

## ICs for use with Crystal Oscillators (PLL built - in)

### GENERAL DESCRIPTION

The XC2173 series are high frequency, low power consumption CMOS ICs with built-in crystal oscillator, divider and clock multiplier PLL circuits. Output is selectable from any one of the following values for  $f_0$ :  $f_0 \times 5$ ,  $f_0 \times 6$ ,  $f_0 \times 7$ ,  $f_0 \times 8$ ,  $f_0/2$ ,  $f_0/4$ ,  $f_0/8$ . With an oscillation capacitor & oscillation feedback resistor built-in, a stable oscillator circuit can be put together using only an external crystal oscillator.

By connecting an external standard clock, the above mentioned output frequencies can be achieved.

### APPLICATIONS

- Crystal oscillation modules
- Computer, DSP clocks
- Communication equipment
- Various system clocks

### FEATURES

- Oscillation Frequency** : 10MHz ~ 25MHz
- Divider Ratio** :  $f_0/2$ ,  $f_0/4$ ,  $f_0/8$
- Multiplier** :  $f_0 \times 5$ ,  $f_0 \times 6$ ,  $f_0 \times 7$ ,  $f_0 \times 8$
- Output** : 3-State
- Operating Voltage Range** : 3.3V  $\pm$  10% and 5.0V  $\pm$  10%
- Small Consumption Current**: Stand-by function included\*  
\* Oscillation continues in stand-by

#### CMOS

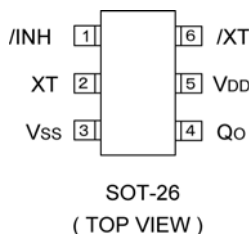
- Output Frequency** : 80MHz ~ 160MHz (5.0V)  
: 50MHz ~ 125MHz (3.3V)

#### Divider Circuit & PLL Circuit Built-In

#### Oscillation Capacitor & Oscillation Feedback Resistor Built-In

- Package** : SOT-26
- Environmentally Friendly** : EU RoHS Compliant, Pb Free

### PIN CONFIGURATION



### PIN ASSIGNMENT

PIN NUMBER	PIN NAME	FUNCTION
1	/INH	Stand-by control*
2	XT	Crystal Oscillator Connection (Input)
3	VSS	GND
4	Q0	Clock Output
5	VDD	Power Supply
6	/XT	Crystal Oscillator Connection (Output) /Standard Clock Input

\* Stand-by control pin has a pull-up resistor built-in.

### INH, Q0 PIN FUNCTION

/INH	"H" or OPEN	"L (Stand-by)
Q0	Divider / Multiplier Output	High Impedance

"H" = High level

"L" = Low level

## PRODUCT CLASSIFICATION

### Ordering Information

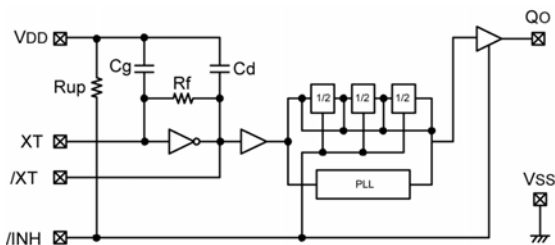
XC2173 - (\*)

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
	Duty Level	C	: CMOS (VDD/2)
	Output Capacity	M	: Multiplier output
		D	: Divider output
	Multiplier or Divider Ratio	2	: $f_0 / 2$
		4	: $f_0 / 4$
		5	: $f_0 \times 5$
		6	: $f_0 \times 6$
		7	: $f_0 \times 7$
		8	: $f_0 / 8$ & $f_0 \times 8$
	Input Oscillation Frequency	1	: 10MHz ~ 25MHz
-	Packages Taping Type (*)	MR-G	: SOT-26

(\*) The “-G” suffix indicates that the products are Halogen and Antimony free as well as being fully RoHS compliant.

