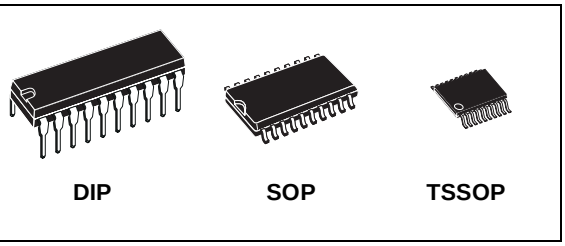
M74HC4353

ANALOG MULTIPLEXER/DEMULTIPLEXER WITH ADDRESS LATCH : SINGLE 8 CHANNEL

- LOGIC LEVEL TRANSLATION TO ENABLE 5V LOGIC SIGNAL TO COMMUNICATE WITH ± 5V ANALOG SIGNAL
- LOW POWER DISSIPATION: I_{CC} = 4μA(MAX.) at T_A = 25 °C
- LOW "ON" RESISTANCE: 70Ω TYP. (V_{CC} - V_{EE} = 4.5V) 50Ω TYP. (V_{CC} - V_{EE} = 9V)
- WIDE ANALOG INPUT VOLTAGE RANGE ± 6v
- LOW CROSSTALK BETWEEN SWITCHES
- FAST SWITCHING
- SINE WAVE DISTORTION: 0.02% (TYP.) at V_{CC} - V_{EE} = 9V
- HIGH NOISE IMMUNITY: V_{NIH} = V_{NIL} = 28 % V_{CC} (MIN.)
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 4353



ORDER CODES

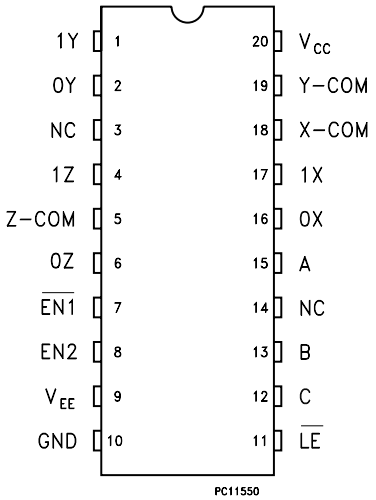
PACKAGE	TUBE	T & R
DIP	M74HC4353B1R	
SOP	M74HC4353M1R	M74HC4353RM13TR
TSSOP		M74HC4353TTR

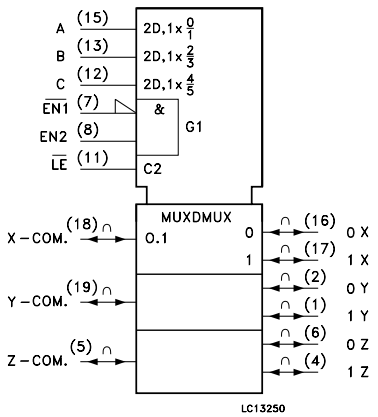
DESCRIPTION

The M74HC4353 is an high speed CMOS ANALOG MULTIPLEXER/DEMULTIPLEXER fabricated with silicon gate C^2MOS technology.
A built-in level shifting is included to allow an input range up to ±6V (peak) for an analog signal with digital control signal of 0 to 6V.

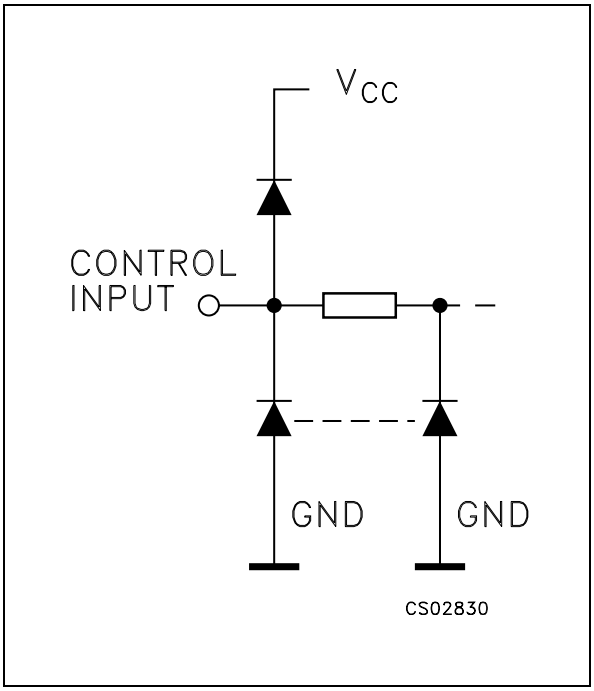
V_{EE} supply pin is provided for analog input signals. It has two enable inputs to enable all the switches when high (EN2) or low ($\overline{EN1}$). For operation as a digital multiplexer/demultiplexer , V_{EE} is connected to GND.
The M74HC4353 is a triple two channel multiplexer / demultiplexer having three separate digital control inputs A, B and C to select independently one of a pair of channels.

