



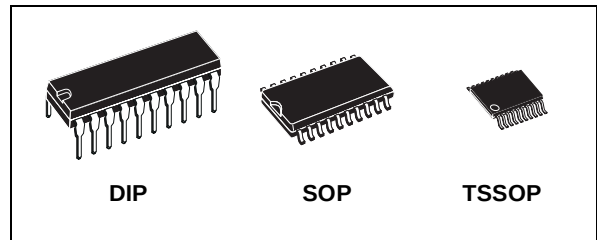
M74HC4352

ANALOG MULTIPLEXER/DEMULTIPLEXER WITH ADDRESS LATCH : DUAL 4 CHANNEL

- LOGIC LEVEL TRANSLATION TO ENABLE 5V LOGIC SIGNAL TO COMMUNICATE WITH $\pm 5V$ ANALOG SIGNAL
- LOW POWER DISSIPATION:
 $I_{CC} = 4\mu A(\text{MAX.})$ at $T_A = 25^\circ C$
- LOW "ON" RESISTANCE:
70 Ω TYP. ($V_{CC} - V_{EE} = 4.5V$)
50 Ω TYP. ($V_{CC} - V_{EE} = 9V$)
- WIDE ANALOG INPUT VOLTAGE RANGE $\pm 6V$
- 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 4352

DESCRIPTION

The M74HC4352 is an high speed CMOS ANALOG MULTIPLEXER/DEMULTIPLEXER fabricated with silicon gate C²MOS technology. A built-in level shifting is included to allow an input range up to $\pm 6V$ (peak) for an analog signal with digital control signal of 0 to 6V.



