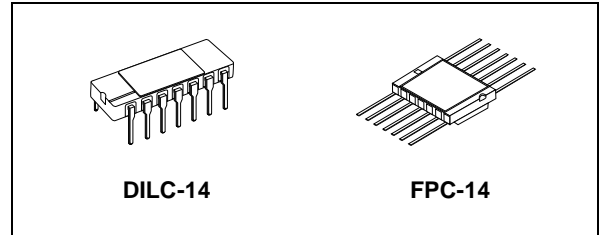


RAD-HARD QUAD BILATERAL SWITCH

- HIGH SPEED:
 $t_{PD} = 7ns$ (TYP.) at $V_{CC} = 6V$
- LOW POWER DISSIPATION:
 $I_{CC} = 1\mu A$ (MAX.) at $T_A = 25^\circ C$
- LOW "ON" RESISTANCE:
 $R_{ON} = 50\Omega$ TYP. AT $V_{CC} = 9V$, $I_{I/O} = 100\mu A$
- WIDE OPERATING VOLTAGE RANGE V_{CC}
 (OPR) = 2V TO 12V
- SINE WAVE DISTORTION:
 0.042% at $V_{CC} = 4V$ $f = 1KHz$
- HIGH NOISE IMMUNITY:
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (MIN.)
- PIN AND FUNCTION COMPATIBLE WITH
 54 SERIES 4066
- SPACE GRADE-1: ESA SCC QUALIFIED
- 50 krad QUALIFIED, 100 krad AVAILABLE ON
 REQUEST
- NO SEL UNDER HIGH LET HEAVY IONS
 IRRADIATION
- DEVICE FULLY COMPLIANT WITH
 SCC-9408-052



ORDER CODES

PACKAGE	FM	EM
DILC	M54HC4066D	M54HC4066D1
FPC	M54HC4066K	M54HC4066K1

The C input is provided to control the switch; the switch is on when the C input is held high and off when C is held low.

DESCRIPTION

The M54HC4066 is an high speed CMOS QUAD BILATERAL SWITCH fabricated with silicon gate C²MOS technology.

