

ASSP

# Piezoelectric VCO (6 MHz to 30 MHz)

## M2 Series (F150)

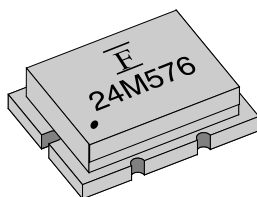
### ■ DESCRIPTION

The M2 series (F150) of VCO (Voltage Controlled Oscillator) apply to the frequency range 6 MHz to 30 MHz. These VCOs have a high stability and wide controllable frequency ranges using a LiTaO<sub>3</sub> piezoelectric single crystal with high electromechanical coupling coefficient. Output level applies to CMOS type for digital interface.

### ■ FEATURES

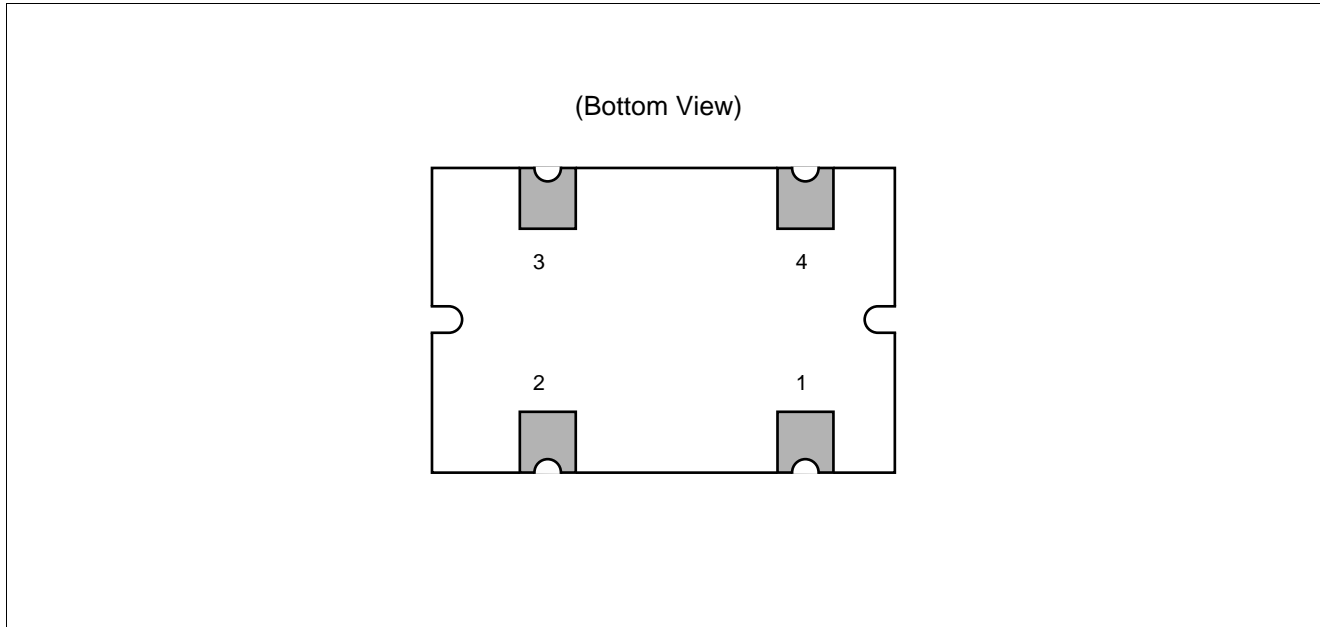
- Wide frequency controllable range (Over than  $\pm 2000$  ppm)
- High carrier noise ratio
- Excellent temperature stability
- CMOS output level
- Compact package (8 mm  $\times$  11 mm  $\times$  2.6 mm)
- Surface mountable package (SMD)

### ■ PACKAGE



# M2 Series (F150)

## ■ PIN ASSIGNMENT



## ■ PIN DESCRIPTIONS

Pin No.	Symbol	Descriptions
1	$V_{IN}$	INPUT (Control voltage)
2	GND	GROUND
3	$V_{CC}$	$V_{CC}$ (Supply voltage)
4	$V_{OUT}$	OUTPUT

# M2 Series (F150)

## ■ ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating		Unit
		Min.	Max.	
Supply voltage	$V_{CC}$	-0.5	+7.0	V
Control voltage	$V_{IN}$	-0.5	+7.0	V
Output voltage	$V_{OUT}$	-0.5	$V_{CC} + 0.5$	V
Output current	$I_{OUT}$	-25	+25	mA
Operating temperature	$T_a$	-10	+70	°C
Storage temperature	$T_{stg}$	-40	+100	°C

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

## ■ RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Value		Unit
		Min.	Max.	
Supply voltage	$V_{CC}$	+4.75	+5.25	V
Control voltage	$V_{IN}$	0	+5.0	V
Operating temperature	$T_a$	-10	+70	°C

WARNING: The recommended operating conditions are required in order to ensure the normal operation of the piezoelectric device. All of the device's electrical characteristics are warranted when the device is operated within these ranges.

