Triac (Bidirectional Triode Thyristor)

Features and Benefits

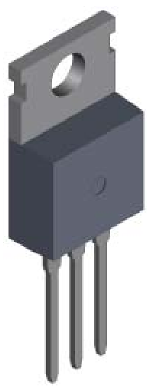
- Exceptional reliability
- Small SIP package with heatsink mounting for high thermal dissipation and long life
- V_{DRM} of 600 V
- 12 A_{RMS} on-state current
- Uniform switching

Description

This Sanken triac (bidirectional triode thyristor) is designed for AC power control, providing reliable, uniform switching for full-cycle AC applications.

In comparison with other products on the market, the TMA126G-L provides greater peak nonrepetitive off-state voltage, V_{DSM} (700 V). In addition, commutation dv/dt and (dv/dt)c are improved.

Package: 3-pin SIP (TO-220)

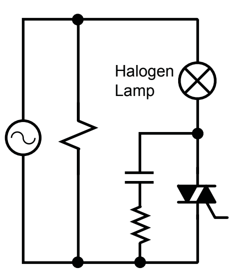


Not to scale

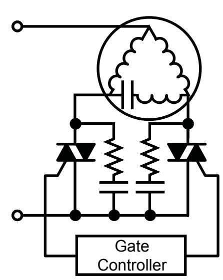
Applications

- Residential and commercial appliances: vacuum cleaners, rice cookers, TVs, home entertainment
- White goods: washing machines
- Office automation power control, photocopiers
- Motor control for small tools
- Temperature control, light dimmers, electric blankets
- General use switching mode power supplies (SMPS)

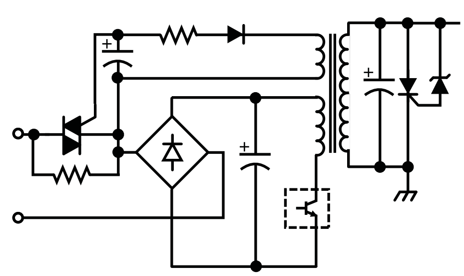
Typical Applications



Heater control
(for example, LBP. PPC, MFP)



Two-phase motor control
(for example, washing machine)



In-rush current control
(for example, SMPS)

Selection Guide

Part Number	Package	Packing
TMA126G-L	3-pin fully molded SIP with heatsink mount	50 pieces per tube

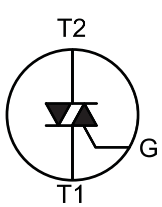
Absolute Maximum Ratings

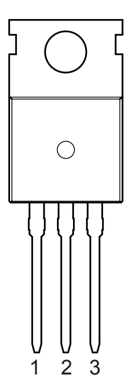
Characteristic	Symbol	Notes		Rating	Units
Peak Repetitive Off-State Voltage	V_{DRM}	$R_{GREF} = \infty$		600	V
Peak Non-Repetitive Off-State Voltage	V_{DSM}	$R_{GREF} = \infty$		700	V
RMS On-State Current	$I_{T(RMS)}$	50/60 Hz full cycle sine wave, total Conduction angle $(\alpha+) + (\alpha-) = 360°$, T_C = 103°C		12	A
Surge On-State Current	I_{TSM}	f = 60 Hz	Full cycle sine wave, peak value, non-repetitive, initial T_J = 25°C	126	A
		f = 50 Hz		120	A
I^2t Value for Fusing	I^2t	Value for 50 Hz half cycle sine wave, 1 cycle, I_{TSM} = 120 A		72	$A^2 \cdot s$
Critical Rising Rate of On-State Current	di/dt	$I_T = I_{T(RMS)} \times \sqrt{2}$, $V_D = V_{DRM} \times 0.5$, f ≤ 60 Hz, t_{gw} ≥ 10 μs, t_{gr} ≤ 250 ns, I_{gp} ≥ 60 mA (refer to Gate Trigger Current diagram)		25	A/μs
Peak Gate Current	I_{GM}	f ≥ 50 Hz, duty cycle ≤ 10%		2	A
Peak Gate Power Dissipation	P_{GM}	f ≥ 50 Hz, duty cycle ≤ 10%		5	W
Average Gate Power Dissipation	$P_{GM(AV)}$			0.5	W
Junction Temperature	T_J			–40 to 125	ºC
Storage Temperature	T_{stg}			–40 to 125	ºC