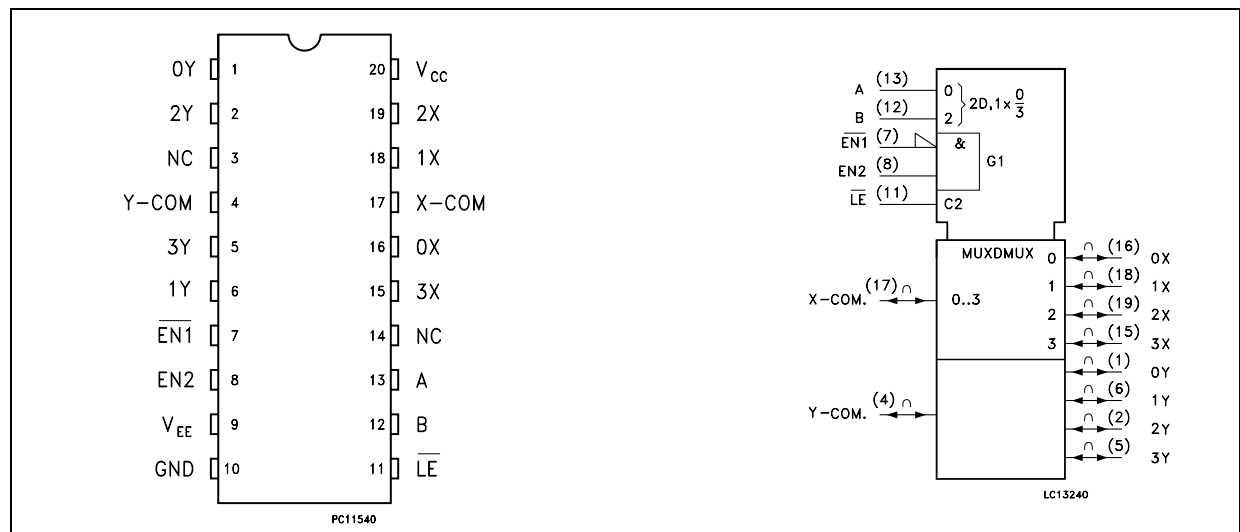
ORDER CODES

PACKAGE	TUBE	T & R
DIP	M74HC4352B1R	
SOP	M74HC4352M1R	M74HC4352RM13TR
TSSOP		M74HC4352TTR

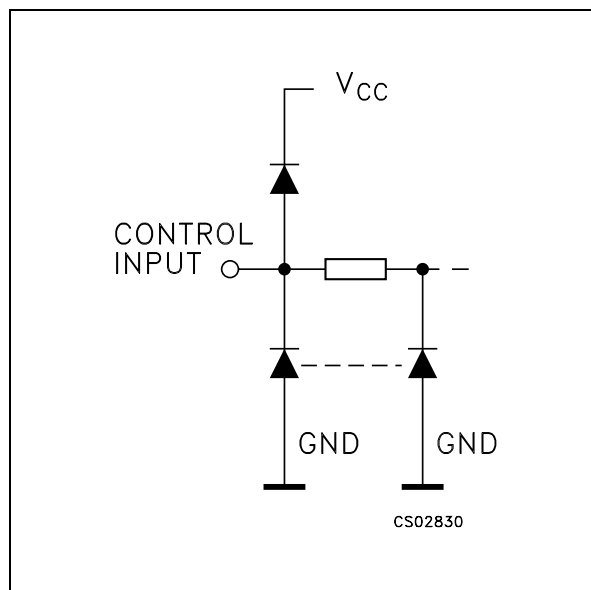
V_{EE} supply pin is provided for analog input signals. It has two enable inputs to enable all the switches when high (EN2) or low (EN1). For operation as a digital multiplexer/demultiplexer, V_{EE} is connected to GND.

The M74HC4352 has a pair of four channel multiplexer/demultiplexer having two control inputs A and B that select one of four channel of the two sections.

PIN CONNECTION AND IEC LOGIC SYMBOLS



CONTROL INPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1, 6, 2, 5	0Y to 3Y	Independent Inputs/Outputs
3, 14	NC	Not Connected
7	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)
13, 12	A, B	Select Inputs
16, 18, 19, 15	0X to 3X	Independent Inputs/Outputs
17, 4	X COM Y COM	Common Outputs/Inputs
10	GND	Ground (0V)
20	V_{CC}	Positive Supply Voltage

TRUTH TABLE

CONTROL INPUTS				"ON" CHANNEL ($\overline{LE} = H$)**
$\overline{EN1}$	EN2	B	A	
L	H	L	L	0X, 0Y
L	H	L	H	1X, 1Y
L	H	H	L	2X, 2Y
L	H	H	H	3X, 3Y
L	H	L	L	--
L	H	L	H	--
L	H	H	L	--
L	H	H	H	--
H	X	X	X	NONE
X	L	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	$V_{CC} = 2.0V$	ns
		$V_{CC} = 4.5V$	
		$V_{CC} = 6.0V$	

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} ≤ 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} ≤ 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} ≤ 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.
Φ _{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						

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.
t _{PZL} t _{PZH}	Output Enable Time (E1, E2 - O)	2.0	GND	R _L = 1KΩ		80	200		250		300	ns
		4.5	GND			20	40		50		60	
		6.0	GND			16	34		43		51	
		4.5	-4.5			18						
t _{PZL} t _{PZH}	Output Enable Time (LE -I/O)	2.0	GND	R _L = 1KΩ		80	225		280		340	ns
		4.5	GND			22	45		56		68	
		6.0	GND			17	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		80	225		280		340	ns
		4.5	GND			22	45		56		68	
		6.0	GND			16	38		48		57	
		4.5	-4.5			17						
t _{PLZ} t _{PHZ}	Output Disable Time (E1, E2 - O)	2.0	GND	R _L = 1KΩ		120	275		344		415	ns
		4.5	GND			38	55		69		83	
		6.0	GND			33	47		59		71	
		4.5	-4.5			36						
t _{PLZ} t _{PHZ}	Output Disable Time (LE -I/O)	2.0	GND	R _L = 1KΩ		160	275		344		415	ns
		4.5	GND			40	55		69		83	
		6.0	GND			34	47		59		71	
		4.5	-4.5			32						
t _{PLZ} t _{PHZ}	Output Disable Time (A, B, C - I/O)	2.0	GND	R _L = 1KΩ		120	275		344		415	ns
		4.5	GND			40	55		69		83	
		6.0	GND			35	47		59		71	
		4.5	-4.5			31						
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			19	40		40		40	pF
C _{OS}	Switch Terminal Capacitance	5.0	-5.0			7	15		15		15	pF
C _{IOS}	Feed Through Capacitance	5.0	-5.0			0.85	2		2		2	pF
C _{PD}	Power Dissipation Capacitance (note 1)	5.0	GND			34						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)