Always use semiconductor devices within their recommended operating condition ranges. Operation outside these ranges may adversely affect reliability and could result in device failure.

No warranty is made with respect to uses, operating conditions, or combinations not represented on the data sheet. Users considering application outside the listed conditions are advised to contact their FUJITSU representatives beforehand.

## ■ STANDARD FREQUENCIES

Nominal frequency	Part number	Application
13.500 MHz	FAR-M2CC-13M500-F150	Video
14.318 MHz	FAR-M2CC-14M318-F150	Video
16.934 MHz	FAR-M2CC-16M934-F150	Audio
18.432 MHz	FAR-M2CC-18M432-F150	Video
24.576 MHz	FAR-M2CC-24M576-F150	Audio
25.175 MHz	FAR-M2CC-25M175-F150	Display
27.000 MHz	FAR-M2CC-27M000-F150	Video
33.869 MHz	FAR-M2CC-33M869-F150	Audio

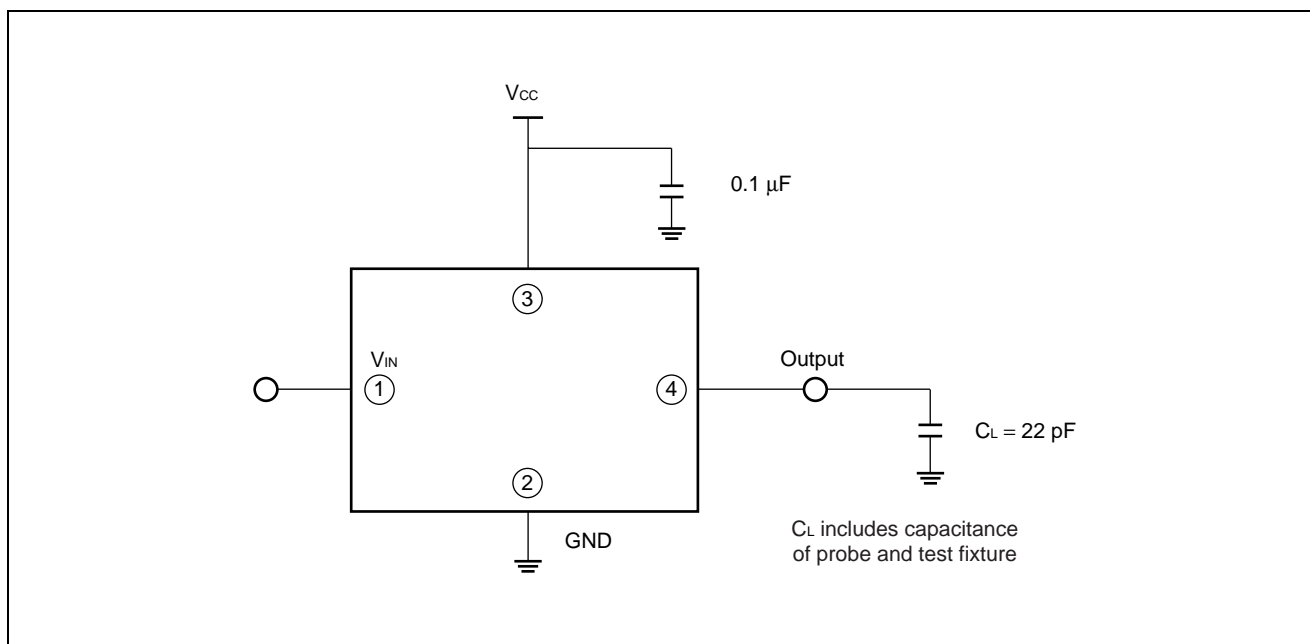
# M2 Series (F150)

## ■ ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Condition	Value			Unit	Remarks
			Min.	Typ.	Max.		
Current consumption	$I_{CC}$	Without load	—	5.0	10	mA	
Output voltage	"H"	$V_{IN} = 2.5\text{ V}$	$V_{CC} - 0.5$	5.0	—	V	
	"L"		—	0	+0.5	V	
Oscillation frequency	$f_H$	$V_{IN} = 5.0\text{ V}$	+2000	—	—	ppm	Nominal frequency reference
	$f_L$	$V_{IN} = 0.0\text{ V}$	—	—	-2000	ppm	
Frequency stability	$\Delta f(V_{CC})$	$V_{CC} = 4.75\text{ V to } 5.25\text{ V}$ $V_{IN} = 2.5\text{ V}$	-150	—	+150	ppm	$V_{CC} = 5.0\text{ V}$ reference
Frequency stability with temperature	$\Delta f(T_a)$	$V_{IN} = 2.5\text{ V}$ $T_a = -10\text{ }^{\circ}\text{C to } +70\text{ }^{\circ}\text{C}$	-500	—	+500	ppm	25°C reference

Unless otherwise specified  $T_a = +25\text{ }^{\circ}\text{C}$ ,  $V_{CC} = 5.0\text{ V}$

