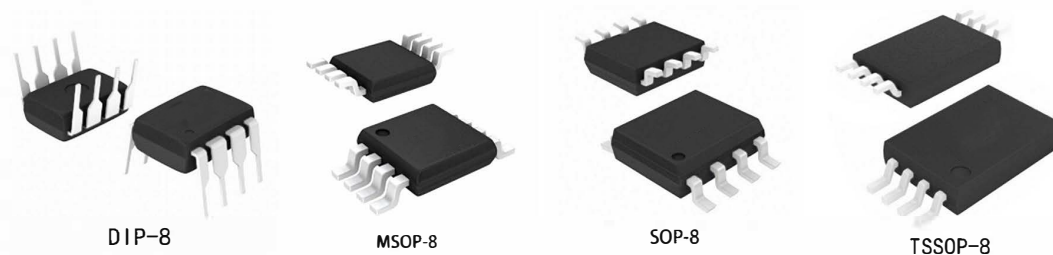


Descriptions

LM358 is composed of two independent high-gain operational amplifiers. Can be single-supply work, can also be, is a double-supply work, power consumption current and power supply power, voltage-independent. Applications include audio power amplifier, industrial controls, DC gain components and all conventional operational amplifiers, large circuits.



Feature

- Wide power supply range:
Single supply: 3V to 24V
or dual supplies: $\pm 1.5V$ to $\pm 12V$
- Wide frequency range
- Low power consumption
- Logic circuit matching
- Contains two operational amplifier

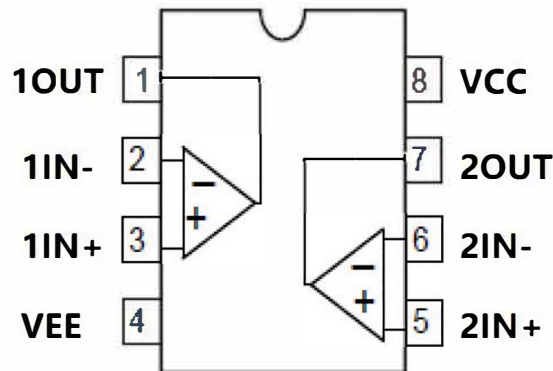
Applications

- Desktop PC and motherboard
- Electronic point-of-sale systems
- Indoor and outdoor air conditioners
- Merchant network and server power supply units
- Multi-function printers
- Power supplies and mobile chargers
- Uninterruptible power supplies
- Washers, dryers, and refrigerators
- AC inverters, string inverters, central inverters, and voltage frequency drives
- Motor control: AC induction, brushed DC, brushless DC, high-voltage, low-voltage, permanent magnet, and stepper motor