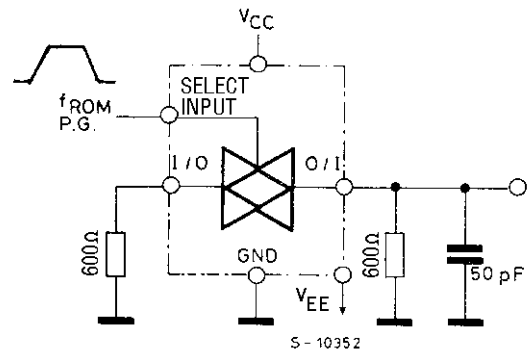
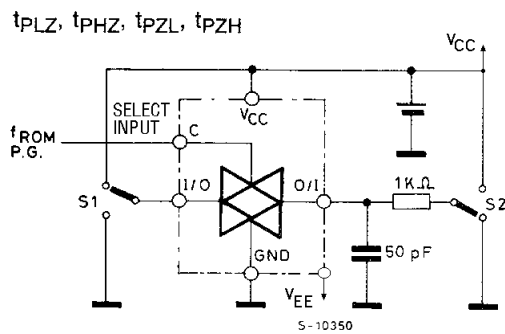
Symbol	Parameter	Test Condition				Value	Unit
		V _{CC} (V)	V _{EE} (V)	V _{IN} (V _{p-p})		Typ.	
	Sine Wave Distortion (THD)	2.25	-2.25	4	f _{IN} = 1 KHz R _L = 10 KΩ, C _L = 50 pF	0.025	%
		4.5	-4.5	8		0.020	
f _{MAX}	Frequency Response (Switch ON)	4.5	-4.5	Adjust f _{IN} voltage to obtain 0 dBm at 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.

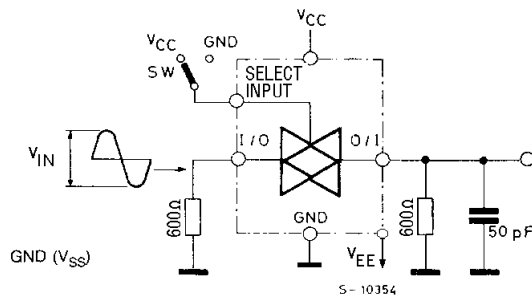
NOTE : These Characteristics are determined by design of device.

SWITCHING CHARACTERISTICS TEST CIRCUIT

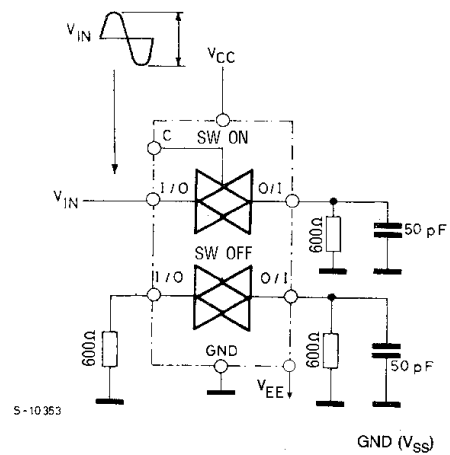
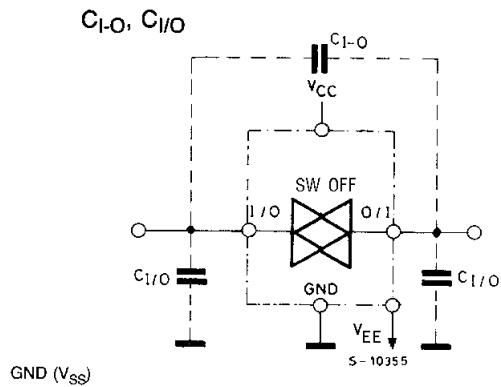
CROSSTALK (control to output)

