIGH level for each connected device (including hysteresis)	$0.2V_{DD}$	-	V

匯流排介面 (BUS INTERFACE)

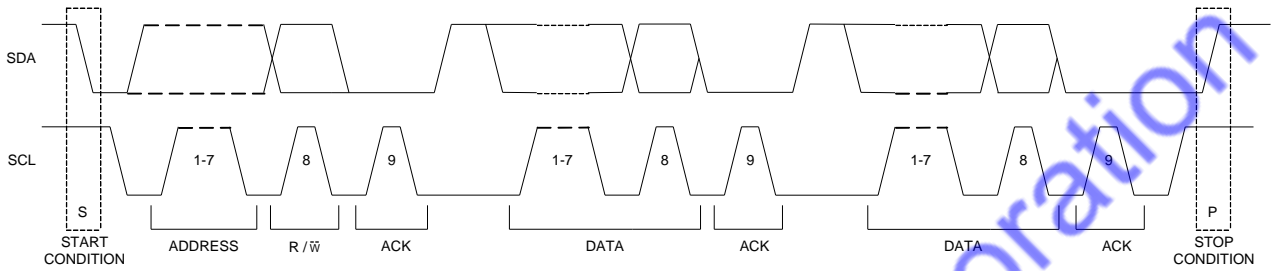
藉由SDA和SCL匯流排，可讓微處理機將資料傳輸到MS6300。因此，SDA和SCL便構成此序列匯流排介面。
(Data are transmitted to and from the MCU to the MS6300 via the SDA and SCL. The SDA and SCL make up the BUS interface. It should be noted that pull-up resistors must be connected to the positive supply voltage.)



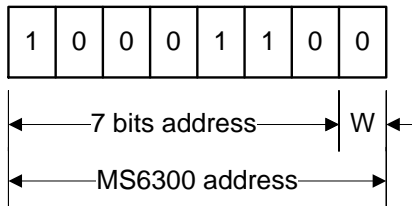
介面協定 (Interface Protocol)

I²C傳輸格式由以下要素所組成(The format consists of the following) :

- 起始位元。(A START condition.)
- 晶片位址位元組。(A chip address byte.)
- 認可位元 (ACK)。(Acknowledge bit.)
- 資料序列,N組 位元組+ACK。(A data sequence, N-bytes + Acknowledge.)
- 結束位元。(A STOP condition.)



MS6300位址碼(MS6300 Address Code)



子位址描述(Sub-Address)

MSB							LSB	功能 Function
A7	A6	A5	A4	A3	A2	A1	A0	
				0	0	0	0	(00H) Voice input loss/gain
				0	0	0	1	(01H) Music input loss/gain
				0	0	1	0	(02H) Output loss/gain
				0	0	1	1	(03H) Echo feedback attenuation
				0	1	0	0	(04H) Echo delay and Function

麥克風輸入增益/衰減(Voice input loss/gain)(00H)

音樂輸入增益/衰減 (Music input loss/gain) (01H)

輸出增益/衰減(Output loss/gain)(02H)

							LSB		功能 Function
D7	D6	D5	D4	D3	D2	D1	D0		
Gain/attenuation									
			0	0	0	0	0	+15.0dB	
			0	0	0	0	1	+13.5dB	
			0	0	0	1	0	+12.0dB	
			0	0	0	1	1	+10.5dB	
			0	0	1	0	0	+9.0dB	
			0	0	1	0	1	+7.5dB	
			0	0	1	1	0	+6.0dB	
			0	0	1	1	1	+4.5dB	
			0	1	0	0	0	+3.0dB	
			0	1	0	0	1	+1.5dB	
			0	1	0	1	0	0dB	
			0	1	0	1	1	-1.5dB	
			0	1	1	0	0	-3.0dB	
			0	1	1	0	1	-4.5dB	
			0	1	1	1	0	-6.0dB	
			0	1	1	1	1	-7.5dB	
			1	0	0	0	0	-9.0dB	
			1	0	0	0	1	-10.5dB	
			1	0	0	1	0	-12.0dB	
			1	0	0	1	1	-13.5dB	
			1	0	1	0	0	-15.0dB	
			1	0	1	0	1	-16.5dB	
			1	0	1	1	0	-18.0dB	
			1	0	1	1	1	-19.5dB	
			1	1	0	0	0	-21.0dB	
			1	1	0	0	1	-22.5dB	
			1	1	0	1	0	-24.0dB	
			1	1	0	1	1	-25.5dB	
			1	1	1	0	0	-27.0dB	
			1	1	1	0	1	-28.5dB	
			1	1	1	1	0	-30.0dB	
			1	1	1	1	1	Mute	

*Power up condition: -30dB

迴聲回授衰減(Echo feedback attenuation)(03H)

MSB				LSB				功能 Function
D7	D6	D5	D4	D3	D2	D1	D0	
				0	0	0	0	attenuation -1dB
				0	0	0	1	-2dB
				0	0	1	0	-3dB
				0	0	1	1	-4dB
				0	1	0	0	-5dB
				0	1	0	1	-6dB
				0	1	1	0	-7dB
				0	1	1	1	-8dB
				1	0	0	0	-9dB
				1	0	0	1	-10dB
				1	0	1	0	-11dB
				1	0	1	1	-12dB
				1	1	0	0	-13dB
				1	1	0	1	-14dB
				1	1	1	0	-15dB
				1	1	1	1	No echo

