DataSheet No: E20006

Version:V0

Date:2024/05/06

TPAN0263

50W TO-263 Non-Inductive High-Power Resistor

Resistance	0.5Ω~10KΩ
Tolerance	±0.5%
TCR	±100ppm/°C
Rated Power	50W

Applications

Instrumentation

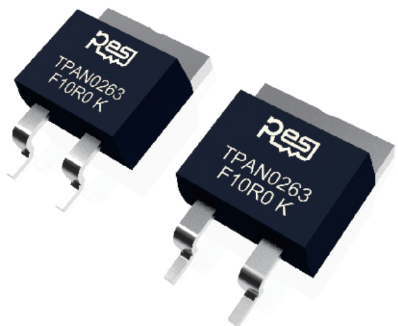
Industrial Power Equipment

Automotive Electronics

Motor Control & Drive Circuits

Better Solution for Sustainable High End Manufacturing

High Power with Excellent Reliability & Stability



RoHS AEC-Q200 3D

Introduction

TPAN0263 is a TO-263 non-inductive high-power resistor. The TO-263 transistor outline package is an SMT package, commonly used for high-power transistors, small to medium-sized integrated circuits, power resistors, etc.

The rated power of TPAN0263 series is 50W. TPAN0263 adopts a flange for its better heat dissipation to balance the thermal characteristics of the circuit. It is usually designed for current measurement, energy absorption, discharge, RC absorption, high-speed switching, high frequency transmission circuits, voltage regulation, constant power loads, and low-energy pulse loads. Its industry applications include industrial lasers, welding equipment, testing equipment, instrumentation, UPS, automobiles, switching power supplies, etc.

TPAN0263 series high-power molded resistor has excellent long-term stability, low TCR, high heat dissipation, low thermal resistance and low current noise, applying for a wide range. From raw materials, core production equipment, to process technology, TPAN0263 production is independent and controllable and achieves stable quality and timely delivery.

Electrical Parameters

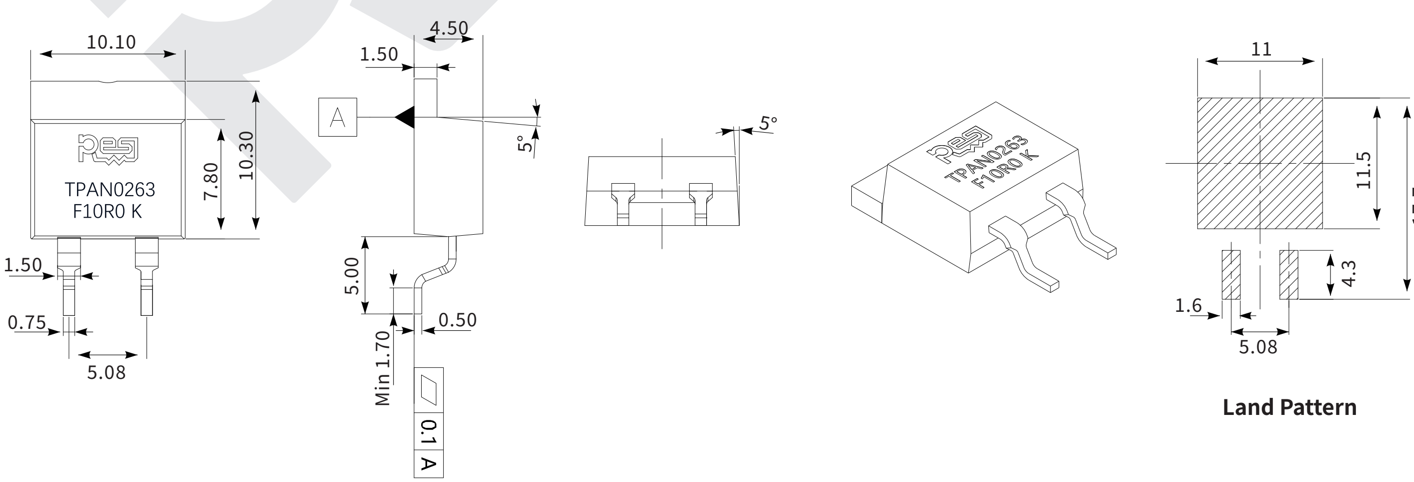
Series	Resistance Ω	TCR ppm/°C(+20°C Ref)	Tolerance %	Max. Operating Voltage[1]	Rated Power[2] With Heat Sink. Flange≤25°C	Without Heat Sink	Operating Temperature
TPAN0263	0.5≤R≤10K	±100(-55°C~125°C)	±0.5, ±1, ±5	500V	50W	2.25W	-55~+150°C

