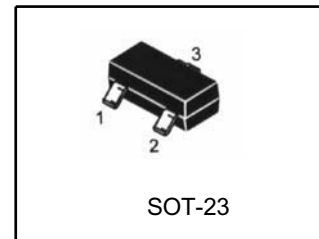


Programmable Precision Reference

LR431ATSLT1G

DESCRIPTION

The LR431 is a three-terminal adjustable regulator with a guaranteed thermal stability over applicable temperature ranges. The output voltage may be set to any value between V_{ref} (approximately 2.5V) and 36V with two external resistors. It provides very wide applications, including shunt regulator, series regulator, switching regulator, voltage reference and others.

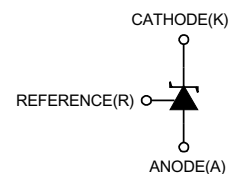
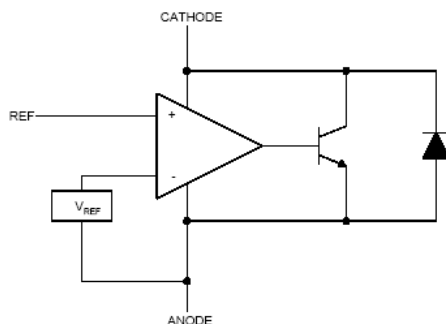


SOT-23 1: Ref; 2: Cathode; 3: Anode

FEATURES

- Programmable output Voltage to 36V.
- Low dynamic output impedance 0.2Ω
- Sink current capability of 1 to 100mA.
- Equivalent full-range temperature coefficient of $50\text{ppm}/^\circ\text{C}$ typical for operation over full rated operating temperature range.
- We declare that material of product compliance with ROHS requirements.
- ESD: HBM 4000V

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (Operating temperature range applies unless otherwise specified)

PARAMETER	SYMBOL	VALUE	UNIT
Cathode Voltage	V _{KA}	36	V
Cathode Current Range(Continuous)	I _{KA}	-100 ~ +150	mA
Reference Input Current Range	I _{ref}	-0.05 ~ +10	mA
Operating Junction Temperature	T _j	150	°C
Thermal Resistance	θ _{JA}	206	°C/W
Operating Ambient Temperature	T _{opr}	-40 ~ +125	°C
Storage Temperature	T _{stg}	-65 ~ +150	°C

RECOMMENDED OPERATING CONDITIONS

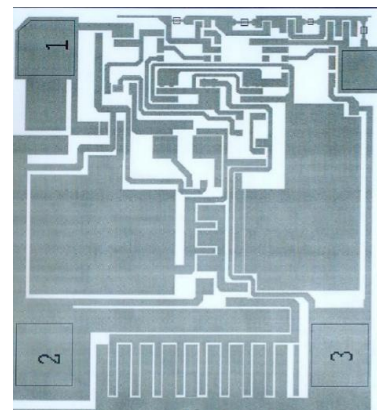
PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Cathode Voltage	V _{KA}	V _{REF}		36	V
Cathode Current	I _{KA}	0.5		100	mA

