

PLL Clock Generator ICs with Built-In Divider/Multiplier Circuits

GENERAL DESCRIPTION

The XC25BS3 series are high frequency, low power consumption PLL clock generator ICs with built-in crystal oscillator circuit, divider circuit & multiplier PLL circuit.

Laser trimming gives the option of being able to select from divider ratios (M) of 1 to 2047 and multiplier ratio (N) of 20 to 2047. Output frequency (Q0) is equal to reference oscillation (fCLKin) multiplied by N/M, within a range of 9MHz to 80MHz. Q1 output is selectable from input reference frequency (f0), Ground (GND), PLL output frequency/2 (Q0/2), and comparative frequency/2 (f0/M/2). Reference oscillation can input 14kHz to 35MHz of reference clock. Further, comparative frequency, within a range of 14kHz to 500kHz, can be obtained by dividing the reference oscillation. By halting oscillation via the CE pin, consumption current can be controlled. Output will be one of high impedance.

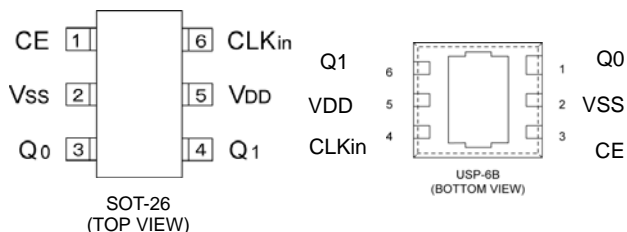
APPLICATIONS

- Crystal oscillation modules
- Microcontroller
- PDAs
- Portable audio systems
- Various system clocks

FEATURES

- Output Frequency** : 9MHz ~ 80MHz (Q0=fCLKin × N/M)
 - Input Frequency (fCLKin)** : 14kHz ~ 35MHz
 - Divider Ratio (M)** : Selectable from divisions of 1 ~ 2047
 - Multiplier Ratio (N)** : Selectable from multiplications of 20 ~ 2047
 - Output** : 3-State
Q1 output selectable from reference oscillation, GND, PLL output frequency/2, comparative frequency/2.
 - Operating Voltage Range** : 2.97V ~ 5.5V
 - Low Power Consumption** : CMOS (stand-by function included)*1
 - Comparative Frequency** : 14kHz ~ 500kHz
 - Ultra Small Package** : SOT-26, USP-6B
 - Environmentally Friendly** : EU RoHS Compliant, Pb Free
- *1 High output impedance during stand-by

PIN CONFIGURATION



*The dissipation pad for the USP-6B package should be solder-plated in recommended mount pattern and metal masking so as to enhance mounting strength and heat release. If the pad needs to be connected to other pins, it should be connected to the VDD pin.

PIN ASSIGNMENT

PIN NUMBER		PIN NAME	FUNCTION
SOT-26	USP-6B		
1	3	CE	Chip Enable
2	2	Vss	GND
3	1	Q0	PLL Output
4	6	Q1	Reference Oscillation, GND, Comparative Frequency/2, or PLL Output/2 Output *
5	5	VDD	Power Supply
6	4	CLKin	Reference Clock Input

* Q1 Output is selectable from the above mentioned functions.

FUNCTION LIST

CE, Q0/Q1 True Logic

CE	FUNCTION
"H"	Q0/Q1 Clock Output
"L"	Stand-by Output Pin = High Impedance
Open	Stand-by Output Pin = High Impedance (Vss pin pull-down due to IC's internal resistance)

"H" = High level
"L" = Low level

PRODUCT CLASSIFICATION

Ordering Information

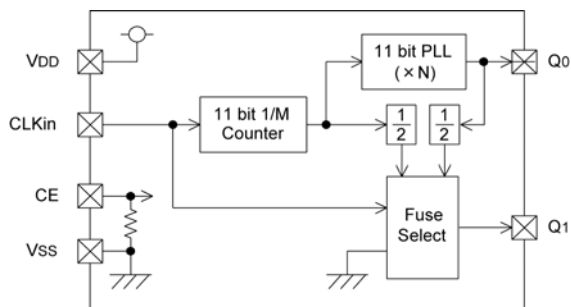
XC25BS3 - (*)

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
	Product Number	Integer	Based on internal standards e.g. Product number 001 = 001
	Packages Taping Type (*)	MR	SOT-26
		MR-G	SOT-26
		DR	USP-6B
		DR-G	USP-6B