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PIN CONNECTION

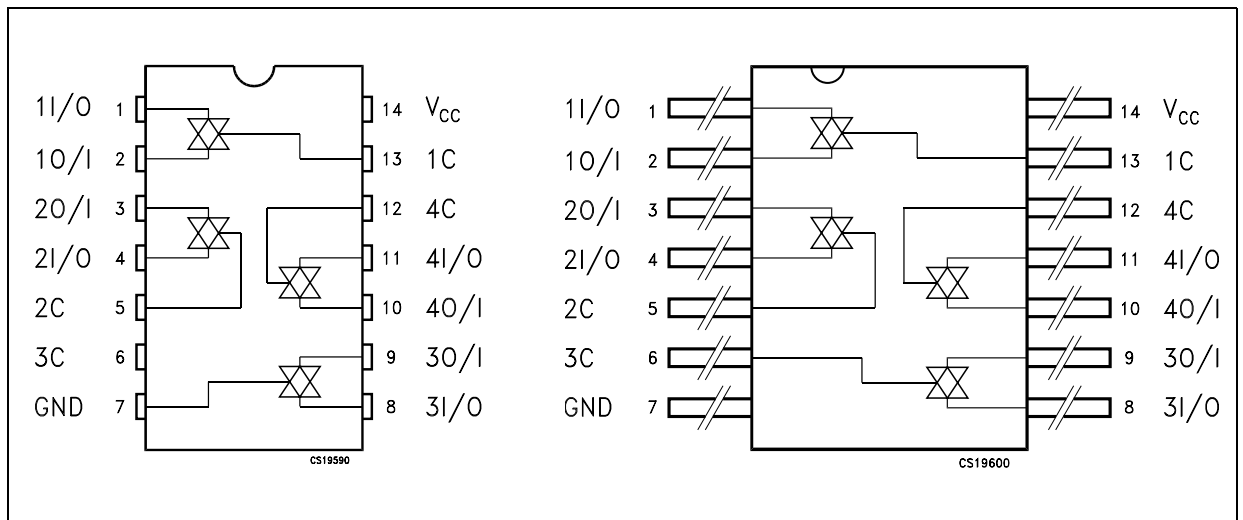


Figure 1: IEC Logic Symbols

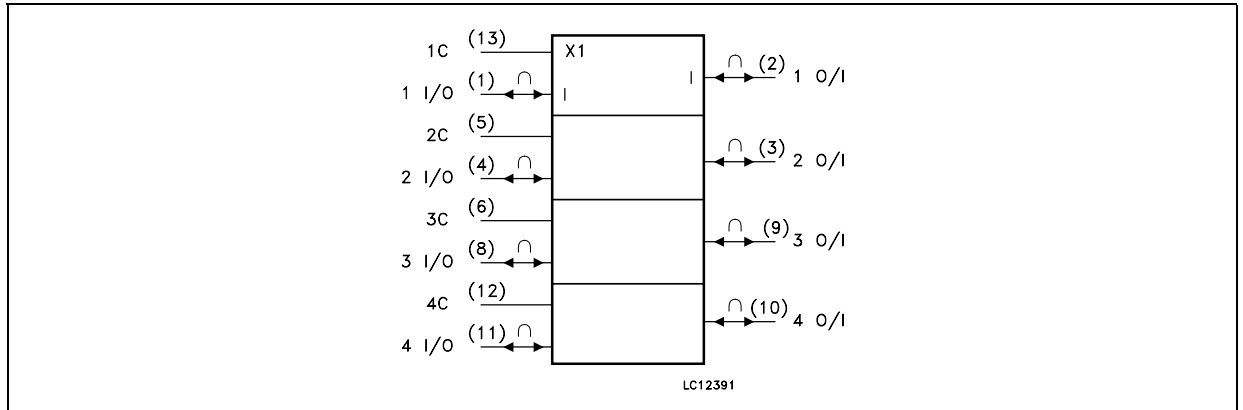


Figure 2: Logic Diagram

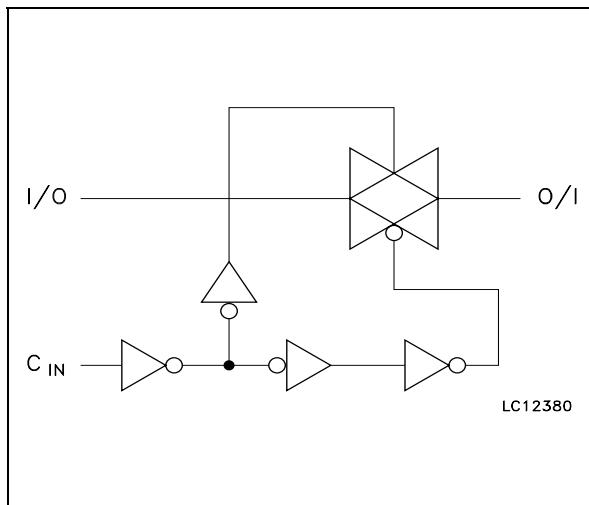


Table 1: Pin Description

PIN N°	SYMBOL	NAME AND FUNCTION
1, 4, 8, 11	1 to 4 I/O	Independent Inputs/Outputs
2, 3, 9, 10	1 to 4 O/I	Independent Outputs/Inputs
13, 5, 6, 12	1C to 4C	Enable Inputs (Active High)
7	GND	Ground (0V)
14	V _{CC}	Positive Supply Voltage