Galvanic Isolation	Insulation Resistance	Thermal Resistance	Inductance[3]	E-Series Value	Technology	Housing	Unit Weight
2000VAC	≥10^4MΩ	2.5°C/W	≤0.1μH	E24	Thick Film	Epoxy Molded	1.65±0.5g

1、According to P=UI, combined with power and the maximum operating voltage, calculate the maximum current value (P and U whichever is less).
2、If the actual operating power is greater than 2.25W, it must be used with a heat sink. The recommended heat sink and installation method refer to pages 6 and 7.
3、When resistance is between 0.5Ω～1KΩ, the applicable testing frequency range is 1kHz ~1MHz. When the resistance value is between 1KΩ～10KΩ, the applicable testing frequency range is 1kHz～100kHz. If higher application frequency is required, it needs to be verified through actual operating conditions testing or contact us.

Dimensions

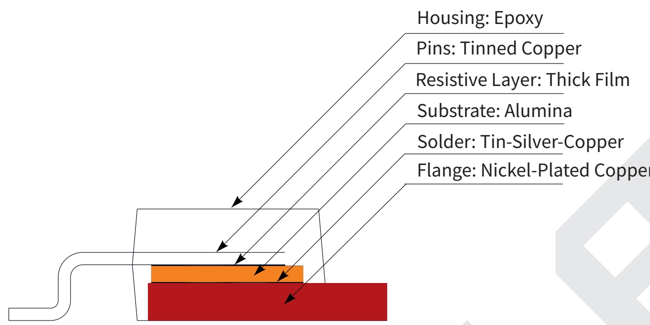
Unit: mm



Land Pattern

Note: The above dimensional tolerance is ± 0.3 mm.

Construction



Marking

The first line (four digits) represents brand.
The second line (eight digits) represents product series and package.
The third line (six digits) represents tolerance, resistance and TCR.

Series	Illustration	E-Series Value	Demonstration
TPAN0263		E24	RESI：Brand TPAN0263：Series & Package F：Tolerance 10R0：Resistance K：TCR

Part Number Information

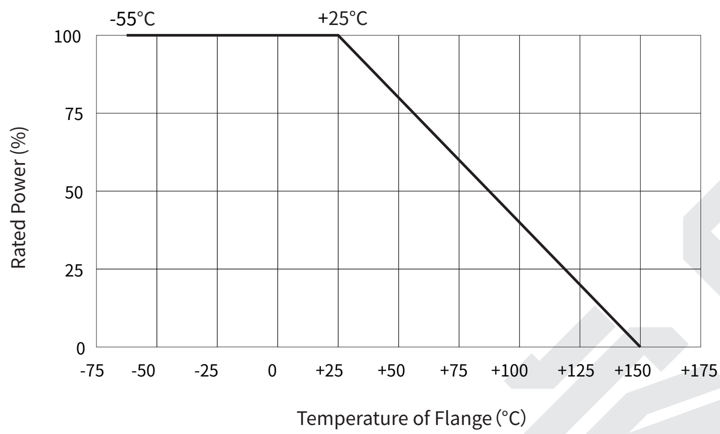
Example：TPAN0263F10R0K9 (TPAN 0263 ±1% 10Ω ±100ppm/°C Standard)

