

## *ASSP for Mobile Telephone*

# VCO (700 to 2000 MHz)

## VC-30 Series

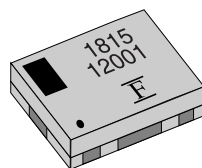
### ■ DESCRIPTION

With excellent C/N characteristics and low current consumption, this VCO series is ideal for CDMA, PCS and GSM mobile communication equipment. The VC-30 series can be used in any frequency band in the 700MHz to 2000MHz range. The device utilizes FUJITSU MEDIA DEVICE's high-frequency design technology, high-density mounting technology, and frequency adjustment technology to provide a high level of reliability in addition to high performance and small size.

### ■ FEATURES

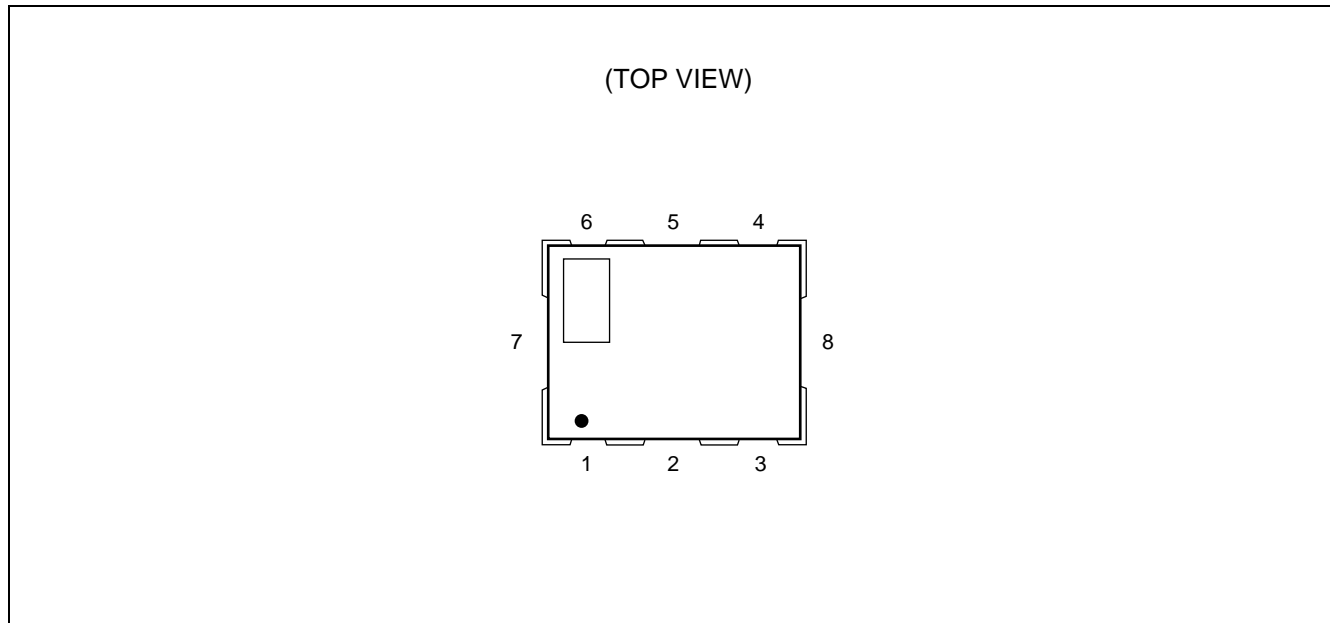
- Superior noise characteristics (C/N, S/N)
- High level of stability in response to ambient temperature and load variations
- FUJITSU MEDIA DEVICE's proprietary fabrication process provides the uniformity of the central frequency distribution
- Small size, light-weight, slim-package :  $7.9 \times 5.8 \times 2.0$  mm (Typ.)
- SMD-type taping specifications suitable for automatic mounting and reflow soldering

### ■ PACKAGE



# VC-30 Series

## ■ PIN ASSIGNMENT



## ■ PIN DESCRIPTION

Pin No.	Symbol	Description
1	V <sub>t</sub>	Control voltage
2	GND	GND
3	V <sub>cc</sub>	Power supply voltage
4	OUT	Output
5	GND	GND
6	GND	GND
7	GND	GND
8	GND	GND

## ■ PRODUCT LINEUP (STANDARD MODELS)

System	Center Frequency (MHz)	Band Width (MHz)	Power Supply Voltage (V)	Part Number
CDMA	1591	±10	2.8 ± 0.2	VC-2R8A30-1591
	967	±13	3.35 ± 0.25	VC-3R3A30-0967
PCS	1750	±30	3.3 ± 0.15	VC-3R3A30-1750
K-PCS	1635	±15	3.3 ± 0.15	VC-3R3A30-1635
GSM	1815	±105	2.8 ± 0.1	VC-2R8A30-1815

## ■ ELECTRICAL CHARACTERISTICS

### 1. For CDMA (Part number : VC-2R8A30-1591)

#### • Absolute Maximum Ratings

Parameter	Symbol	Rating		Unit
		Min.	Max.	
Input DC voltage	V <sub>CC</sub>	—	+ 3.0	V
Control voltage	V <sub>t</sub>	—	+ 2.5	V
Operating temperature	T <sub>a</sub>	−20	+85	°C
Storage temperature	T <sub>stg</sub>	−35	+90	°C
Storage humidity	H <sub>stg</sub>	5	95	%

WARNING: VCO can be permanently damaged by application of stress (voltage, temperature, humidity, etc.) in excess of absolute maximum ratings. Do not exceed these ratings.

