FUJITSU MEDIA DEVICE
DATA SHEET

DS04-21715-1E

*ASSP for Mobile Telephone*

# VCO (700 to 2000 MHz)

# VC-30 Series

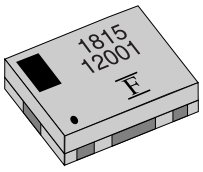
## ■ DESCRIPTION

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

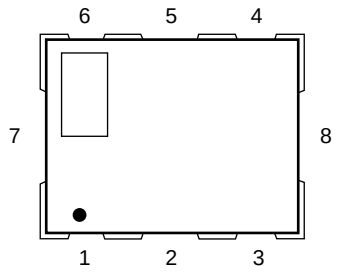
- Superior noise characteristics (C/N, S/N)
- High level of stability in response to ambient temperature and load variations
- FUJITSU MEDIA DEVICE's proprietary fabrication process provides the uniformity of the central frequency distribution
- Small size, light-weight, slim-package : 7.9 × 5.8 × 2.0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

## ■ PACKAGE



## ■ PIN ASSIGNMENT

(TOP VIEW)




## ■ PIN DESCRIPTION

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | Vt | Control voltage |
| 2 | GND | GND |
| 3 | $V_{CC}$ | 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 | $V_{CC}$ | — | + 3.0 | V |
| Control voltage | Vt | — | + 2.5 | V |
| Operating temperature | Ta | –20 | +85 | °C |
| Storage temperature | Tstg | –35 | +90 | °C |
| Storage humidity | Hstg | 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**

(Ta = +25 °C±3 °C)

| Parameter | Symbol | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Current consumption | $I_{CC}$ | $V_{CC}$ = 2.8 V, Vt = 1.35 V | — | — | 6.2 | mA |
| Frequency | fmin | $V_{CC}$ = 2.8 V, Vt = 0.5 V | — | — | 1581.0* | MHz |
| Frequency | fmax | $V_{CC}$ = 2.8 V, Vt = 2.2 V | 1601.0* | — | — | MHz |
| Control voltage sensitivity | kv | (fmax – fmin) / 1.7 | 25.0 | — | 37.0 | MHz/V |
| Oscillator output | $P_O$ | $V_{CC}$ = 2.8 V, Vt = 1.35 V | –5.0 | — | 1.0 | dBm |
| C/N | C/N | $V_{CC}$ = 2.8 V, Vt = 1.35 V, Offset = 1 kHz, BW = 1 Hz | 65.0* | — | — | dBc/Hz |
| | | $V_{CC}$ = 2.8 V, Vt = 1.35 V, Offset = 20 kHz, BW = 1 Hz | 96.0* | — | — | dBc/Hz |
| Higher harmonics | Hs | $V_{CC}$ = 2.8 V, Vt = 1.35 V, 2nd, 3rd | — | — | –10.0 | dBc |
| Power supply variation | Push | $V_{CC}$ = 2.8 V ± 0.2 V, Vt = 1.35 V | — | — | ±1000 | kHz |
| Load variation | Pull | $V_{CC}$ = 2.8 V, Vt = 1.35 V, VSWR = 2 ALL PHASE | — | — | ±1000 | kHz |
| Temperature drift | Td | Ta = +25 (+60/–45) °C | — | — | ±4000* | kHz |

* : Ta = –20 °C to +85 °C

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

**• Absolute Maximum Ratings**

| Parameter | Symbol | Rating | | Unit |
|---|---|---|---|---|
| | | Min. | Max. | |
| Input DC voltage | $V_{CC}$ | — | + 7.0 | V |
| Operating temperature | Ta | –30 | +80 | °C |
| Storage temperature | Tstg | –40 | +90 | °C |
| Storage humidity | Hstg | 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**