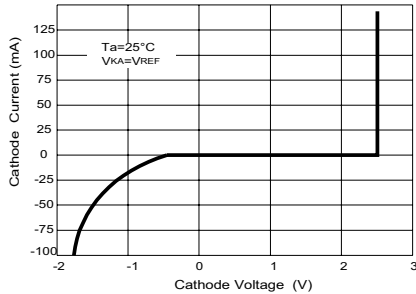
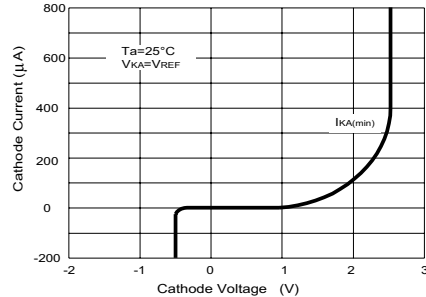
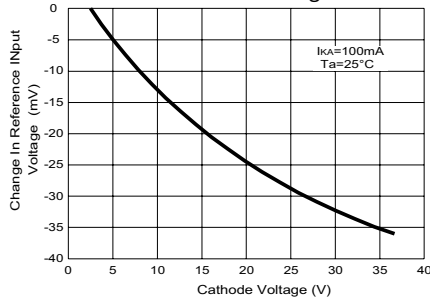
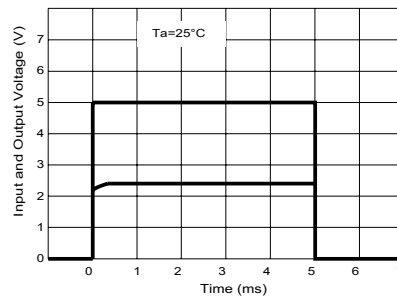
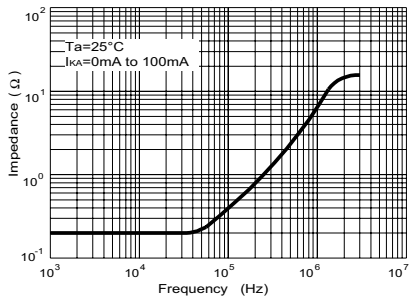
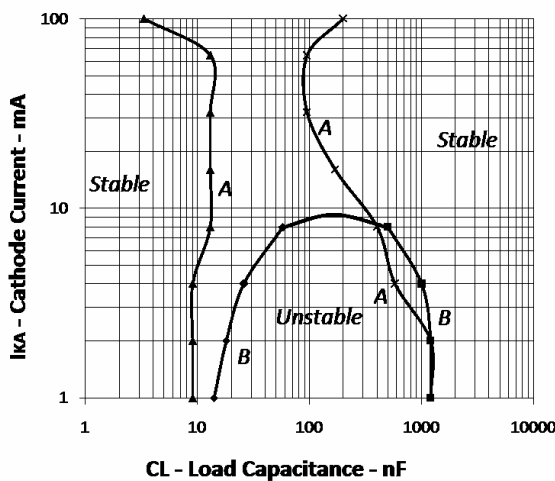
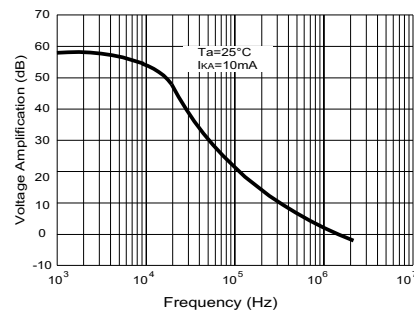
ELECTRICAL CHARACTERISTICS(T_a=25°C, unless otherwise specified)

Characteristic		Symbol	Test conditions	MIN	TYP	MAX	UNIT
Reference Input Voltage 1	0.5%	V _{ref}	V _{KA} =V _{REF} , I _{KA} =10mA	2.488	2.50	2.512	V
	1%			2.475	2.50	2.525	
	2%			2.450	2.50	2.550	
Reference Input Voltage 2*	0.5%	V _{ref}	V _{KA} =V _{REF} , I _{KA} =10mA	2.483	2.495	2.507	V
	1%			2.470	2.495	2.520	
	2%			2.445	2.495	2.545	
Deviation of reference Input Voltage Over temperature		ΔV _{ref}	V _{KA} =V _{REF} , I _{KA} =10mA T _{MIN} ≤T _A ≤T _{MAX}		4.5	25	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage		ΔV _{ref} /ΔV _{KA}	I _{KA} =10mA	ΔV _{KA} =10V~V _{REF}	-1.0	-2.7	mV/V
				ΔV _{KA} =36V~10V	-0.5	-2.0	
Reference Input Current		I _{ref}	I _{KA} =10mA, R ₁ =10kΩ, R ₂ =∞		1	2	μA
Deviation of Reference Input Current Over Full Temperature Range		ΔI _{ref} /ΔT	I _{KA} =10mA, R ₁ =10kΩ, R ₂ =∞, T _A =full Temperature		0.2	0.4	μA
Minimum cathode current for regulation		I _{KA} (min)	V _{KA} =V _{REF}		0.3	0.5	mA
Off-state cathode Current		I _{KA} (OFF)	V _{KA} =36V, V _{REF} =0		0.05	0.5	μA
Dynamic Impedance		Z _{KA}	V _{KA} =V _{REF} , I _{KA} =1 to 100mA f≤1.0kHz		0.15	0.5	Ω