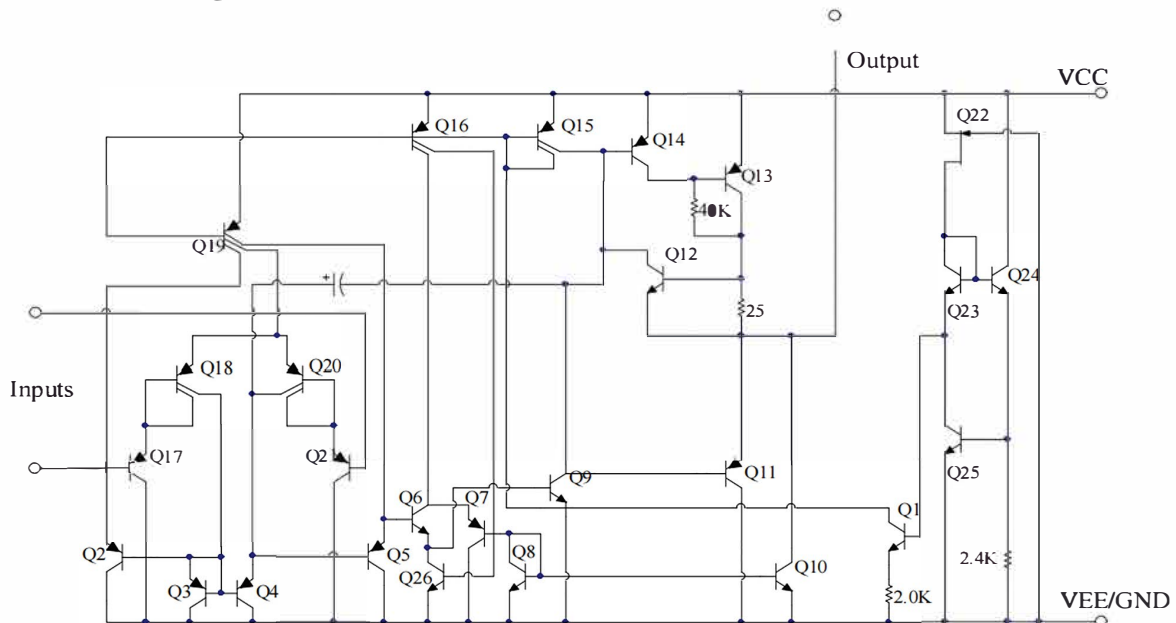
Ordering Information

Product Model	Package Type	Marking	Packing	Packing Qty
XBLW LM358N	DIP-8	LM358N	Tube	2000Pcs/Box
XBLW LM358DTR	SOP-8	LM358	Tape	2500Pcs/Reel
XBLW LM358MDTR	MSOP-8	358M	Tape	2500Pcs/Reel
XBLW LM358TDTR	TSSOP-8	LM358	Tape	2000Pcs/Reel

Pin Connections



Schematic Diagram (One-Half of Circuit Shown)



Absolute Maximum Ratings

TA = + 25 ° C, unless otherwise specified

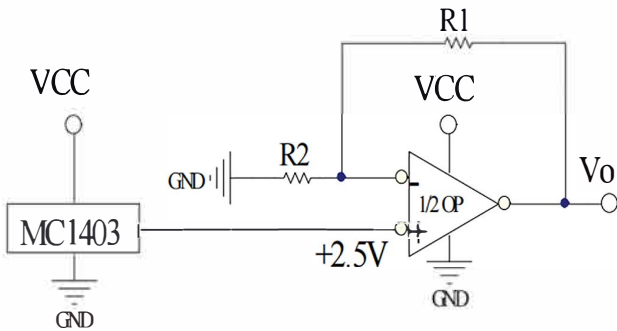
Rating		Value	Unit
Power Supply Voltages		24 or ± 12	V
Input Differential Voltage Range		24	V
Input Common Mode Voltage Range		-0.3 ~ VCC	V
Power Dissipation (Note1)	DIP8	830	mW
	SOP8	530	
Output Short Circuit Duration (One Amplifier) ($V \leq 15V, T_a = 25^\circ C$)		Continuous	
Input Current ($V_{IN} < -0.3V$)		50	mA
Junction Temperature		150	$^\circ C$
Operating Temperature Range		0 ~ 70	$^\circ C$
Storage Temperature Range		-65 ~ 150	$^\circ C$

Electrical Characteristics

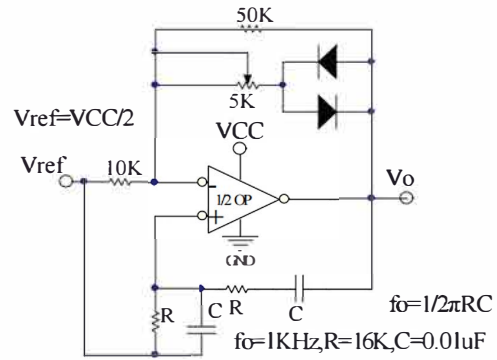
$V_{CC}=5.0V, T_A = +25^\circ C$, unless otherwise specified.