Thermal Characteristics May require derating at maximum conditions

Characteristic	Symbol	Test Conditions	Value	Units
Package Thermal Resistance (Junction to Case)	$R_{\theta JC}$	For AC	1.6	ºC/W

Pin-out Diagram





Terminal List Table

Number	Name	Function
1	T1	Main terminal, gate referenced
2	T2	Main terminal connect to signal side
3	G	Gate control

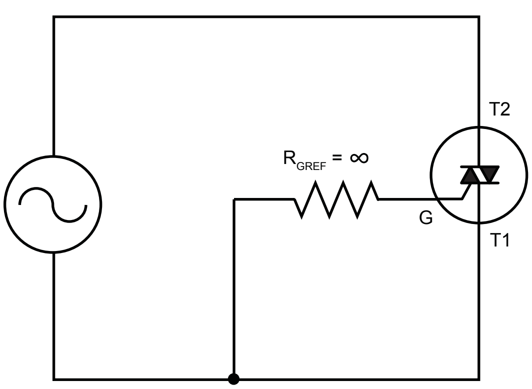
All performance characteristics given are typical values for circuit or system baseline design only and are at the nominal operating voltage and an ambient temperature, T_A, of 25°C, unless otherwise stated.

ELECTRICAL CHARACTERISTICS

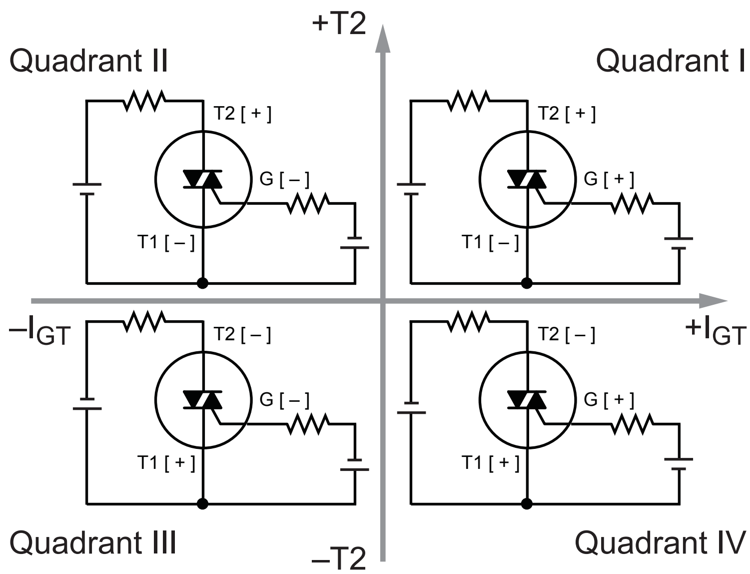
Characteristics	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Off-State Leakage Current	I_{DRM}	$V_D = V_{DRM}$, T_J = 125°C, $R_{GREF} = \infty$ using test circuit 1		–	–	2.0	mA
		$V_D = V_{DRM}$, T_J = 25°C, $R_{GREF} = \infty$ using test circuit 1		–	–	100	μA
On-State Voltage	V_{TM}	I_T = 17 A, T_J = 25°C		–	–	1.5	V
Gate Trigger Voltage	V_{GT}	Quadrant I: T2+, G+	V_D = 12 V, R_L = 20 Ω, T_J = 25°C	–	–	1.5	V
		Quadrant II: T2+, G–		–	–	1.5	V
		Quadrant III: T2–, G–		–	–	1.5	V
Gate Trigger Current	I_{GT}	Quadrant I: T2+, G+	V_D = 12 V, R_L = 20 Ω, T_J = 25°C	–	–	30	mA
		Quadrant II: T2+, G–		–	–	30	mA
		Quadrant III: T2–, G–		–	–	30	mA
Gate Non-trigger Voltage	V_{GD}	$V_D = V_{DRM} \times 0.5$, R_L = 4 kΩ, T_J = 125°C		0.2	–	–	V
Critical Rising Rate of Off-State Voltage during Commutation*	(dv/dt)c	V_D = 400 V, (di/dt)c = –6 A/ms, I_{TP} = 2 A, T_J = 125°C		10	–	–	V/μs
Critical Rising Rate of Off-StateVoltage	dv/dt	$V_D = V_{DRM} \times 0.66$, $R_{GREF} = \infty$ using test circuit 1, T_J = 125°C		200	–	–	V/μs