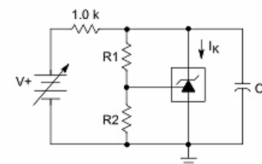
CLASSIFICATION OF V_{ref} AND PACKAGE

Type	RanK	Range(V)	Marking	Package	T _{opr}
LR431ATSLT1G	0.5%	2.488~2.512	RAS	SOT-23	-40~+125 °C
LR431BTSLS1G	1%	2.475~2.525	RBS	SOT-23	-40~+125 °C
LR431APTSLS1G	0.5%	2.483~2.507		SOT-23	-40~+125 °C
LR431BPTSLS1G	1%	2.470~2.520		SOT-23	-40~+125 °C


 Chip Size(before saw) : 0.69 *0.62 (mm)²

TYPICAL PERFORMANCE CHARACTERISTICS
Fig 1 Cathode Current Vs Cathode Voltage

Fig 2 Cathode Current Vs Cathode Voltage

Fig 3 Change in Reference Input Voltage Vs Cathode voltage

Fig 4 Pulse Response

Fig 5 Dynamic Impedance Vs Frequency

Fig 6 Small Signal Voltage Amplification Vs Frequency

Fig7. Stability Boundary Conditions (Ta=25 ° C)

Note: The region C is not unstable when test current is above 1mA,


Fig8. Test Circuit for Fig7

Unstable region	VKA(V)	R1(KΩ)	R2(KΩ)
A	Vref	0	∞
B	5	10	10
C	10	30	10

TEST CIRCUIT

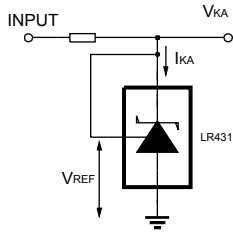


Fig9 Test Circuit For $V_{KA}=V_{REF}$

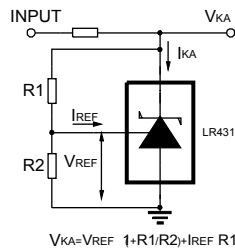


Fig10 Test Circuit for $V_{KA} \geq V_{REF}$

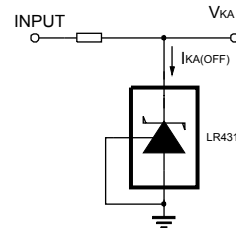


Fig11 Test Circuit For $I_{KA(OFF)}$