#### • Electrical Characteristics

(T<sub>a</sub> = +25 °C±3 °C)

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Current consumption	I <sub>CC</sub>	V <sub>CC</sub> = 2.8 V, V <sub>t</sub> = 1.35 V	—	—	6.2	mA
Frequency	f <sub>min</sub>	V <sub>CC</sub> = 2.8 V, V <sub>t</sub> = 0.5 V	—	—	1581.0*	MHz
Frequency	f <sub>max</sub>	V <sub>CC</sub> = 2.8 V, V <sub>t</sub> = 2.2 V	1601.0*	—	—	MHz
Control voltage sensitivity	k <sub>v</sub>	(f <sub>max</sub> − f <sub>min</sub> ) / 1.7	25.0	—	37.0	MHz/V
Oscillator output	P <sub>o</sub>	V <sub>CC</sub> = 2.8 V, V <sub>t</sub> = 1.35 V	−5.0	—	1.0	dBm
C/N	C/N	V <sub>CC</sub> = 2.8 V, V <sub>t</sub> = 1.35 V, Offset = 1 kHz, BW = 1 Hz	65.0*	—	—	dBc/Hz
		V <sub>CC</sub> = 2.8 V, V <sub>t</sub> = 1.35 V, Offset = 20 kHz, BW = 1 Hz	96.0*	—	—	dBc/Hz
Higher harmonics	H <sub>s</sub>	V <sub>CC</sub> = 2.8 V, V <sub>t</sub> = 1.35 V, 2nd, 3rd	—	—	−10.0	dBc
Power supply variation	Push	V <sub>CC</sub> = 2.8 V ± 0.2 V, V <sub>t</sub> = 1.35 V	—	—	±1000	kHz
Load variation	Pull	V <sub>CC</sub> = 2.8 V, V <sub>t</sub> = 1.35 V, VSWR = 2 ALL PHASE	—	—	±1000	kHz
Temperature drift	T <sub>d</sub>	T <sub>a</sub> = +25 (+60/−45) °C	—	—	±4000*	kHz

\* : T<sub>a</sub> = −20 °C to +85 °C

# VC-30 Series

## 2. For CDMA (Part number : VC-3R3A30-0967)

### • Absolute Maximum Ratings

Parameter	Symbol	Rating		Unit
		Min.	Max.	
Input DC voltage	V <sub>CC</sub>	—	+ 7.0	V
Operating temperature	T <sub>a</sub>	−30	+80	°C
Storage temperature	T <sub>stg</sub>	−40	+90	°C
Storage humidity	H <sub>stg</sub>	5	95	%

WARNING: VCO can be permanently damaged by application of stress (voltage, temperature, humidity, etc.) in excess of absolute maximum ratings. Do not exceed these ratings.

### • Electrical Characteristics

(T<sub>a</sub> = +25 °C ± 3 °C)

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Current consumption	I <sub>CC</sub>	V <sub>CC</sub> = 3.35 V, V <sub>t</sub> = 1.7 V	—	—	6.0 6.4*	mA
Frequency	f <sub>min</sub>	V <sub>CC</sub> = 3.35 V, V <sub>t</sub> = 0.7 V	—	—	954.0*	MHz
Frequency	f <sub>max</sub>	V <sub>CC</sub> = 3.35 V, V <sub>t</sub> = 2.7 V	980.0*	—	—	MHz
Control voltage sensitivity	k <sub>v</sub>	(f <sub>max</sub> − f <sub>min</sub> ) / 2.0	18.0*	23.0	28.0*	MHz/V
Oscillator output	P <sub>o</sub>	V <sub>CC</sub> = 3.35 V, V <sub>t</sub> = 1.7 V	−5.0 −6.0*	−2.5 —	0.0 1.0*	dBm
C/N	C/N	V <sub>CC</sub> = 3.35 V, V <sub>t</sub> = 1.7 V, Offset = 1 kHz, BW = 1 Hz	70.0*	—	—	dBc/Hz
		V <sub>CC</sub> = 3.35 V, V <sub>t</sub> = 1.7 V, Offset = 10 kHz, BW = 1 Hz	100.0*	—	—	dBc/Hz
		V <sub>CC</sub> = 3.35 V, V <sub>t</sub> = 1.7 V, Offset = 30 kHz, BW = 1 Hz	110.0*	—	—	dBc/Hz
		V <sub>CC</sub> = 3.35 V, V <sub>t</sub> = 1.7 V, Offset = 60 kHz, BW = 1 Hz	115.0*	—	—	dBc/Hz
Higher harmonics	H <sub>s</sub>	V <sub>CC</sub> = 3.35 V, V <sub>t</sub> = 1.7 V, 2nd, 3rd	—	—	−10.0*	dBc
Spurious	Sp	V <sub>CC</sub> = 3.35 V, V <sub>t</sub> = 1.7 V	—	—	−70.0*	dBc
Power supply variation	Push	V <sub>CC</sub> = 3.35 V ± 0.25 V, V <sub>t</sub> = 1.7 V	—	—	±800*	kHz
Load variation	Pull	V <sub>CC</sub> = 3.35 V, V <sub>t</sub> = 1.7 V, VSWR = 2 ALL PHASE	—	—	±1000*	kHz
Temperature drift	T <sub>d</sub>	T <sub>a</sub> = +25 °C ± 55 °C	—	—	±3000*	kHz