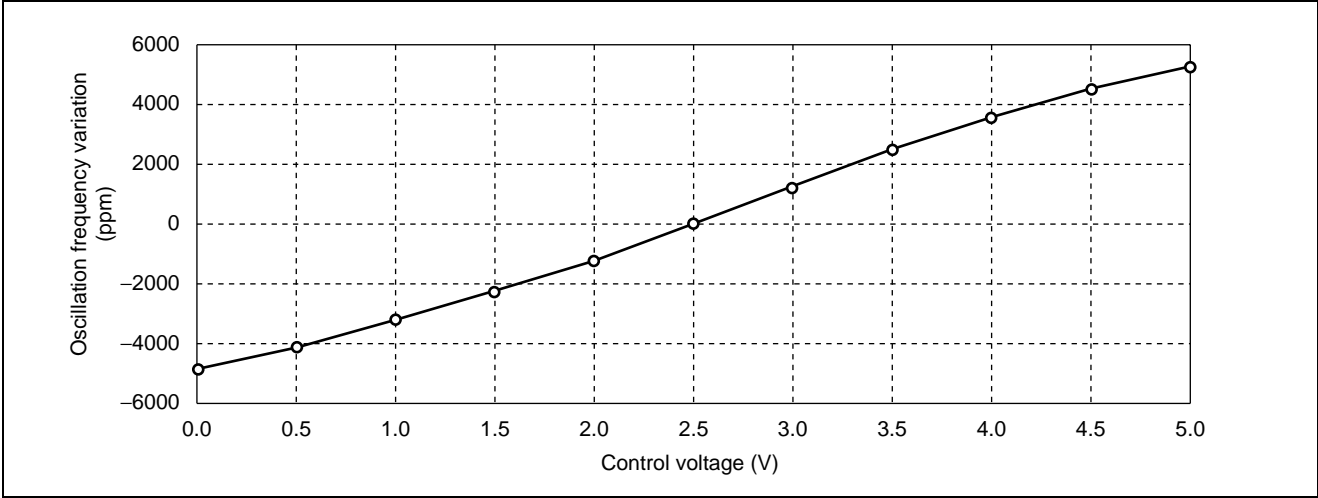
## ■ MEASUREMENT CIRCUIT



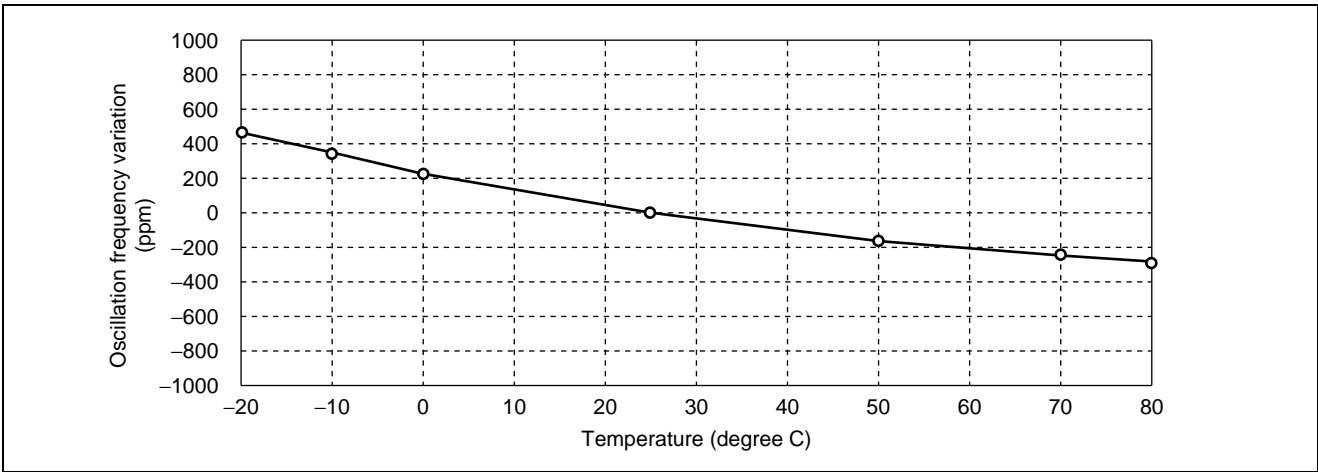
■ TYPICAL CHARACTERISTICS

Part number: FAR-M2CC-16M934-F150

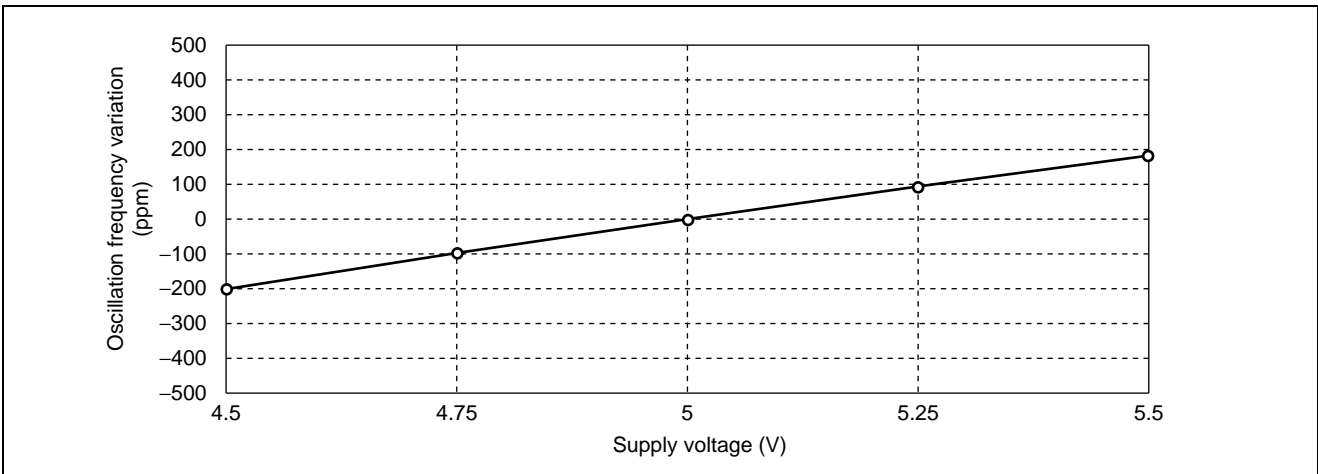
1. Control Voltage vs. Oscillation Frequency Variation



2. Temperature Characteristics