(Ta = +25 °C ± 3 °C)

| Parameter | Symbol | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Current consumption | $I_{CC}$ | $V_{CC}$ = 3.35 V, Vt = 1.7 V | — | — | 6.0<br>6.4* | mA |
| Frequency | fmin | $V_{CC}$ = 3.35 V, Vt = 0.7 V | — | — | 954.0* | MHz |
| Frequency | fmax | $V_{CC}$ = 3.35 V, Vt = 2.7 V | 980.0* | — | — | MHz |
| Control voltage sensitivity | kv | (fmax – fmin) / 2.0 | 18.0* | 23.0 | 28.0* | MHz/V |
| Oscillator output | $P_O$ | $V_{CC}$ = 3.35 V, Vt = 1.7 V | –5.0<br>–6.0* | –2.5<br>— | 0.0<br>1.0* | dBm |
| C/N | C/N | $V_{CC}$ = 3.35 V, Vt = 1.7 V, Offset = 1 kHz, BW = 1 Hz | 70.0* | — | — | dBc/Hz |
| | | $V_{CC}$ = 3.35 V, Vt = 1.7 V, Offset = 10 kHz, BW = 1 Hz | 100.0* | — | — | dBc/Hz |
| | | $V_{CC}$ = 3.35 V, Vt = 1.7 V, Offset = 30 kHz, BW = 1 Hz | 110.0* | — | — | dBc/Hz |
| | | $V_{CC}$ = 3.35 V, Vt = 1.7 V, Offset = 60 kHz, BW = 1 Hz | 115.0* | — | — | dBc/Hz |
| Higher harmonics | Hs | $V_{CC}$ = 3.35 V, Vt = 1.7 V, 2nd, 3rd | — | — | –10.0* | dBc |
| Spurious | Sp | $V_{CC}$ = 3.35 V, Vt = 1.7 V | — | — | –70.0* | dBc |
| Power supply variation | Push | $V_{CC}$ = 3.35 V±0.25 V, Vt = 1.7 V | — | — | ±800* | kHz |
| Load variation | Pull | $V_{CC}$ = 3.35 V, Vt = 1.7 V, VSWR = 2 ALL PHASE | — | — | ±1000* | kHz |
| Temperature drift | Td | Ta = +25 °C ± 55 °C | — | — | ±3000* | kHz |

* : Ta = –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 | $V_{CC}$ | — | + 5.0 | V |
| Control voltage | Vt | — | + 5.0 | V |
| Operating temperature | Ta | –30 | +80 | °C |
| Storage temperature | Tstg | –40 | +125 | °C |
| Storage humidity | Hstg | 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**

(Ta = –30 °C to +80 °C)

| Parameter | Symbol | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Current consumption | $I_{CC}$ | $V_{CC}$ = 3.3 V, Vt = 1.65 V | — | — | 8.5 | mA |
| Frequency | fmin | $V_{CC}$ = 3.3 V, Vt = 0.3 V | — | — | 1720.0 | MHz |
| Frequency | fmax | $V_{CC}$ = 3.3 V, Vt = 3.0 V | 1780.0 | — | — | MHz |
| Control voltage sensitivity | kv | (fmax – fmin) / 2.7 | 28.0 | 34.0 | 40.0 | MHz/V |
| Oscillator output | $P_O$ | $V_{CC}$ = 3.3 V, Vt = 1.65 V | –5.0 | –2.0 | 1.0 | dBm |
| C/N | C/N | $V_{CC}$ = 3.3 V, Vt = 1.65 V, Offset = 300 Hz, BW = 1 Hz | 60.0 | — | — | dBc/Hz |
| | | $V_{CC}$ = 3.3 V, Vt = 1.65 V, Offset = 1 kHz, BW = 1 Hz | 70.0 | — | — | dBc/Hz |
| | | $V_{CC}$ = 3.3 V, Vt = 1.65 V, Offset = 10 kHz, BW = 1 Hz | 90.0 | — | — | dBc/Hz |
| | | $V_{CC}$ = 3.3 V, Vt = 1.65 V, Offset = 100 kHz, BW = 1 Hz | 110.0 | — | — | dBc/Hz |
| | | $V_{CC}$ = 3.3 V, Vt = 1.65 V, Offset = 625 kHz, BW = 1 Hz | 129.0 | — | — | dBc/Hz |
| | | $V_{CC}$ = 3.3 V, Vt = 1.65 V, Offset = 1.25 MHz, BW = 1 Hz | 135.0 | — | — | dBc/Hz |
| | | $V_{CC}$ = 3.3 V, Vt = 1.65 V, Offset ≥ 2 MHz, BW = 1 Hz | 139.0 | — | — | dBc/Hz |
| Higher harmonics | Hs | $V_{CC}$ = 3.3 V, Vt = 1.65 V, Up to 3rd | — | — | –10.0 | dBc |
| Spurious | Sp | $V_{CC}$ = 3.3 V, Vt = 1.65 V, Up to 6 GHz | — | — | –70 | dBc |
| | | $V_{CC}$ = 3.3 V, Vt = 1.65 V, Carrier±100 MHz | — | — | –80 | dBc |
| Power supply variation | Push | $V_{CC}$ = 3.3 V ± 0.15 V, Vt = 1.65 V | — | — | ±600 | kHz |
| Load variation | Pull | $V_{CC}$ = 3.3 V, Vt = 1.65 V, VSWR = 2 ALL PHASE | — | — | ±1200 | kHz |
| Temperature drift | Td | Ta = +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 | $V_{CC}$ | — | + 6.0 | V |
| Operating temperature | Ta | –20 | +70 | °C |
| Storage temperature | Tstg | –30 | +85 | °C |
| Storage humidity | Hstg | 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**