(\*) The device orientation is fixed in its embossed tape pocket. For reverse orientation, please contact your local Torex sales office or representative. (Standard orientation: R- , Reverse orientation: L- )

## BLOCK DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	CONDITIONS	UNITS
Supply Voltage	VDD	VSS-0.3 ~ VSS+7.0	V
Input Voltage	VIN	VSS-0.3 ~ VDD+0.3	V
Power Dissipation	Pd	250 (*)	mW
Operating Temperature Range	Topr	-40 ~ +85	
Storage Temperature Range	Tstg	-55 ~ +125	

\* When measured on a glass epoxy PCB

## ELECTRICAL CHARACTERISTICS

3.3V, f<sub>0</sub> x 8 multiplier (\*1)

T<sub>a</sub>=25

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating Voltage	V <sub>DD</sub>		2.97	3.30	3.63	V
'H' Level Input Voltage	V <sub>IH</sub>		2.4	-	-	V
'L' Level Input Voltage	V <sub>IL</sub>		-	-	0.4	V
'H' Level Output Voltage	V <sub>OH</sub>	CMOS: V <sub>DD</sub> =2.97V, I <sub>OH</sub> =-8mA	2.47	-	-	V
'L' Level Output Voltage	V <sub>OL</sub>	CMOS: V <sub>DD</sub> =2.97V, I <sub>OL</sub> =8mA	-	-	0.4	V
Supply Current 1	I <sub>DD1</sub>	/INH="OPEN", C <sub>L</sub> =15pF, f=80MHz	-	10	-	mA
Supply Current 2	I <sub>DD2</sub>	/INH="L", C <sub>L</sub> =15pF, f=80MHz	-	1	-	mA
Input Pull-Up Resistance 1	R <sub>up1</sub>	/INH="L"	1.0	2.0	4.0	M
Input Pull-Up Resistance 2	R <sub>up2</sub>	/INH=0.7V <sub>DD</sub>	35	70	140	k
Internal Oscillation Capacitance	C <sub>g</sub>	(*3)	-	13	-	pF
	C <sub>d</sub>	(*3)	-	13	-	pF
Internal Oscillation Feedback Resistance	R <sub>f</sub>		0.3	1.0	2.0	M
Output Off Leak Current	I <sub>oz</sub>	/INH="L"	-	-	10	μA

5.0V, f<sub>0</sub> x 8 multiplier (\*2)

T<sub>a</sub>=25

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating Voltage	V <sub>DD</sub>		4.5	5.0	5.5	V
'H' Level Input Voltage	V <sub>IH</sub>		2.4	-	-	V
'L' Level Input Voltage	V <sub>IL</sub>		-	-	0.4	V
'H' Level Output Voltage	V <sub>OH</sub>	CMOS: V <sub>DD</sub> =4.5V, I <sub>OH</sub> =-16mA	3.9	4.2	-	V
'L' Level Output Voltage	V <sub>OL</sub>	CMOS: V <sub>DD</sub> =4.5V, I <sub>OL</sub> =16mA	-	0.3	0.4	V
Supply Current 1	I <sub>DD1</sub>	/INH="OPEN", C <sub>L</sub> =15pF, f=160MHz	-	35	-	mA
Supply Current 2	I <sub>DD2</sub>	/INH="L", C <sub>L</sub> =15pF, f=160MHz	-	5	-	mA
Input Pull-Up Resistance 1	R <sub>up1</sub>	/INH="L"	0.5	1.0	2.0	M
Input Pull-Up Resistance 2	R <sub>up2</sub>	/INH=0.7V <sub>DD</sub>	25	50	100	k
Internal Oscillation Capacitance	C <sub>g</sub>	(*3)	-	13	-	pF
	C <sub>d</sub>	(*3)	-	13	-	pF
Internal Oscillation Feedback Resistance	R <sub>f</sub>		100	240	400	k
Output Off Leak Current	I <sub>oz</sub>	/INH="L"	-	-	10	μA

\*1: Output frequency range is 80 MHz to 125MHz with a multiplier of f<sub>0</sub> x 8 at 3.3V

\*2: Output frequency range is 80 MHz to 160MHz with a multiplier of f<sub>0</sub> x 8 at 5.0V

\*3: R&D value

## ELECTRICAL CHARACTERISTICS (Continued)

3.3V, f<sub>0</sub> x 7 multiplier (\*1)