(*) 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

Ta = 25

PARAMETER	SYMBOL	CONDITIONS	UNITS
Supply Voltage	VDD	Vss-0.3 ~ Vss+7.0	V
CLKin Pin Voltage	VCK	Vss-0.3 ~ VDD+0.3	V
CE Pin Voltage	VCE	Vss-0.3 ~ VDD+0.3	V
Q0 Pin Voltage	VQ0	Vss-0.3 ~ VDD+0.3	V
Q1 Pin Voltage	VQ1	Vss-0.3 ~ VDD+0.3	V
Q0 Output Current	IQ0	± 50	mA
Q1 Output Current	IQ1	± 50	mA
Power Dissipation	SOT-26	Pd	150
	USP-6B		100
Storage Temperature Range	Topr	-30 ~ +80	
Operating Temperature Range	Tstg	-40 ~ +125	

ELECTRICAL CHARACTERISTICS

XC25BS30xxMR

Set Value (example 1)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS
Input Frequency	fCLKin	13.000	-	20.000	MHz
Q0 Pin Output Multiplier Ratio	N/M	-	4.000	-	Multiplier
Output Frequency 1	fQ0	52.000	-	80.000	MHz
Output Frequency 2	Q1	fCLKin			-

DC Characteristics

XC25BS30xxMR

fCLKin=20MHz, Q0 pin output multiplier ratio=4, Ta=25 °C, No Load

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Supply Voltage	VDD		2.97	3.30	3.63	V
Input Voltage "High"	VIH		2.7	-	-	V
Input Voltage "Low"	VIL		-	-	0.6	V
Input Current "High"	IiH	VCK=3.3V	-	-	3.0	μA
Input Current "Low"	IiL	VCK=0V	-3.0	-	-	μA
Output Voltage "High"	VOH	VDD=2.97V, IOH=-8mA	2.5	-	-	V
Output Voltage "Low"	VOL	VDD=2.97V, IOL=8mA	-	-	0.4	V
Supply Current 1	IDD1	CE=3.3V	-	5.5	11.0	mA
Supply Current 2	IDD2	CE=0V	-	-	5.0	μA
CE "High" Voltage	VCEH		2.70	-	-	V
CE "Low" Voltage	VCEL		-	-	0.45	V
CE Pull-Down Resistance 1	Rp1	CE=3.3V	0.5	1.5	2.5	M
CE Pull-Down Resistance 2	Rp2	CE=0.3V	20.0	50.0	80.0	k

AC Characteristics

XC25BS30xxMR

fCLKin=20MHz, Q0 pin output multiplier ratio=4, Ta=25 °C, CL=15pF

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Output Rise Time	TTLH	VDD=3.3V (20% to 80%) (*2)	-	5.0	-	ns
Output Fall Time	TTHL	VDD=3.3V (20% to 80%) (*2)	-	5.0	-	ns
Duty Ratio	DUTY		40	50	60	%
Output Start Time	Ton	(*2)	-	-	20	ms
PLL Output Jitter	Tj	1 (*2)	-	60	-	ps

*2 R&D guarantee

ELECTRICAL CHARACTERISTICS (Continued)

XC25BS30xxMR (Continued)

Set Value (example 2)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS
Input Frequency	fCLKin	10.000	-	16.000	MHz
Q0 Pin Output Multiplier Ratio	N/M	-	3.000	-	Multiplier
Output Frequency 1	fQ0	30.000	-	48.000	MHz
Output Frequency 2	Q1	GND			-

DC Characteristics

XC25BS30xxMR

fCLKin=16MHz, Q0 pin output multiplier ratio=3, Ta=25 °C, No Load

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Supply Voltage	VDD		2.97	3.30	3.63	V
Input Voltage "High"	VIH		2.7	-	-	V
Input Voltage "Low"	VIL		-	-	0.6	V
Input Current "High"	I _{IH}	V _{CK} =3.3V	-	-	3.0	μA
Input Current "Low"	I _{IL}	V _{CK} =0V	-3.0	-	-	μA
Output Voltage "High"	VOH	VDD=2.97V, I _{OH} =-8mA	2.5	-	-	V
Output Voltage "Low"	VOL	VDD=2.97V, I _{OL} =8mA	-	-	0.4	V
Supply Current 1	I _{DD1}	CE=3.3V	-	4.0	8.0	mA
Supply Current 2	I _{DD2}	CE=0V	-	-	5.0	μA
CE "High" Voltage	V _{CEH}		2.70	-	-	V
CE "Low" Voltage	V _{CEL}		-	-	0.45	V
CE Pull-Down Resistance 1	R _{p1}	CE=3.3V	0.5	1.5	2.5	MΩ
CE Pull-Down Resistance 2	R _{p2}	CE=0.3V	20.0	50.0	80.0	kΩ