(Ta = +25 °C ± 3 °C)

| Parameter | Symbol | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Current consumption | $I_{CC}$ | $V_{CC}$ = 3.3 V, Vt = 1.5 V | — | — | 8.5 | mA |
| Frequency | fmin | $V_{CC}$ = 3.3 V, Vt = 0.5 V | — | — | 1620.0 | MHz |
| Frequency | fmax | $V_{CC}$ = 3.3 V, Vt = 2.5 V | 1650.0 | — | — | MHz |
| Control voltage sensitivity | kv | (fmax – fmin) / 2 | 22.0 | 27.0 | 32.0 | MHz/V |
| Oscillator output | $P_O$ | $V_{CC}$ = 3.3 V, Vt = 1.5 V | –3.0 | 0.0 | 3.0 | dBm |
| C/N | C/N | $V_{CC}$ = 3.3 V, Vt = 1.5 V, Offset = 100 kHz, BW = 1 Hz | 110.0 | — | — | dBc/Hz |
| Higher harmonics | Hs | $V_{CC}$ = 3.3 V, Vt = 1.5 V, 2nd, 3rd | — | — | –10.0 | dBc |
| Power supply variation | Push | $V_{CC}$ = 3.3 V ± 0.15 V, Vt = 1.5 V | — | — | ±1000 | kHz |
| Load variation | Pull | $V_{CC}$ = 3.3 V, Vt = 1.5 V, VSWR = 2 ALL PHASE | — | — | ±1000 | kHz |
| Temperature drift | Td | Ta = +25 °C ± 45 °C | — | — | ±3000 | kHz |

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

**• Absolute Maximum Ratings**

| Parameter | Symbol | Rating | | Unit |
|---|---|---|---|---|
| | | Min. | Max. | |
| Input DC voltage | $V_{CC}$ | — | + 3.0 | V |
| Control voltage | Vt | — | + 2.5 | V |
| Operating temperature | Ta | –25 | +70 | °C |
| Storage temperature | Tstg | –40 | +85 | °C |
| Storage humidity | Hstg | 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.

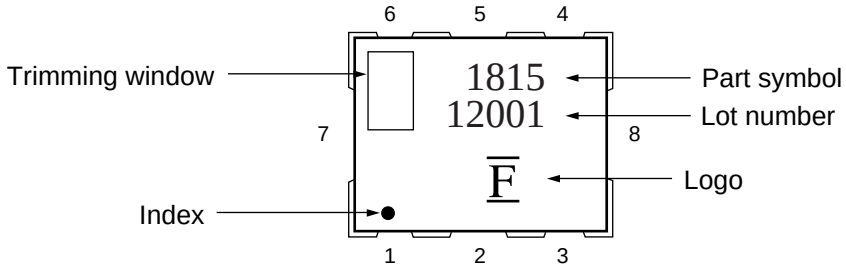
**• Electrical Characteristics**

(Ta = +25 °C ± 3 °C)