Table 2: Truth Table

CONTROL	SWITCH FUNCTION
H	ON
L	OFF

Table 3: Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V _{CC}	Supply Voltage	-0.5 to +13	V
V _{IN}	DC Input Voltage	-0.5 to V _{CC} + 0.5	V
V _{I/O}	DC Input/Output Voltage	-0.5 to V _{CC} + 0.5	V
I _{OK}	Control Input DC Diode Current	± 20	mA
I _{IOK}	I/O DC Diode Current	± 20	mA
I _O	DC Output Source Sink Current Per Output Pin	± 25	mA
I _{CC} or I _{GND}	DC V _{CC} or Ground Current	± 50	mA
P _D	Power Dissipation	300	mW
T _{stg}	Storage Temperature	-65 to +150	°C
T _L	Lead Temperature (10 sec)	265	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied

Table 4: Recommended Operating Conditions

Symbol	Parameter	Value	Unit	
V_{CC}	Supply Voltage	2 to 12	V	
V_{IN}	Input Voltage (Control)	0 to V_{CC}	V	
$V_{I/O}$	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	
		$V_{CC} = 10.0V$	0 to 250	

Table 5: DC Specifications

Symbol	Parameter	Test Condition		Value						Unit	
				$T_A = 25^\circ C$			-40 to 85°C		-55 to 125°C		
		V_{CC} (V)		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		
		9.0		6.3			6.3		6.3		
		12.0		8.4			8.4		8.4		
V_{ILC}	Low Level Control Input Voltage	2.0				0.5		0.5		0.5	V
		4.5				1.35		1.35		1.35	
		9.0				2.7		2.7		2.7	
		12.0				3.6		3.6		3.6	
R_{ON}	ON Resistance	4.5	$V_I = V_{IHC}$ $V_{I/O} = V_{CC}$ to GND $I_{I/O} \leq 1mA$		96	170		200		250	Ω
		9.0			55	85		100		150	
		12.0			45	80		90		120	
		4.5	$V_I = V_{IHC}$ $V_{I/O} = V_{CC}$ or GND $I_{I/O} \leq 1mA$		70	100		130		160	
		9.0			50	75		95		115	
		12.0			45	70		90		110	
ΔR_{ON}	Difference of ON Resistance between switches	4.5	$V_I = V_{IHC}$ $V_{I/O} = V_{CC}$ or GND $I_{I/O} \leq 1mA$		10						Ω
		9.0			5						
		12.0			5						
I_{OFF}	Input/Output Leakage Current (SWITCH OFF)	12.0	$V_{OS} = V_{CC}$ or GND $V_{IS} = V_{CC}$ or GND $V_{IN} = V_{ILC}$			± 0.1		± 1		± 2	μA
I_{IZ}	Switch Input Leakage Current (SWITCH ON, OUTPUT OPEN)	12.0	$V_{OS} = V_{CC}$ or GND $V_{IN} = V_{IHC}$			± 0.1		± 1		± 2	μA
I_{IN}	Control Input Current	6.0	$V_I = V_{CC}$ or GND			± 0.1		± 1		± 1	μA
I_{CC}	Quiescent Supply Current	6.0	$V_I = V_{CC}$ or GND		1		10		20		μA
		9.0			4		40		80		
		12.0			8		80		160		

Table 6: AC Electrical Characteristics ($C_L = 50$ pF, Input $t_r = t_f = 6$ ns)

Symbol	Parameter	Test Condition		Value						Unit	
		V_{CC} (V)		$T_A = 25^\circ\text{C}$			-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			10	50		65		75	ns
		4.5			4	10		13		15	
		9.0			3	8		10		13	
		12.0			3	7		9		10	
t_{PZL} t_{PZH}	Output Enable Time	2.0	$R_L = 1\text{K}\Omega$		18	100		125		150	ns
		4.5			8	20		25		30	
		9.0			6	12		22		27	
		12.0			6	12		18		25	
t_{PLZ} t_{PHZ}	Output Disable Time	2.0	$R_L = 1\text{K}\Omega$		20	115		145		175	ns
		4.5			10	23		29		35	
		9.0			8	20		25		30	
		12.0			8	18		22		27	
	Maximum Control Input Frequency	2.0	$R_L = 1\text{K}\Omega$ $C_L = 15$ pF $V_{OUT} = 1/2 V_{CC}$		30						MHz
		4.5			30						
		9.0			30						
		12.0			30						