3. Supply Voltage (Vcc) vs. Oscillation Frequency Variation



# M2 Series (F150)

## ■ PART NUMBER DESIGNATION

[Designation example]

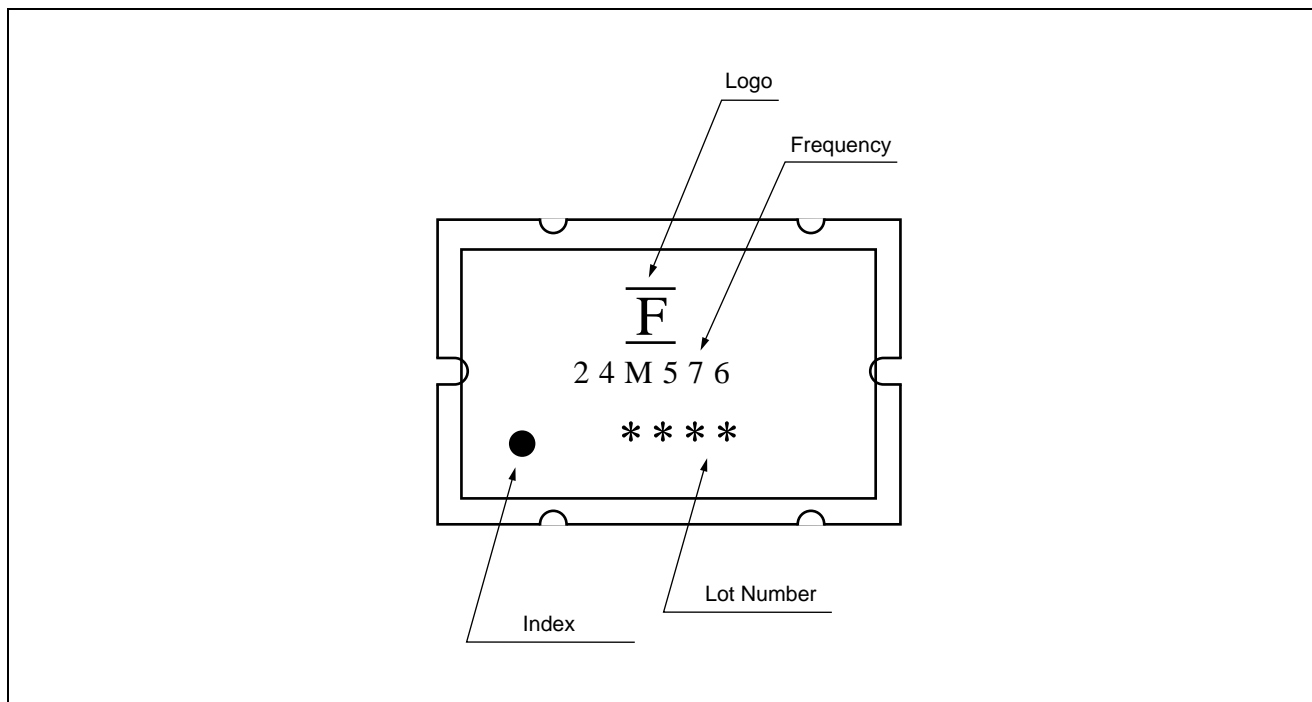
FAR – M2CC – □□□□□□ – F150 – R  
(1) (2)

(1) : Frequency : This specifies the nominal frequency using six alphanumeric characters.  
M indicates the decimal point.

