C²MOS DIGITAL INTEGRATED CIRCUIT
SILICON MONOLITHIC

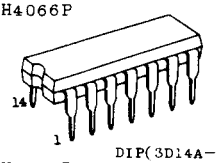
TC50H4066P/F

TC50H4066 QUAD BILATERAL SWITCH

TC50H4066 contains four independent circuit of bidirectional switches. When control input CONT is set to "H" level, the impedance between input and output of the switch becomes low and when it is set to "L" level, the impedance becomes high. This can be applied for switching of analog signals and digital signals.

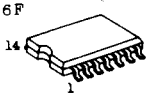
- ON-resistance, R_{ON}
  - 2kΩ(TYP.) ..... V_{DD}-V_{SS}=2V
  - 90Ω(TYP.) ..... V_{DD}-V_{SS}=5V
  - 60Ω(TYP.) ..... V_{DD}-V_{SS}=8V
- OFF-resistance, R_{OFF}
  - R_{OFF} (TYP.) $>10^9\Omega$

TC50H4066P



DIP(3D14A-P)

TC50H4066F



MFP(F14GB-P)

MAXIMUM RATINGS

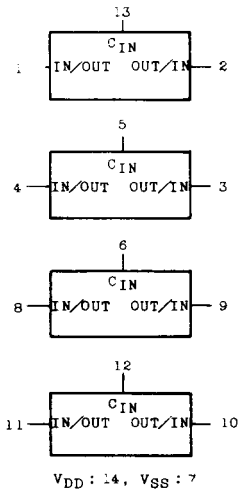
CHARACTERISTIC	SYMBOL	RATING	UNITS
DC Supply Voltage	V_{DD}	V_{SS}-0.5 ~ V_{SS}+10	V
Control Input Voltage	$V_{C\ IN}$	V_{SS}-0.5 ~ V_{DD}+0.5	V
Switch I/O Voltage	$V_{I/O}$	V_{SS}-0.5 ~ V_{DD}+0.5	V
Power Dissipation	P_D	300(DIP)/180(MFP)	mW
Potential Difference Across I/O During ON	V_I-V_O	±0.5	V
Control Input Current	$I_{C\ IN}$	±10	mA
Storage Temperature Range	T_{stg}	-65 ~ 150	°C
Lead Temp./Time	T_{sol}	260°C · 10sec	

TRUTH TABLE

CONTROL	IMPEDANCE BETWEEN IN/OUT-OUT/IN *
H	90Ω (TYP.)
L	$>10^9\Omega$(TYP.)

* See static electrical characteristics.

BLOCK DIAGRAM



RECOMMENDED OPERATING CONDITIONS (V_{SS}=0V)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{DD}	-	2.0	-	8.0	V
Input Voltage	V_{IN}	-	0	-	V_{DD}	V
Operating Temperature	T_{opr}	-	-40	-	85	°C

TC50H4066P/F

STATIC ELECTRICAL CHARACTERISTICS (V_{SS}=0.0V)

CHARACTERISTIC	SYMBOL	TEST CONDITION		V_{DD} (V)	-40°C MIN.	-40°C MAX.	25°C MIN.	25°C TYP.	25°C MAX.	85°C MIN.	85°C MAX.	UNITS
Control Input High Voltage	V_{IHC}	Fig. 1		5	4.0	-	4.0	-	-	4.0	-	V
Control Input Low Voltage	V_{ILC}	$I_{is} \leqq 1\mu A$ $V_{is}=V_{SS}$, $V_{OS}=V_{DD}$ $V_{is}=V_{DD}$, $V_{OS}=V_{SS}$		5	-	1.0	-	-	1.0	-	1.0	V
On-State Resistance	R_{ON}	$V_C=V_{DD}$ $I_{is}=150\mu A$ Fig. 2	V_{is}=0.25V	5	150	-	-	65	100	-	150	Ω
			V_{is}=1.5V		200	-	-	80	150	-	200	
			V_{is}=2.5V		180	-	-	75	130	-	180	
			V_{is}=4.0V		200	-	-	80	150	-	200	
			V_{is}=5.0V		150	-	-	65	100	-	150	
△On-State Resistance Between Any 2 Switches	$R_{ON}^{\triangle}$	$V_C=V_{DD}$, $I_{is}=150\mu A$		5	-	-	-	3	-	-	-	Ω
Input/Output Leakage Current	I_{OFF}	$V_C=V_{SS}$ $V_{is}=V_{SS}$, $V_{OS}=V_{DD}$ $V_{is}=V_{DD}$, $V_{OS}=V_{SS}$		8	-	±1.0	-	±0.1	±0.5	-	±1.0	μA
Input Current	"H" Level I_{IH}	$V_{IH}=V_{DD}$		8	-	1.0	-	0.1	0.5	-	1.0	μA
	"L" Level I_{IL}	$V_{IL}=V_{SS}$		8	-	-1.0	-	-0.1	-0.5	-	-1.0	
Quiescent Device Current	I_{DD}	$V_C=V_{DD}$, V_{SS}		8	-	10	-	1.0	5.0	-	1.0	μA