Parameter	Conditions	Min	Typ	Max	Units	
Input Offset Voltage	$T_a=25^\circ C$		2	5	mV	
Input Bias Current	$T_a=25^\circ C$, $I_{IN}(+)$ or $I_{IN}(-)$, $V_{CM}=0V$		45	250	nA	
Input Offset Current	$T_a=25^\circ C$, $I_{IN}(+) - I_{IN}(-)$, $V_{CM}=0V$		3	50	nA	
Input Common Mode Voltage Range	$T_a=25^\circ C$, $V^+=24V$	0		$V_{CC} - 1.5$	V	
Power Supply Current	$R_L=\infty$, Total Device	$V_{CC} = 24V$		1	2	mA
		$V_{CC} = 5V$		0.5	1.2	mA
Large Signal Open Loop Voltage Gain	$V_{CC} = 15V$, $T_a=25^\circ C$, $R_L \geq 2k\Omega$ (for $V_o=1\sim 11V$)	25	100		V/mV	
Common Mode Rejection	DC, $T_a=25^\circ C$, $V_{CM}=0\sim V_{CC}-1.5V$	65	90		dB	
Power Supply Rejection	DC, $T_a=25^\circ C$, $V_{CC} = 5\sim 30V$	65	100		dB	
Output Source Current	$V_{IN}(+)=1V, V_{IN}(-)=0V, V_{CC}=15V, V_o=2V, T_a=25^\circ C$	20	40		mA	
Output Sink Current	$V_{IN}(-)=1V, V_{IN}(+)=0V, V_{CC}=15V, V_o=2V, T_a=25^\circ C$	10	15		mA	
	$V_{IN}(-)=1V, V_{IN}(+)=0V, V_{CC}=15V, V_o=200mV, T_a=25^\circ C$	12	50		μA	
Output Short Circuit to Ground	$V_{CC}=15V$, $T_a=25^\circ C$		40	60	mA	
Output Voltage Swing	VOH	$V_{CC}=24V$	$R_L=2k\Omega$	22		V
		$V_{CC}=24V$	$R_L=10k\Omega$	22		V
	VOL	$V_{CC}=5V$, $R_L=10k\Omega$		5	20	mV

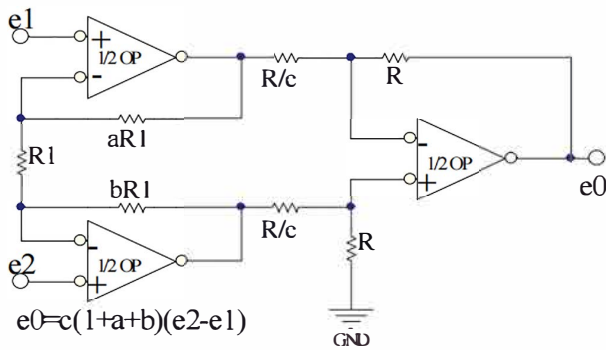
Typical Applications



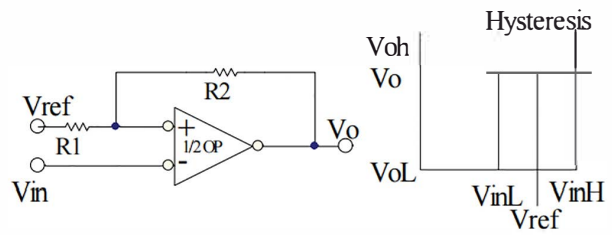
Voltage Reference, $V_o = 2.5V (1 + R1/R2)$



Wien Bridge Oscillator



High Impedance Differential Amplifier

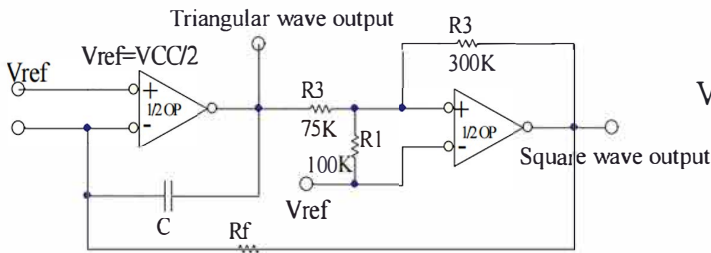


$$V_{inL} = (R1/(R1+R2)) * (VoL - Vref) + Vref$$

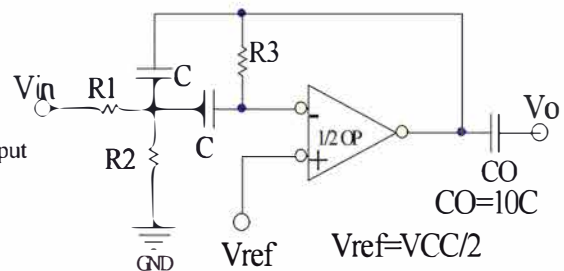
$$V_{inH} = (R1/(R1+R2)) * (VoH - Vref) + Vref$$