AC Characteristics

XC25BS30xxMR

fCLKin=16MHz, Q0 pin output multiplier ratio=3, Ta=25 °C, CL=15pF

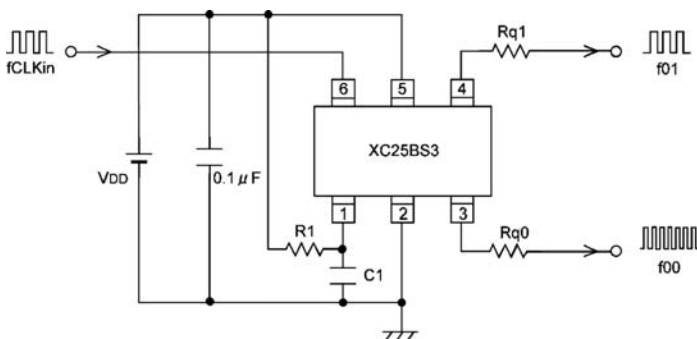
PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Output Rise Time	T _{TLH}	VDD=3.3V (20% to 80%) (*2)	-	5.0	-	ns
Output Fall Time	T _{THL}	VDD=3.3V (20% to 80%) (*2)	-	5.0	-	ns
Duty Ratio	DUTY		40	50	60	%
Output Start Time	T _{on}	(*2)	-	-	20	ms
PLL Output Jitter	T _j	1 (*2)	-	60	-	ps