\* : T<sub>a</sub> = −30 °C to +80 °C

### 3. For PCS (Part number : VC-3R3A30-1750)

#### • Absolute Maximum Ratings

Parameter	Symbol	Rating		Unit
		Min.	Max.	
Input DC voltage	V <sub>cc</sub>	—	+ 5.0	V
Control voltage	V <sub>t</sub>	—	+ 5.0	V
Operating temperature	T <sub>a</sub>	−30	+80	°C
Storage temperature	T <sub>stg</sub>	−40	+125	°C
Storage humidity	H <sub>stg</sub>	5	95	%

WARNING: VCO can be permanently damaged by application of stress (voltage, temperature, humidity, etc.) in excess of absolute maximum ratings. Do not exceed these ratings.

# VC-30 Series

## • Electrical Characteristics

(Ta = -30 °C to +80 °C)

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Current consumption	I <sub>cc</sub>	V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 1.65 V	—	—	8.5	mA
Frequency	f <sub>min</sub>	V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 0.3 V	—	—	1720.0	MHz
Frequency	f <sub>max</sub>	V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 3.0 V	1780.0	—	—	MHz
Control voltage sensitivity	k <sub>v</sub>	(f <sub>max</sub> – f <sub>min</sub> ) / 2.7	28.0	34.0	40.0	MHz/V
Oscillator output	P <sub>o</sub>	V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 1.65 V	-5.0	-2.0	1.0	dBm
C/N	C/N	V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 1.65 V, Offset = 300 Hz, BW = 1 Hz	60.0	—	—	dBc/Hz
		V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 1.65 V, Offset = 1 kHz, BW = 1 Hz	70.0	—	—	dBc/Hz
		V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 1.65 V, Offset = 10 kHz, BW = 1 Hz	90.0	—	—	dBc/Hz
		V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 1.65 V, Offset = 100 kHz, BW = 1 Hz	110.0	—	—	dBc/Hz
		V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 1.65 V, Offset = 625 kHz, BW = 1 Hz	129.0	—	—	dBc/Hz
		V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 1.65 V, Offset = 1.25 MHz, BW = 1 Hz	135.0	—	—	dBc/Hz
		V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 1.65 V, Offset ≥ 2 MHz, BW = 1 Hz	139.0	—	—	dBc/Hz
Higher harmonics	H <sub>s</sub>	V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 1.65 V, Up to 3rd	—	—	-10.0	dBc
Spurious	Sp	V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 1.65 V, Up to 6 GHz	—	—	-70	dBc
		V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 1.65 V, Carrier ±100 MHz	—	—	-80	dBc
Power supply variation	Push	V <sub>CC</sub> = 3.3 V ± 0.15 V, V <sub>t</sub> = 1.65 V	—	—	±600	kHz
Load variation	Pull	V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 1.65 V, VSWR = 2 ALL PHASE	—	—	±1200	kHz
Temperature drift	T <sub>d</sub>	T <sub>a</sub> = +25 °C ± 55 °C	—	—	±6000	kHz

## 4. For K-PCS (Part number : VC-3R3A30-1635)

### • Absolute Maximum Ratings

Parameter	Symbol	Rating		Unit
		Min.	Max.	
Input DC voltage	V <sub>CC</sub>	—	+ 6.0	V
Operating temperature	T <sub>a</sub>	−20	+70	°C
Storage temperature	T <sub>stg</sub>	−30	+85	°C
Storage humidity	H <sub>stg</sub>	5	95	%

WARNING: VCO can be permanently damaged by application of stress (voltage, temperature, humidity, etc.) in excess of absolute maximum ratings. Do not exceed these ratings.

### • Electrical Characteristics

(T<sub>a</sub> = +25 °C ± 3 °C)

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Current consumption	I <sub>CC</sub>	V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 1.5 V	—	—	8.5	mA
Frequency	f <sub>min</sub>	V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 0.5 V	—	—	1620.0	MHz
Frequency	f <sub>max</sub>	V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 2.5 V	1650.0	—	—	MHz
Control voltage sensitivity	k <sub>v</sub>	(f <sub>max</sub> − f <sub>min</sub> ) / 2	22.0	27.0	32.0	MHz/V
Oscillator output	P <sub>o</sub>	V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 1.5 V	−3.0	0.0	3.0	dBm
C/N	C/N	V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 1.5 V, Offset = 100 kHz, BW = 1 Hz	110.0	—	—	dBc/Hz
Higher harmonics	H <sub>s</sub>	V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 1.5 V, 2nd, 3rd	—	—	−10.0	dBc
Power supply variation	Push	V <sub>CC</sub> = 3.3 V ± 0.15 V, V <sub>t</sub> = 1.5 V	—	—	±1000	kHz
Load variation	Pull	V <sub>CC</sub> = 3.3 V, V <sub>t</sub> = 1.5 V, VSWR = 2 ALL PHASE	—	—	±1000	kHz
Temperature drift	T <sub>d</sub>	T <sub>a</sub> = +25 °C ± 45 °C	—	—	±3000	kHz