[Example] 24.576 MHz → 24M576

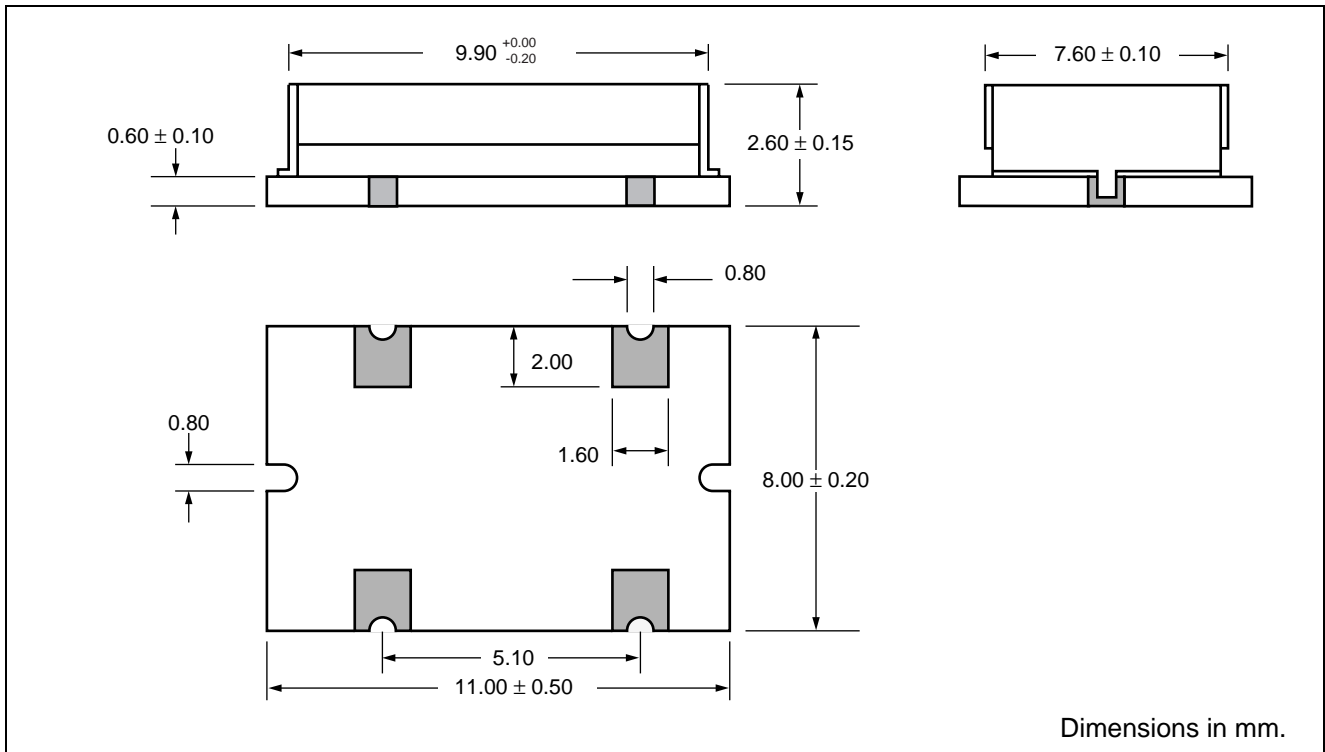
(2) : Taping : “-R” means 1000 pcs/reel