$$H = (R1/(R1+R2)) * (VoH - VoL)$$

Comparator with Hysteresis



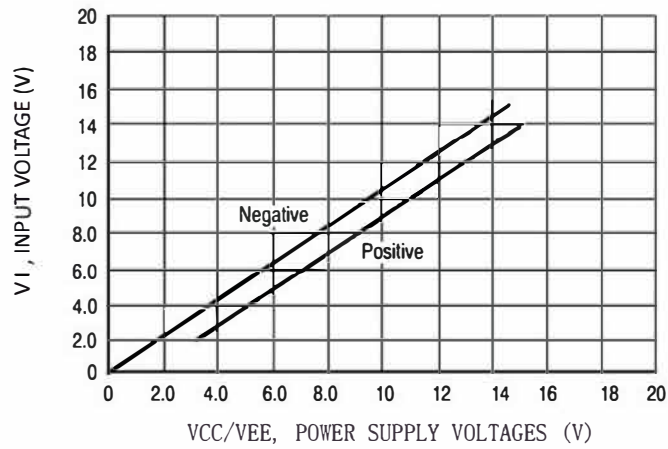
Function Generator



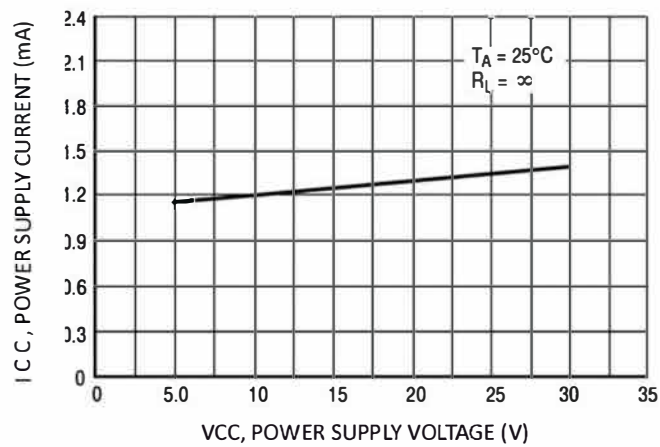
f_o = center frequency

Multiple Feedback Bandpass Filter

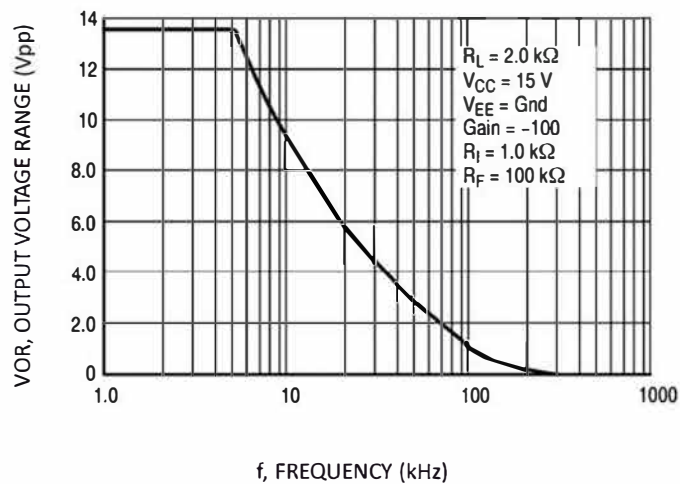
Typical Performance Characteristics