*2 R&D guarantee

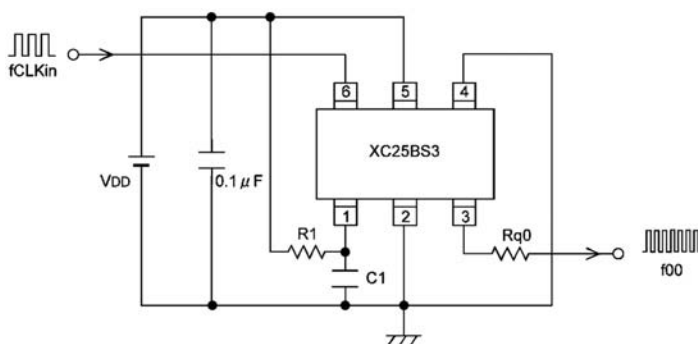
TYPICAL APPLICATION CIRCUITS

Circuit Example

Q1 Pin - reference oscillation, PLL output frequency/2, comparative frequency/2



Q1 Pin - GND

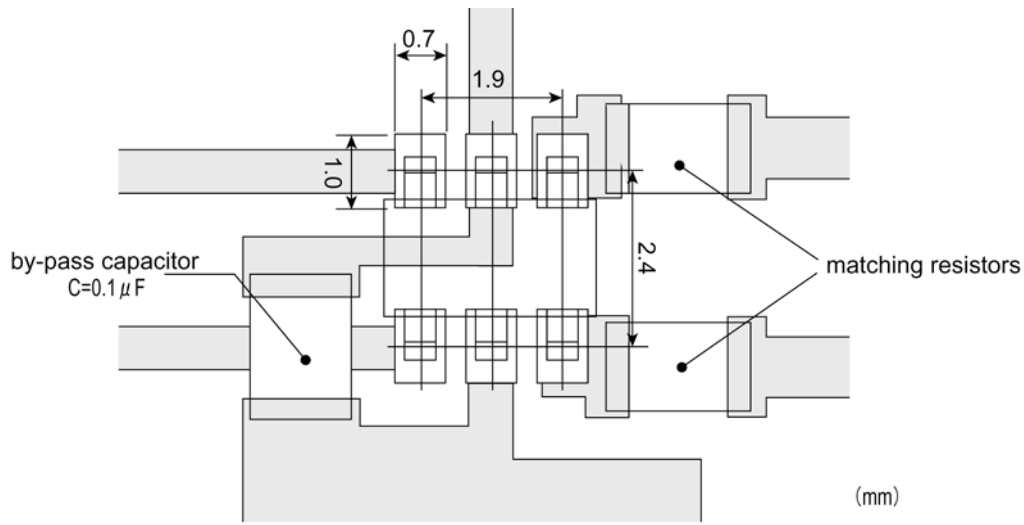


NOTES ON USE

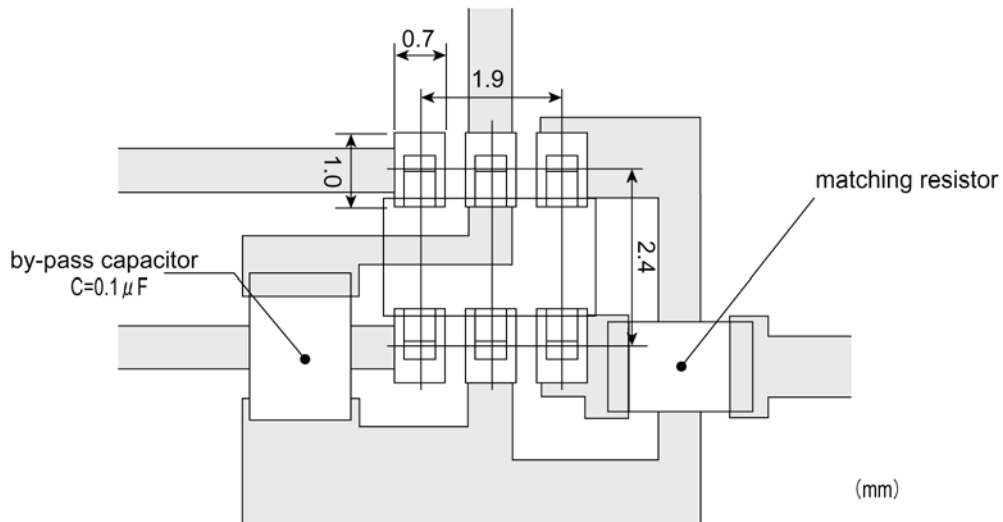
- (1) Please insert a by-pass capacitor of 0.1 μ F.
- (2) Rq0 and Rq1 are matching resistors. Their use is recommended in order to counter unwanted radiations.
- (3) Please place a by-pass capacitor and matching resistors as close to the IC as possible. The output may not be locked if the by-pass capacitor is not close enough to the IC. Further, there is a possibility of unwanted radiation occurrence between the resistor and the IC pin if the matching resistors are not close enough to the IC.
- (4) When selecting GND for the Q1 pin, although the IC will be connected to GND internally, it is also recommended that the PCB be connected to GND.
- (5) When the CE pin is not controlled by external signals, it is recommended that a time constant circuit of $R1=1k \times C1=0.1 \mu$ F be added for stability.
- (6) With this IC, output is achieved by dividing and multiplying the reference oscillation by means of the PLL circuit. In cases where this output is further used as a reference oscillation of another PLL circuit, the final output signal's jitter may increase, so all necessary precautions should be taken to avoid this.
- (7) It is recommended that a low noise power supply, such as a series regulator, be used for the supply voltage. Using a power supply such as a switching regulator might lead to a larger jitter, which in turn may lead to an inability to lock due to the ripple of the switching regulator.
- (8) As for this IC, synchronization of input and output signal's edge is not guaranteed though the input frequency operates to the output frequency multiply.