| Parameter | Symbol | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Current consumption | $I_{CC}$ | $V_{CC}$ = 2.8 V, Vt = 1.35 V | — | — | 20.0* | mA |
| Frequency | fmin | $V_{CC}$ = 2.8 V, Vt = 0.3 V | — | — | 1710.0* | MHz |
| Frequency | fmax | $V_{CC}$ = 2.8 V, Vt = 2.4 V | 1920.0* | — | — | MHz |
| Control voltage sensitivity | kv | (fmax – fmin) / 2.1 | 110.0* | — | 140.0* | MHz/V |
| Oscillator output | $P_O$ | $V_{CC}$ = 2.8 V, Vt = 1.35 V | 3.0<br>2.0* | — | 7.0<br>8.0* | dBm |
| C/N | C/N | $V_{CC}$ = 2.8 V, Vt = 1.35 V,<br>Offset = 10 kHz, BW = 1 Hz | 90.0* | — | — | dBc/Hz |
| | | $V_{CC}$ = 2.8 V, Vt = 1.35 V,<br>Offset = 400 kHz, BW = 1 Hz | 118.0* | — | — | dBc/Hz |
| Higher harmonics | Hs | $V_{CC}$ = 2.8 V, Vt = 1.35 V,<br>Up to 3rd | — | — | –15.0* | dBc |
| Power supply variation | Push | $V_{CC}$ = 2.8 V ± 0.1 V,<br>Vt = 1.35 V | — | — | ±2000* | kHz |
| Load variation | Pull | $V_{CC}$ = 2.8 V, Vt = 1.35 V,<br>VSWR = 2 ALL PHASE | — | — | ±2000* | kHz |
| Temperature drift | Td | Ta = +25 (+45/–50) °C | — | — | ±8000* | kHz |

* : Ta = –25 °C to +70 °C

## ■ MARKING

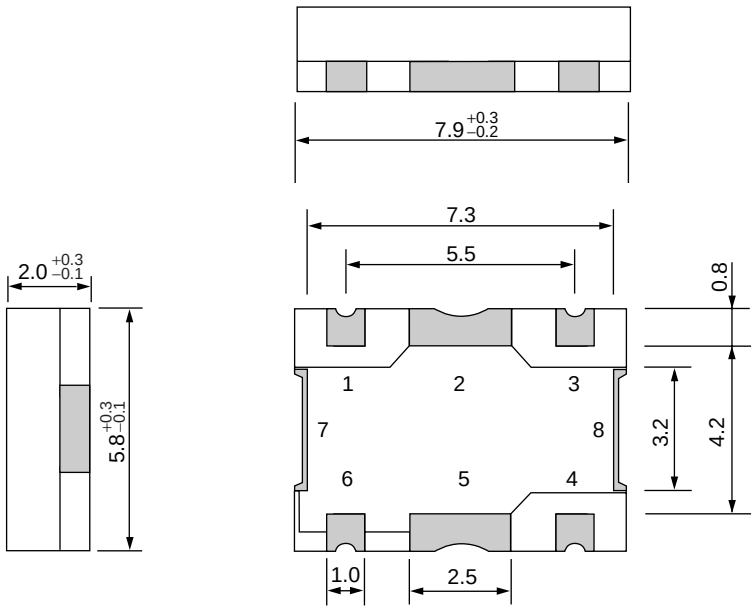



## ■ PART NUMBER DESIGNATION

VC – 2R8 A 30 – 1815

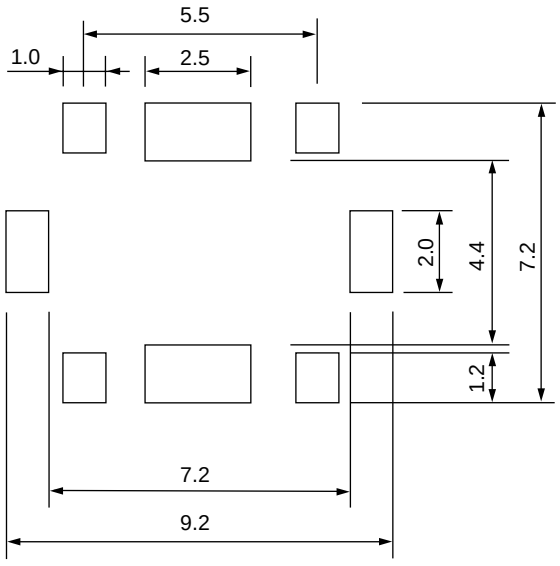
| | |
|---|---|
| Center Frequency | : 1815 MHz |
| Series Name | : VC-30 Series |
| Outer Sheath Type | : SMD |
| Power Supply Voltage | : 2.8 V |
| Product Category | : VCO |