Input Voltage Range



Power Supply Current versus Power Supply Voltage

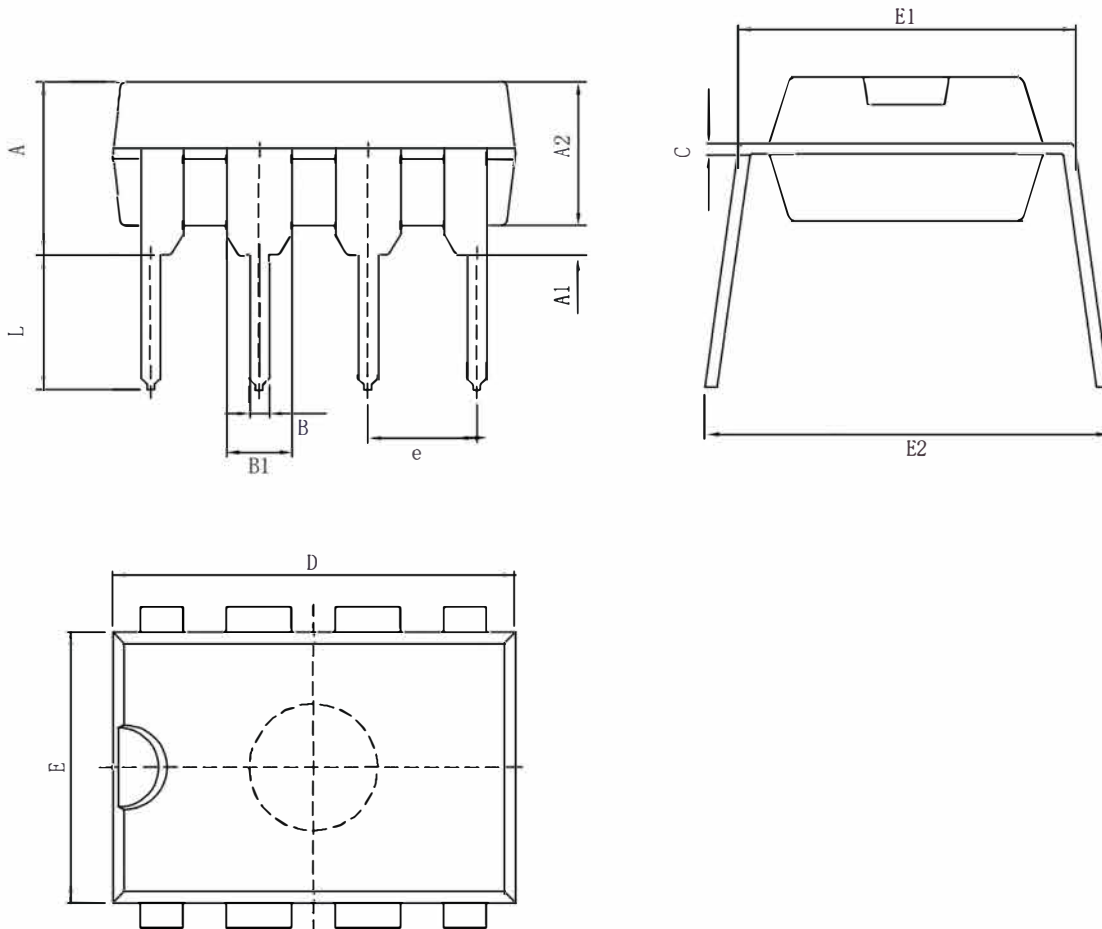


Large-Signal Frequency Response

Package Information

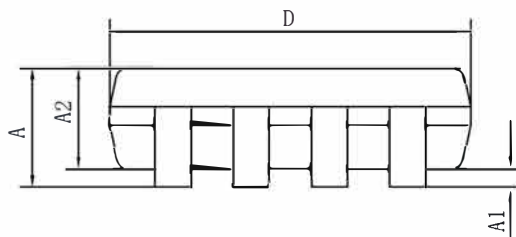
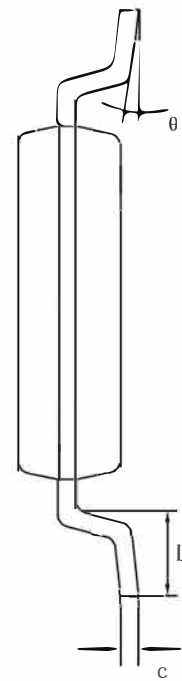
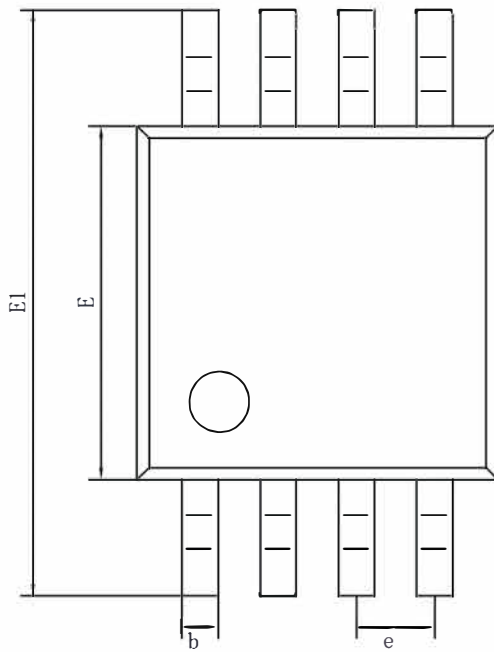
- DIP-8