Table 7: Capacitive Characteristics

Symbol	Parameter	Test Condition		Value						Unit	
		V_{CC} (V)		$T_A = 25^\circ\text{C}$			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
C_{IN}	Input Capacitance				5	10		10		10	pF
$C_{I/O}$	Switch Terminal Capacitance				6						pF
C_{IOS}	Feed Through Capacitance				0.5						pF
C_{PD}	Power Dissipation Capacitance (note 1)				15						pF

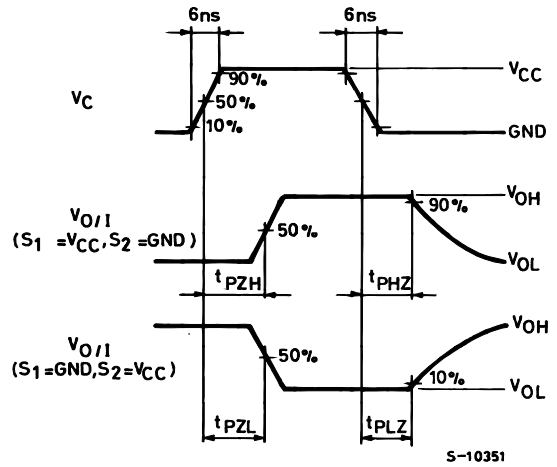
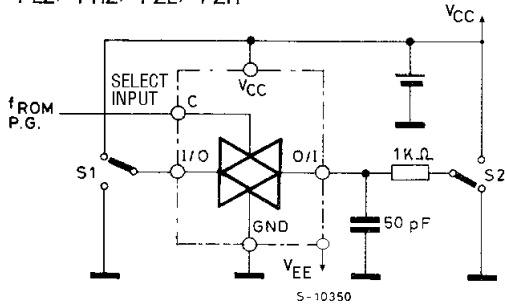
1) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. $I_{CC(oper)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$

Table 8: Analog Switch Characteristics (GND = 0V; T_A = 25°C)

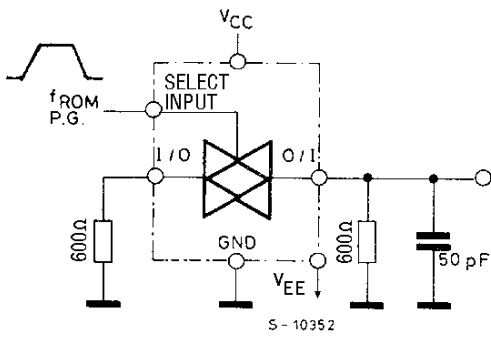
Symbol	Parameter	Test Condition		Value	Unit	
		V _{CC} (V)	V _{IN} (V _{p-p})			
	Sine Wave Distortion (THD)	4.5	4	f _{IN} = 1 KHz R _L = 10 KΩ, C _L = 50 pF	0.05	%
		9.0	8		0.04	
f _{MAX}	Frequency Response (Switch ON)	4.5	Adjust f _{IN} voltage to obtain 0 dBm at V _{OS} .		200	MHz
		9.0	Increase f _{IN} Frequency until dB meter reads -3dB R _L = 50Ω, C _L = 10 pF		200	
	Feed through Attenuation (Switch OFF)	4.5	V _{IN} is centered at V _{CC} /2. Adjust input for 0 dBm		-60	dB
		9.0	R _L = 600Ω C _L = 50 pF, f _{IN} = 1MHz sine wave		-60	
	Crosstalk (Control Input to Signal Output)	4.5	R _L = 600Ω, C _L = 50 pF, f _{IN} = 1MHz square wave (t _r = t _f = 6ns)		60	mV
		9.0			100	
	Crosstalk (Between Any Switches)	4.5	Adjust V _{IN} to Obtain 0 dBm at input		-60	dB
		9.0	R _L = 600Ω, C _L = 50 pF, f _{IN} = 1MHz sine wave		-60	