*Where I_{TP} is the peak current through T2 to T1.

Test Circuit 1

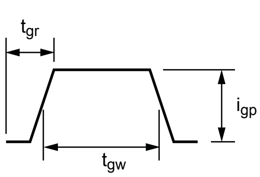


Gate Trigger Characteristics

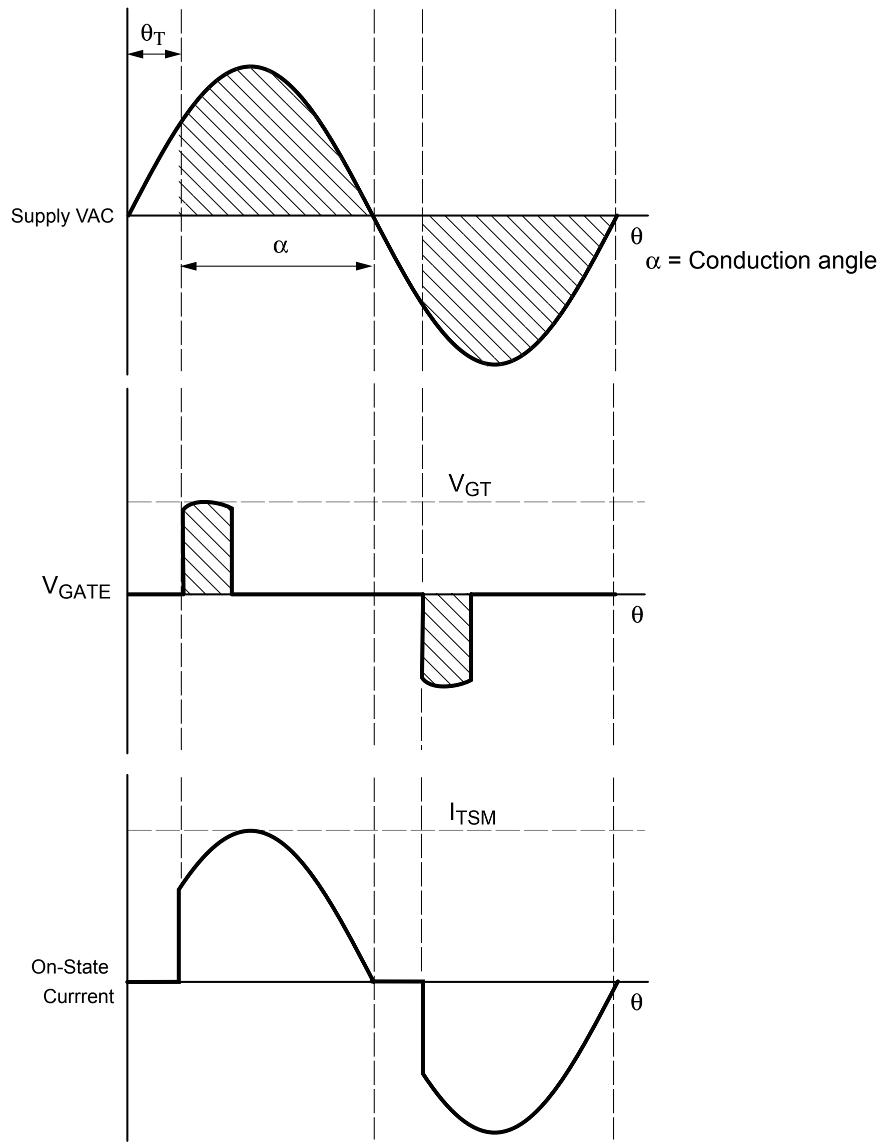


Polarities referenced to T1

Gate Trigger Current

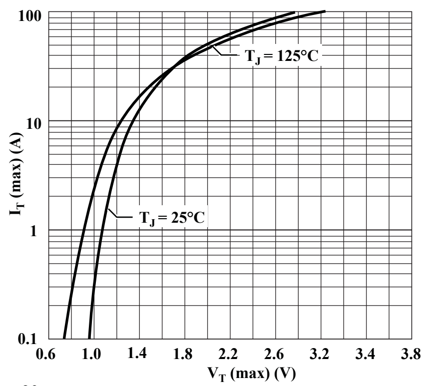


Commutation Timing Diagrams

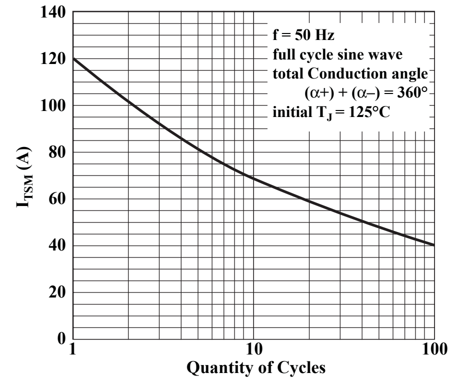


Performance Characteristics at T_A = 25°C