*All valid input combinations.

SWITCHING CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	V_{SS}(V)	V_{DD}(V)	MIN.	TYP.	MAX.	UNITS
Propagation Delay Time (IN - OUT)	t_{pLH}	R_L=10kΩ, C_L=50pF Fig. 3	0	5	-	2	4	ns
	t_{pHL}				-	2	4	
Propagation Delay Time (CONTROL - OUT)	t_{pZL}	R_L=10kΩ, C_L=50pF Fig. 4	0	5	-	23	50	
	t_{pZH}				-	17	35	
	t_{pLZ}				-	16	30	
	t_{pHZ}				-	14	30	

SWITCHING CHARACTERISTICS

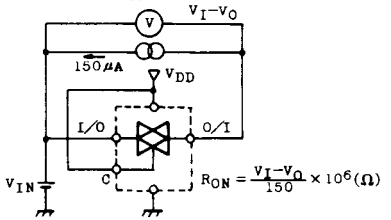
CHARACTERISTIC	SYMBOL	TEST CONDITION	V_{SS}(V)	V_{DD}(V)	MIN.	TYP.	MAX.	UNITS
Max. Control Input Repetition Rate	f_{MAX} (C)	$V_{OS}=\frac{1}{2}V_{DD}$, R_L=1kΩ C_L=15pF Fig. 5	0	5	-	25	-	MHz
Total Harmonic Distortion		R_L=10kΩ Sine wave of V_{is}=2.5Vp-p Fig. 6	-2.5	2.5	-	0.05	-	%
-3dB Cutoff Frequency	f_{MAX} (I/O -O/I)	R_L=10kΩ Sine wave of V_{is}=2.5Vp-p $20\log 10\frac{V_{OS}}{V_{is}}$=-3dB Fig. 6	-2.5	2.5	-	35	-	MHz
-50dB Feedthrough Frequency		R_L=1kΩ Sine wave of V_{is}=2.5Vp-p $20\log 10\frac{V_{OS}}{V_{is}}$=-50dB Fig. 6	-2.5	2.5	-	0.5	-	MHz
Crosstalk		R_L=1kΩ, R_I=1kΩ Sine wave of V_{is}=2.5Vp-p $20\log 10\frac{V_{OS}}{V_{is}}$=-50dB Fig. 7	-2.5	2.5	-	0.5	-	MHz
Crosstalk (CONTROL - OUTPUT)		R_{IN}=1kΩ, R_L=10kΩ Fig. 8	0	5	-	150	-	mV
Input Capacitance	C_{IN} C	Control Input	-2.5	2.5	-	5	-	pF
	C_{I-O}	Switch I/O	-2.5	2.5	-	10	-	pF
Feedthrough Capacitance	C_{IOS}		-2.5	2.5	-	0.7	-	pF

CONDITION AND CIRCUIT FOR MEASURMENT OF ELECTRICAL CHARACTERISTICS

Fig. 1 CONDITION FOR MEASUREMENT OF V_{IHC}

V_{DD} (V)	INPUT (Switch) Vis (V)	Iis (mA) -40°C	25°C	85°C	OUTPUT (Switch) V_{OS} (V) MIN.	MAX.
5	0	1.4	1.1	0.8	-	0.4
5	5	-1.4	-1.1	-0.8	4.5	-

Fig. 2 CIRCUIT FOR MEASUREMENT OF R_{ON}



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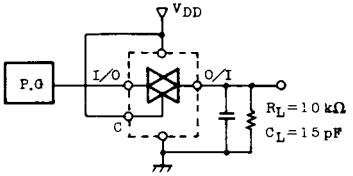
CIRCUIT AND WAVEFORM FOR MEASUREMENT OF SWITCHING CHARACTERISTICS