T	P	A	N	0	2	6	3	F	1	0	R	0	K	9

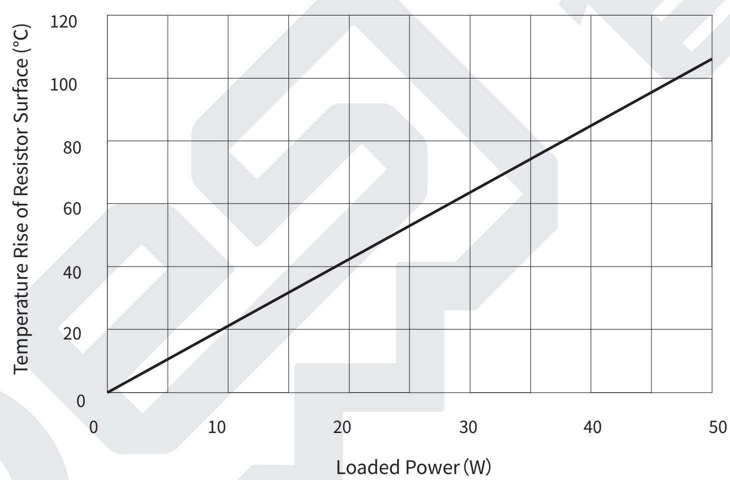
Series	Package	Tolerance	Resistance	TCR	Code
TPAN	0263	D=±0.5% F=±1% J=±5%	R500=0.5Ω 10R0=10Ω 1K00=1KΩ 10K0=10KΩ	K=±100ppm/°C	9=Standard 0-8=Custom

For higher/lower resistance, tighter tolerance, higher power, lower TCR and larger size, please contact us