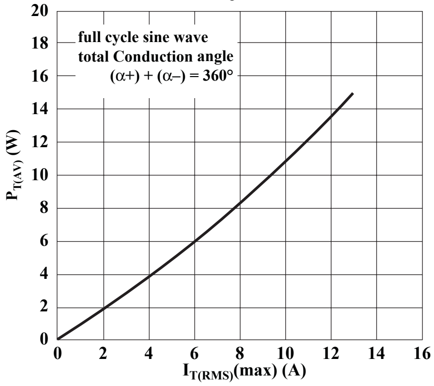
Maximum On-State Current versus Maximum On-State Voltage



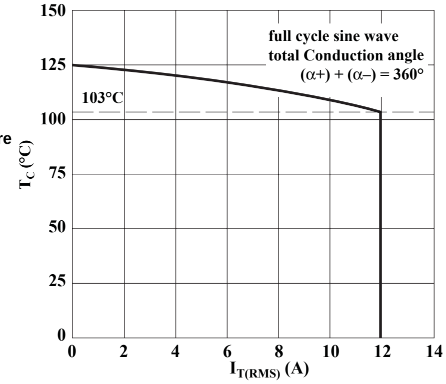
Surge On-State Current versus Quantity of Cycles



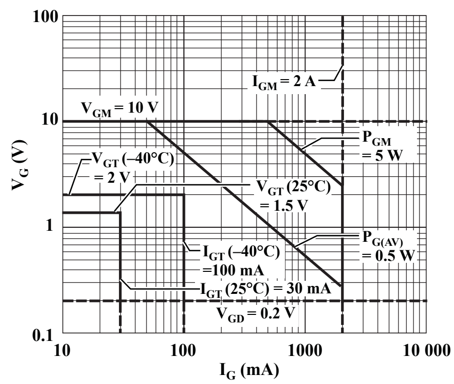
On-State Average Power Dissipation versus Maximum On-State RMS Current



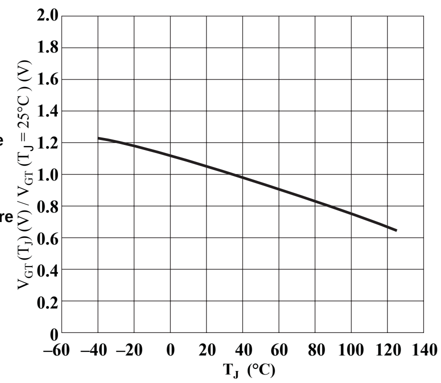
Case Temperature versus On-State RMS Current