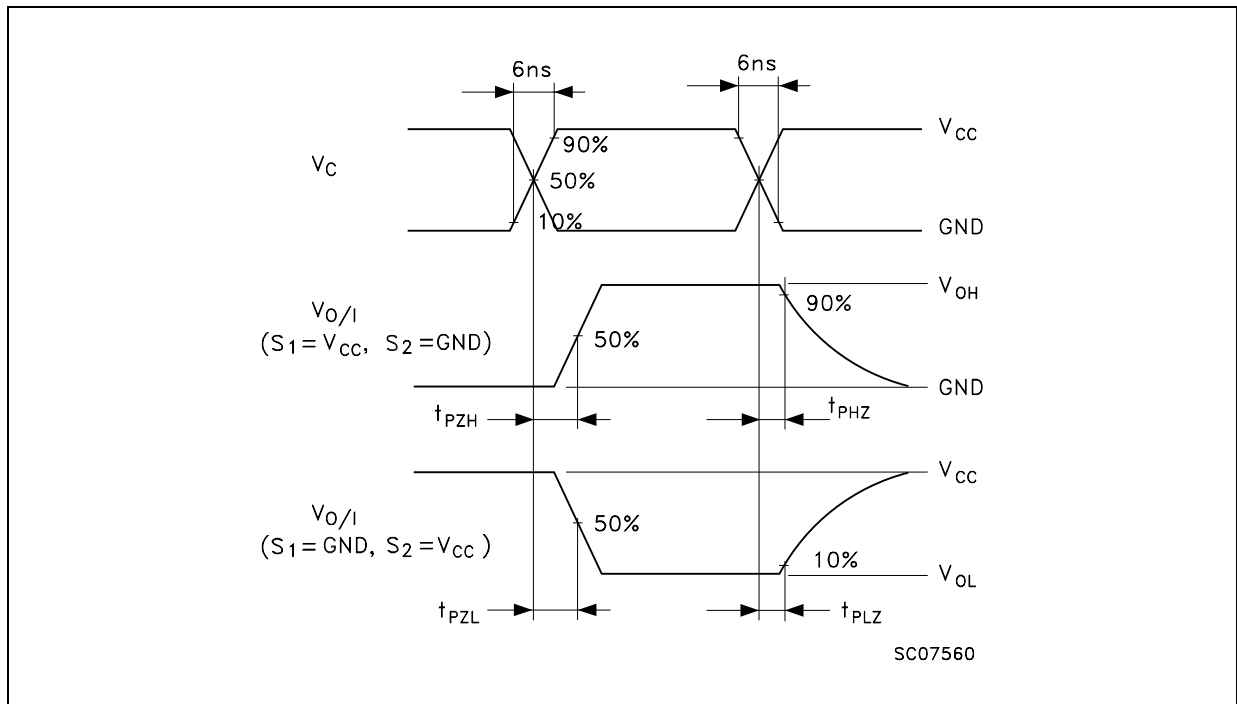
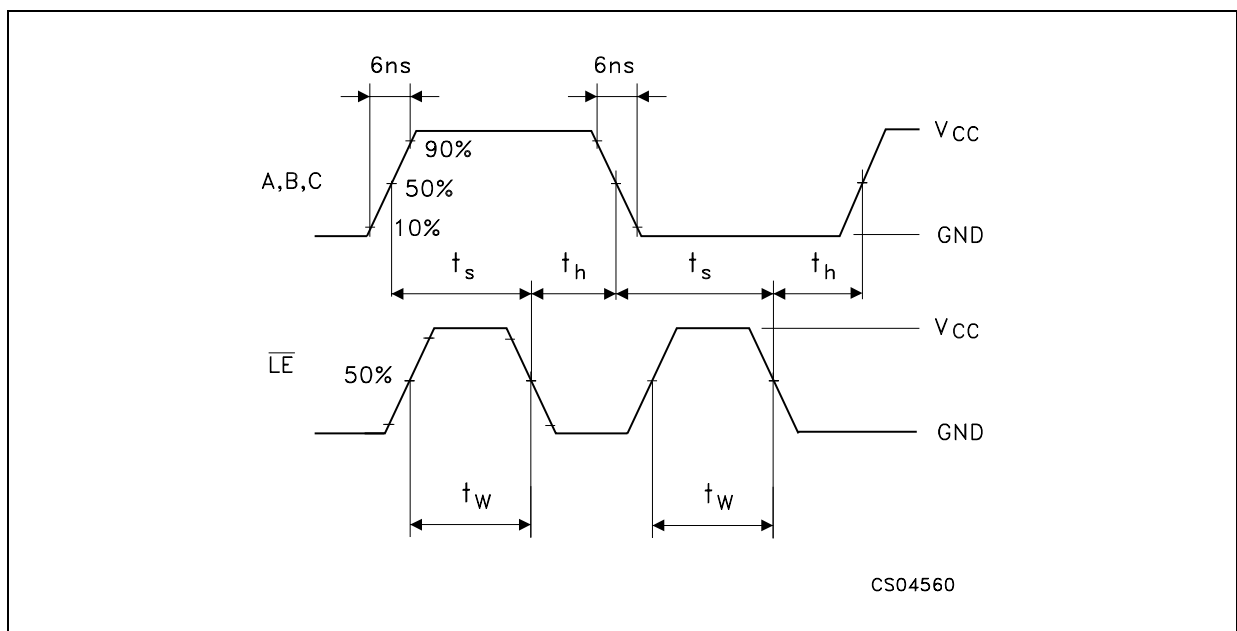