Figure 3: Switching Characteristics Test Circuit

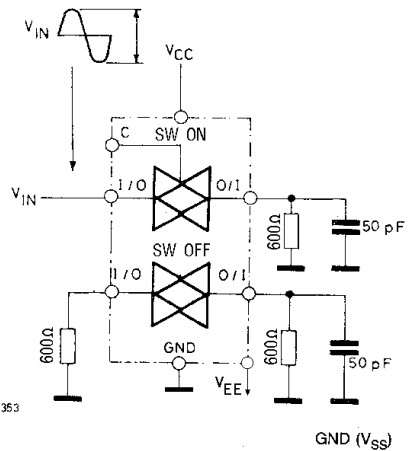
t_{PLZ} , t_{PHZ} , t_{PZL} , t_{PZH}



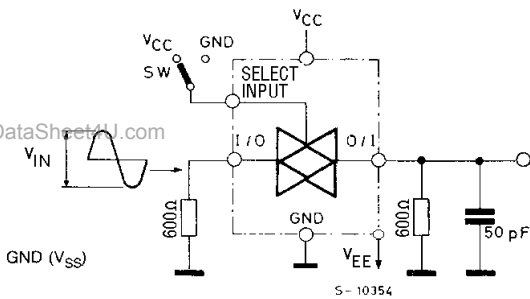
CROSSTALK (control to output)