## ■ PACKAGE DIMENSION




Dimensions in mm

## ■ RECOMMENDED PATTERN FOR SOLDERING

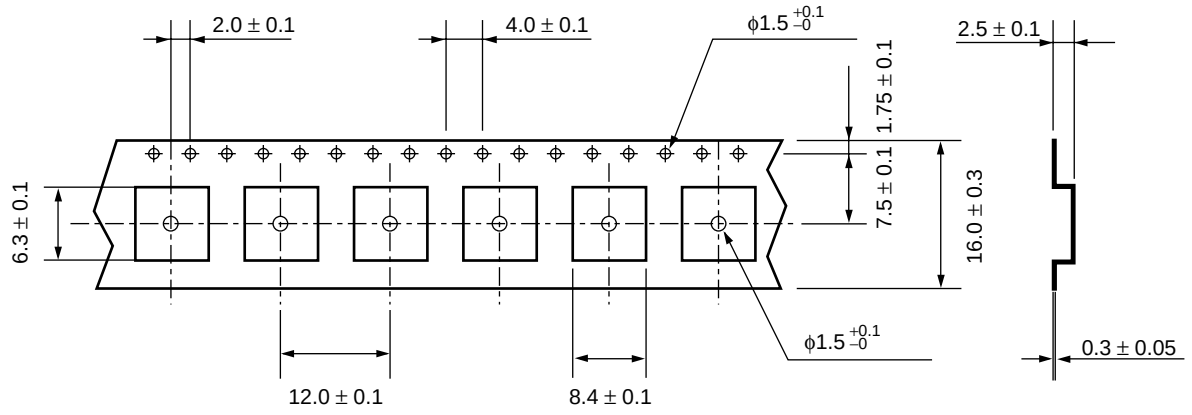



Dimensions in mm
Dimension tolerance : ± 0.1 mm

## ■ TAPING AND PACKAGING

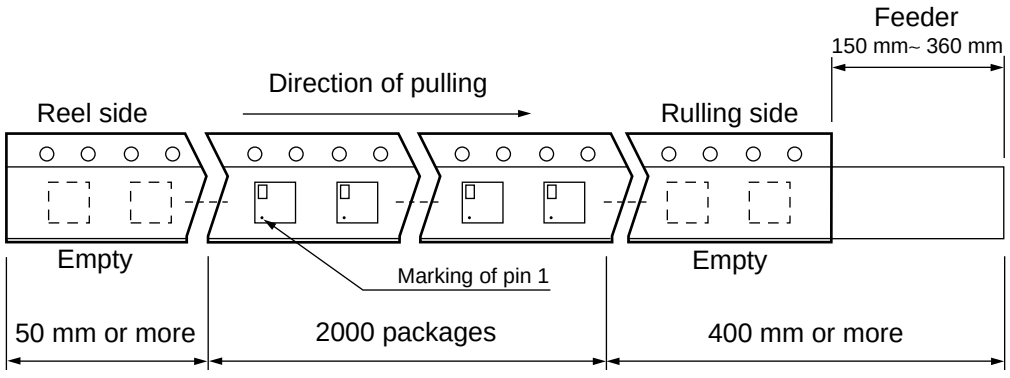
- **Volume : 2000 pcs/reel**