# VC-30 Series

## 5. For GSM (Part number : VC-2R8A30-1815)

### • Absolute Maximum Ratings

Parameter	Symbol	Rating		Unit
		Min.	Max.	
Input DC voltage	V <sub>cc</sub>	—	+ 3.0	V
Control voltage	V <sub>t</sub>	—	+ 2.5	V
Operating temperature	T <sub>a</sub>	−25	+70	°C
Storage temperature	T <sub>stg</sub>	−40	+85	°C
Storage humidity	H <sub>stg</sub>	5	95	%

WARNING: VCO can be permanently damaged by application of stress (voltage, temperature, humidity, etc.) in excess of absolute maximum ratings. Do not exceed these ratings.

### • Electrical Characteristics

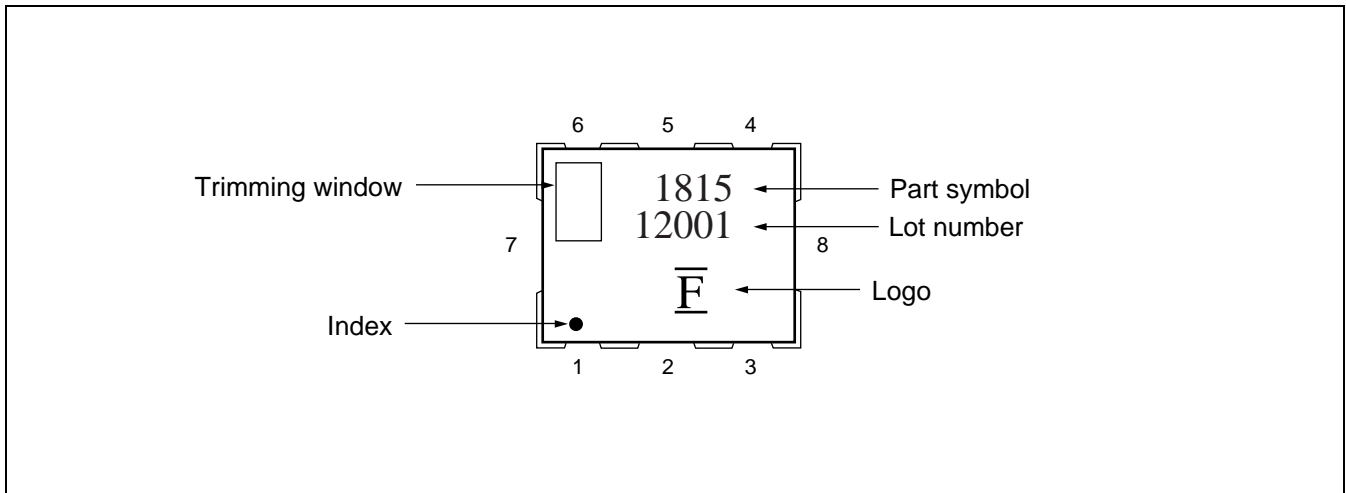
(T<sub>a</sub> = +25 °C ± 3 °C)

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Current consumption	I <sub>cc</sub>	V <sub>cc</sub> = 2.8 V, V <sub>t</sub> = 1.35 V	—	—	20.0*	mA
Frequency	f <sub>min</sub>	V <sub>cc</sub> = 2.8 V, V <sub>t</sub> = 0.3 V	—	—	1710.0*	MHz
Frequency	f <sub>max</sub>	V <sub>cc</sub> = 2.8 V, V <sub>t</sub> = 2.4 V	1920.0*	—	—	MHz
Control voltage sensitivity	k <sub>v</sub>	(f <sub>max</sub> – f <sub>min</sub> ) / 2.1	110.0*	—	140.0*	MHz/V
Oscillator output	P <sub>o</sub>	V <sub>cc</sub> = 2.8 V, V <sub>t</sub> = 1.35 V	3.0 2.0*	—	7.0 8.0*	dBm
C/N	C/N	V <sub>cc</sub> = 2.8 V, V <sub>t</sub> = 1.35 V, Offset = 10 kHz, BW = 1 Hz	90.0*	—	—	dBc/Hz
		V <sub>cc</sub> = 2.8 V, V <sub>t</sub> = 1.35 V, Offset = 400 kHz, BW = 1 Hz	118.0*	—	—	dBc/Hz
Higher harmonics	H <sub>s</sub>	V <sub>cc</sub> = 2.8 V, V <sub>t</sub> = 1.35 V, Up to 3rd	—	—	−15.0*	dBc
Power supply variation	Push	V <sub>cc</sub> = 2.8 V ± 0.1 V, V <sub>t</sub> = 1.35 V	—	—	±2000*	kHz
Load variation	Pull	V <sub>cc</sub> = 2.8 V, V <sub>t</sub> = 1.35 V, VSWR = 2 ALL PHASE	—	—	±2000*	kHz
Temperature drift	T <sub>d</sub>	T <sub>a</sub> = +25 (+45/−50) °C	—	—	±8000*	kHz

