

PATENT PENDING

Photomultiplier Tube with Cooling Function 13mm (1/2 inch) Diameter, Side-on Type

FEATURES

● Peltier Cooling

- Dark Current Decrease Capability 1/10
- Cooling Capacity (ΔT^*)

R6060-02	-15°C
R6060-12	-25°C

* ΔT means temperature difference from an ambience.

- Excellent ENI (Equivalent Noise Input *)

R6060-02	2.3×10^{-17} at 600 nm
R6060-12	1.7×10^{-16} at 800 nm

*ENI : Equivalent to NEP at 1 Hz

● Compact Cooling System with Peltier Cooler

- Fast Cooling Time 5 minutes (Typ.)
- Power Consumption

R6060-02	1.6 W
R6060-12	9.2 W

● High Sensitivity

- Spectral Response

R6060, -01, -02	185 to 850 nm
R6060-11, -12	185 to 900 nm

- Photocathode Sensitivity

R6060, -01, -02	250 $\mu A/lm$ (Typ.)
R6060-11, -12	450 $\mu A/lm$ (Typ.)



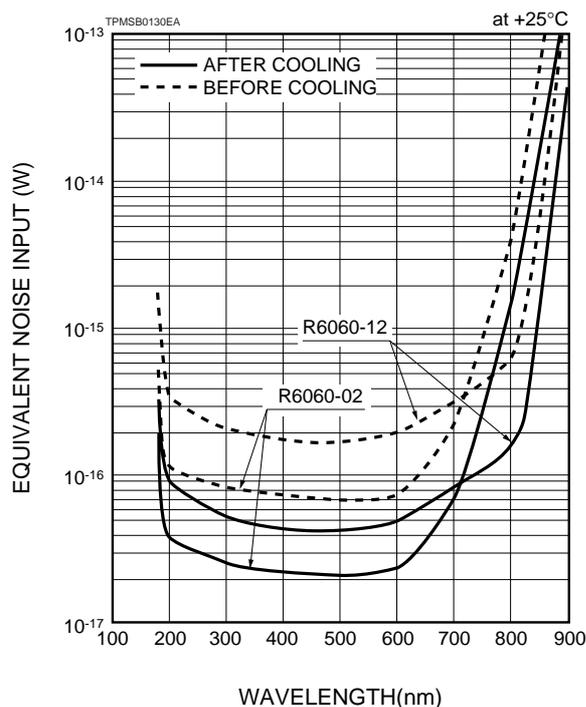
APPLICATIONS

- ICP Emission Spectrophotometer
- Fluorescence Detector
- Chemiluminescence Detector
- Bioluminescence Detector
- Confocal Microscope
- NOx Detector

SELECTION GUIDE

Type No.	Notes
R6060	Photomultiplier tube only
R6060-01	Photomultiplier tube with Peltier Cooler
R6060-02	Photomultiplier tube with Peltier Cooler and Heatsink
R6060-11	Photomultiplier tube (High Sens.) with Peltier Cooler
R6060-12	Photomultiplier tube (High Sens.) with Peltier Cooler, Heatsink and Fan

Figure 1 : ENI (Equivalent Noise Input)



COOLED PHOTOMULTIPLIER TUBES R6060 SERIES

GENERAL

Parameter		R6060, -01, -02	R6060-11, -12	Unit
Spectral Response		185 to 850	185 to 900	nm
Wavelength of Maximum Response		530	450	nm
Photocathode	Material	Multialkali		–
	Minimum Effective Area	4 × 13		mm
	Mesh	With mesh	Without mesh	–
Window Material		UV glass		–
Dynode	Structure	Circular-cage		–
	Number of Stage	9		–
Direct Interelectrode Capacitances				
Anode to Dynode No.9		1.7		pF
Anode to All Other Electrode		2		pF
Base		11-pin glass base		
Weight	R6060	11	–	g
	R6060-01	12	–	
	R6060-02	37	–	
	R6060-11	–	28	
	R6060-12	–	71	
Suitable Socket		E678-11H		–
Suitable D Type Socket Assembly		E850-13		–

MAXIMUM RATINGS (Absolute Maximum Values)