APPLICATION CIRCUIT

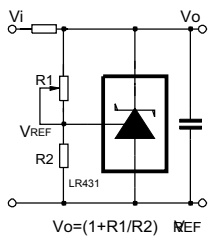


Fig12 Shutdown Regulator

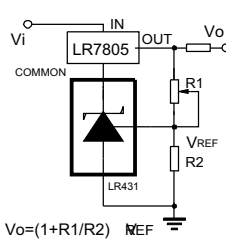


Fig13 Output Control of a Three-Terminal Fixed Regulator

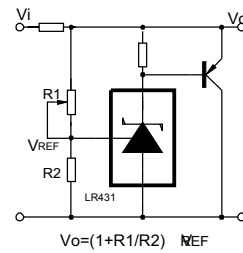


Fig14 Higher-current Shunt Regulator

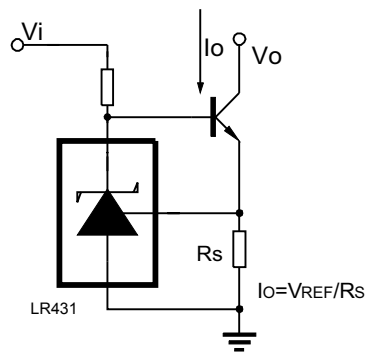


Fig15 Constant-current Sink

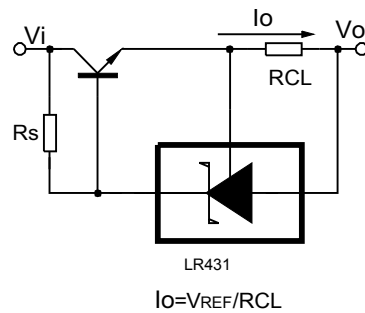
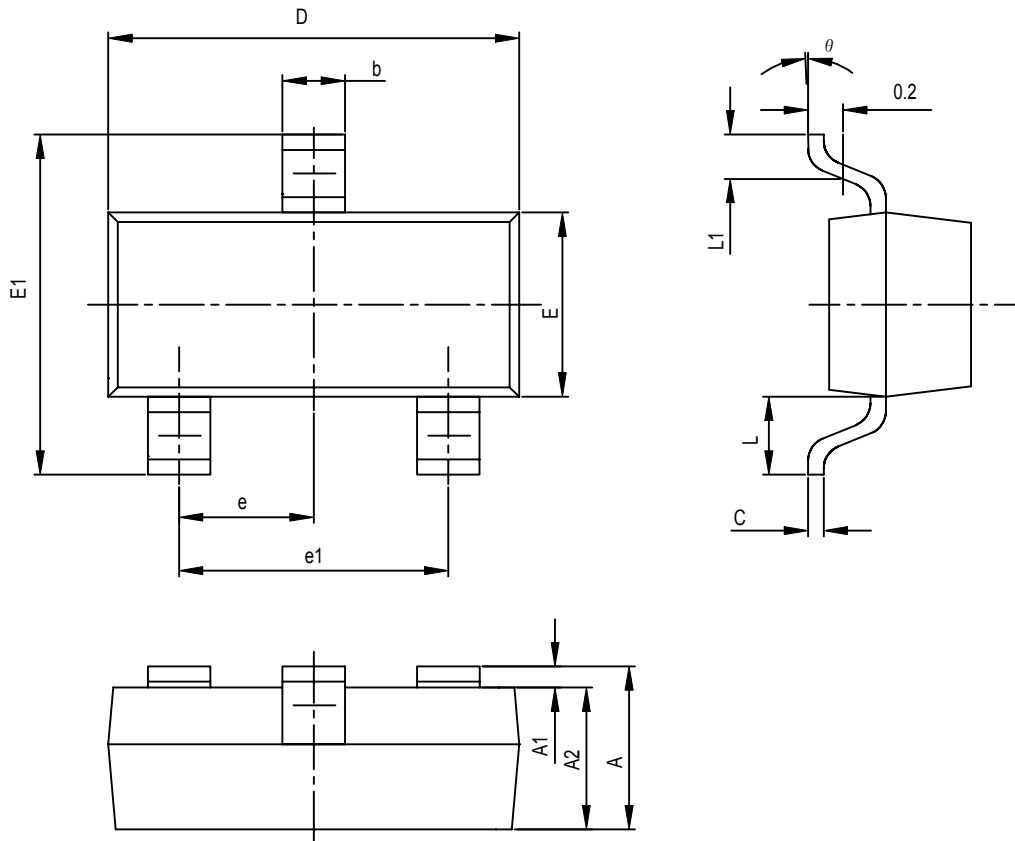


Fig16 Current Limiting or Current Source

SOT-23 PACKAGE OUTLINE DIMENSIONS


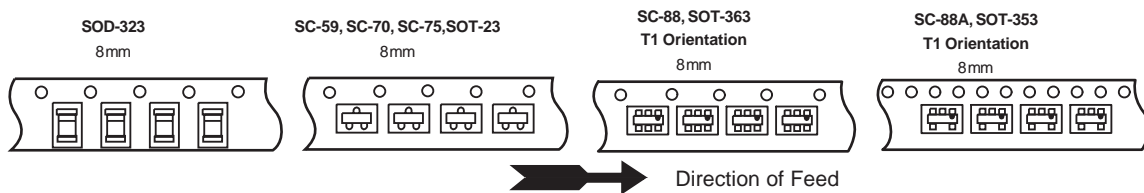
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.100	0.110	0.118
E	1.200	1.610	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950TPY		0.037TPY	
e1	1.800	2.000	0.071	0.079
L	0.550REF		0.022REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

Tape & Reel and Packaging Specifications

Embossed Tape and Reel is used to facilitate automatic pick and place equipment feed requirements. The tape is used as the shipping container for various products and requires a minimum of handling. The antistatic/conductive tape provides a secure cavity for the product when sealed with the “peel-back” cover tape.