Derating Curve

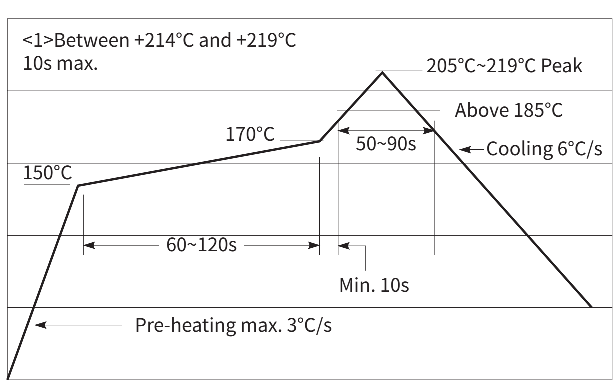


Power - Temperature Rise Curve

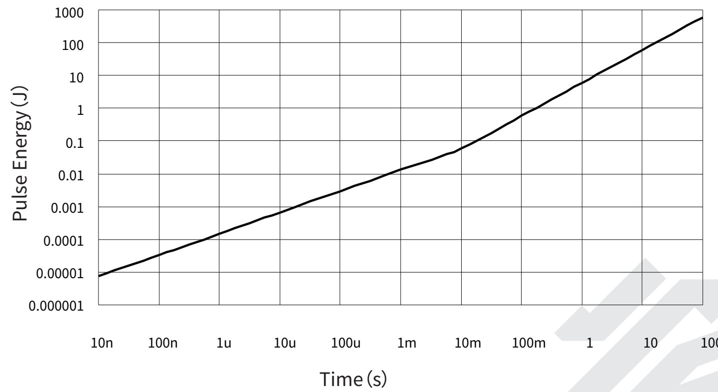


Reflow Soldering Profile

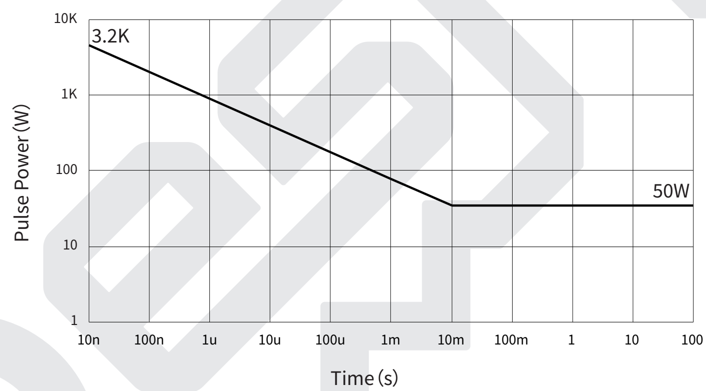
Resistor Surface Temperature:
Pre-Heat: +150°C~+170°C, 60~120sec.
Reflow: Above+185°C, 50~90sec.
Applicable Solder Composition:
Sn62%Pb36%Ag2%, or Sn63%Pb37%.



Pulse Energy Curve



Pulse Power Curve

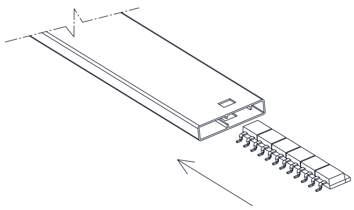


Performance

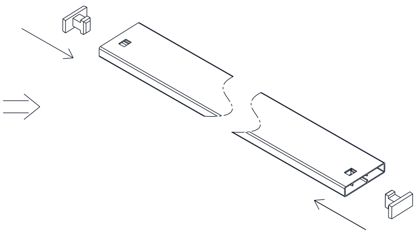
Test	Test Method	Standards	Test Limits
High Temperature Storage	1000h@+150°C, unpowered	AEC-Q200 TEST 3 MIL-STD-202 Method 108	△R⩽±1%
Bias Humidity	+85°C, 85%RH, powered 10% rated power for 1000h. Inspect within 24±4 hours after the test	AEC-Q200 TEST 7 MIL-STD-202 Method 103	△R±⩽0.5%
Load Life	+25°C[1], 1000h, rated power, not exceeding maximum operating voltage, 90 min on, 30 min off	AEC-Q200 TEST 8 MIL-STD-202 Method 108	△R⩽±1%
Resistance to Solvent	Immerse in solvent for 1 min and wipe 10 times. Three cycles of three solvents.	AEC-Q200 TEST 12 MIL-STD-202 Method 215	Clear marking. No visible damage
Mechanical Shock	Half Sine Wave, peak acceleration 100g's, pulse duration 6ms, 3 times in each of six directions, on three different axes	AEC-Q200 TEST 13 MIL-STD-202 Method 213	△R⩽±0.25%
Vibration	10-2KHz, 5g's, 20min/cycle, 12 cycles in each directions of X Y Z	AEC-Q200 TEST 14 MIL-STD-202 Method 204	△R⩽±0.25%
Resistance to Solder Heat	+260°C tin bath for 10s	AEC-Q200 TEST 15 MIL-STD-202 Method 210	△R⩽±0.25%
Thermal Shock	-55°C, 15min~ambient temperature<20s~+150°C, 15min, 1000 cycles	AEC-Q200 TEST 16 MIL-STD-202 Method 107	△R⩽±0.5%
Solderability	+245°C tin bath for 3s	AEC-Q200 TEST 18 IEC 60115-1 4.17	No visible damage. 95% minimum coverage
TCR	-55°C and +125°C, +20°C Ref.	AEC-Q200 TEST 19 IEC 60115-1 4.8	Within the nominal value range
Flammability	Flame the sample for 10 seconds, twice	UL-94	Meet the level conditions of V1
Terminal Strength	Apply force 20N for 5~10s	MIL-STD-202G Method 211A	△R⩽±0.2%
Withstand Voltage	Apply an effective 2000VAC between the terminal and flange for 60 seconds	IEC 60115-1 4.7	No breakdown or flashover, △R⩽±0.25%
Short Time Overload	2x rated power for 5s, not exceeding 1.5x maximum operating voltage	IEC 60115-1 4.13	△R⩽±0.5%
Low Temperature Operation	-55 °C, unpowered for 1h, powered rated voltage for 45 min, unpowered for 15 min	IEC 60115-1 4.36	△R⩽±0.5%

1、During testing, water-cooled or air-cooled heat dissipation should be used to ensure that the flange temperature is ⩽ 25 °C.