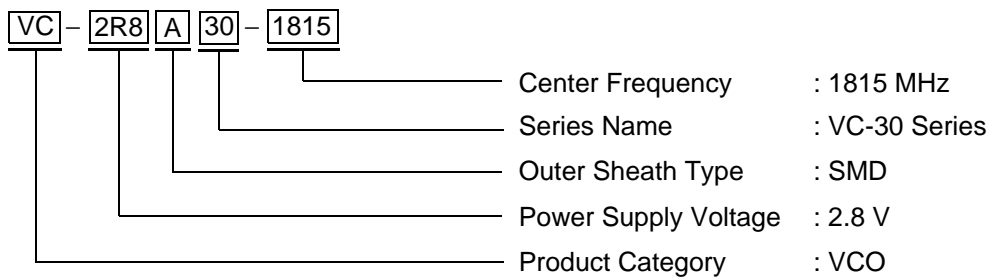
\* : T<sub>a</sub> = −25 °C to +70 °C



## ■ MARKING

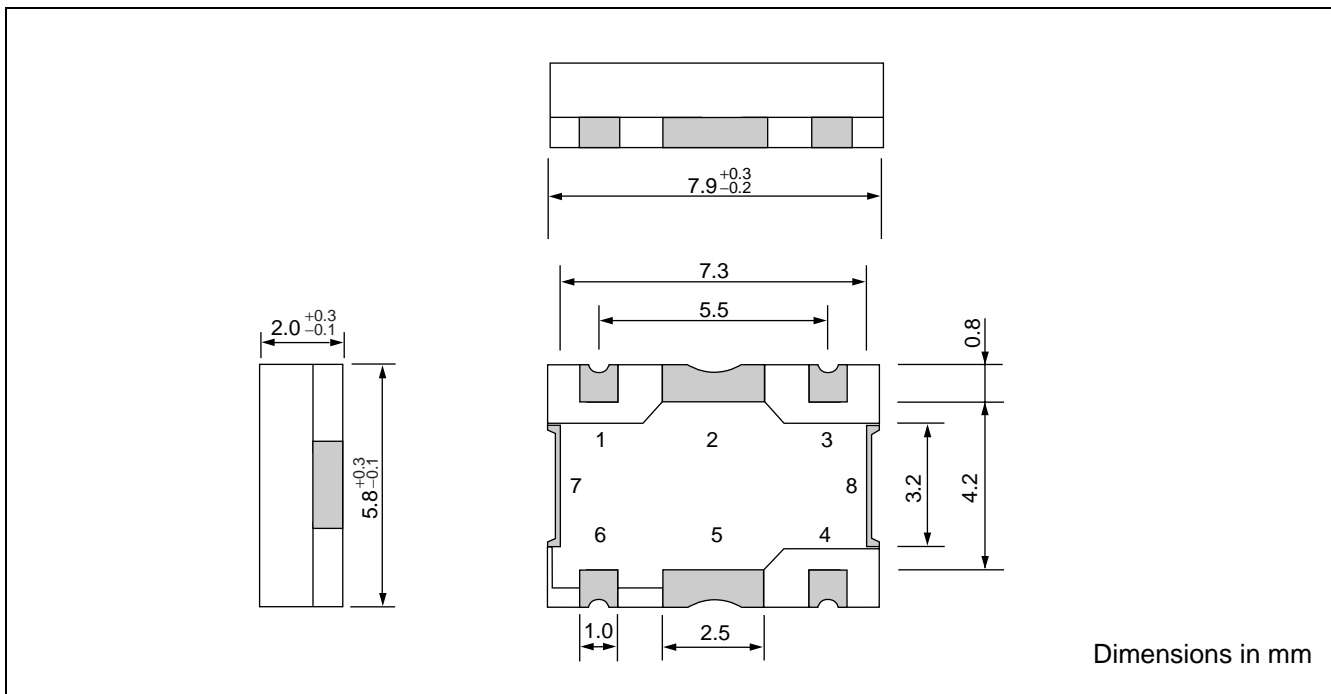


## ■ PART NUMBER DESIGNATION

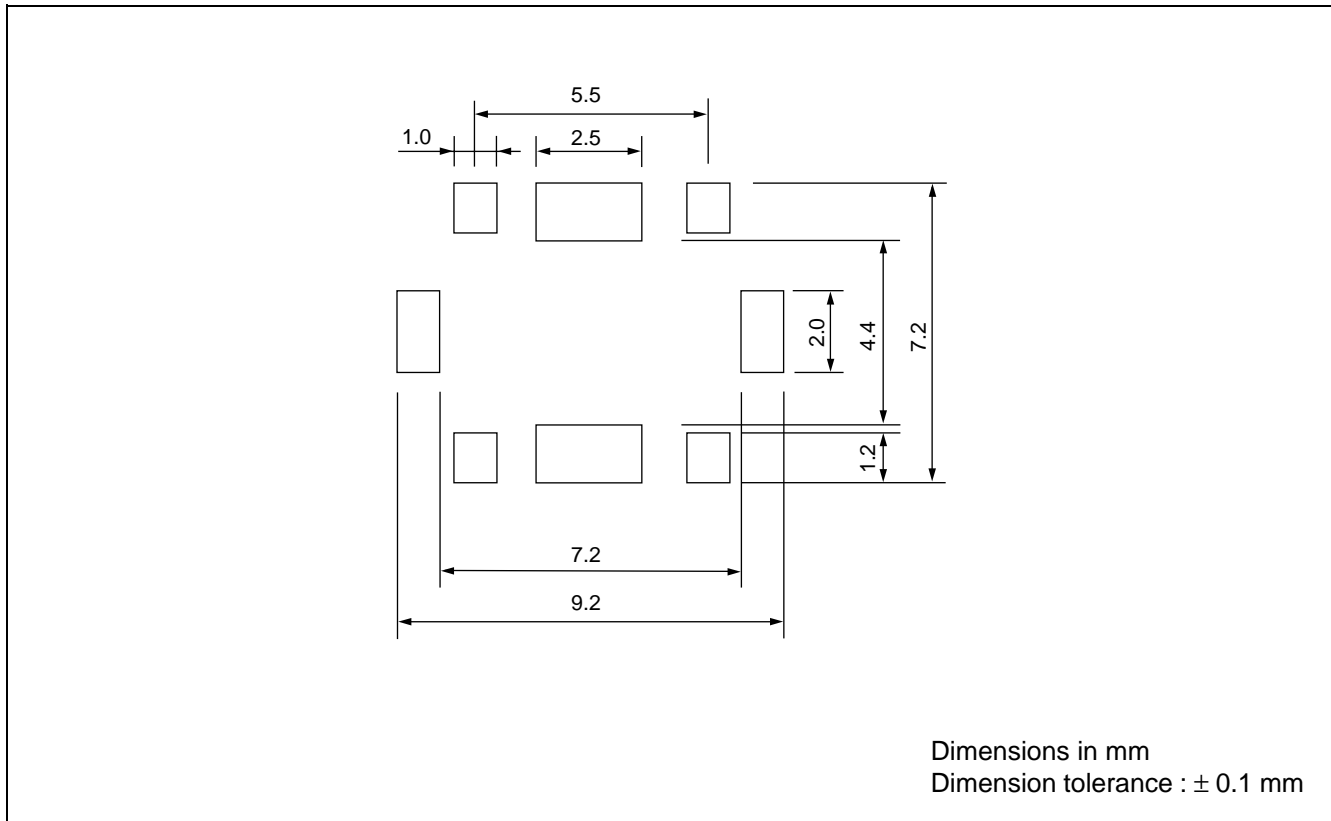


# VC-30 Series

## ■ PACKAGE DIMENSION



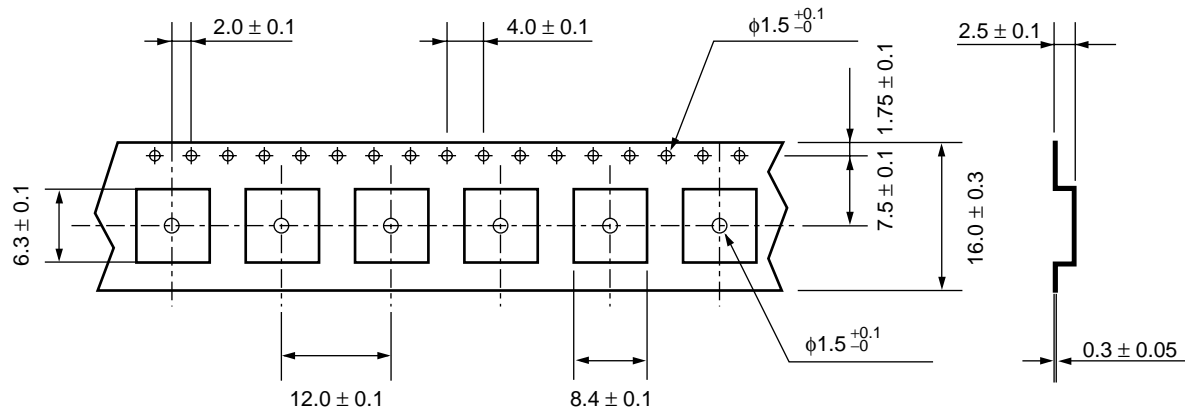
## ■ RECOMMENDED PATTERN FOR SOLDERING



## ■ TAPING AND PACKAGING

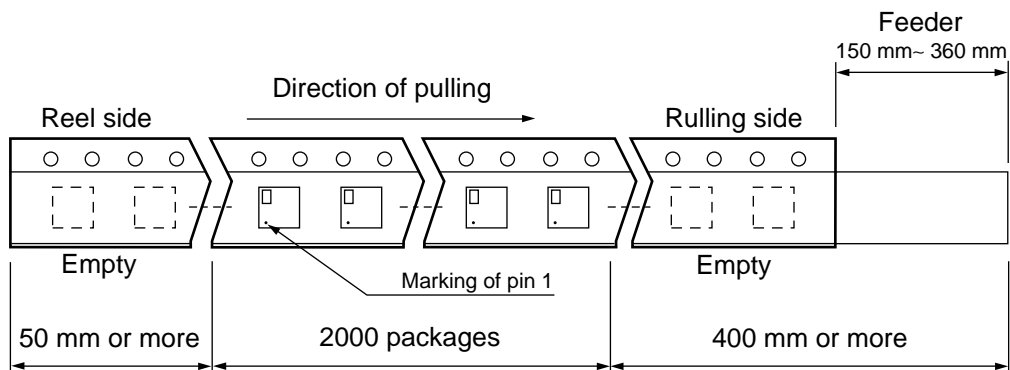
- Volume : 2000 pcs/reel