PIN CONNECTION AND IEC LOGIC SYMBOLS





CONTROL INPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1, 2	0Y, 1Y	Independent Inputs/Outputs
5	Z COM	Common Output/Inputs
6, 4	0Z, 1Z	Independent Inputs/Outputs
3, 14	NC	Not Connected
7	$\overline{EN1}$	Enable Input (Active LOW)
8	EN2	Enable Input (Active HIGH)
9	V_{EE}	Negative Supply Voltage
11	$\overline{LE}$	Latch Enable Input (Active LOW)
15, 13, 12	A, B, C	Select Inputs
16, 17	0X, 1X	Independent Inputs/Outputs
18	X COM	Common Output/Inputs
19	Y COM	Common Output/Inputs
10	GND	Ground (0V)
20	V_{CC}	Positive Supply Voltage

TRUTH TABLE

CONTROL INPUTS					"ON" CHANNEL ($\overline{LE}$ = H)**
$\overline{EN1}$	EN2	C	B	A	
L	H	L	L	L	0X, 0Y, 0Z
L	H	L	L	H	1X, 0Y, 0Z
L	H	L	H	L	0X,1Y, 0Z
L	H	L	H	H	1X,1Y, 0Z
L	H	H	L	L	0X, 0Y, 1Z
L	H	H	L	H	1X, 0Y, 1Z
L	H	H	H	L	0X,1Y, 1Z
L	H	H	H	H	1X,1Y, 1Z
H	X	X	X	X	NONE
X	L	X	X	X	NONE

X : Don't Care
** : When latch Enable is low, the Channel Selection is latched and the Channel Address Latch does not change state.

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	-0.5 to +7	V
V_{CC} - V_{EE}	Supply Voltage Range	-0.5 to +13	V
V_{IN}	DC Input Voltage	-0.5 to V_{CC} + 0.5	V
$V_{I/O}$	DC Switch Input/Output Voltage	V_{EE} -0.5 to V_{CC} + 0.5	V
I_{IK}	Input Diode Current	± 20	mA
I_{OK}	I/O Diode Current	± 20	mA
I_{OUT}	DC Output Current	± 25	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	± 50	mA
P_D	Power Dissipation	500(*)	mW
T_{stg}	Storage Temperature	-65 to +150	°C
T_L	Lead Temperature (10 sec)	300	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied
(*) 500mW at 65 °C; derate to 300mW by 10mW/°C from 65°C to 85°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Value	Unit
V_{CC}	Supply Voltage		2 to 12	V
V_{EE}	Supply Voltage		2 to 12	V
V_{CC} - V_{EE}	Supply Voltage		2 to 12	V
V_I	Input Voltage		0 to V_{CC}	V
$V_{I/O}$	Switch I/O Voltage		0 to V_{CC}	V
T_{op}	Operating Temperature		-55 to 125	°C
t_r, t_f	Input Rise and Fall Time	V_{CC} = 2.0V	0 to 1000	ns
		V_{CC} = 4.5V	0 to 500	
		V_{CC} = 6.0V	0 to 400	