## ■ MARKING

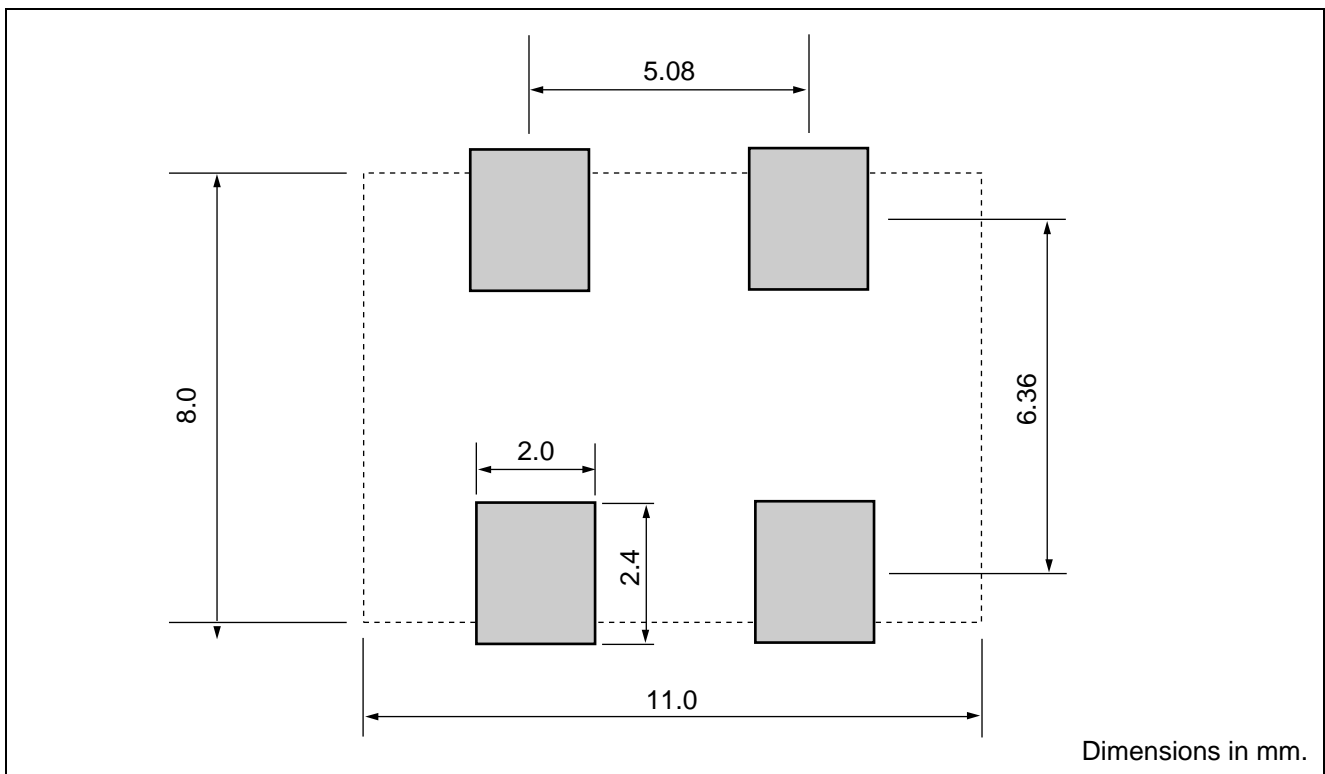


# M2 Series (F150)

## ■ PACKAGE DIMENSION