T<sub>a</sub>=25

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating Voltage	V <sub>DD</sub>		2.97	3.30	3.63	V
'H' Level Input Voltage	V <sub>IH</sub>		2.4	-	-	V
'L' Level Input Voltage	V <sub>IL</sub>		-	-	0.4	V
'H' Level Output Voltage	V <sub>OH</sub>	CMOS: V <sub>DD</sub> =2.97V, I <sub>OH</sub> =-8mA	2.47	-	-	V
'L' Level Output Voltage	V <sub>OL</sub>	CMOS: V <sub>DD</sub> =2.97V, I <sub>OL</sub> =8mA	-	-	0.4	V
Supply Current 1	I <sub>DD1</sub>	/INH="OPEN", C <sub>L</sub> =15pF, f=70MHz	-	9	-	mA
Supply Current 2	I <sub>DD2</sub>	/INH="L", C <sub>L</sub> =15pF, f=70MHz	-	1	-	mA
Input Pull-Up Resistance 1	R <sub>up1</sub>	/INH="L"	1.0	2.0	4.0	M
Input Pull-Up Resistance 2	R <sub>up2</sub>	/INH=0.7V <sub>DD</sub>	35	70	140	k
Internal Oscillation Capacitance	C <sub>g</sub>	(*3)	-	13	-	pF
	C <sub>d</sub>	(*3)	-	13	-	pF
Internal Oscillation Feedback Resistance	R <sub>f</sub>		0.3	1.0	2.0	M
Output Off Leak Current	I <sub>oz</sub>	/INH="L"	-	-	10	μA

5.0V, f<sub>0</sub> x 7 multiplier (\*2)

T<sub>a</sub>=25

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating Voltage	V <sub>DD</sub>		4.5	5.0	5.5	V
'H' Level Input Voltage	V <sub>IH</sub>		2.4	-	-	V
'L' Level Input Voltage	V <sub>IL</sub>		-	-	0.4	V
'H' Level Output Voltage	V <sub>OH</sub>	CMOS: V <sub>DD</sub> =4.5V, I <sub>OH</sub> =-16mA	3.9	4.2	-	V
'L' Level Output Voltage	V <sub>OL</sub>	CMOS: V <sub>DD</sub> =4.5V, I <sub>OL</sub> =16mA	-	0.3	0.4	V
Supply Current 1	I <sub>DD1</sub>	/INH="OPEN", C <sub>L</sub> =15pF, f=140MHz	-	28	-	mA
Supply Current 2	I <sub>DD2</sub>	/INH="L", C <sub>L</sub> =15pF, f=140MHz	-	5	-	mA
Input Pull-Up Resistance 1	R <sub>up1</sub>	/INH="L"	0.5	1.0	2.0	M
Input Pull-Up Resistance 2	R <sub>up2</sub>	/INH=0.7V <sub>DD</sub>	25	50	100	k
Internal Oscillation Capacitance	C <sub>g</sub>	(*3)	-	13	-	pF
	C <sub>d</sub>	(*3)	-	13	-	pF
Internal Oscillation Feedback Resistance	R <sub>f</sub>		100	240	400	k
Output Off Leak Current	I <sub>oz</sub>	/INH="L"	-	-	10	μA

\*1 : Output frequency range is 70 MHz to 125MHz with a multiplier of f<sub>0</sub> x 7 at 3.3V

\*2 : Output frequency range is 80 MHz to 160MHz with a multiplier of f<sub>0</sub> x 7 at 5.0V

\*3 : R&D value

## ELECTRICAL CHARACTERISTICS (Continued)

 3.3V, f<sub>0</sub> x 6 multiplier (\*1)