DC SPECIFICATIONS

Symbol	Parameter	Test Condition			Value							Unit
		V_{CC} (V)	V_{EE} (V)		T_A = 25°C			-40 to 85°C		-55 to 125°C		
					Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
V_{IHC}	High Level Control Input Voltage	2.0			1.5			1.5		1.5		V
		4.5			3.15			3.15		3.15		
		6.0			4.2			4.2		4.2		
V_{ILC}	Low Level Control Input Voltage	2.0					0.5		0.5		0.5	V
		4.5					1.35		1.35		1.35	
		6.0					1.8		1.8		1.8	
R_{ON}	ON Resistance	4.5	GND	$V_I = V_{IHC}$ or V_{ILC} $V_{I/O} = V_{CC}$ to V_{EE} $I_{I/O} \leq 2$ mA		85	180		225			Ω
		4.5	-4.5			55	120		150			
		6.0	-6.0			50	100		125			
		2.0	GND	$V_I = V_{IHC}$ or V_{ILC} $V_{I/O} = V_{CC}$ or V_{EE} $I_{I/O} \leq 2$ mA		150						
		4.5	GND			70	150		190			
		4.5	-4.5			50	100		125			
		6.0	-6.0			45	80		100			
ΔR_{ON}	Difference of ON Resistance between switches	4.5	GND	$V_I = V_{IHC}$ or V_{ILC} $V_{I/O} = V_{CC}$ to V_{EE} $I_{I/O} \leq 2$ mA		10	30		35			Ω
		4.5	-4.5			5	12		15			
		6.0	-6.0			5	10		12			
I_{OFF}	Input/Output Leakage Current (SWITCH OFF)	6.0	-6.0	$V_{OS} = V_{CC}$ or GND $V_{IS} = V_{CC}$ or GND $V_{IN} = V_{ILC}$			± 100		± 1000			nA
I_{IZ}	Switch Input Leakage Current (SWITCH ON, OUTPUT OPEN)	6.0	-6.0	$V_{OS} = V_{CC}$ or GND $V_{INH} = V_{IHC}$			± 100		± 1000			nA
I_{IN}	Control Input Current	6.0	GND	$V_{IN} = V_{CC}$ or GND			± 0.1		± 1		± 1	µA
I_{CC}	Quiescent Supply Current	6.0	GND	$V_{IN} = V_{CC}$ or GND			4		40		80	µA
		6.0	-6.0				8		80		160	

AC ELECTRICAL CHARACTERISTICS (C_L = 50 pF, Input $t_r = t_f$ = 6ns, GND = 0)

Symbol	Parameter	Test Condition			Value							Unit
		V_{CC} (V)	V_{EE} (V)		T_A = 25°C			-40 to 85°C		-55 to 125°C		
					Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
$\Phi_{I/O}$	Phase Difference Between Input and Output	2.0	GND			25	60		75			ns
		4.5	GND			6	12		15			
		6.0	GND			5	10		13			
		4.5	-4.5			4						
t_{PZL} t_{PZH}	Output Enable Time ($\overline{E1}$, E2 - O)	2.0	GND	R_L = 1KΩ		100	200		250		300	ns
		4.5	GND			22	40		50		60	
		6.0	GND			18	34		43		51	
		4.5	-4.5			19						
t_{PZL} t_{PZH}	Output Enable Time ($\overline{LE}$ -I/O)	2.0	GND	R_L = 1KΩ		110	225		280		340	ns
		4.5	GND			24	45		56		68	
		6.0	GND			20	38		48		57	
		4.5	-4.5			18						
t_{PZL} t_{PZH}	Output Enable Time (A, B, C - I/O)	2.0	GND	R_L = 1KΩ		100	225		280		340	ns
		4.5	GND			22	45		56		68	
		6.0	GND			18	38		48		57	
		4.5	-4.5			19						
t_{PLZ} t_{PHZ}	Output Disable Time ($\overline{E1}$, E2 - O)	2.0	GND	R_L = 1KΩ		130	290		363		435	ns
		4.5	GND			38	58		72		87	
		6.0	GND			32	49		61		74	
		4.5	-4.5			30						
t_{PLZ} t_{PHZ}	Output Disable Time ($\overline{LE}$ -I/O)	2.0	GND	R_L = 1KΩ		140	300		375		450	ns
		4.5	GND			41	60		75		90	
		6.0	GND			34	51		64		77	
		4.5	-4.5			37						
t_{PLZ} t_{PHZ}	Output Disable Time (A, B, C - I/O)	2.0	GND	R_L = 1KΩ		135	325		406			ns
		4.5	GND			42	65		81		100	
		6.0	GND			32	55		69		85	
		4.5	-4.5			35						
$t_{W(H)}$	Minimum Pulse Width (LE)	2.0	GND				75		95		110	ns
		4.5	GND				15		19		22	
		6.0	GND				13		16		19	
t_s	Minimum Set-Up Time	2.0	GND				50		60		75	ns
		4.5	GND				10		12		15	
		6.0	GND				9		11		13	
t_h	Minimum Hold Time	2.0	GND				5		5		5	ns
		4.5	GND				5		5		5	
		6.0	GND				5		5		5	