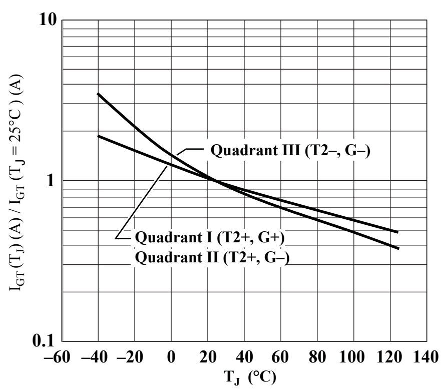
Gate Voltage versus Gate Current



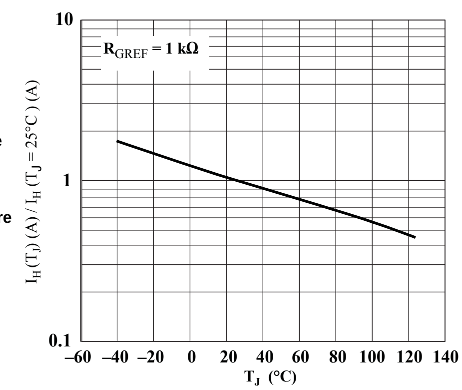
Proportional Change of Typical Trigger Voltage versus Junction Temperature



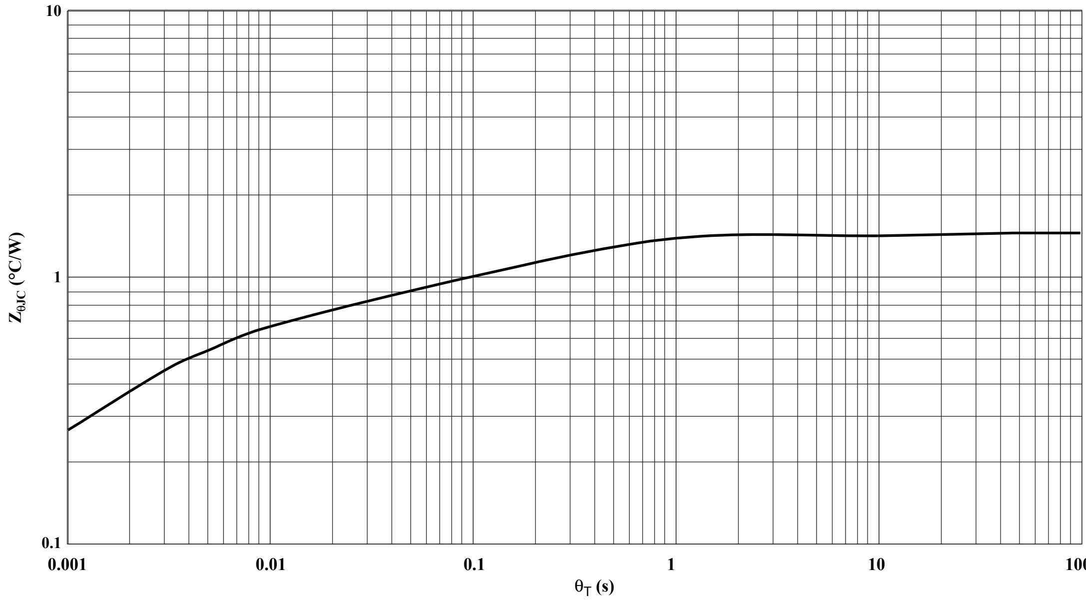
Proportional Change of Typical Trigger Current versus Junction Temperature