REFERENCE LAND PATTERN

Q1 Pin - reference oscillation, PLL output frequency/2, comparative frequency/2

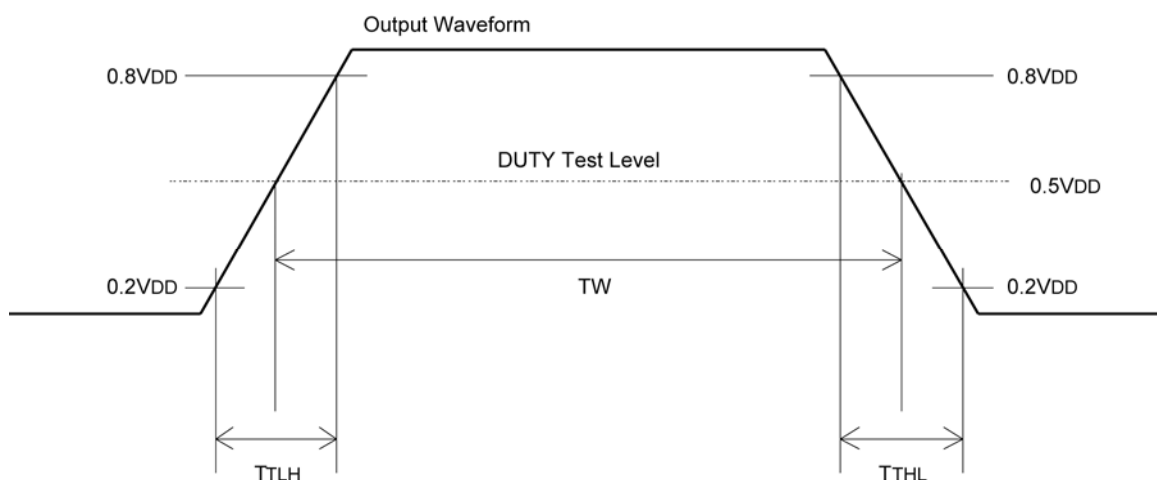


Q1 Pin - GND

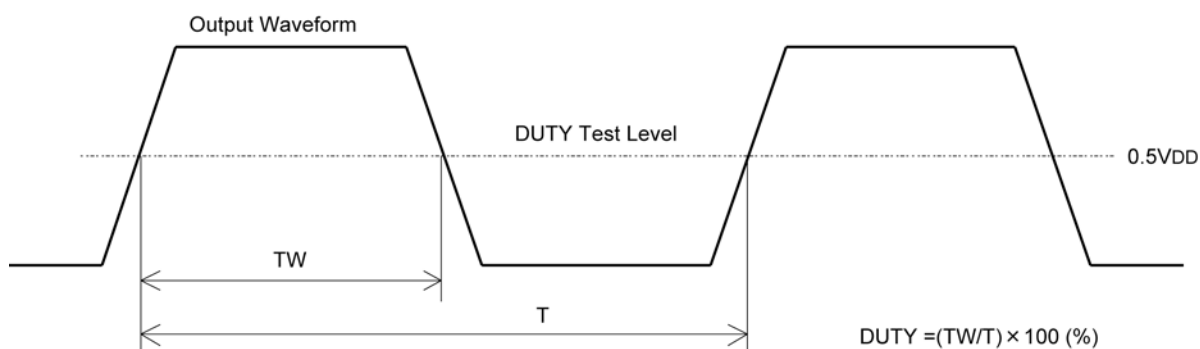


AC CHARACTERISTICS WAVEFORMS

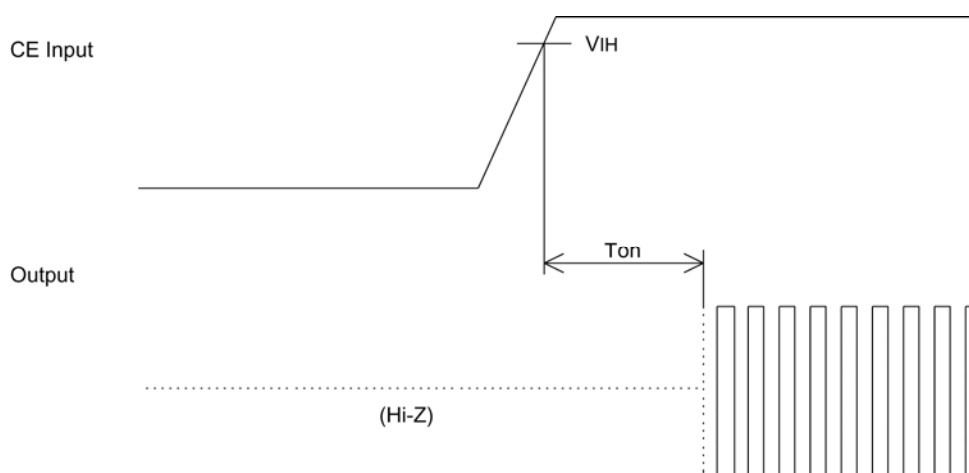
1) Output Rise Time / Output Fall Time



2) Duty Ratio

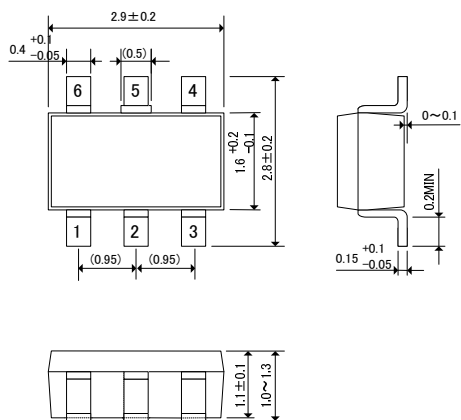


3) Output Start Time

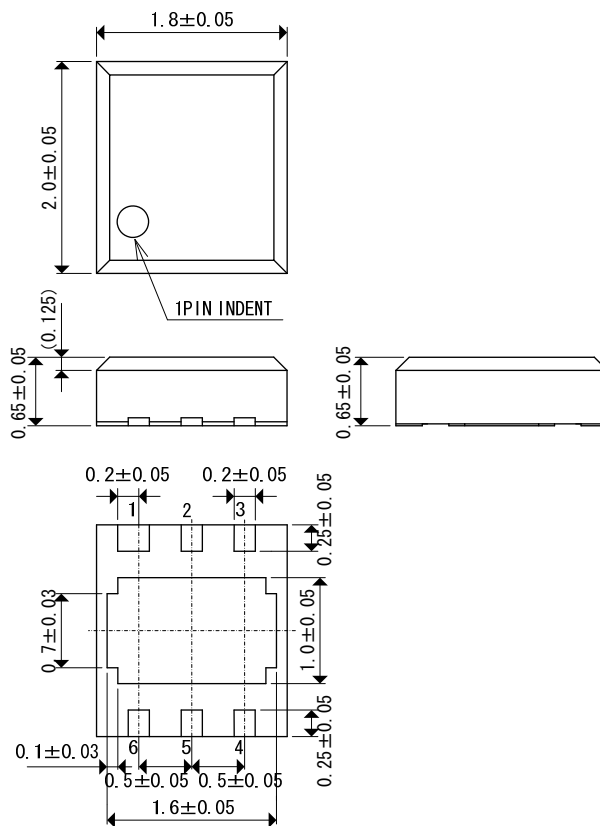


PACKAGING INFORMATION

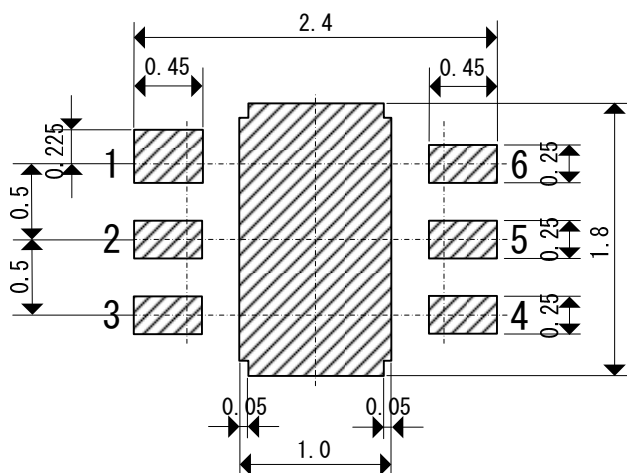
SOT-26



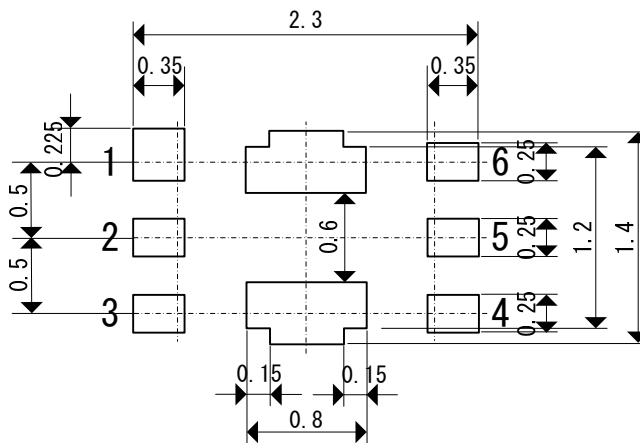
USP-6B



USP-6B Reference Pattern Layout

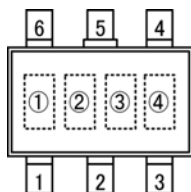


USP-6B Reference Metal Mask Design



MARKING RULE

SOT-26



SOT-26
(TOP VIEW)

represents product series

MARK			PRODUCT SERIES
B		3	XC25BS30xxMx