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition			Value							Unit
		V_{CC} (V)	V_{EE} (V)		T_A = 25°C			-40 to 85°C		-55 to 125°C		
					Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
C_{IN}	Input Capacitance					5	10		10		10	pF
C_{IS}	Common Terminal Capacitance	5.0	-5.0			11	20		20		20	pF
C_{OS}	Switch Terminal Capacitance	5.0	-5.0			7	15		15		15	pF
C_{IOS}	Feed Through Capacitance	5.0	-5.0			0.75	2		2		2	pF
C_{PD}	Power Dissipation Capacitance (note 1)	5.0	GND			10						pF

1) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$

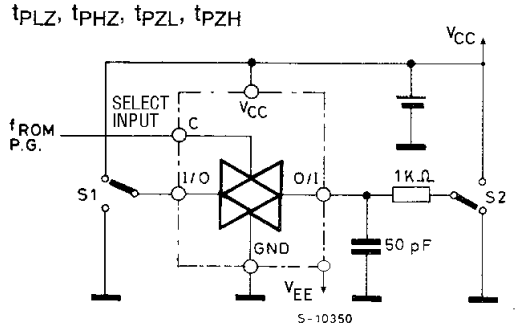
ANALOG SWITCH CHARACTERISTICS (GND = 0V;T_A = 25°C)

Symbol	Parameter	Test Condition				Value	Unit
		V_{CC} (V)	V_{EE} (V)	V_{IN} (V_{p-p})		Typ.	
	Sine Wave Distortion (THD)	2.25	-2.25	4	f_{IN} = 1 KHz R_L = 10 KΩ, C_L = 50 pF	0.025	%
		4.5	-4.5	8		0.020	
f_{MAX}	Frequency Response (Switch ON)	4.5	-4.5	Adjust f_{IN} voltage to obtain 0 dBm at V_{OS}. Increase f_{IN} Frequency until dB meter reads -3dB R_L = 50Ω, C_L = 10 pF(*)		200	MHz
	Feed through Attenuation (Switch OFF)	2.25	-2.25	V_{IN} is centered at (V_{CC} - V_{EE}) /2. Adjust input for 0 dBm R_L = 600Ω, C_L = 50 pF, f_{IN} = 1MHz sine wave		-50	dB
		4.5	-4.5			-50	
		6.0	-6.0			-50	
	Crosstalk Control to Switch	2.25	-2.25	$t_r = t_f$ =6ns R_L = 600Ω, C_L = 50 pF f_{IN} = 1MHz square wave		110	mV
		4.5	-4.5			225	
		6.0	-6.0			310	
	Crosstalk (Between Any Switches)	2.25	-2.25	Adjust V_{IN} to Obtain 0 dBm at input R_L = 600Ω, C_L = 50 pF, f_{IN} = 1MHz sine wave		-50	dB
		4.5	-4.5			-50	
		6.0	-6.0			-50	

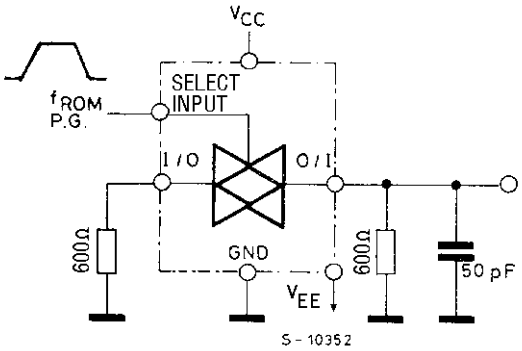
(*) : Input COMMON Terminal, and measured at SWITCH Terminal.
NOTE : These Characteristics are determined by design of device.