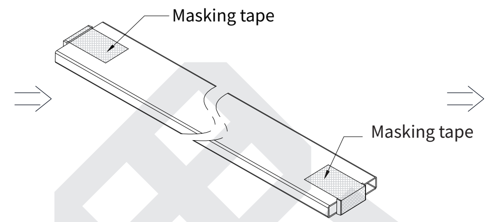
Packaging



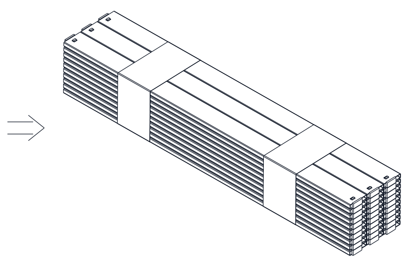
1. 50pcs./tube.



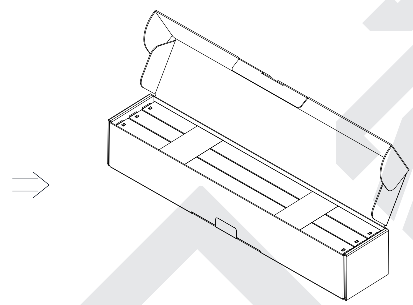
2. Insert caps into both ends of the tube and ensure that the caps are fully inserted.



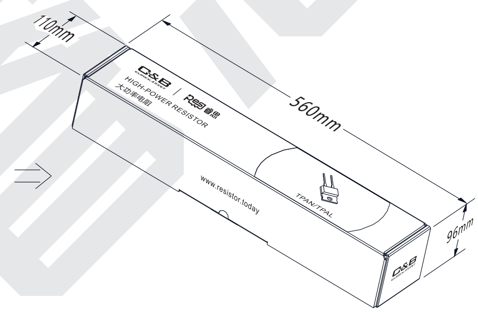
3. Fix the caps at both ends with masking tape (width 15mm).



4. Pack every 30 tubes into a bundle.

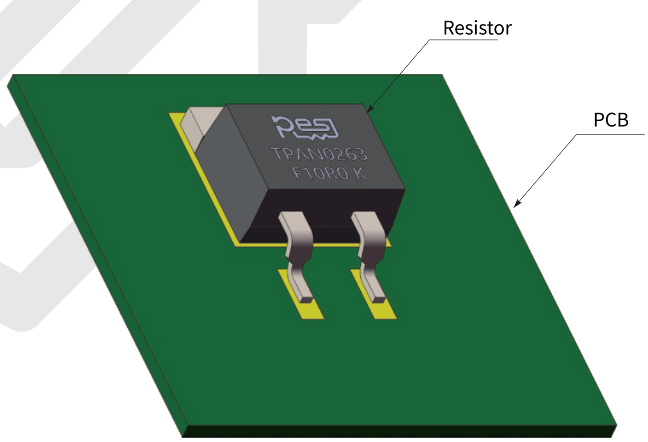


5. Put each bundle into a box, and fill the gaps with bubble bags or EPE until the product is not movable



6. The bundle box size is 560*110*96mm。

Installation



1、The general SMD mounting of TO-263 resistors is shown in the figure above. It is recommended to use the vacuum nitrogen reflow soldering process, ensuring the best soldering between the flange of the resistor and the PCB. If not soldered in a vacuum or nitrogen environment, there may be many voids between the flange and PCB, which can affect the thermal conductivity. It is recommended that the void rate after soldering should be ≤ 3%.