Ta=25

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating Voltage	V <sub>DD</sub>		2.97	3.30	3.63	V
'H' Level Input Voltage	V <sub>IH</sub>		2.4	-	-	V
'L' Level Input Voltage	V <sub>IL</sub>		-	-	0.4	V
'H' Level Output Voltage	V <sub>OH</sub>	CMOS: V <sub>DD</sub> =2.97V, I <sub>OH</sub> =-8mA	2.47	-	-	V
'L' Level Output Voltage	V <sub>OL</sub>	CMOS: V <sub>DD</sub> =2.97V, I <sub>OL</sub> =8mA	-	-	0.4	V
Supply Current 1	I <sub>DD1</sub>	/INH="OPEN", C <sub>L</sub> =15pF, f=60MHz	-	8	-	mA
Supply Current 2	I <sub>DD2</sub>	/INH="L", C <sub>L</sub> =15pF, f=60MHz	-	1	-	mA
Input Pull-Up Resistance 1	R <sub>up1</sub>	/INH="L"	1.0	2.0	4.0	M
Input Pull-Up Resistance 2	R <sub>up2</sub>	/INH=0.7V <sub>DD</sub>	35	70	140	k
Internal Oscillation Capacitance	C <sub>g</sub>	(*3)	-	13	-	pF
	C <sub>d</sub>	(*3)	-	13	-	pF
Internal Oscillation Feedback Resistance	R <sub>f</sub>		0.3	1.0	2.0	M
Output Off Leak Current	I <sub>oz</sub>	/INH="L"	-	-	10	μA

 5.0V, f<sub>0</sub> x 6 multiplier (\*2)

Ta=25

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating Voltage	V <sub>DD</sub>		4.5	5.0	5.5	V
'H' Level Input Voltage	V <sub>IH</sub>		2.4	-	-	V
'L' Level Input Voltage	V <sub>IL</sub>		-	-	0.4	V
'H' Level Output Voltage	V <sub>OH</sub>	CMOS: V <sub>DD</sub> =4.5V, I <sub>OH</sub> =-16mA	3.9	4.2	-	V
'L' Level Output Voltage	V <sub>OL</sub>	CMOS: V <sub>DD</sub> =4.5V, I <sub>OL</sub> =16mA	-	0.3	0.4	V
Supply Current 1	I <sub>DD1</sub>	/INH="OPEN", C <sub>L</sub> =15pF, f=120MHz	-	23	-	mA
Supply Current 2	I <sub>DD2</sub>	/INH="L", C <sub>L</sub> =15pF, f=120MHz	-	5	-	mA
Input Pull-Up Resistance 1	R <sub>up1</sub>	/INH="L"	0.5	1.0	2.0	M
Input Pull-Up Resistance 2	R <sub>up2</sub>	/INH=0.7V <sub>DD</sub>	25	50	100	k
Internal Oscillation Capacitance	C <sub>g</sub>	(*3)	-	13	-	pF
	C <sub>d</sub>	(*3)	-	13	-	pF
Internal Oscillation Feedback Resistance	R <sub>f</sub>		100	240	400	k
Output Off Leak Current	I <sub>oz</sub>	/INH="L"	-	-	10	μA

 \*1: Output frequency range is 60 MHz to 125MHz with a multiplier of f<sub>0</sub> x 6 at 3.3V

 \*2: Output frequency range is 80 MHz to 150MHz with a multiplier of f<sub>0</sub> x 6 at 5.0V

\*3:R&amp;D value

## ELECTRICAL CHARACTERISTICS (Continued)

3.3V, f<sub>0</sub> x 5 multiplier (\*1)

T<sub>a</sub>=25

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating Voltage	V <sub>DD</sub>		2.97	3.30	3.63	V
'H' Level Input Voltage	V <sub>IH</sub>		2.4	-	-	V
'L' Level Input Voltage	V <sub>IL</sub>		-	-	0.4	V
'H' Level Output Voltage	V <sub>OH</sub>	CMOS: V <sub>DD</sub> =2.97V, I <sub>OH</sub> =-8mA	2.47	-	-	V
'L' Level Output Voltage	V <sub>OL</sub>	CMOS: V <sub>DD</sub> =2.97V, I <sub>OL</sub> =8mA	-	-	0.4	V
Supply Current 1	I <sub>DD1</sub>	/INH="OPEN", C <sub>L</sub> =15pF, f=50MHz	-	7	-	mA
Supply Current 2	I <sub>DD2</sub>	/INH="L", C <sub>L</sub> =15pF, f=50MHz	-	1	-	mA
Input Pull-Up Resistance 1	R <sub>up1</sub>	/INH="L"	1.0	2.0	4.0	M
Input Pull-Up Resistance 2	R <sub>up2</sub>	/INH=0.7V <sub>DD</sub>	35	70	140	k
Internal Oscillation Capacitance	C <sub>g</sub>	(*3)	-	13	-	pF
	C <sub>d</sub>	(*3)	-	13	-	pF
Internal Oscillation Feedback Resistance	R <sub>f</sub>		0.3	1.0	2.0	M
Output Off Leak Current	I <sub>oz</sub>	/INH="L"	-	-	10	μA