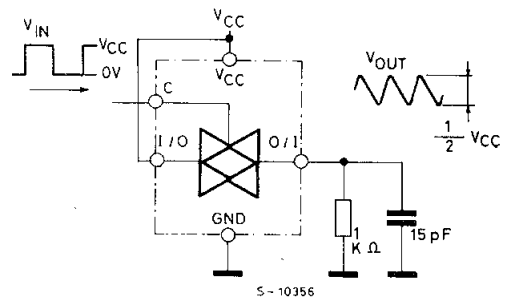
CROSSTALK BETWEEN ANY TWO SWITCHES



BANDWIDTH AND FEEDTHROUGH ATTENUATION



MAXIMUM CONTROL FREQUENCY



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

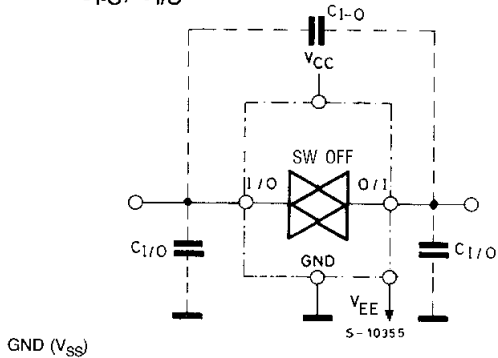
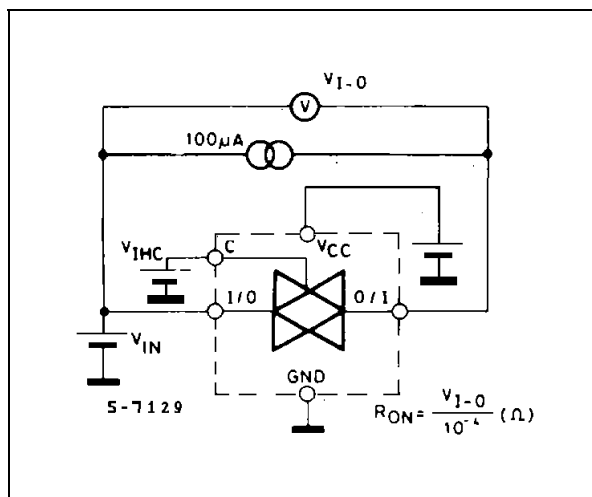
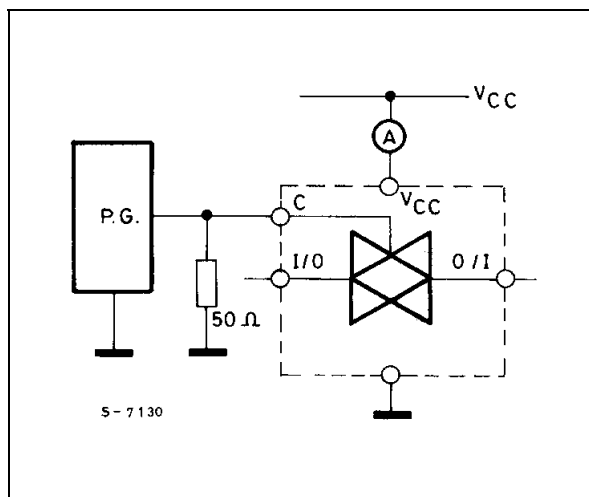
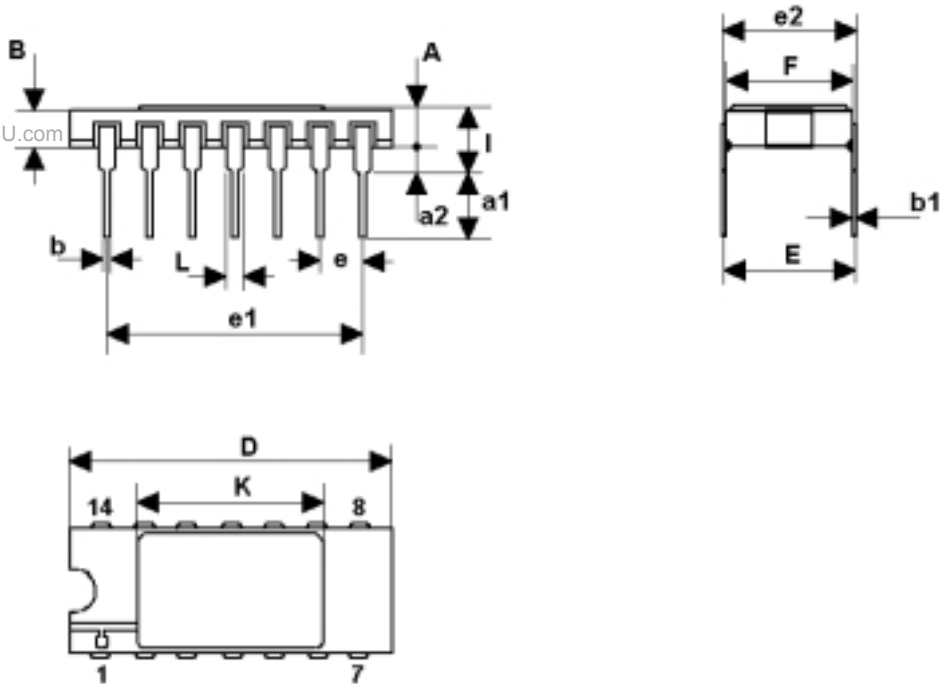


Figure 4: Channel Resistance (R_{ON})Figure 5: I_{CC} (Opr.)

DILC-14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	2.1		2.54	0.083		0.100
a1	3.00		3.70	0.118		0.146
a2	0.63	0.88	1.14	0.025	0.035	0.045
B	1.82	2.03	2.39	0.072	0.080	0.094
b	0.40	0.45	0.50	0.016	0.018	0.020
b1	0.20	0.254	0.30	0.008	0.010	0.012
D	18.79	19.00	19.20	0.740	0.748	0.756
E	7.36	7.62	7.87	0.290	0.300	0.310
e		2.54			0.100	
e1	15.11	15.24	15.37	0.595	0.600	0.605
e2	7.62	7.87	8.12	0.300	0.310	0.320
F	7.11		7.75	0.280		0.305
I			3.70			0.146
K	10.90		12.1	0.429		0.476
L	1.14	1.27	1.5	0.045	0.050	0.059