Symbol	Size	Dimensions In Millimeters		Symbol	Size	Dimensions In Inches	
		Min(mm)	Max(mm)			Min(in)	Max(in)
A		3.710	4.310	A		0.146	0.170
A1		0.510		A1		0.020	
A2		3.200	3.600	A2		0.126	0.142
B		0.380	0.570	B		0.015	0.022
B1		1.524 (BSC)		B1		0.060 (BSC)	
C		0.204	0.360	C		0.008	0.014
D		9.000	9.400	D		0.354	0.370
E		6.200	6.600	E		0.244	0.260
E1		7.320	7.920	E1		0.288	0.312
e		2.540 (BSC)		e		0.100 (BSC)	
L		3.000	3.600	L		0.118	0.142
E2		8.400	9.000	E2		0.331	0.354



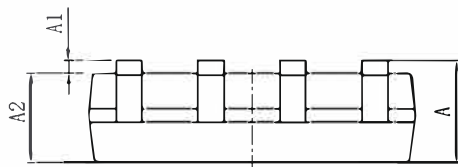
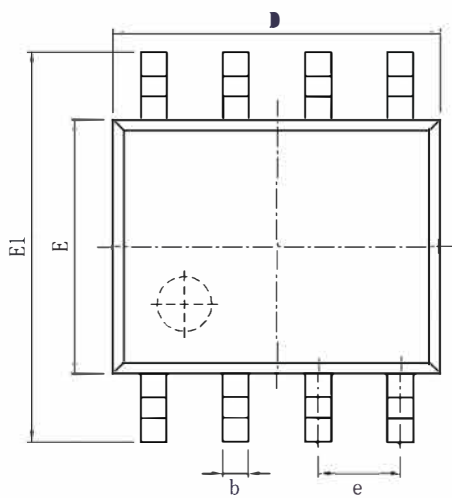
• MSOP-8

Size Symbol	Dimensions In Millimeters		Size Symbol	Dimensions In Inches	
	Min (mm)	Max (mm)		Min (in)	Max (in)
A	0.820	1.100	A	0.320	0.043
A1	0.020	0.150	A1	0.001	0.006
A2	0.750	0.950	A2	0.030	0.037
b	0.250	0.380	b	0.010	0.015
c	0.090	0.230	c	0.004	0.009
D	2.900	3.100	D	0.114	0.122
e	0.65 (BSC)		e	0.026 (BSC)	
E	2.900	3.100	E	0.114	0.122
E1	4.750	5.050	E1	0.187	0.199
L	0.400	0.800	L	0.016	0.031
θ	0°	6°	θ	0°	6°



• SOP-8

Symbol	Dimensions In Millimeters		Symbol	Dimensions In Inches	
	Min (mm)	Max (mm)		Min (in)	Max (in)
A	1.350	1.750	A	0.053	0.069
A1	0.100	0.250	A1	0.004	0.010
A2	1.350	1.550	A2	0.053	0.061
b	0.330	0.510	b	0.013	0.020
c	0.170	0.250	c	0.006	0.010
D	4.700	5.100	D	0.185	0.200
E	3.800	4.000	E	0.150	0.157
E1	5.800	6.200	E1	0.228	0.224
e	1.270 (BSC)		e	0.050 (BSC)	
L	0.400	1.270	L	0.016	0.050
θ	0°	8°	θ	0°	8°



• TSSOP-8

Symbol	Dimensions In Millimeters		Symbol	Dimensions In Inches	
	Min (mm)	Max (mm)		Min (in)	Max (in)
D	2.900	3.100	D	0.114	0.122
E	4.300	4.500	E	0.169	0.177
b	0.190	0.300	b	0.007	0.012
c	0.090	0.200	c	0.004	0.008
E1	6.250	6.550	E1	0.246	0.258
A		1.100	A		0.043
A2	0.800	1.000	A2	0.031	0.039
A1	0.020	0.150	A1	0.001	0.006
e	0.65 (BSC)		e	0.026 (BSC)	
L	0.500	0.700	L	0.020	0.028
H	0.25 (TYP)		H	0.01 (TYP)	
θ	1°	7°	θ	1°	7°