5.0V, f<sub>0</sub> x 5 multiplier (\*2)

T<sub>a</sub>=25

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating Voltage	V <sub>DD</sub>		4.5	5.0	5.5	V
'H' Level Input Voltage	V <sub>IH</sub>		2.4	-	-	V
'L' Level Input Voltage	V <sub>IL</sub>		-	-	0.4	V
'H' Level Output Voltage	V <sub>OH</sub>	CMOS: V <sub>DD</sub> =4.5V, I <sub>OH</sub> =-16mA	3.9	4.2	-	V
'L' Level Output Voltage	V <sub>OL</sub>	CMOS: V <sub>DD</sub> =4.5V, I <sub>OL</sub> =16mA	-	0.3	0.4	V
Supply Current 1	I <sub>DD1</sub>	/INH="OPEN", C <sub>L</sub> =15pF, f=100MHz	-	23	-	mA
Supply Current 2	I <sub>DD2</sub>	/INH="L", C <sub>L</sub> =15pF, f=100MHz	-	5	-	mA
Input Pull-Up Resistance 1	R <sub>up1</sub>	/INH="L"	0.5	1.0	2.0	M
Input Pull-Up Resistance 2	R <sub>up2</sub>	/INH=0.7V <sub>DD</sub>	25	50	100	k
Internal Oscillation Capacitance	C <sub>g</sub>	(*3)	-	13	-	pF
	C <sub>d</sub>	(*3)	-	13	-	pF
Internal Oscillation Feedback Resistance	R <sub>f</sub>		100	240	400	k
Output Off Leak Current	I <sub>oz</sub>	/INH="L"	-	-	10	μA

\*1: Output frequency range is 50 MHz to 125MHz with a multiplier of f<sub>0</sub> x 5 at 3.3V

\*2: Output frequency range is 80 MHz to 125MHz with a multiplier of f<sub>0</sub> x 5 at 5.0V

\*3: R&D value

## SWITCHING CHARACTERISTICS

3.3V

Ta=25

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Output Rise Time	tr	CL=15pF, 0.1VDD ~ 0.9VDD (*1)	-	2.0	-	ns
Output Fall Time	tf	CL=15pF, 0.9VDD ~ 0.1VDD (*1)	-	2.0	-	ns
Output DUTY Cycle	DUTY	CMOS: 0.5VDD, CL=15pF	45	-	55	%
Output Disable Delay Time	tplz	CL=15pF (*1)	-	-	100	ns
Output Enable Delay Time	tpzl	CL=15pF (*1)	-	-	100	ns
Jitter	tj	1 (*1)	-	50	-	ps

5.0V

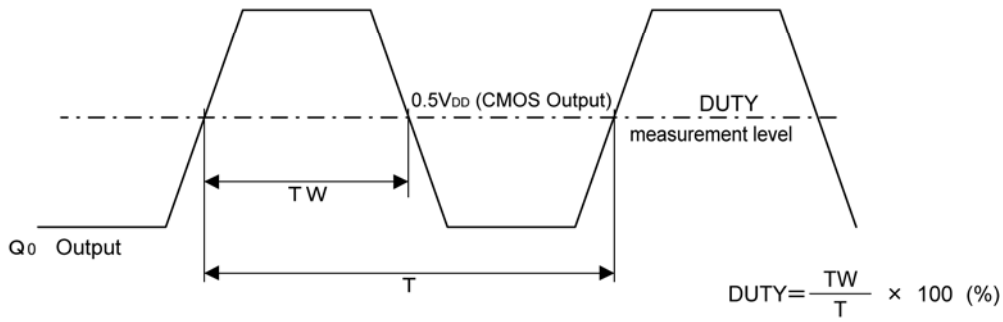
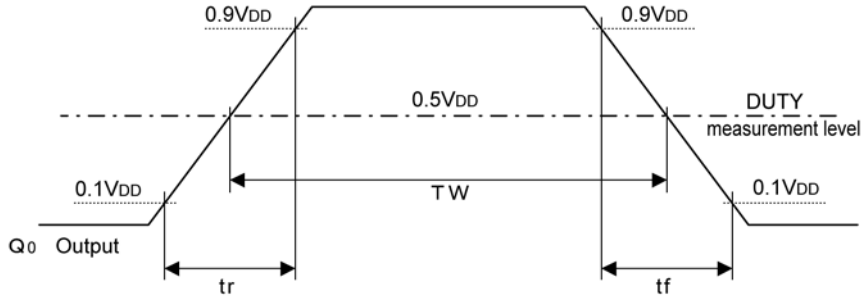
Ta=25