- Two Reel Sizes Available (7" and 13")
- Used for Automatic Pick and Place Feed Systems
- Minimizes Product Handling
- EIA 481, -1, -2
- SOT-23, SC-70/SOT-323,
- SC-89, SC-88/SOT-363, SC-88A/SOT-353,
- SOD-323, SOD-523 in 8 mm Tape

Use the standard device title and add the required suffix as listed in the option table below (Table 1). Note that the individual reels have a finite number of devices depending on the type of product contained in the tape. Also note the minimum lot size is one full reel for each line item, and orders are required to be in increments of the single reel quantity.

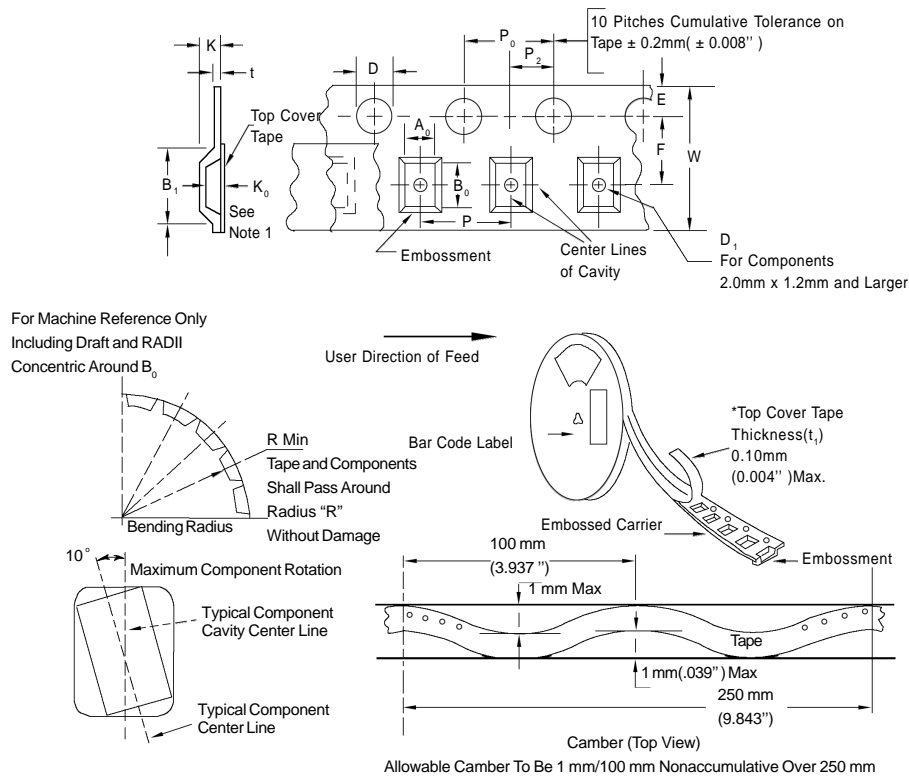


Typical Reel Orientations

Table 1. EMBOSSED TAPE AND REEL ORDERING INFORMATION

Package	Tape Width (mm)	Pitch mm	Reel Size mm(inch)	Devices Per Reel and Minimum Order Quantity	Device Suffix
SOT-23	8	4	178	(7)	3,000 T1
	8		330	(13)	10,000 T3
SC-70/SOT-323	8	4	178	(7)	3,000 T1
	8		330	(13)	10,000 T3
SC-89	8	4	178	(7)	3,000 T1
	8		330	(13)	10,000 T3
SC-88/SOT-363	8	4	178	(7)	3,000 T1
	8		330	(13)	10,000 T3
SC-88A/SOT-353	8	4	178	(7)	3,000 T1
	8		330	(13)	10,000 T3
SOD-323	8	4	178	(7)	3,000 T1
	8		330	(13)	10,000 T3
SOD-523	8	4	178	(7)	3,000 T1
	8		330	(13)	10,000 T3