Parameter		R6060, -01, -02	R6060-11, -12	Unit
Photomultiplier Tube Supply Voltage	Between Anode and Cathode	1250		Vdc
	Between Each Succeeding Electrode	150		Vdc
Average Anode Current		0.01		mA
Peltier Cooler Input Current (-02, -12) [Ⓐ]		1.25	4.5	A
Peltier Cooler Input Voltage (-02, -12) [Ⓐ]		3	2.5	Vdc
Storage Ambient Temperature		-40 to +50		°C
Operating Ambient Humidity		70 [Ⓑ]		% RH

CHARACTERISTICS

Parameter		R6060, -01, -02			R6060-11, -12			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
Cathode Sensitivity	Luminous (2856 K)	140	250	–	300	450	–	μA/lm
	Red / White Ratio	0.1	0.2	–	0.25	0.35	–	–
Anode Luminous Sensitivity [Ⓒ]		200	1000	–	300	1500	–	A/lm
Gain [Ⓒ]		–	4 × 10 ⁶	–	–	3.3 × 10 ⁶	–	–
Anode Dark Current (after 30 min storage in darkness)	Before Cooling (+25 °C)	–	0.3	3	–	3	10	nA
	After Cooling (-02, -12) [Ⓓ]	–	0.03	0.3	–	0.2	1	nA
Time Response [Ⓒ]	Anode Pulse Rise Time	–	1.4	–	–	1.4	–	ns
	Electron Transit Time	–	15	–	–	15	–	ns

NOTE [Ⓐ] Subject to be changed with a Heatsink type in R6060-01 and -11. Please consult with us.

[Ⓑ] No condensation.

[Ⓒ] Measured with the condition shows "VOLTAGE DISTRIBUTION RATIO AND SUPPLY VOLTAGE".

[Ⓓ] On photocathode temperature R6060-02: +10 °C R6060-12: 0 °C

COOLING CHARACTERISTICS (R6060-02/R6060-12)

Parameter	R6060-02	R6060-12	Unit
Cooling Temperature (ΔT) [Ⓔ]	-15	-25	°C
Cooling Time	5	5	min
Suitable Input Voltage	2	2.2	Vdc
Input Current	0.8	4.2	Adc
Power Consumption	1.6	9.2	W

NOTE [Ⓔ] ΔT means temperature difference from an ambience.

VOLTAGE DISTRIBUTION RATIO AND SUPPLY VOLTAGE

Electrode	K	Dy1	Dy2	Dy3	Dy4	Dy5	Dy6	Dy7	Dy8	Dy9	P
Distribution Ratio	1	1	1	1	1	1	1	1	1	1	1