### (1) Carrier Tape and Packaging



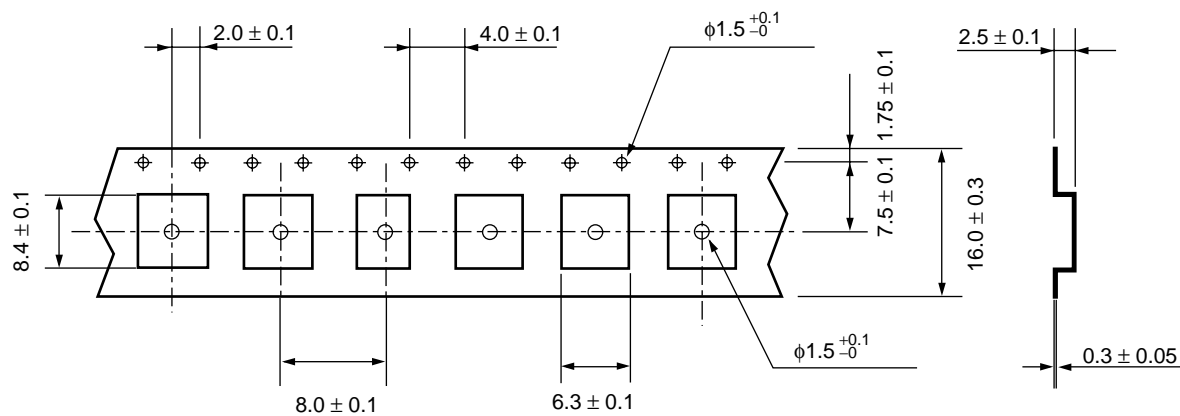
Dimensions in mm

### (2) Taping Layout



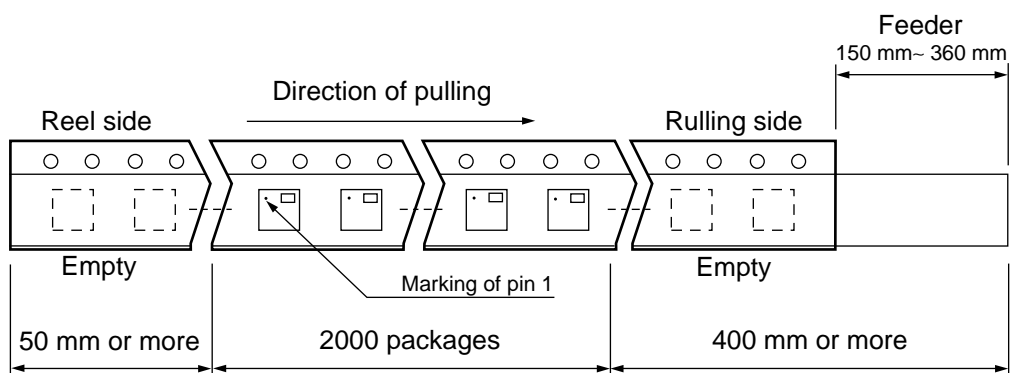
- **Volume : 3000 pcs/reel**

### **(1) Carrier Tape and Packaging**

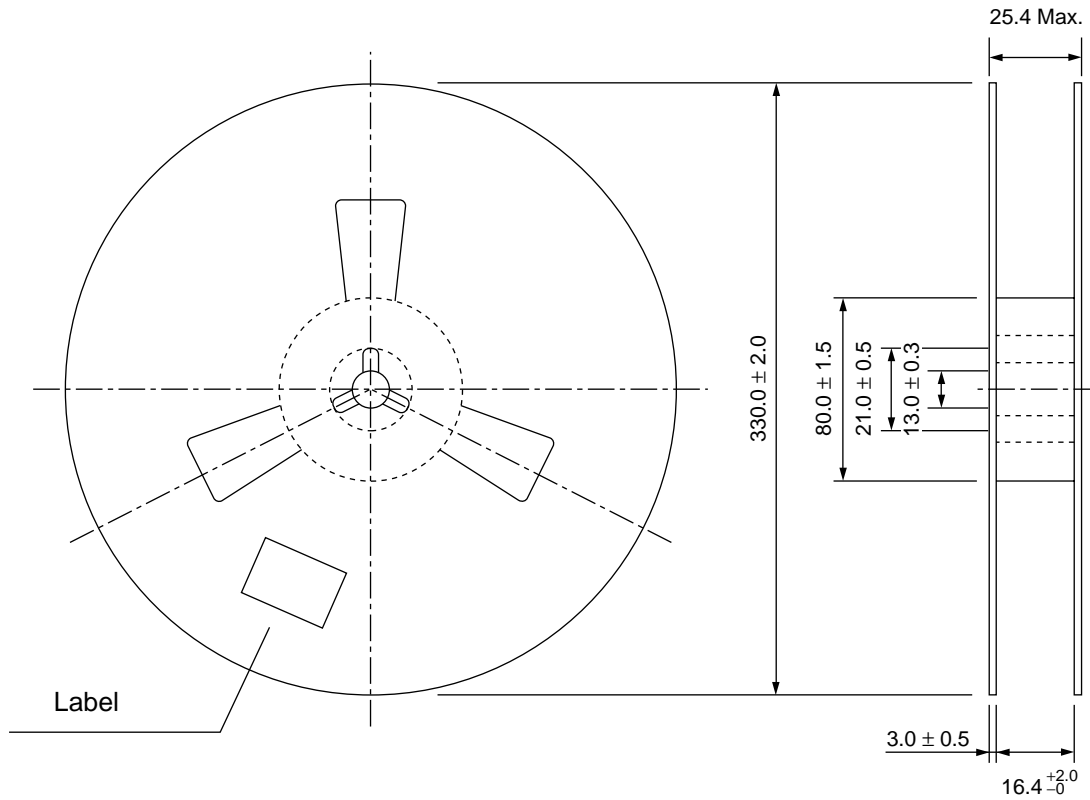


Dimensions in mm

## (2) Taping Layout



## • Reel Shape and Dimensions



Note : The label specifies the part number, quantity, and lot number.

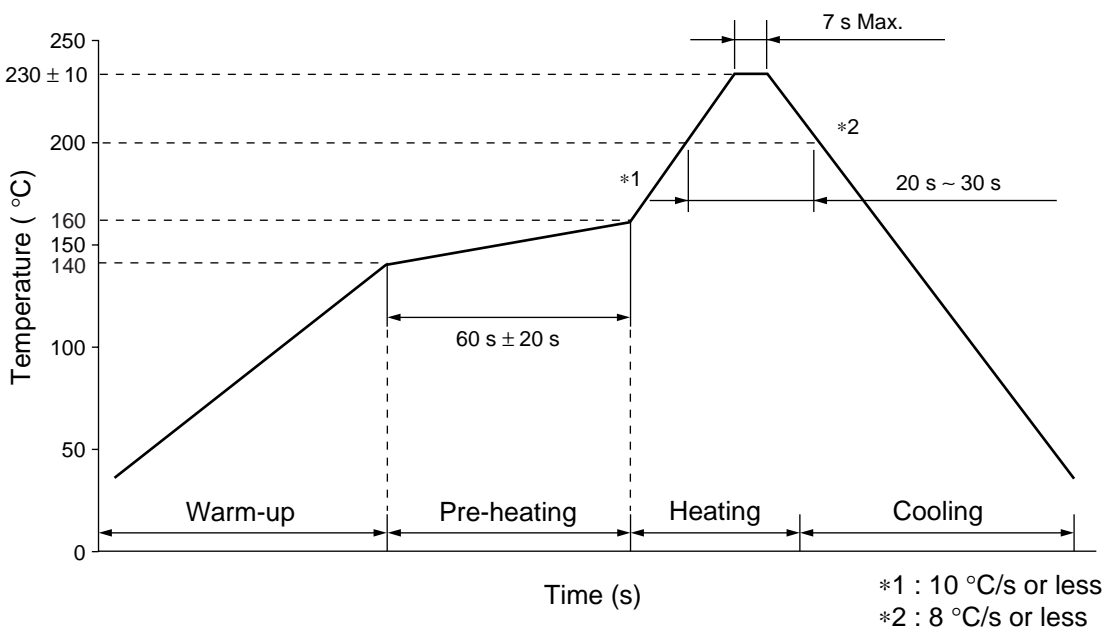
Volume : 2000 pcs/reel or 3000 pcs/reel  
Type : (L) 340 × (W) 340 × (t) 30 (mm)

Dimensions in mm

# VC-30 Series

## REFLOW MOUNTING CONDITIONS (RECOMMENDED)

- Perform mounting using the temperature profile shown below. To prevent thermal stress to the VCO, ensure gentle temperature gradients and use preheating whenever possible. (Recommended preheating: 140 °C to 160 °C for 60 s ± 20 s)
- Always consult FUJITSU MEDIA DEVICE beforehand if mounting more than once.
- Never remove a VCO that has already been mounted and attempt to reuse.
- For mounting, use a general-purpose flux suitable for mounting electronic components.



## WASHING CONDITIONS

- Washing solution: Use isopropyl alcohol.
- Washing procedure: Immersion or steam cleaning is recommended.
- Washing time: For immersion: Less than 5 minutes at 40 °C or less.  
For steam: Less than 2 minutes at 90 °C or less is recommended.

# VC-30 Series

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