Fig. 3 t_{pLH}, t_{pHL}
I/O-O/I



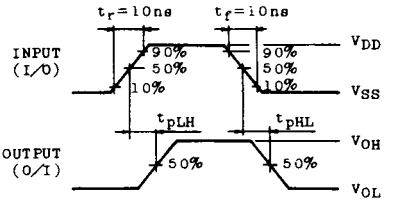
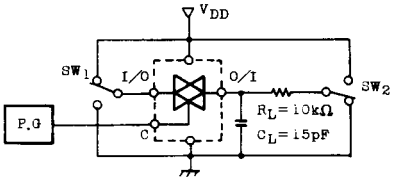


Fig. 4 t_{pZL}, t_{pZH}, t_{pLZ}, t_{pHZ}
CONTROL-O/I



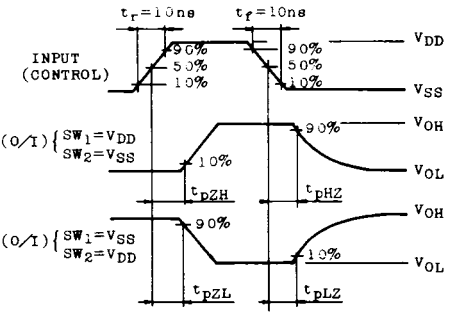
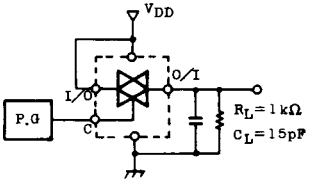
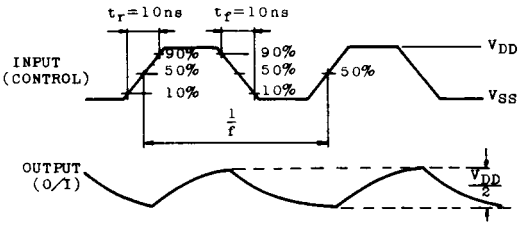


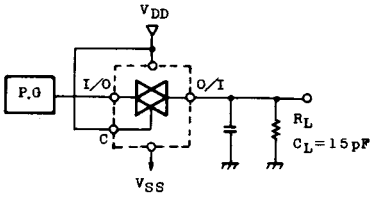
Fig. 5 $f_{MAX(C)}$





CIRCUIT AND WAVEFORM FOR MEASUREMENT OF SWITCHING CHARACTERISTICS

Fig. 6 TOTAL HARMONIC DISTORTION, f_{MAX}(I/O-O/I), -50dB FEEDTHROUGH FREQUENCY



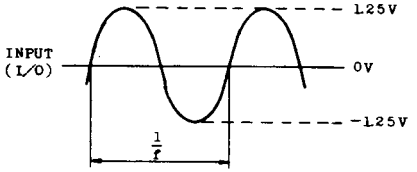
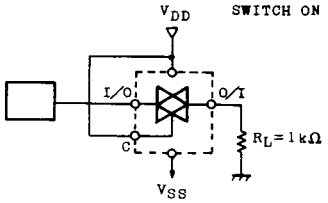
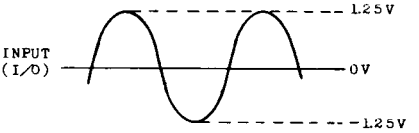


Fig. 7 CROSSTALK





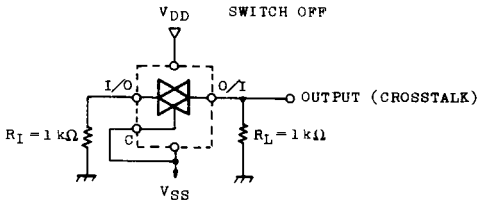
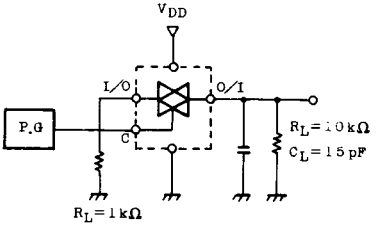
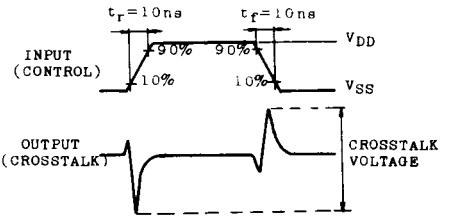