Supply Voltage: 1000Vdc, K: Cathode, Dy: Dynode, P: Anode

Figure 2: Spectral Response Characteristics

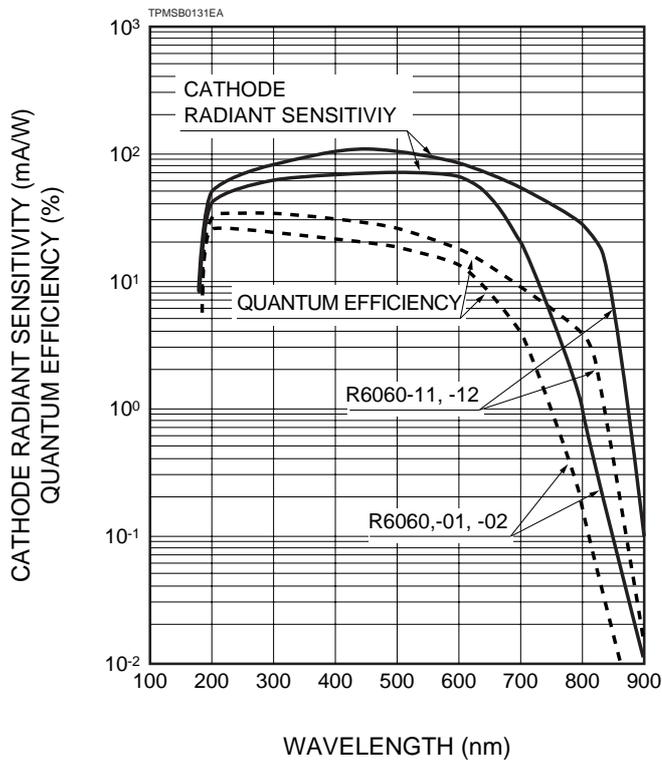


Figure 3: Anode Sensitivity and Gain

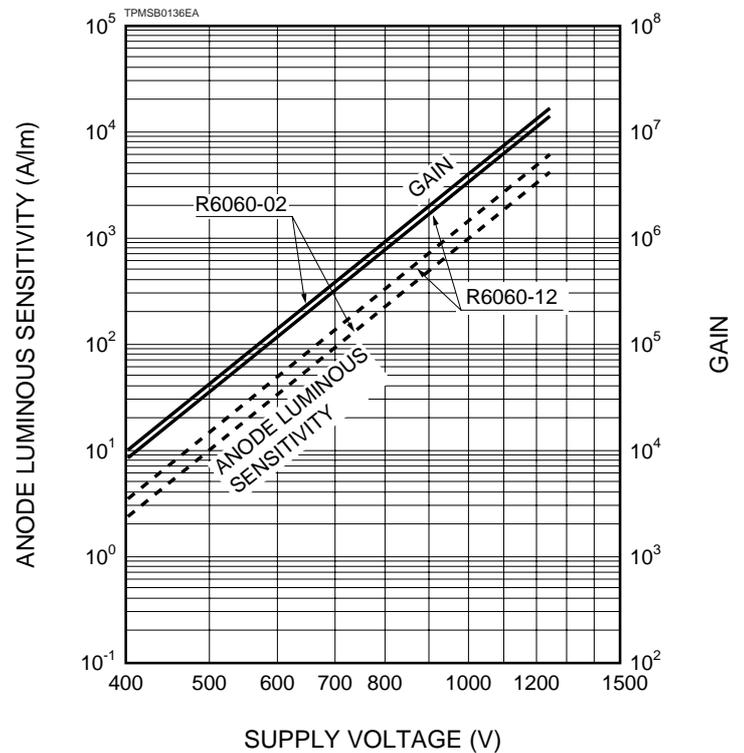


Figure 4: Typical Dark Current Characteristic VS Photocathode Temperature (at 1000V, after 30 min storage in darkness)

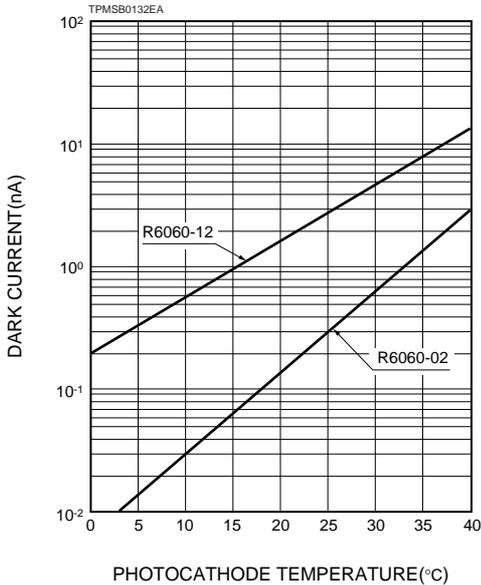


Figure 5: Cooling Time (R6060-02,-12)