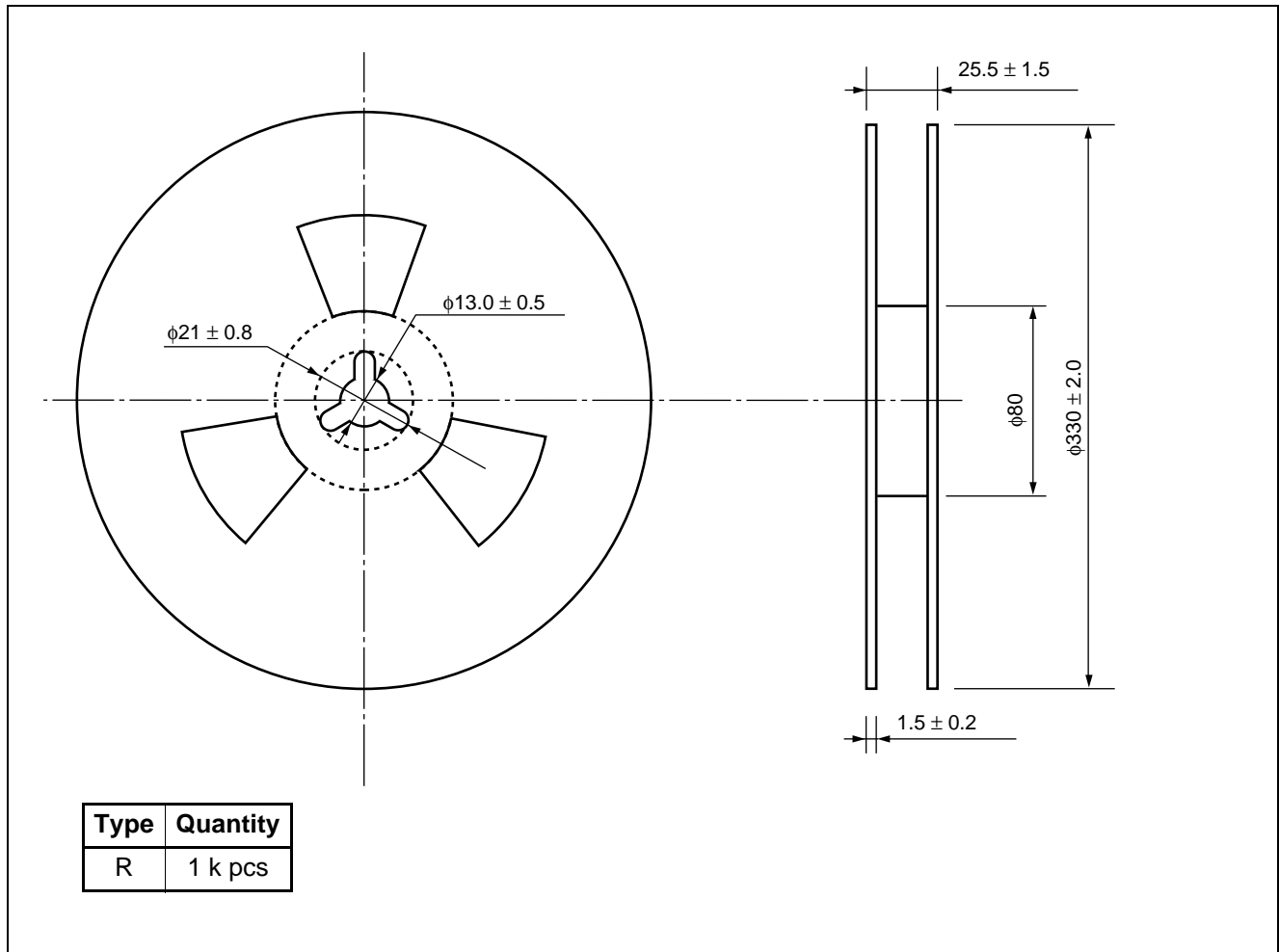
## ■ RECOMMENDED LAND PATTERN



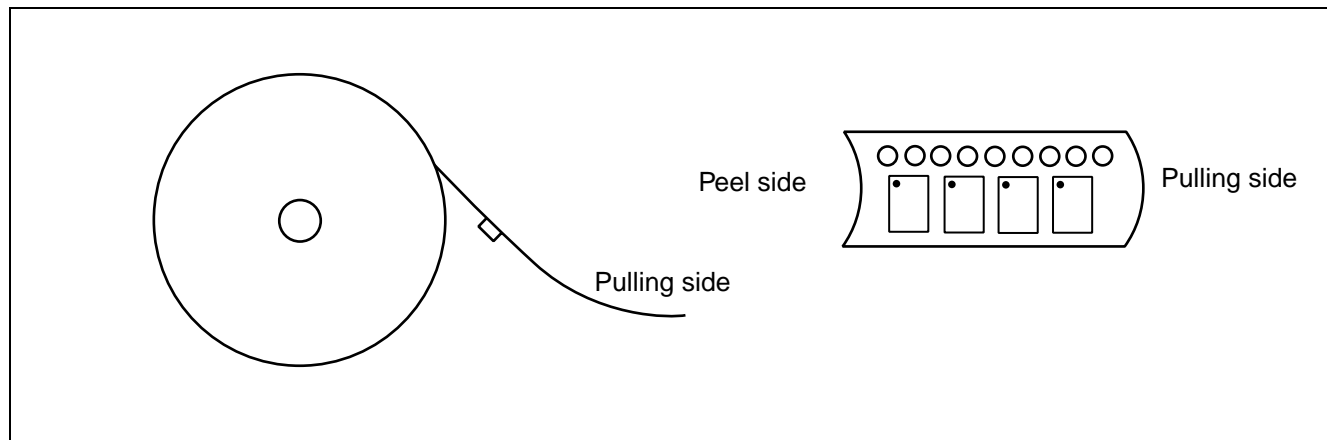
# M2 Series (F150)