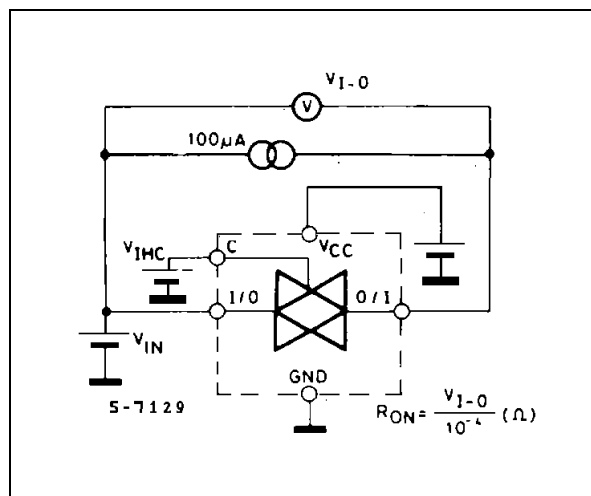
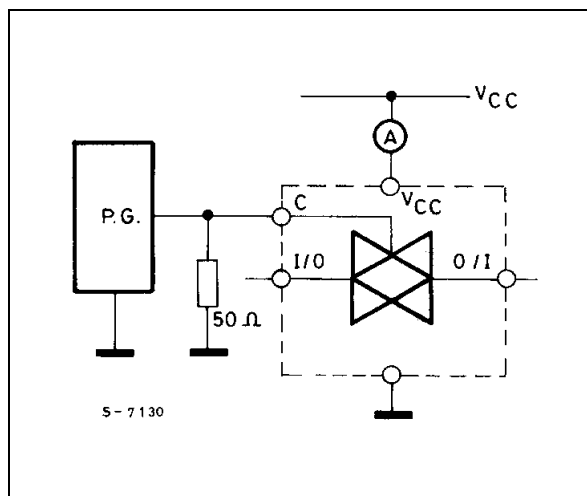
BANDWIDTH AND FEEDTHROUGH ATTENUATION