**(1) Carrier Tape and Packaging**



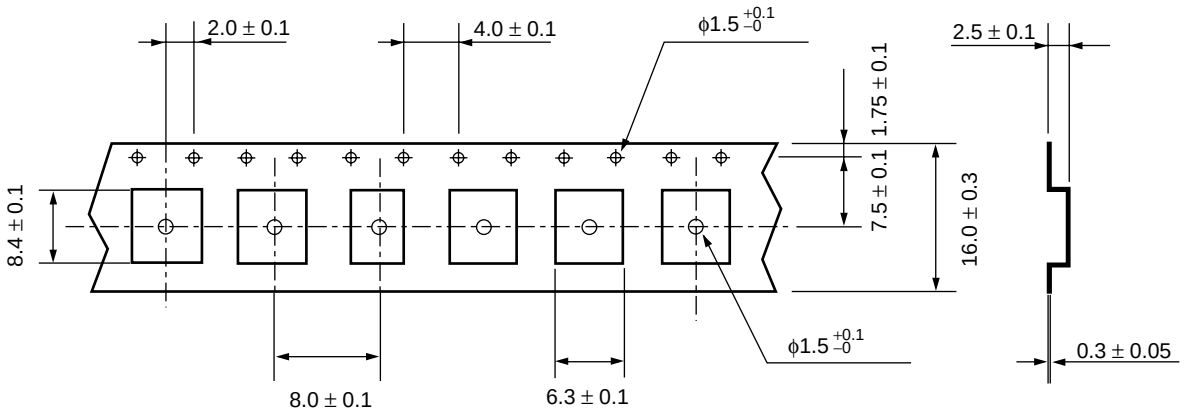

Dimensions in mm

**(2) Taping Layout**



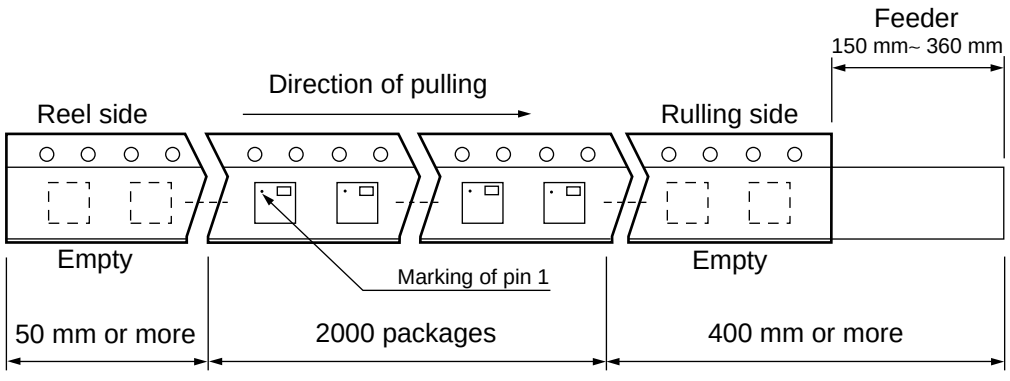
- **Volume : 3000 pcs/reel**

**(1) Carrier Tape and Packaging**

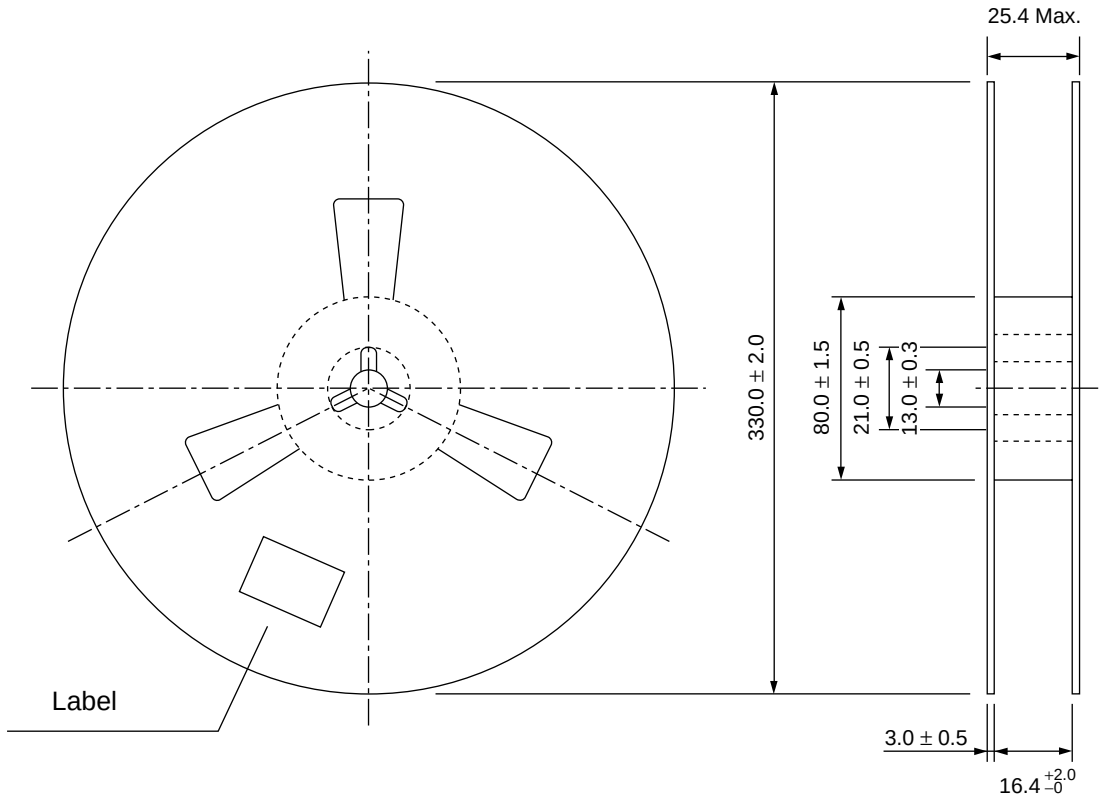



Dimensions in mm

**(2) Taping Layout**



- **Reel Shape and Dimensions**