SWITCHING CARACTERISTICS TEST CIRCUIT

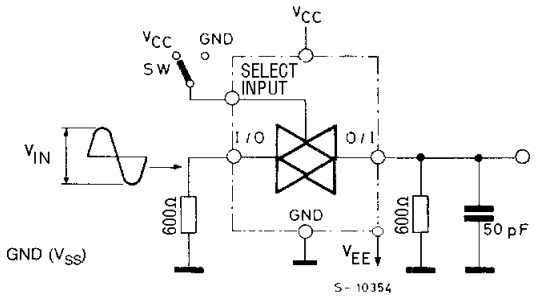
t_{PLZ}, t_{PHZ}, t_{PZL}, t_{PZH}



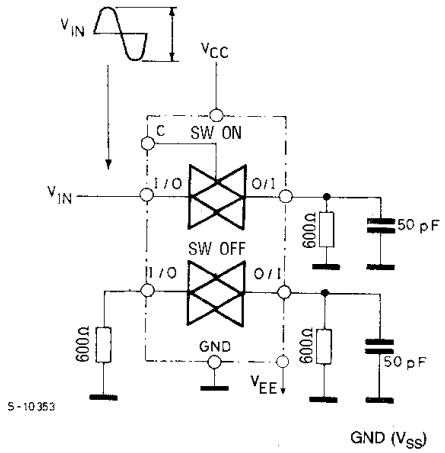
CROSSTALK (control to output)