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Output Rise Time	tr	CL=15pF, 0.1VDD ~ 0.9VDD (*1)	-	1.5	-	ns
Output Fall Time	tf	CL=15pF, 0.9VDD ~ 0.1VDD (*1)	-	1.5	-	ns
Output DUTY Cycle	DUTY	CMOS: 0.5VDD, CL=15pF	45	-	55	%
Output Disable Delay Time	tplz	CL=15pF (*1)	-	-	100	ns
Output Enable Delay Time	tpzl	CL=15pF (*1)	-	-	100	ns
Jitter	tj	1 (*1)	-	50	-	ps

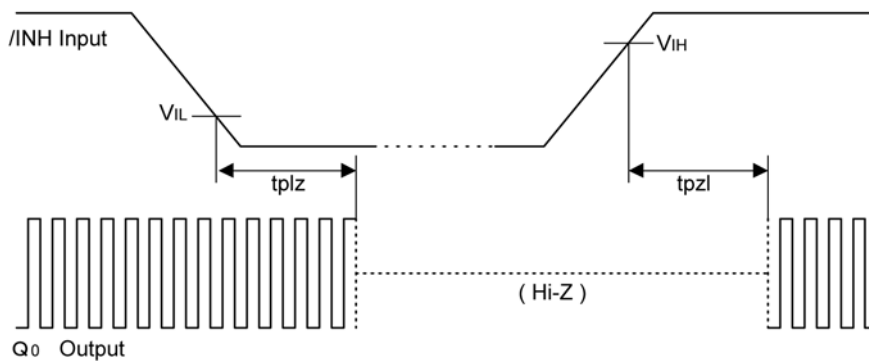
\*1 : R&D value

## SWITCHING CHARACTERISTICS

1) CMOS Level: tr , tf , Duty



2) Output Disable/Enable Delay Time

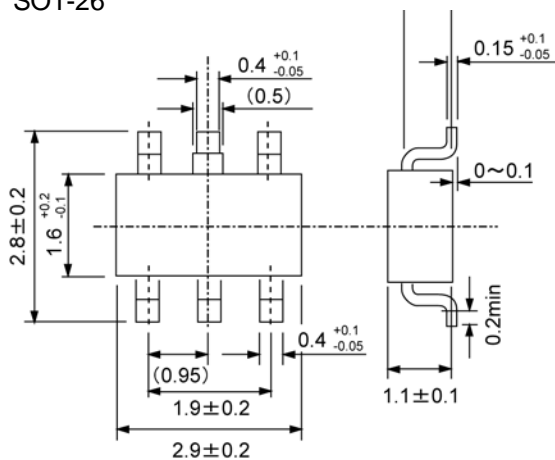


\*) /INH pin input waveform: tr = tf = less than 10 ns



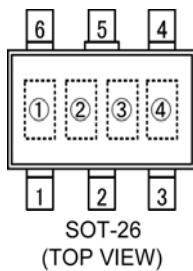
## PACKAGING INFORMATION

SOT-26



## MARKING RULE

SOT-26



Represents product series

MARK
7

Represents output

MARK	OUTPUT
M	Multiplier
D	Divider

Represents multiplier and/or divider ratio

MARK	RATIO	MARK	RATIO
2	f0/2	6	f0 x 6
4	f0/4	7	f0 x 7
5	f0/5	8	f0/8 & f0 x 8

Represents assembly lot number.  
(Based on internal standards)

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