Fig. 8 CROSSTALK (CONTROL-OUTPUT)





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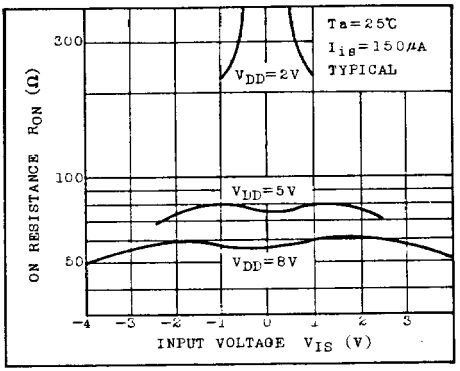
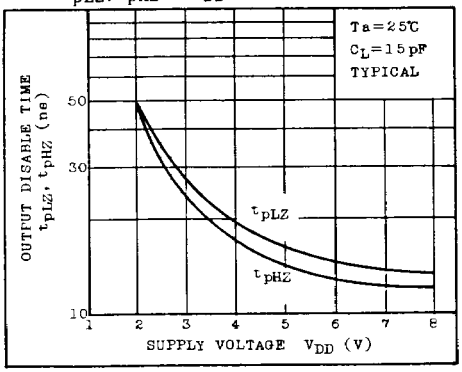
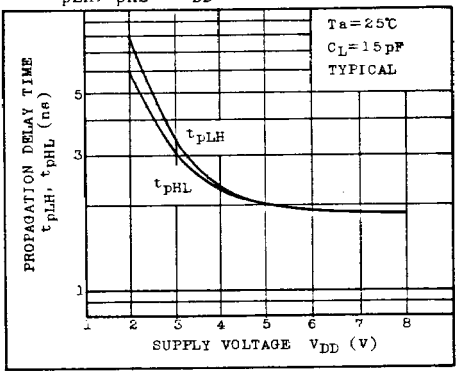
R_{ON} - V_{is} CHARACTERISTICS



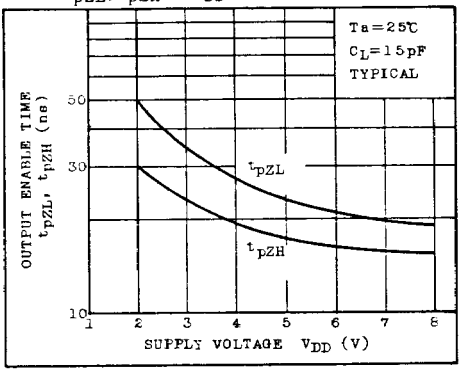
t_{pLZ}, t_{pHZ} - V_{DD} CHARACTERISTICS



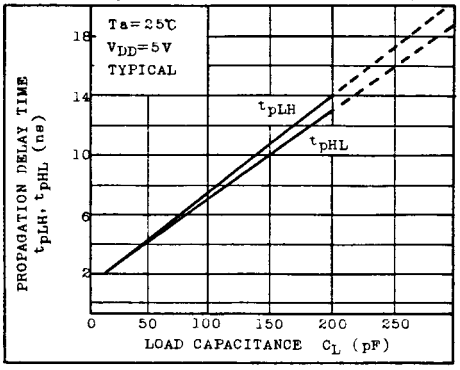
t_{pLH}, t_{pHL} - V_{DD} CHARACTERISTICS



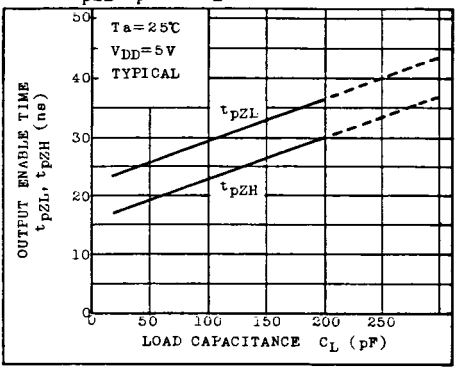
t_{pZL}, t_{pZH} - V_{DD} CHARACTERISTICS



t_{pLH}, t_{pHL} - C_L CHARACTERISTICS



t_{pZL}, t_{pZH} - C_L CHARACTERISTICS



t_{pLZ}, t_{pHZ} - C_L CHARACTERISTICS