BANDWIDTH AND FEEDTHROUGH ATTENUATION

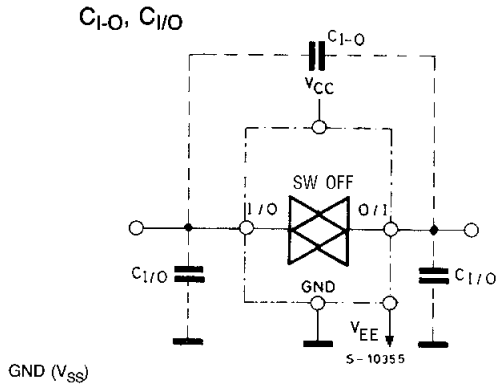


CROSSTALK BETWEEN ANY TWO SWITCHES

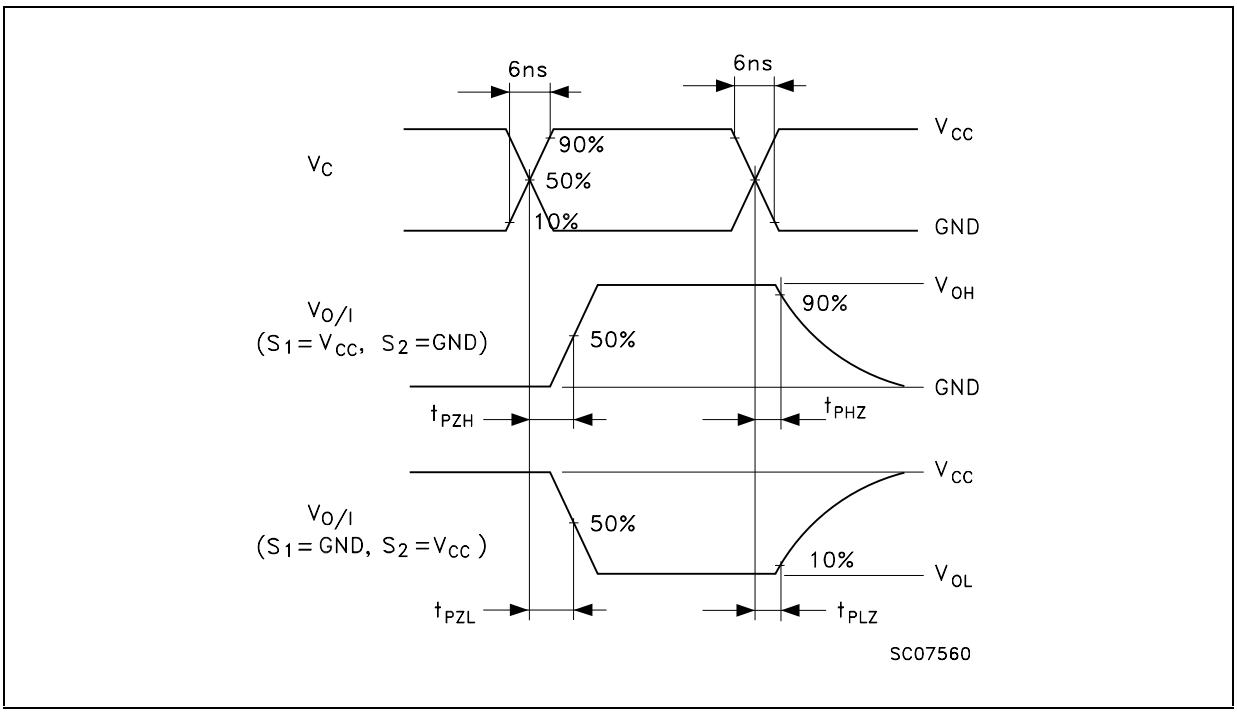


C_{I-O} $C_{I/O}$

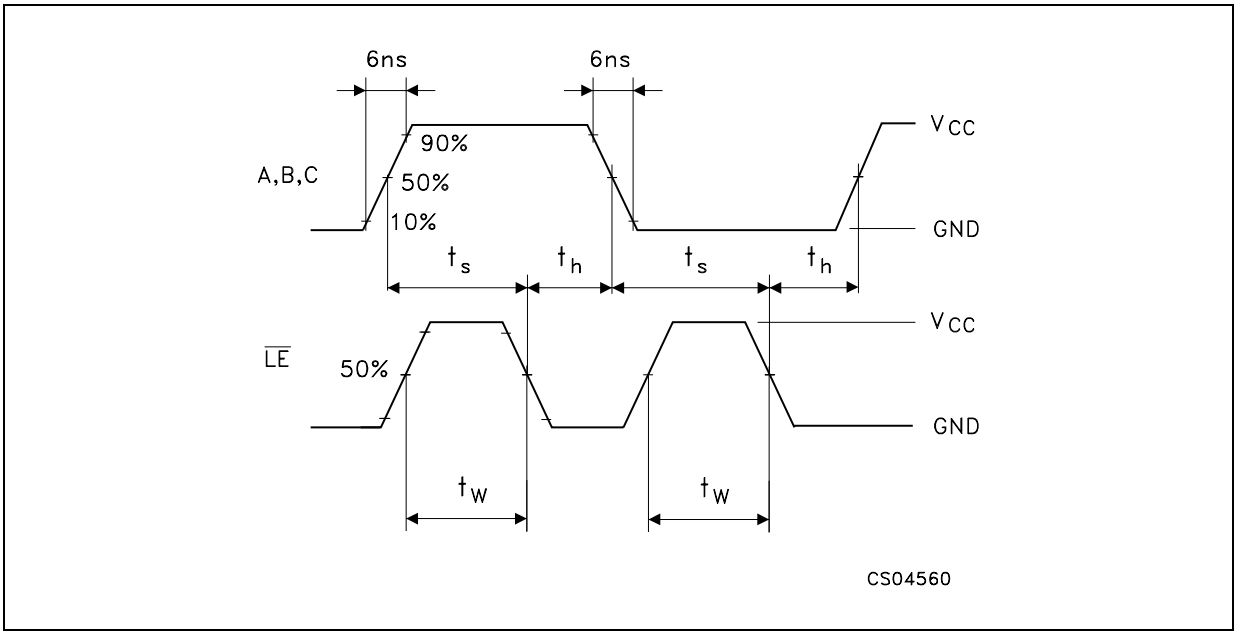
C_{I-O}, $C_{I/O}$



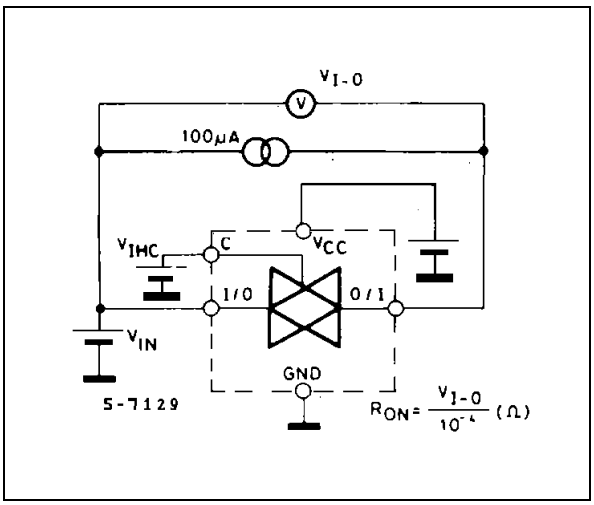