represents and of product number as in ordering information

SYMBOL			PRODUCT SERIES	SYMBOL			PRODUCT SERIES
1	0	1	XC25BS3x01Mx	K	1	7	XC25BS3x17Mx
2	0	2	XC25BS3x02Mx	L	1	8	XC25BS3x18Mx
3	0	3	XC25BS3x03Mx	M	1	9	XC25BS3x19Mx
4	0	4	XC25BS3x04Mx	N	2	0	XC25BS3x20Mx
5	0	5	XC25BS3x05Mx	P	2	1	XC25BS3x21Mx
6	0	6	XC25BS3x06Mx	R	2	2	XC25BS3x22Mx
7	0	7	XC25BS3x07Mx	S	2	3	XC25BS3x23Mx
8	0	8	XC25BS3x08Mx	T	2	4	XC25BS3x24Mx
9	0	9	XC25BS3x09Mx	U	2	5	XC25BS3x25Mx
A	1	0	XC25BS3x10Mx	V	2	6	XC25BS3x26Mx
B	1	1	XC25BS3x11Mx	X	2	7	XC25BS3x27Mx
C	1	2	XC25BS3x12Mx	Y	2	8	XC25BS3x28Mx
D	1	3	XC25BS3x13Mx	Z	2	9	XC25BS3x29Mx
E	1	4	XC25BS3x14Mx	0	3	0 *	XC25BS3x30Mx
F	1	5	XC25BS3x15Mx	1	3	1 *	XC25BS3x31Mx
H	1	6	XC25BS3x16Mx

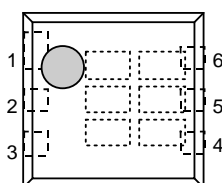
represents assembly lot number

0 to 9, A to Z, reverse character 0 to 9 and A to Z repeated.