CROSSTALK BETWEEN ANY TWO SWITCHES

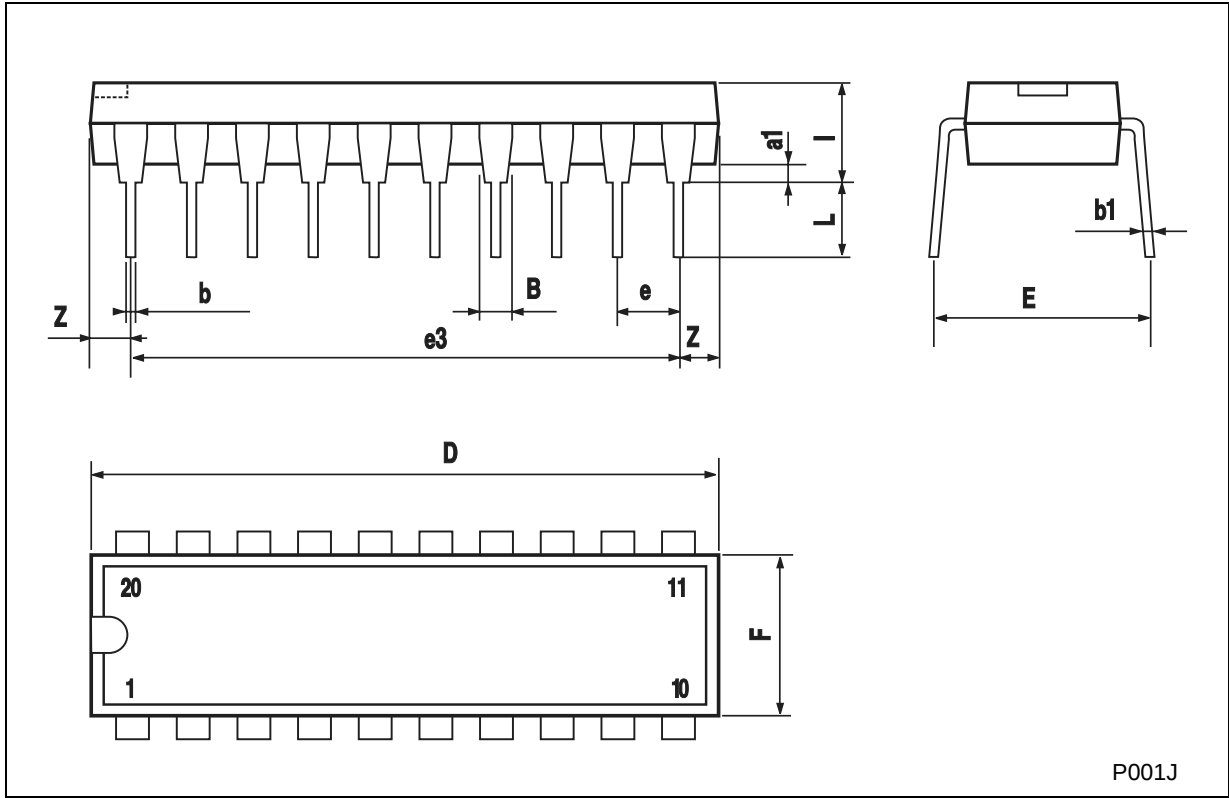
 C_{I-O} $C_{I/O}$ 

WAVEFORM 1 : OUTPUT ENABLE AND DISABLE TIME ($f=1\text{MHz}$; 50% duty cycle)**WAVEFORM 2 : MINIMUM PULSE WIDTH, SETUP AND HOLD TIME** ($f=1\text{MHz}$; 50% duty cycle)

CHANNEL RESISTANCE (R_{ON}) I_{CC} (Opr.)