WAVEFORM 1 : OUTPUT ENABLE AND DISABLE TIME (f=1MHz; 50% duty cycle)



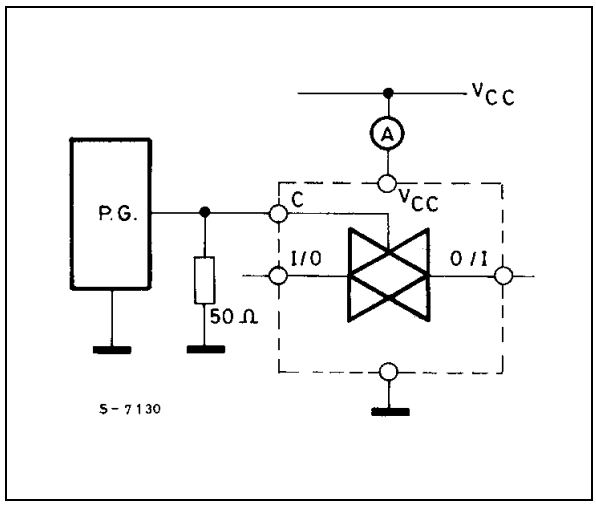
WAVEFORM 2 : MINIMUM PULSE WIDTH, SETUP AND HOLD TIME (f=1MHz; 50% duty cycle)



CHANNEL RESISTANCE (R_{ON})

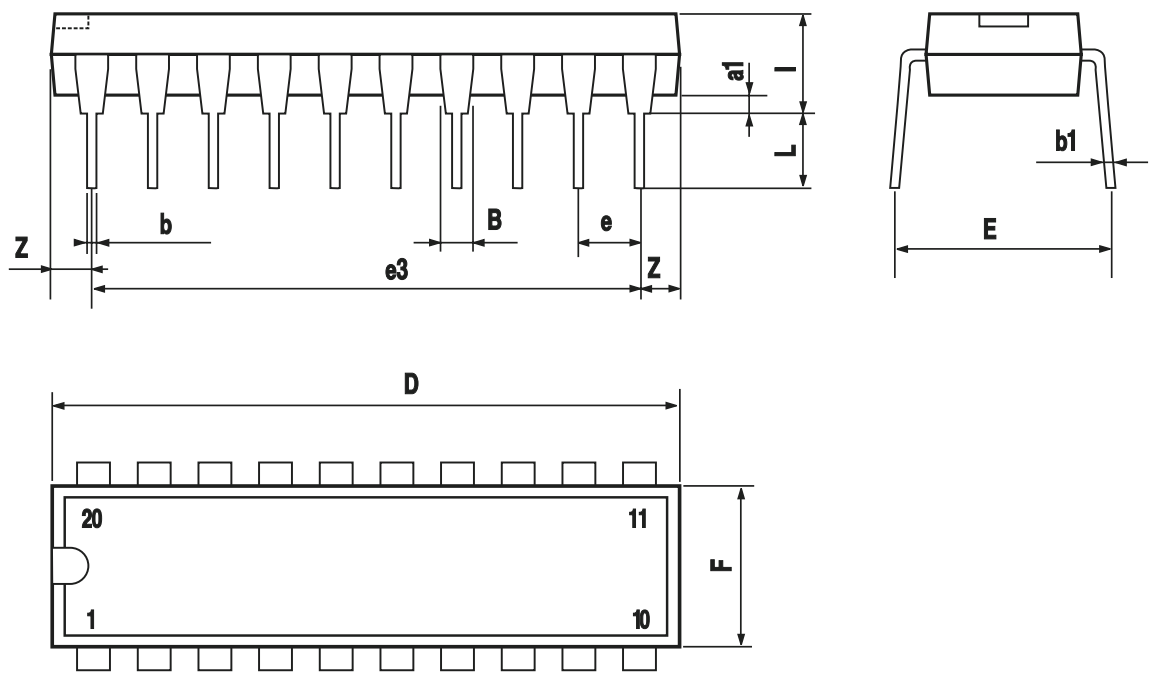


I_{CC} (Opr.)