EMBOSSED TAPE AND REEL DATA CARRIER TAPE SPECIFICATIONS



DIMENSIONS

Tape Size	B ₁ Max	D	D ₁	E	F	K	P ₀	P ₂	RMin	TMax	WMax
8mm	4.55mm (.179")	1.5±0.1mm - 0.0	1.0Min (.039")	1.75±0.1mm (.069±.004)	3.5±0.05mm (.138±.002")	2.4mmMax (.094")	4.0±0.1mm (.157±.004")	2.0±0.1mm (.079±.002")	25mm (.98")	0.6mm (.024")	8.3mm (.327")
12mm	8.2mm (.323")	(.059±.004" - 0.0)	1.5mmMin (.060")		5.5±0.05mm (.217±.002")	6.4mmMax (.252")			30mm (1.18")		12±.30mm (.470±.012")
16mm	12.1mm (.476")				7.5±0.10mm (.295±.004")	7.9mmMax (.311")					16.3mm (.642")
24mm	20.1mm (.791")				11.5±0.1mm (.453±.004")	11.9mmMax (.468")					24.3mm (.957")

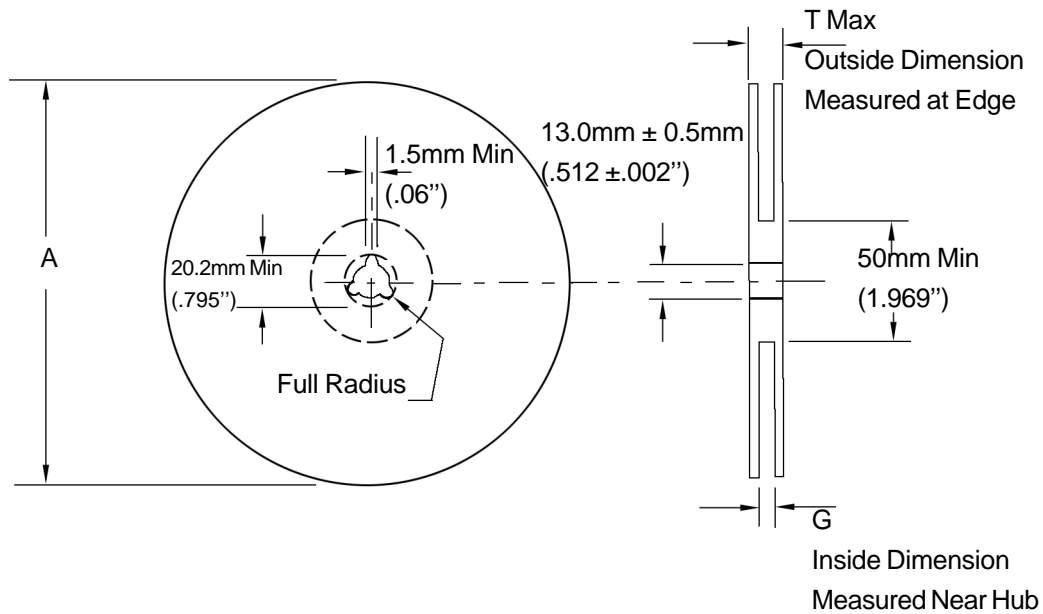
Metric dimensions govern - English are in parentheses for reference only.

NOTE 1: A₀, B₀, and K₀ are determined by component size. The clearance between the components and the cavity must be within .05 mm min. to .50 mm max.,

NOTE 2: the component cannot rotate more than 10° within the determined cavity.

NOTE 3: If B₁ exceeds 4.2 mm (.165") for 8 mm embossed tape, the tape may not feed through all tape feeders.

EMBOSSED TAPE AND REEL DATA



Size	A Max	G	T Max
8 mm	330mm (12.992")	8.4mm+1.5mm, -0.0 (.33"+.059", -0.00)	14.4mm (.56")
12mm	330mm (12.992")	12.4mm+2.0mm, -0.0 (.49 "+ .079", -0.00)	18.4mm (.72")
16mm	360mm (14.173")	16.4mm+2.0mm, -0.0 (.646"+.078", -0.00)	22.4mm (.882")
24 mm	360mm (14.173")	24.4mm+2.0mm, -0.0 (.961"+.070", -0.00)	30.4mm (1.197")

Reel Dimensions

Metric Dimensions Govern — English are in parentheses for reference only

Storage Conditions

Temperature: 5 to 40 Deg.C (20 to 30 Deg. C is preferred)
 Humidity: 30 to 80 RH (40 to 60 is preferred)
 Recommended Period: One year after manufacturing
 (This recommended period is for the soldering condition only. The characteristics and reliabilities of the products are not restricted to this limitation)