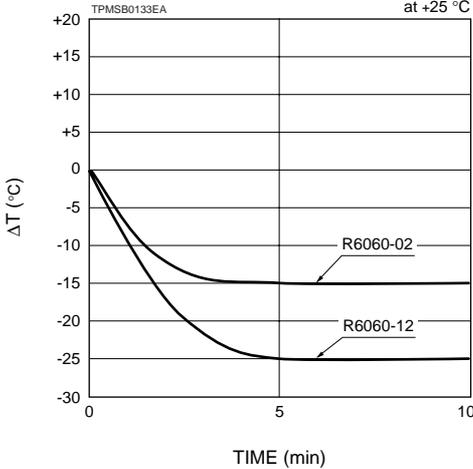


Figure 6: Peltier Cooler Operating Range

R6060-02

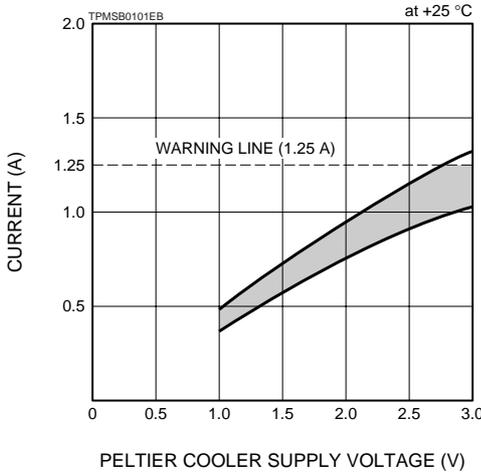
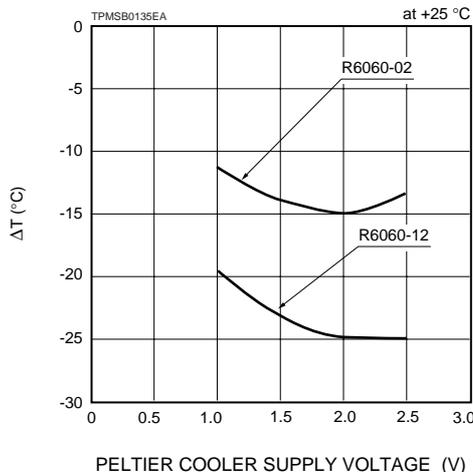
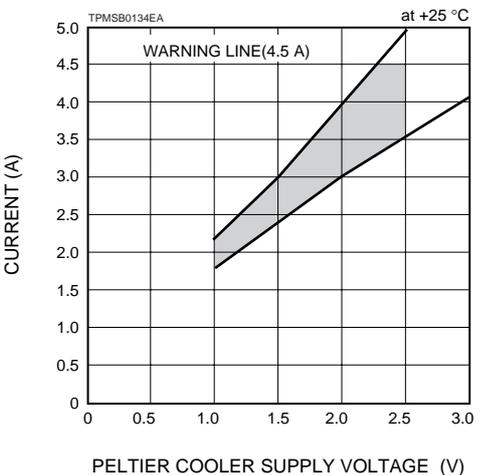


Figure 7: Cooling Temperature VS Peltier Supply Voltage (R6060-02, -12)