Plastic DIP-20 (0.25) MECHANICAL DATA

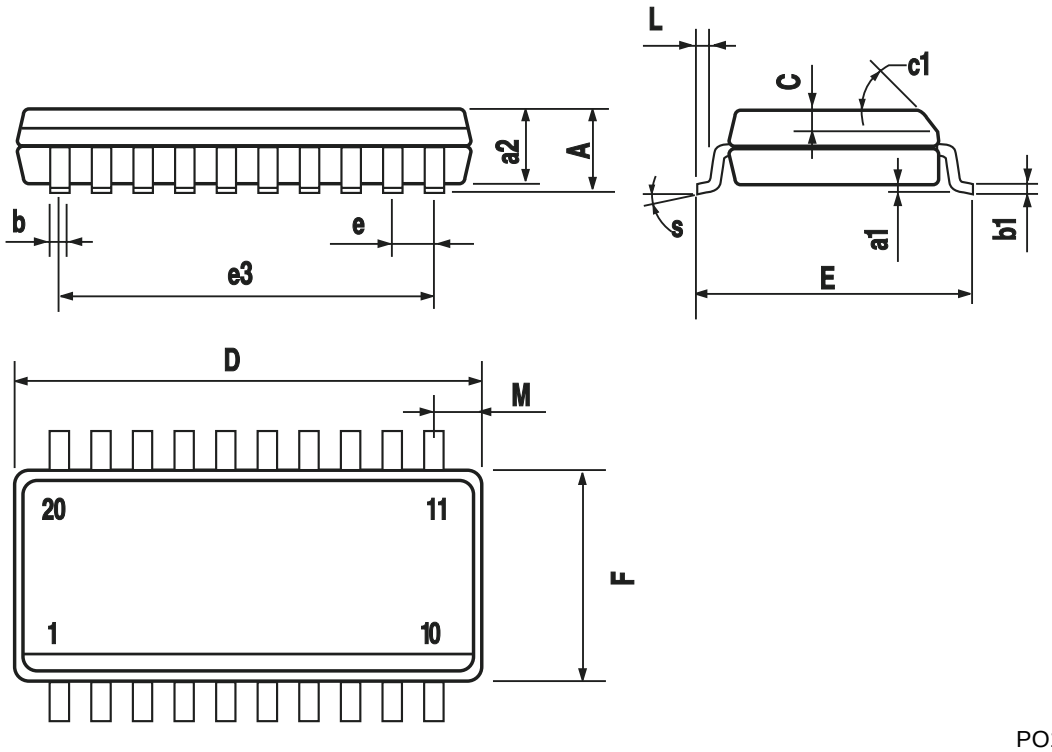
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.254			0.010		
B	1.39		1.65	0.055		0.065
b		0.45			0.018	
b1		0.25			0.010	
D			25.4			1.000
E		8.5			0.335	
e		2.54			0.100	
e3		22.86			0.900	
F			7.1			0.280
I			3.93			0.155
L		3.3			0.130	
Z			1.34			0.053



P001J

SO-20 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.1		0.2	0.004		0.008
a2			2.45			0.096
b	0.35		0.49	0.014		0.019
b1	0.23		0.32	0.009		0.012
C		0.5			0.020	
c1	45° (typ.)					
D	12.60		13.00	0.496		0.512
E	10.00		10.65	0.393		0.419
e		1.27			0.050	
e3		11.43			0.450	
F	7.40		7.60	0.291		0.300
L	0.50		1.27	0.020		0.050
M			0.75			0.029
S	8° (max.)					



PO13L

TSSOP20 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0089
D	6.4	6.5	6.6	0.252	0.256	0.260
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030