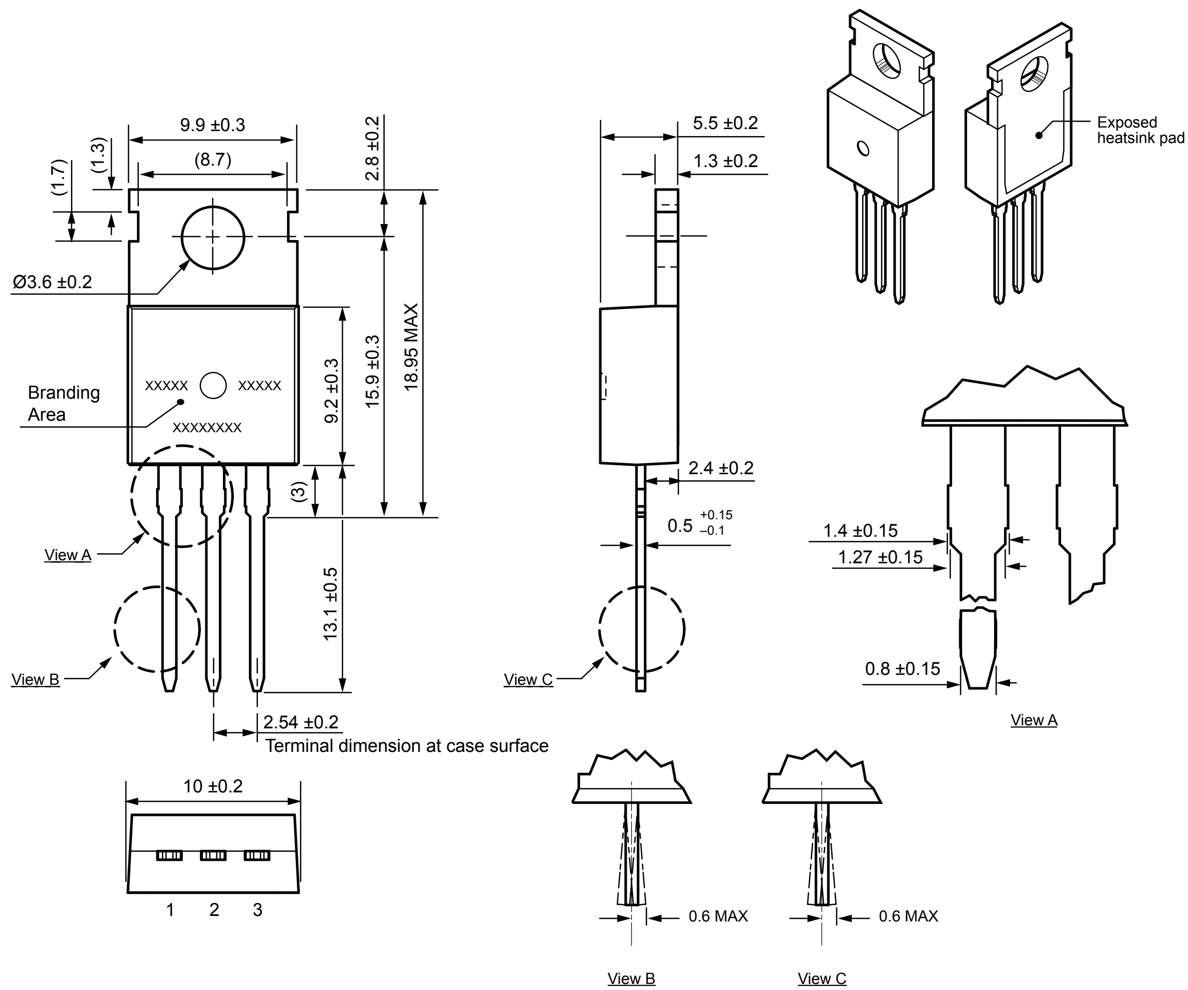
Proportional Change of Typical Holding Current versus Junction Temperature