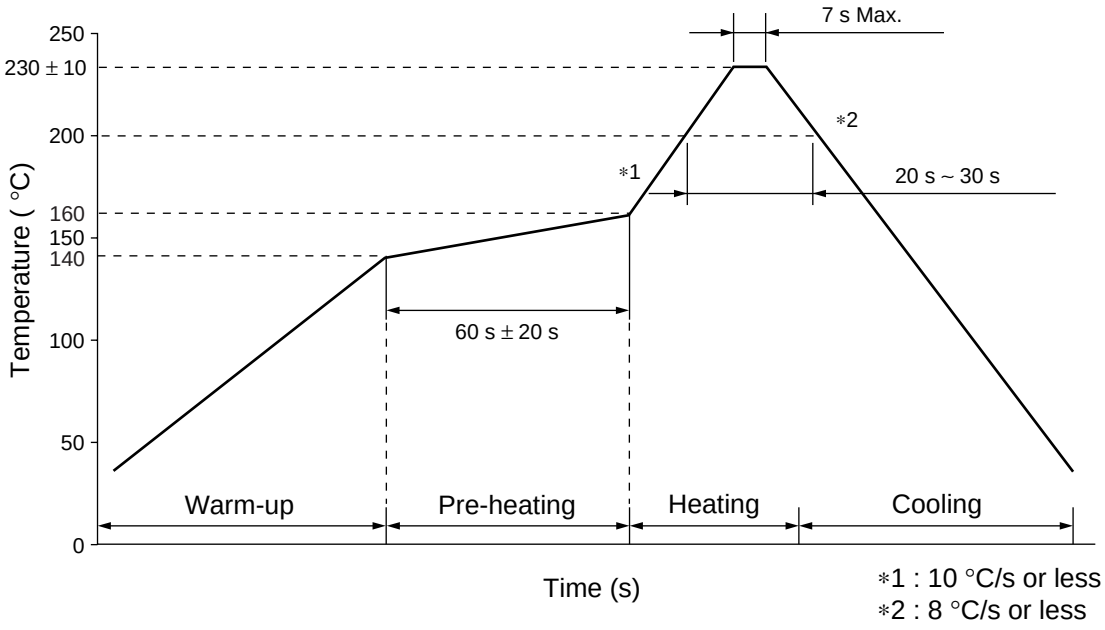

Note : The label specifies the part number, quantity, and lot number.

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

Dimensions in mm

## ■ 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.

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