## ■ PACKAGE: Reel type

### 1. Reel Dimensions

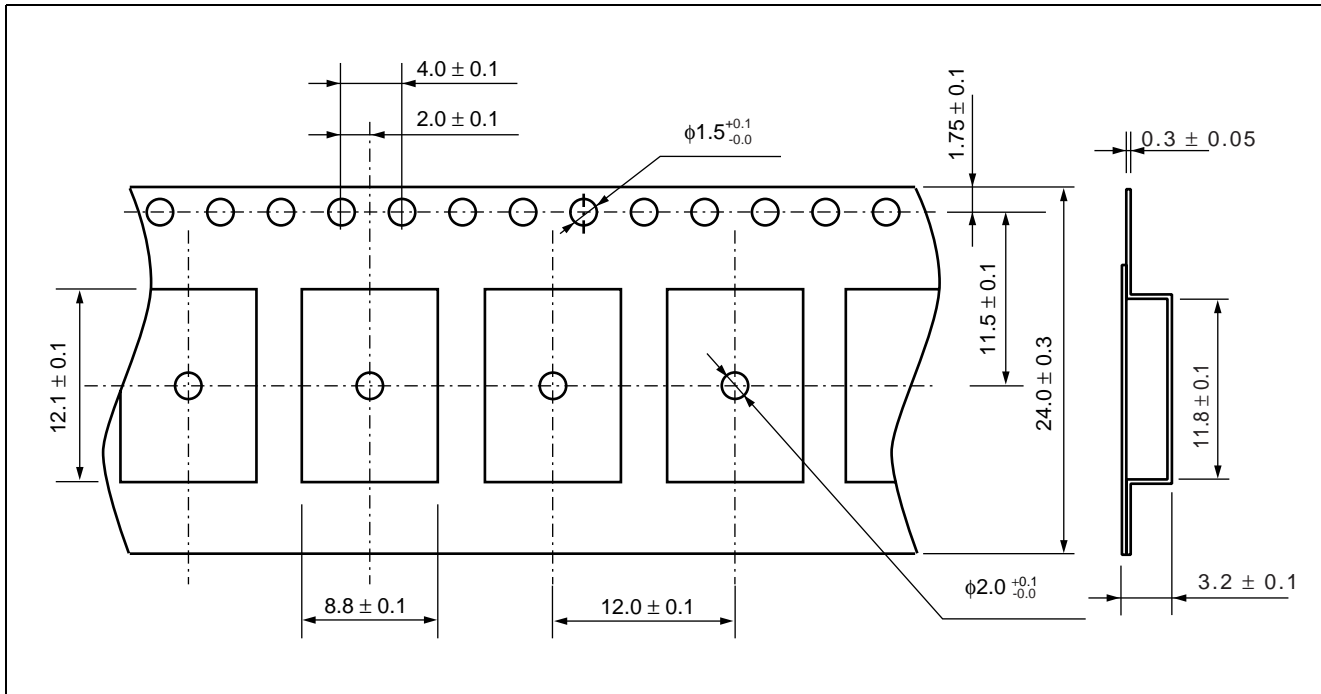


### 2. Packing style





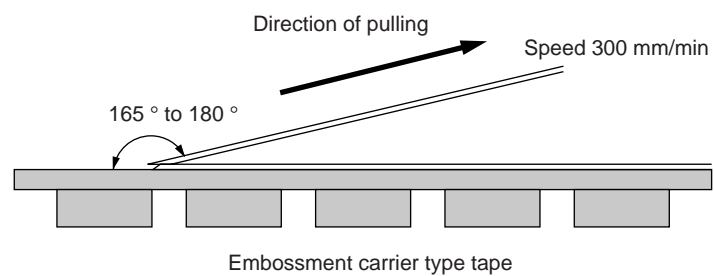
## 3. Tape Dimensions



## 4. Peel strength of top cover tape

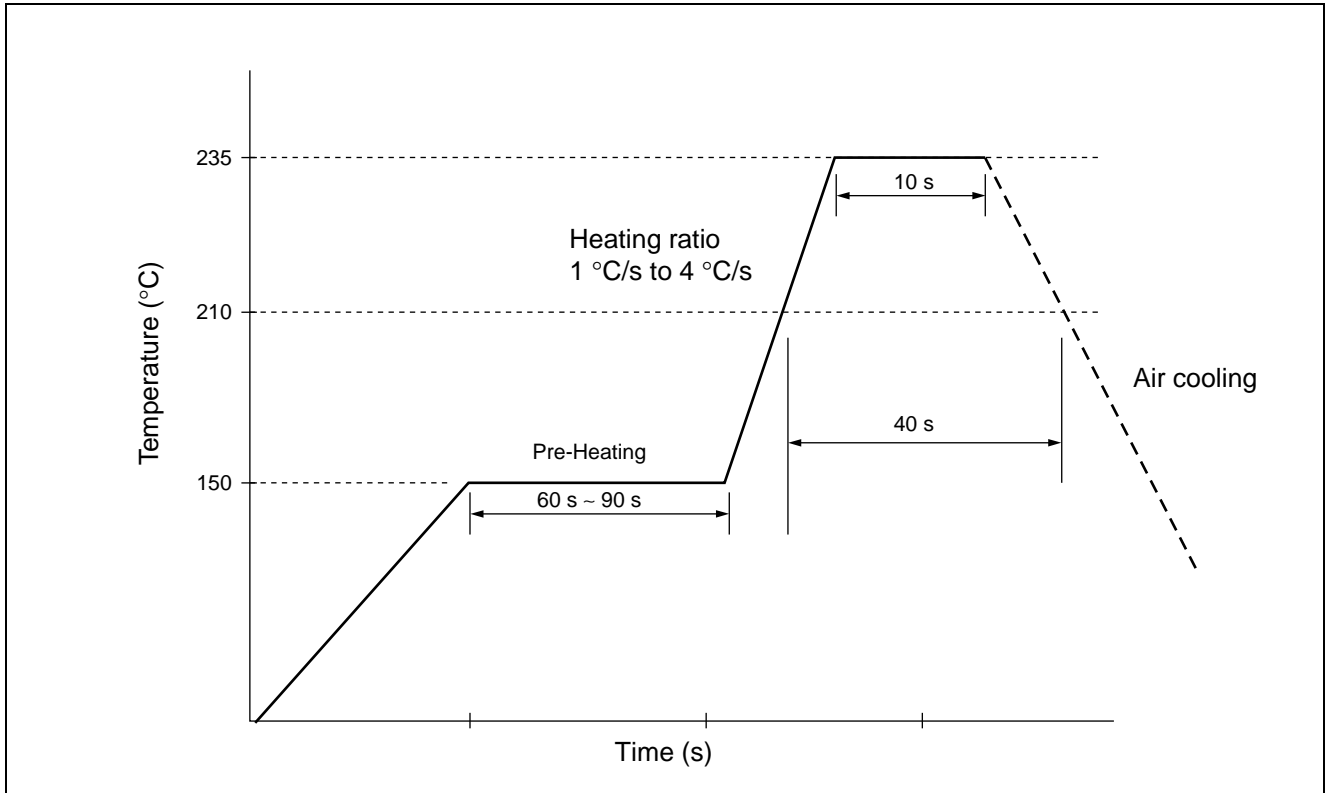
Peel off by the force of 0.1 N to 1.0 N under the condition at the right.

(Conforms to JIS C 0806 section 3)



# M2 Series (F150)

## ■ RECOMMENDED REFLOW PROFILE



## ■ NOTE

A mass-produced product order is accepted by a unit of 1000.

# M2 Series (F150)

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