Transient Thermal Impedence versus Triac Voltage Pulse Duration
For AC



TO-220 Package Outline Drawing



Terminal core material: Cu
Terminal treatment: Sn plating
Package: TO-220

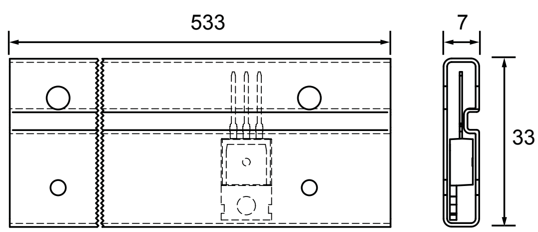
Dimensions in millimeters

Branding codes (exact appearance at manufacturer discretion):
1st line left, lot: *YM*
Where: Y is the last digit of the year of manufacture
M is the month (*1* to *9, O, N, D*)
1st line right, lot: *DDR*
Where: DD is the date
R is a tracking letter
2nd line, type: MA126G

Leadframe plating Pb-free. Device meets RoHS requirements.

Packing Specification

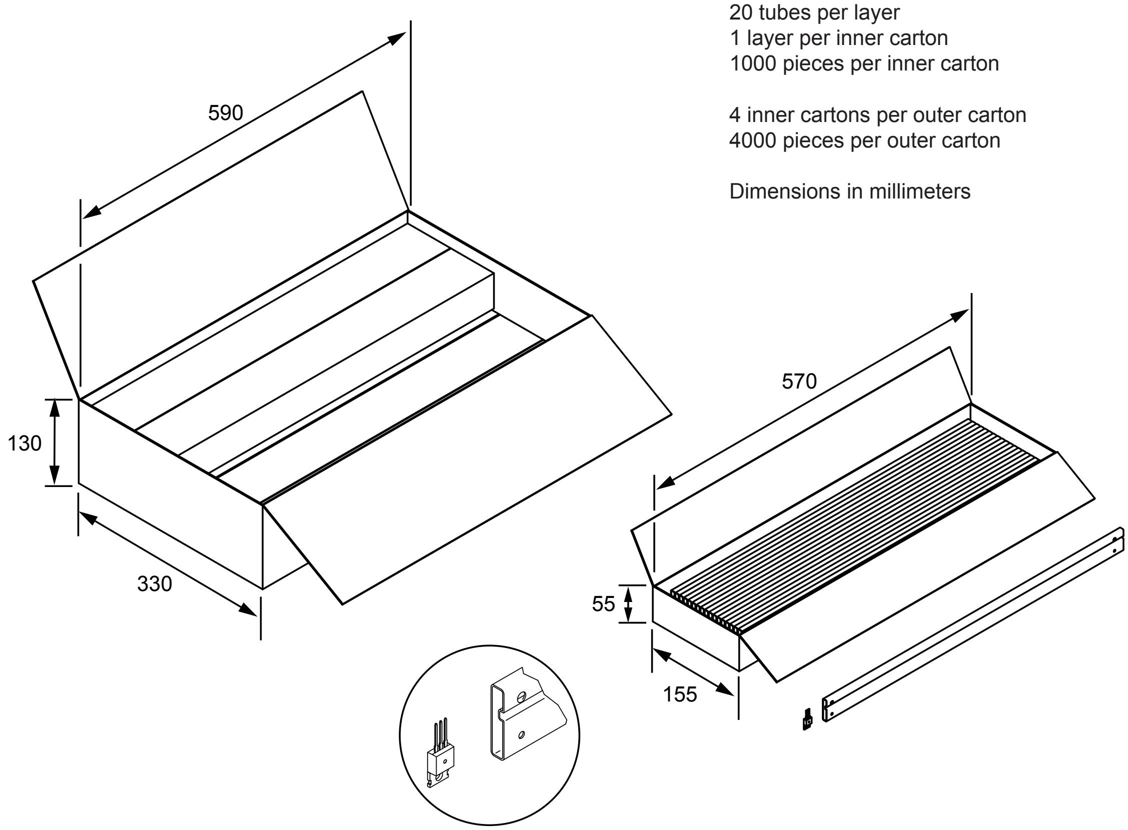
Tube Packing



50 pieces per tube
20 tubes per layer
1 layer per inner carton
1000 pieces per inner carton

4 inner cartons per outer carton
4000 pieces per outer carton

Dimensions in millimeters



WARNING — These devices are designed to be operated at lethal voltages and energy levels. Circuit designs that embody these components must conform with applicable safety requirements. Precautions must be taken to prevent accidental contact with power-line potentials. Do not connect grounded test equipment.