(G, I, J, O, Q, W excluded.)

* Character inversion is used.

USP-6B



USP-6B
(TOP VIEW)

represents product series

MARK			PRODUCT SERIES
B	S	3	XC25BS30xxDx
S	3	S	XC25BS3SxxDx

, represents and of product number as in ordering information (ex)

MARK		PRODUCT SERIES
0	7	XC25BS3007Dx
0	1	XC25BS3S01Dx

represents production lot number

0 to 9, A to Z repeated (G, I, J, O, Q, W excluded)

Note: No character inversion used.

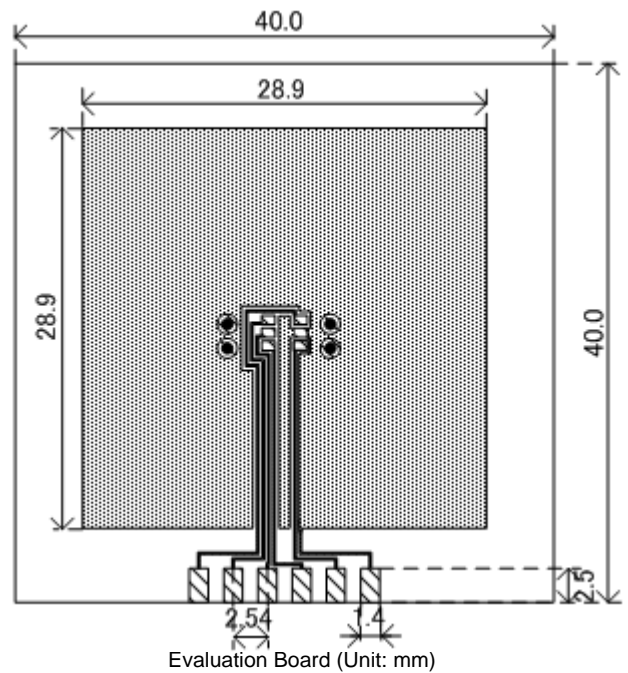
PACKAGING INFORMATION (Continued)

SOT-26 Power Dissipation

Power dissipation data for the SOT-26 is shown in this page.
 The value of power dissipation varies with the mount board conditions.
 Please use this data as one of reference data taken in the described condition.

1. Measurement Condition (Reference data)

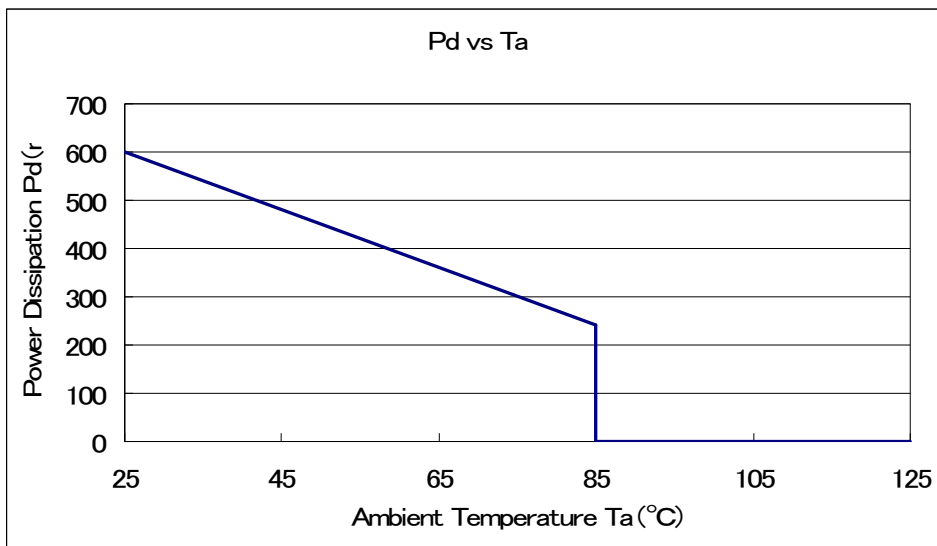
- Condition: Mount on a board
- Ambient: Natural convection
- Soldering: Lead (Pb) free
- Board: Dimensions 40 x 40 mm (1600 mm² in one side)
 Copper (Cu) traces occupy 50% of the board area
 In top and back faces
 Package heat-sink is tied to the copper traces
- Material: Glass Epoxy (FR-4)
- Thickness: 1.6 mm
- Through-hole: 4 x 0.8 Diameter



2. Power Dissipation vs. Operating temperature

Board Mount ($T_j \text{ max} = 125$)