0016173H

FPC-14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	6.75	6.91	7.06	0.266	0.272	0.278
B	9.76	9.95	10.14	0.384	0.392	0.399
C	1.49		1.95	0.059		0.077
D	0.10	0.127	0.15	0.004	0.005	0.006
E	7.50	7.62	7.75	0.295	0.300	0.305
F		1.27			0.050	
G	0.38	0.43	0.48	0.015	0.017	0.019
H		6.0			0.236	
L	18.75		22.0	0.738		0.866
M		0.38			0.015	
N		4.31			0.170	

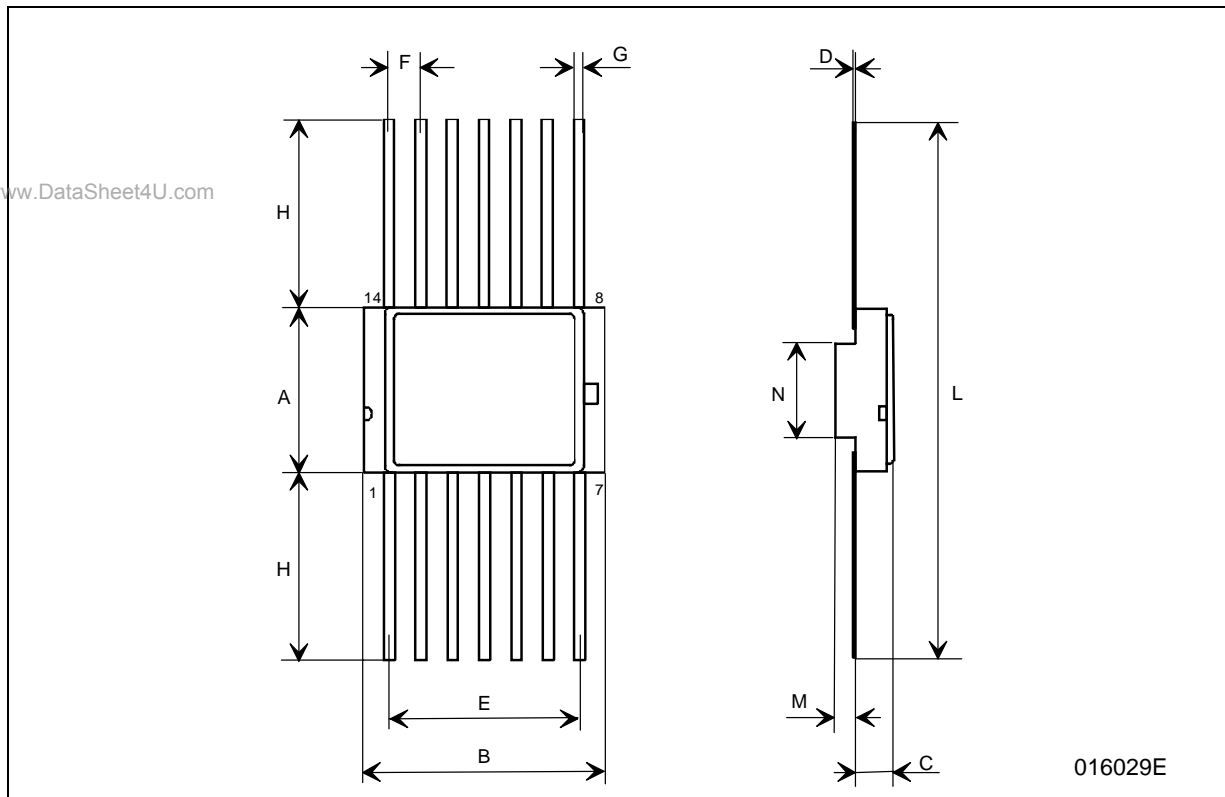


Table 9: Revision History

Date	Revision	Description of Changes
14-May-2004	1	First Release

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