*Power up condition: -15dB

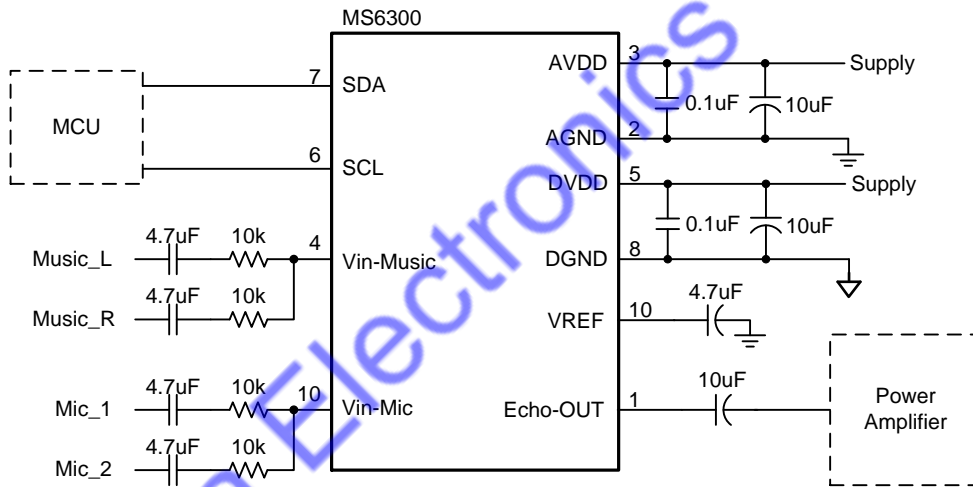
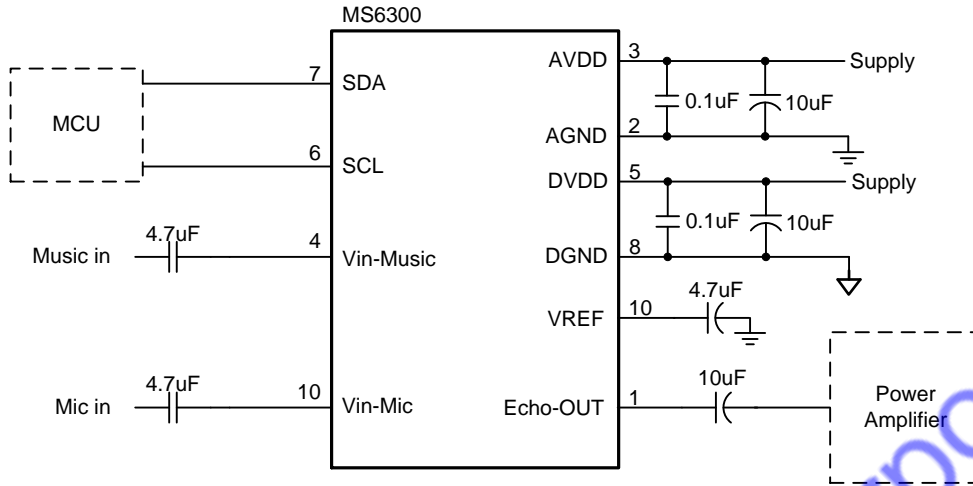
迴聲延遲與功能設定(Echo delay and Function)(04H)

MSB				LSB				功能 Function			
D7	D6	D5	D4	D3	D2	D1	D0				
								AAF and SMF bands(Hz)			
		0	0					2.0K			
		0	1					2.5K			
		1	0					3.2K			
		1	1					4K			
								Delay Time(ms)			
				0	0	0	0	0	0	0	0
				0	0	0	1	49	39	30	24
				0	0	1	0	73	58	45	36
				0	0	1	1	96	77	60	48
				0	1	0	0	120	96	75	60
				0	1	0	1	144	115	90	72
				0	1	1	0	168	134	105	84
				0	1	1	1	193	154	120	96
				1	0	0	0	216	173	135	108
				1	0	0	1	240	192	150	120
				1	0	1	0	264	211	165	132
				1	0	1	1	288	230	180	144
				1	1	0	0	313	250	195	156
				1	1	0	1	336	269	210	168
				1	1	1	0	360	288	225	180
				1	1	1	1	384	307	240	192

*Power up condition Filter 4K , echo dealy 180ms,

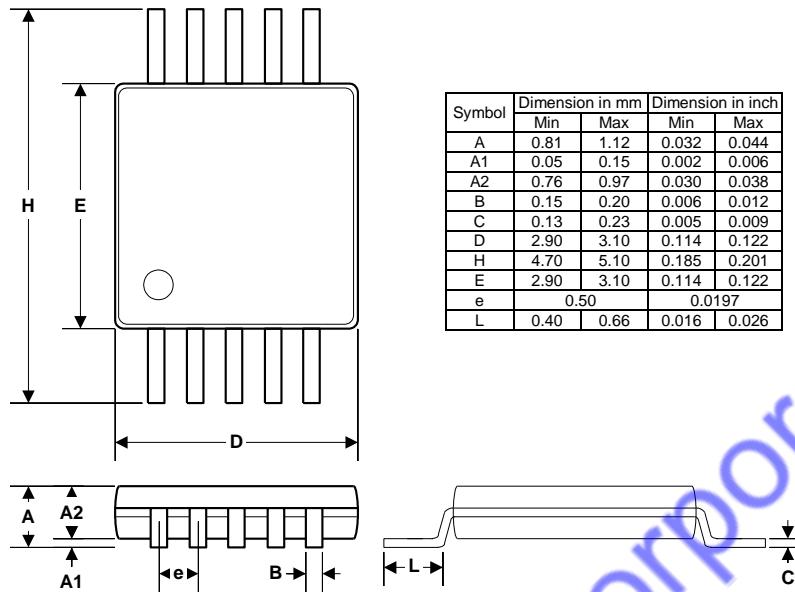
應用資訊(APPLICATION INFORMATION)

基本應用範例(Basic application example)



封装尺寸(EXTERNAL DIMENSIONS)

MSOP10



卷带规格(TAPE AND REEL) (Unit : mm)