The use of an isolation transformer is recommended during circuit development and breadboarding.

Because reliability can be affected adversely by improper storage environments and handling methods, please observe the following cautions.

Cautions for Storage

- Ensure that storage conditions comply with the standard temperature (5°C to 35°C) and the standard relative humidity (approximately 40% to 75%); avoid storage locations that experience extreme changes in temperature or humidity.
- Avoid locations where dust or harmful gases are present and avoid direct sunlight.
- Reinspect for rust on leads and solderability of products that have been stored for a long time.

Cautions for Testing and Handling

When tests are carried out during inspection testing and other standard test periods, protect the products from power surges from the testing device, shorts between adjacent products, and shorts to the heatsink.

Remarks About Using Silicone Grease with a Heatsink

- When silicone grease is used in mounting this product on a heatsink, it shall be applied evenly and thinly. If more silicone grease than required is applied, it may produce stress.
- Coat the back surface of the product and both surfaces of the insulating plate to improve heat transfer between the product and the heatsink.
- Volatile-type silicone greases may permeate the product and produce cracks after long periods of time, resulting in reduced heat radiation effect, and possibly shortening the lifetime of the product.
- Our recommended silicone greases for heat radiation purposes, which will not cause any adverse effect on the product life, are indicated below:

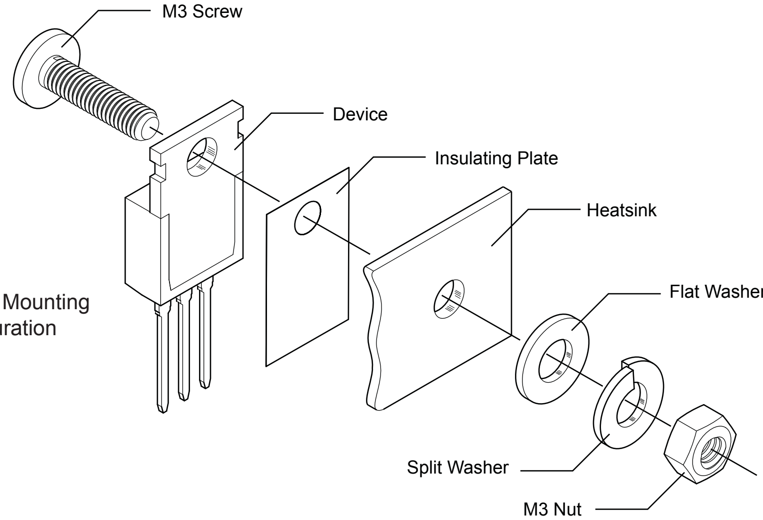
Type	Suppliers
G746	Shin-Etsu Chemical Co., Ltd.
YG6260	Momentive Performance Materials
SC102	Dow Corning Toray Silicone Co., Ltd.

Heatsink Mounting Method

- Torque When Tightening Mounting Screws. Thermal resistance increases when tightening torque is low, and radiation effects are decreased. When the torque is too high, the screw can strip, the heatsink can be deformed, and distortion can arise in the product frame. To avoid these problems, observe the recommended tightening torques for this product package type 0.490 to 0.686 N•m (5 to 7 kgf•cm).
- For effective heat transfer, the contact area between the product and the heatsink should be free from burrs and metal fragments, and the heatsink should be flat and large enough to contact over the entire side of the product, including mounting flange and exposed thermal pad.
- The mounting hole in customer-supplied heatsink must be less than Ø4 mm; this includes the diameter of any dimple around punched holes. This is to prevent possible deflection and cracking of the product case when fastened to the heatsink.

Soldering

- When soldering the products, please be sure to minimize the working time, within the following limits:
  260°C 10 s
  350°C 3 s
- Soldering iron should be at a distance of at least 1.5 mm from the body of the products



Typical Mounting Configuration

This datasheet is based on Sanken datasheet SSE-24370

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