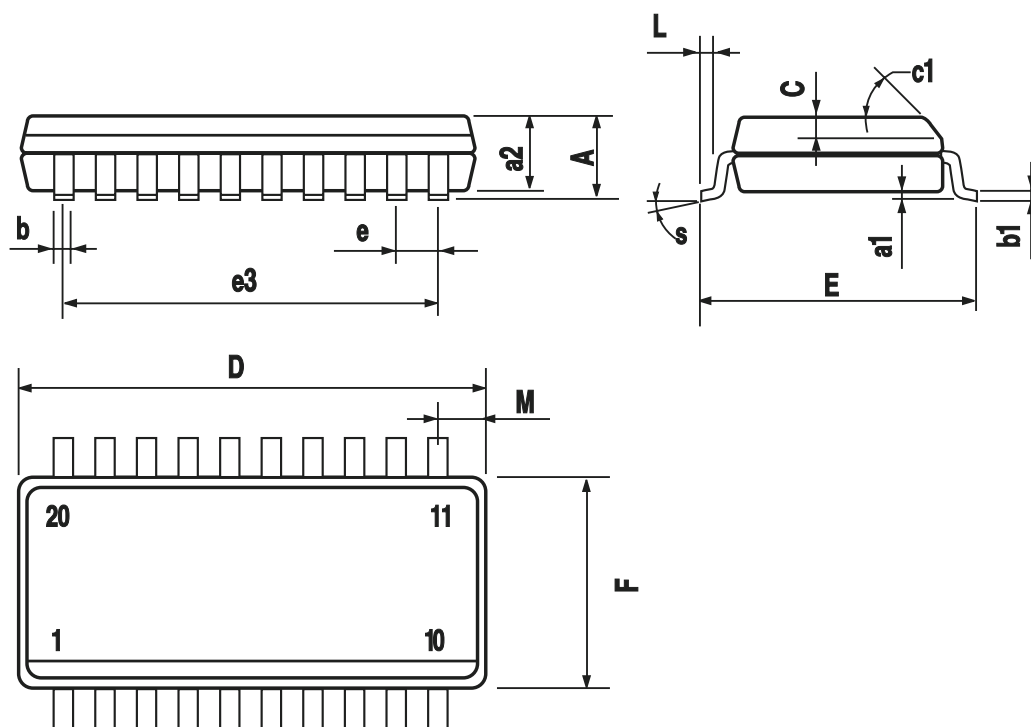
Plastic DIP-20 (0.25) MECHANICAL DATA

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



SO-20 MECHANICAL DATA

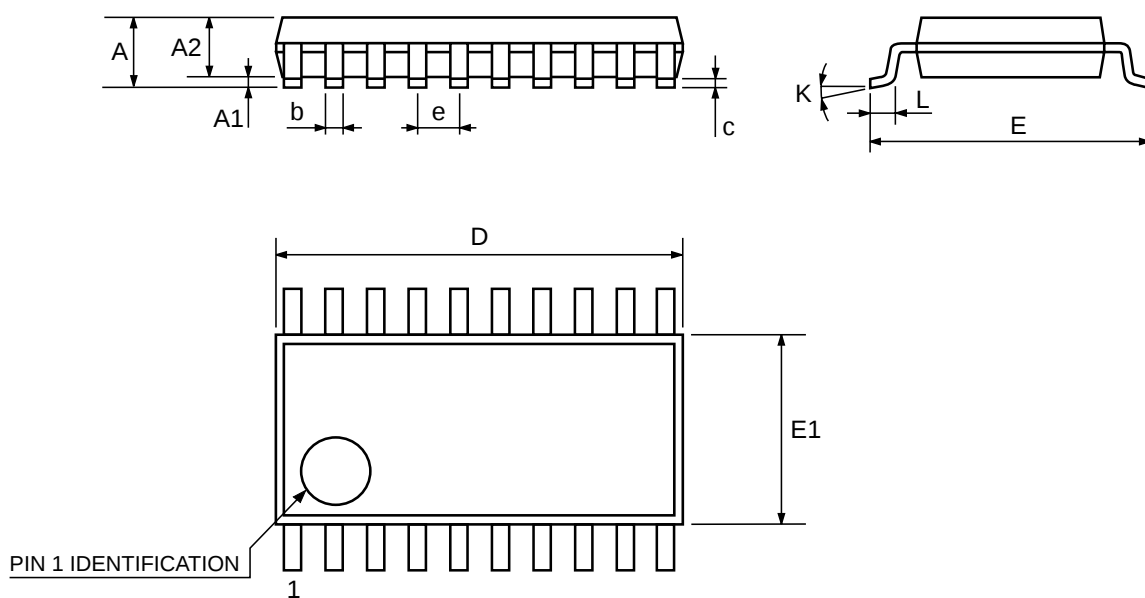
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.1		0.2	0.004		0.008
a2			2.45			0.096
b	0.35		0.49	0.014		0.019
b1	0.23		0.32	0.009		0.012
C		0.5			0.020	
c1	45° (typ.)					
D	12.60		13.00	0.496		0.512
E	10.00		10.65	0.393		0.419
e		1.27			0.050	
e3		11.43			0.450	
F	7.40		7.60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



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