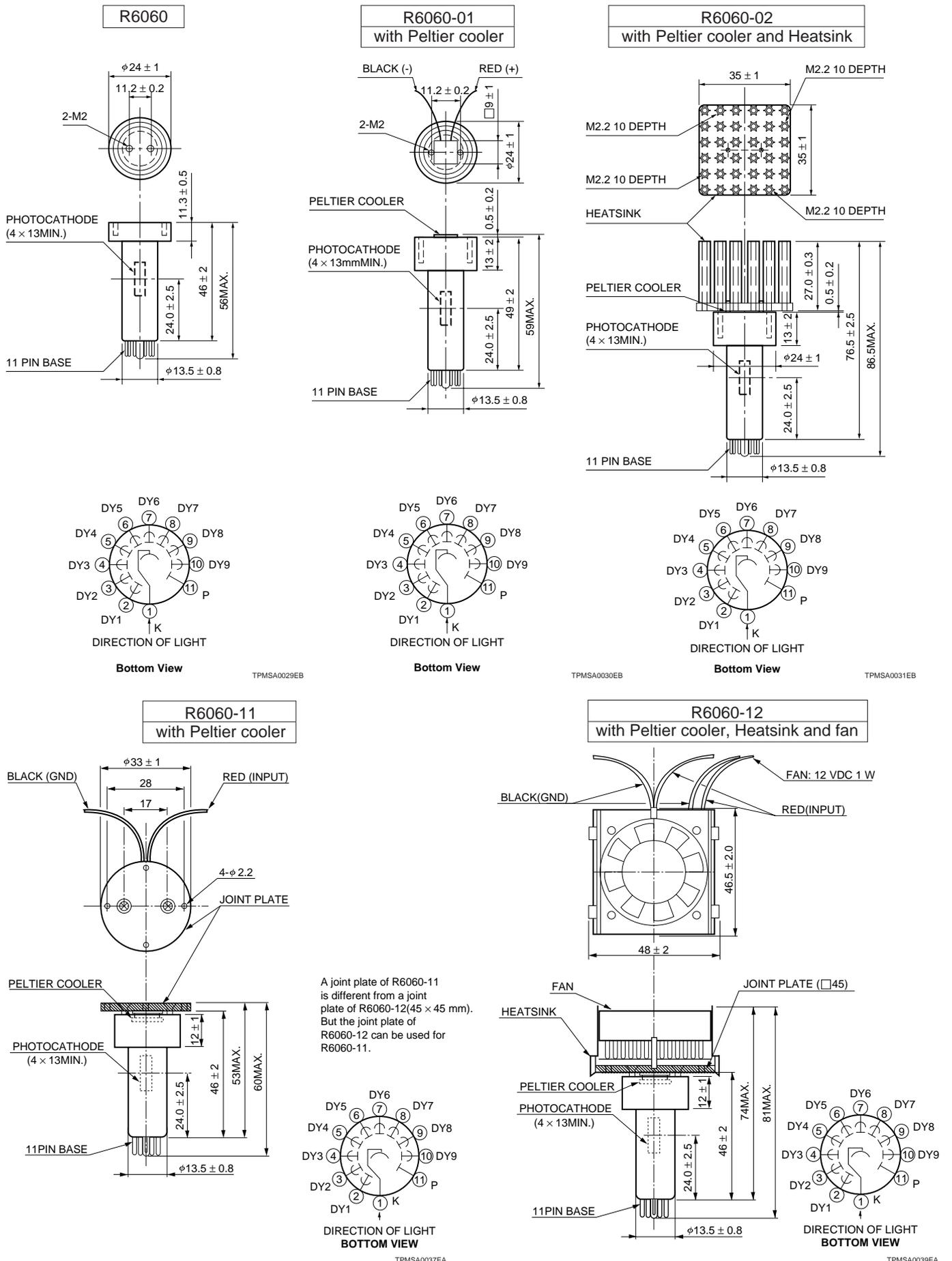


R6060-12



NOTE : Guaranteed Characteristics Range

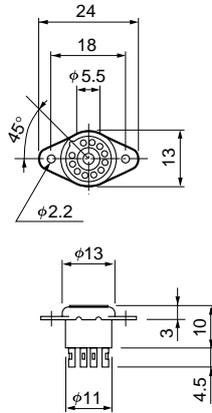
Figure 8: Dimensional Outlines and Basing Diagram (Unit: mm)



COOLED PHOTOMULTIPLIER TUBES R6060 SERIES

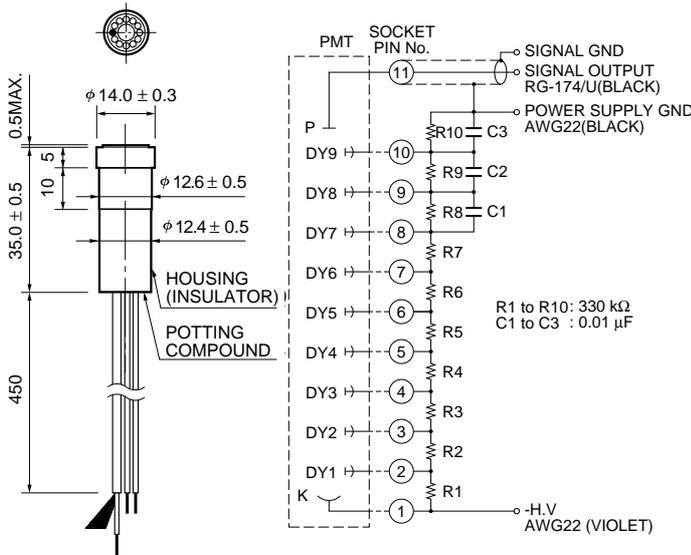
Figure 9: Dimensional Outlines of Accessories (Unit: mm)

Socket E678-11H



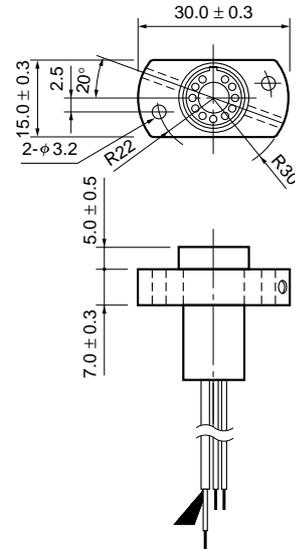
TACCA0063EA

D Type Socket Assembly E850-13 (Option)



TACCA0096EB

With Mounting Frange (Supplies)



TACCA0097EA

* R6060-02, R6060-12 have built-in Heatsink so that they provide the cooling performance as is R6060, R6060-01 and R6060-11 must be used with additional cooling method (water or air) or connected to Heatsink to obtain the rated cooling performance.

* PATENT PENDING: JAPAN 1, U.S.A. 1, Europe 2

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