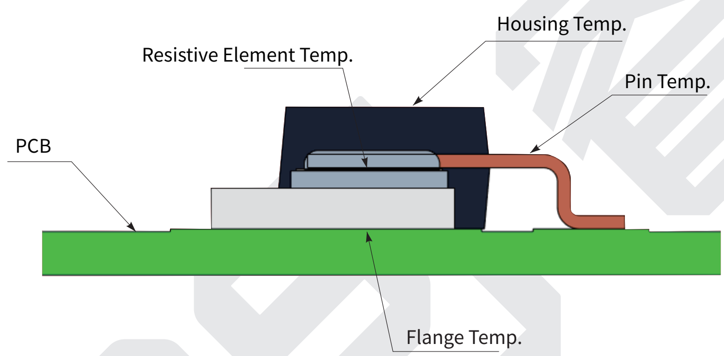
2、It is recommended that the steel mesh opening area should avoid the position of the plastic casing of the resistor to prevent the generation of solder beads during reflow soldering. At the same time, it is recommended to divide the opening area into several areas and set exhaust ducts in the middle.

3、According to the derating curve, when using resistors at full power, it is necessary to use cooling methods such as water cooling or oil cooling to ensure that the temperature of the flange is ≤ 25°C, in order to ensure the product's load life and long-term reliability.

Statement of Rated Power and Temperature

The maximum rated power of TPAN0263 series high-power resistor is 50W, which is based on 25 ℃ operating ambient temperature of the flange. The temperature measurement point is in the center of the back of the flange, which is below the resistive element. The temperature of the resistor flange is different from the temperature of the housing, pin or ambient temperature. The heat dissipation effect of the resistor can be reflected by the flange temperature. Heat dissipation effect is a crucial factor. When equipment or resistor fails, please investigate the heat dissipation of the resistor first. If the flange is over temperature, it usually indicates that the heat dissipation effect has not achieved the conditions specified in the datasheet, which means the installation of the heat sink or the heat dissipation capacity of the applied heat sink does not meet the requirements. Long-term use can lead to drift of the resistance, thereby reducing the load life of the resistor. When using resistors, it is recommended to apply appropriate thermal design, calculation, and temperature measurement or finite element analysis to verify the feasibility of the design and avoid resistor failure due to poor heat dissipation.

Temperature Diagram of Product Assembly



Heat Sink Selection

Users must choose a suitable heat sink based on the usage conditions of the resistors (e.g. power, ambient temperature, etc.). The maximum operating temperature of TPAN0263 series is 150 ℃. TPAN0263 power calculation is as follows:

$$P = \frac{\Delta T}{R_{TH\,(j-c)} + R_{TH\,(c-h)} + R_{TH\,(h-a)}}$$

P: The operating power of the resistor;

△T: The difference of the maximum operating temperature of the resistor and the ambient temperature;

$R_{TH\,(j-c)}$: The thermal resistance between the resistive layer and the outer part of the resistor, i.e. the thermal resistance of the resistor;

$R_{TH\,(c-h)}$: The thermal resistance between the outer part of the resistor and the upper part of the heat sink, i.e. the thermal resistance at the contact interface;

$R_{TH\,(h-a)}$: The thermal resistance of the heat sink.

Example:

$R_{TH\,(h-a)}$: Determine an operating power of 15W and an ambient temperature of +25 ℃ for TPAN0263;

Referring to the datasheet, the thermal resistance $R_{TH\,(j-c)}$ of TPAN0200 series is 2.5 ℃/W;

The calculation is as follows:

△T=150℃-25℃=125℃

$R_{TH\,(j-c)}+R_{TH\,(c-h)}+R_{TH\,(h-a)}$=△T/P=8.33℃/W

$R_{TH\,(c-h)}+R_{TH\,(h-a)}$=8.33-2.5=5.83℃/W

The thermal resistance at the contact interface, $R_{TH\,(c-h)}$, can be concluded, based on the operating condition. If $R_{TH\,(c-h)}$ is 1 ℃/W, a heat sink with $R_{TH\,(h-a)}$ less than 4.83 ℃/W is needed.