Ambient Temperature (°C)	Power Dissipation Pd (mW)	Thermal Resistance (°C/W)
25	600	166.67
85	240	



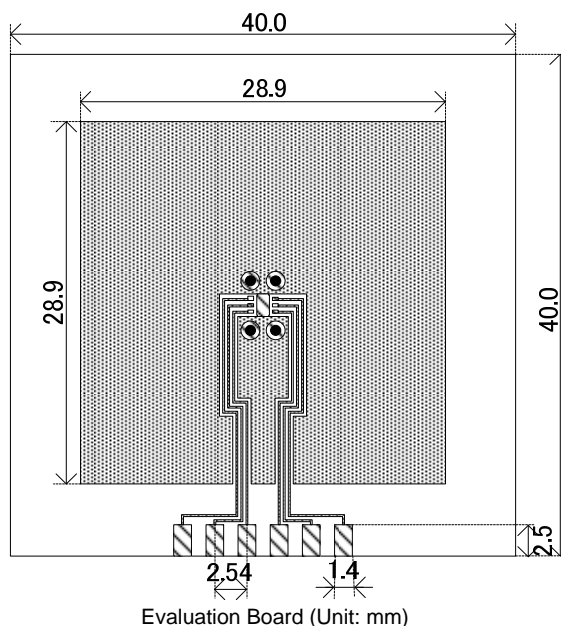
PACKAGING INFORMATION (Continued)

USP-6B Power Dissipation

Power dissipation data for the USP-6B is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as one of reference data taken in the described condition.

3. Measurement Condition (Reference data)

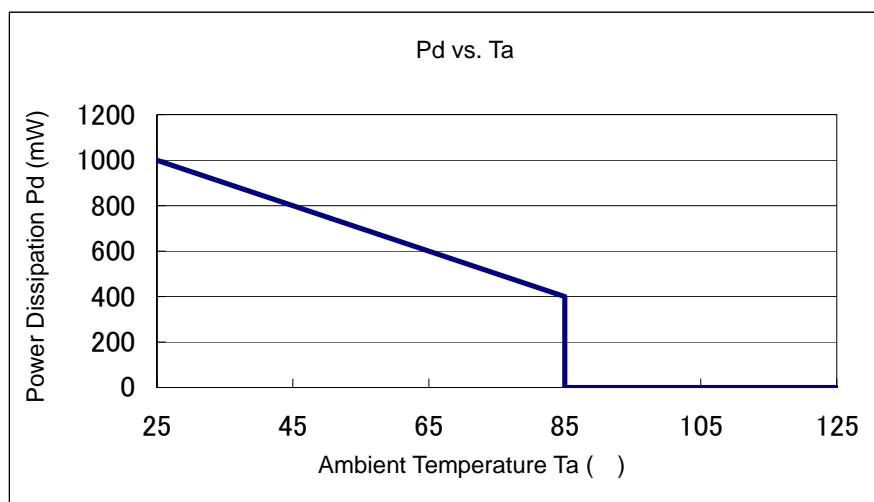
- Condition: Mount on a board
- Ambient: Natural convection
- Soldering: Lead (Pb) free
- Board: Dimensions 40 x 40 mm (1600 mm² in one side)
Copper (Cu) traces occupy 50% of the board area
In top and back faces
Package heat-sink is tied to the copper traces
- Material: Glass Epoxy (FR-4)
- Thickness: 1.6 mm
- Through-hole: 4 x 0.8 Diameter



4. Power Dissipation vs. Operating temperature

Board Mount ($T_j \text{ max} = 125$)

Ambient Temperature (°C)	Power Dissipation Pd (mW)	Thermal Resistance (°C/W)
25	1000	100.00
85	400	



1. The products and product specifications contained herein are subject to change without notice to improve performance characteristics. Consult us, or our representatives before use, to confirm that the information in this datasheet is up to date.
2. We assume no responsibility for any infringement of patents, patent rights, or other rights arising from the use of any information and circuitry in this datasheet.
3. Please ensure suitable shipping controls (including fail-safe designs and aging protection) are in force for equipment employing products listed in this datasheet.
4. The products in this datasheet are not developed, designed, or approved for use with such equipment whose failure of malfunction can be reasonably expected to directly endanger the life of, or cause significant injury to, the user.
(e.g. Atomic energy; aerospace; transport; combustion and associated safety equipment thereof.)
5. Please use the products listed in this datasheet within the specified ranges.
Should you wish to use the products under conditions exceeding the specifications, please consult us or our representatives.
6. We assume no responsibility for damage or loss due to abnormal use.
7. All rights reserved. No part of this datasheet may be copied or reproduced without the prior permission of TOREX SEMICONDUCTOR LTD.

TOREX SEMICONDUCTOR LTD.