Popular Part Numbers

Part Number	Package	Tolerance	Resistance	TCR	Power	Max. Operating Voltage
TPAN0263DR500K9	TO-263	±0.5%	0.5Ω	±100ppm/°C	50W	500V
TPAN0263D1R00K9	TO-263	±0.5%	1Ω	±100ppm/°C	50W	500V
TPAN0263D1R50K9	TO-263	±0.5%	1.5Ω	±100ppm/°C	50W	500V
TPAN0263D2R00K9	TO-263	±0.5%	2Ω	±100ppm/°C	50W	500V
TPAN0263D3R00K9	TO-263	±0.5%	3Ω	±100ppm/°C	50W	500V
TPAN0263D3R30K9	TO-263	±0.5%	3.3Ω	±100ppm/°C	50W	500V
TPAN0263D6R80K9	TO-263	±0.5%	6.8Ω	±100ppm/°C	50W	500V
TPAN0263D7R50K9	TO-263	±0.5%	7.5Ω	±100ppm/°C	50W	500V
TPAN0263D10R0K9	TO-263	±0.5%	10Ω	±100ppm/°C	50W	500V
TPAN0263D15R0K9	TO-263	±0.5%	15Ω	±100ppm/°C	50W	500V
TPAN0263D20R0K9	TO-263	±0.5%	20Ω	±100ppm/°C	50W	500V
TPAN0263D25R0K9	TO-263	±0.5%	25Ω	±100ppm/°C	50W	500V
TPAN0263D33R0K9	TO-263	±0.5%	33Ω	±100ppm/°C	50W	500V
TPAN0263D47R0K9	TO-263	±0.5%	47Ω	±100ppm/°C	50W	500V
TPAN0263D50R0K9	TO-263	±0.5%	50Ω	±100ppm/°C	50W	500V
TPAN0263D100RK9	TO-263	±0.5%	100Ω	±100ppm/°C	50W	500V
TPAN0263D200RK9	TO-263	±0.5%	200Ω	±100ppm/°C	50W	500V
TPAN0263D500RK9	TO-263	±0.5%	500Ω	±100ppm/°C	50W	500V
TPAN0263D1K00K9	TO-263	±0.5%	1KΩ	±100ppm/°C	50W	500V
TPAN0263D2K00K9	TO-263	±0.5%	2KΩ	±100ppm/°C	50W	500V
TPAN0263D5K00K9	TO-263	±0.5%	5KΩ	±100ppm/°C	50W	500V
TPAN0263D10K0K9	TO-263	±0.5%	10KΩ	±100ppm/°C	50W	500V
TPAN0263FR500K9	TO-263	±1%	0.5Ω	±100ppm/°C	50W	500V
TPAN0263F1R00K9	TO-263	±1%	1Ω	±100ppm/°C	50W	500V
TPAN0263F1R50K9	TO-263	±1%	1.5Ω	±100ppm/°C	50W	500V
TPAN0263F2R00K9	TO-263	±1%	2Ω	±100ppm/°C	50W	500V
TPAN0263F3R00K9	TO-263	±1%	3Ω	±100ppm/°C	50W	500V
TPAN0263F3R30K9	TO-263	±1%	3.3Ω	±100ppm/°C	50W	500V
TPAN0263F6R80K9	TO-263	±1%	6.8Ω	±100ppm/°C	50W	500V
TPAN0263F7R50K9	TO-263	±1%	7.5Ω	±100ppm/°C	50W	500V
TPAN0263F10R0K9	TO-263	±1%	10Ω	±100ppm/°C	50W	500V
TPAN0263F15R0K9	TO-263	±1%	15Ω	±100ppm/°C	50W	500V
TPAN0263F20R0K9	TO-263	±1%	20Ω	±100ppm/°C	50W	500V
TPAN0263F25R0K9	TO-263	±1%	25Ω	±100ppm/°C	50W	500V
TPAN0263F33R0K9	TO-263	±1%	33Ω	±100ppm/°C	50W	500V
TPAN0263F47R0K9	TO-263	±1%	47Ω	±100ppm/°C	50W	500V
TPAN0263F50R0K9	TO-263	±1%	50Ω	±100ppm/°C	50W	500V
TPAN0263F100RK9	TO-263	±1%	100Ω	±100ppm/°C	50W	500V
TPAN0263F200RK9	TO-263	±1%	200Ω	±100ppm/°C	50W	500V
TPAN0263F500RK9	TO-263	±1%	500Ω	±100ppm/°C	50W	500V
TPAN0263F1K00K9	TO-263	±1%	1KΩ	±100ppm/°C	50W	500V
TPAN0263F2K00K9	TO-263	±1%	2KΩ	±100ppm/°C	50W	500V
TPAN0263F5K00K9	TO-263	±1%	5KΩ	±100ppm/°C	50W	500V
TPAN0263F10K0K9	TO-263	±1%	10KΩ	±100ppm/°C	50W	500V
TPAN0263JR500K9	TO-263	±5%	0.5Ω	±100ppm/°C	50W	500V
TPAN0263J1R00K9	TO-263	±5%	1Ω	±100ppm/°C	50W	500V
TPAN0263J1R50K9	TO-263	±5%	1.5Ω	±100ppm/°C	50W	500V
TPAN0263J2R00K9	TO-263	±5%	2Ω	±100ppm/°C	50W	500V
TPAN0263J3R00K9	TO-263	±5%	3Ω	±100ppm/°C	50W	500V
TPAN0263J3R30K9	TO-263	±5%	3.3Ω	±100ppm/°C	50W	500V
TPAN0263J6R80K9	TO-263	±5%	6.8Ω	±100ppm/°C	50W	500V

Popular Part Numbers

Part Number	Package	Tolerance	Resistance	TCR	Power	Max. Operating Voltage
TPAN0263J7R50K9	TO-263	±5%	7.5Ω	±100ppm/°C	50W	500V
TPAN0263J10R0K9	TO-263	±5%	10Ω	±100ppm/°C	50W	500V
TPAN0263J15R0K9	TO-263	±5%	15Ω	±100ppm/°C	50W	500V
TPAN0263J20R0K9	TO-263	±5%	20Ω	±100ppm/°C	50W	500V
TPAN0263J25R0K9	TO-263	±5%	25Ω	±100ppm/°C	50W	500V
TPAN0263J33R0K9	TO-263	±5%	33Ω	±100ppm/°C	50W	500V
TPAN0263J47R0K9	TO-263	±5%	47Ω	±100ppm/°C	50W	500V
TPAN0263J50R0K9	TO-263	±5%	50Ω	±100ppm/°C	50W	500V
TPAN0263J100RK9	TO-263	±5%	100Ω	±100ppm/°C	50W	500V
TPAN0263J200RK9	TO-263	±5%	200Ω	±100ppm/°C	50W	500V
TPAN0263J500RK9	TO-263	±5%	500Ω	±100ppm/°C	50W	500V
TPAN0263J1K00K9	TO-263	±5%	1KΩ	±100ppm/°C	50W	500V
TPAN0263J2K00K9	TO-263	±5%	2KΩ	±100ppm/°C	50W	500V
TPAN0263J5K00K9	TO-263	±5%	5KΩ	±100ppm/°C	50W	500V
TPAN0263J10K0K9	TO-263	±5%	10KΩ	±100ppm/°C	50W	500V

Revision

Version	Revised Content	Date	Approver
V0	Initial Issue	2024.05.06	LWW

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