

Features

- 4:1 Wide Input Voltage Range
- 1.6kVDC Isolation
- UL Certified
- Efficiency up to 89%
- Six-Sided Continuous Shield

Regulated Converters

RECOM
DC/DC Converter

RP20-FW

20 Watt
2" x 1"
Single & Dual
Output



Description

The RP20-FW series wide range input DC/DC converters are certified to UL 60950-1 and to cUL 60950-1. This makes them ideal for all telecom and industrial applications where approved safety standards are required. The industry standard 2" x 1" package meets military standards for thermal shock and vibration tolerance.

Selection Guide

Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current [mA]	Input ⁽¹⁾ Current [mA]	Efficiency ⁽¹⁾ typ. [%]	Max. Capacitive Load ⁽²⁾ [μF]
RP20-243.3SFW ^(3,4)	9-36	3.3	5500	890	85	18000
RP20-2405SFW ^(3,4)	9-36	5	4000	947	88	9600
RP20-2412SFW ^(3,4)	9-36	12	1670	971	86	1650
RP20-2415SFW ^(3,4)	9-36	15	1330	967	86	1050
RP20-483.3SFW ^(3,4)	18-75	3.3	5500	445	85	18000
RP20-4805SFW ^(3,4)	18-75	5	4000	473	88	9600
RP20-4812SFW ^(3,4)	18-75	12	1670	480	87	1650
RP20-4815SFW ^(3,4)	18-75	15	1330	478	87	1050
RP20-2405DFW ^(3,4)	9-36	±5	±2000	947	88	±4800
RP20-2412DFW ^(3,4)	9-36	±12	±833	957	87	±825
RP20-2415DFW ^(3,4)	9-36	±15	±667	958	87	±525
RP20-4805DFW ^(3,4)	18-75	±5	±2000	468	89	±4800
RP20-4812DFW ^(3,4)	18-75	±12	±833	473	88	±825
RP20-4815DFW ^(3,4)	18-75	±15	±667	474	88	±525



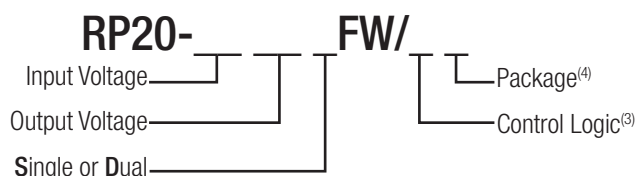
UL60950-1 Certified

Notes:

Note1: Maximum value at nominal input voltage and full load.

Note2: Test by minimum V_{in} and constant resistor load.

Model Numbering



Ordering Examples

RP20-2405SFW = 24V 4:1 Input, 5V Output, Positive Logic CTRL pin fitted

RP20-4812DFW/N-HC = 48V 4:1 Input, ±12V Output, Negative Logic CTRL pin fitted, Heat-sink fitted

Notes:

Note3: no suffix for CTRL function with Positive Logic (1=ON, 0=OFF), and trim pin add "N" for CTRL function with Negative Logic (0=ON, 1=OFF), and trim pin

Note4: add suffix -HC for premounted Heat-sink and clips

Specifications measured at Ta = 25°C, nominal input voltage, full load otherwise noted

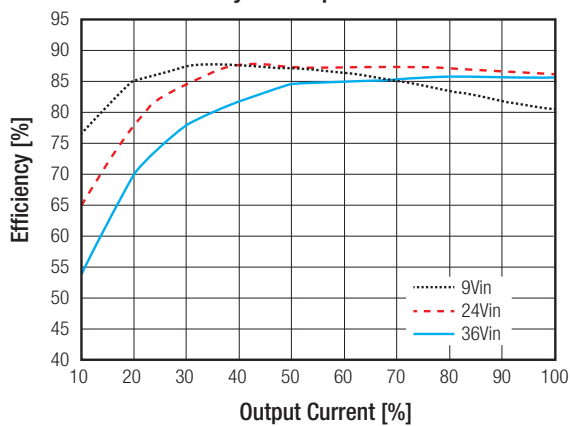
BASIC CHARACTERISTICS					
Parameter	Condition		Min.	Typ.	Max.
Input Voltage Range	nom. Vin = 24V nom. Vin = 48V		9VDC 18VDC	24VDC 48VDC	36VDC 75VDC
Under Voltage Lockout (UVLO)	Vin = 24V	DC-DC ON DC-DC OFF		7.5VDC	9VDC
	Vin = 48V	DC-DC ON DC-DC OFF		15VDC	18VDC
Input Filter			Pi-Type		
Input Reflected Ripple Current	nominal Vin and full load			20mA _{p-p}	
Input Surge Voltage	Vin = 24V, 100ms max. Vin = 48V, 100ms max.				50VDC 100VDC
Start-up time	Power up Remote ON/OFF			20ms 20ms	
Operating Frequency Range			360kHz	400kHz	440kHz
Minimum Load ⁽⁵⁾			0%		
Optional Output Trim			±10%		
Ripple and Noise	measured by 20MHz bandwidth with a 0.1µF/50V MLCC	3.3V 5.0V, 12V, 15V		60mV _{p-p} 75mV _{p-p}	
		Dual		100mV _{p-p}	
Remote ON/OFF ⁽⁶⁾	Positive Logic	DC-DC ON DC-DC OFF	Open or 3.0V < Vr < 12V Short or 0V < Vr < 1.2V		
	Negative Logic	DC-DC ON DC-DC OFF	Short or 0V < Vr < 1.2V Open or 3.0V < Vr < 12V		
Input current of Remote pin (CTRL)	DC-DC OFF			2mA	
	DC-DC ON		-0.5mA		0.5mA

Notes:

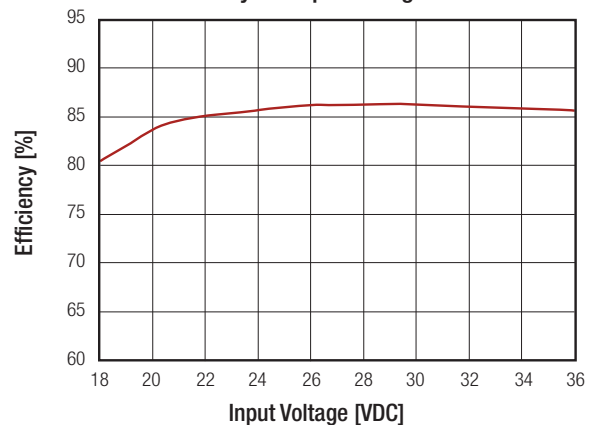
- Note5: The RP20-FW series requires a minimum of 10% loading on the output to maintain specified regulation. Operation under no-load condition will not damage these devices, however they may not meet all listed specification.
- Note6: The ON/OFF control function can be positive or negative logic. The pin voltage is referenced to -Vin pin.

RP20-2405SFW

Efficiency vs. Output Current



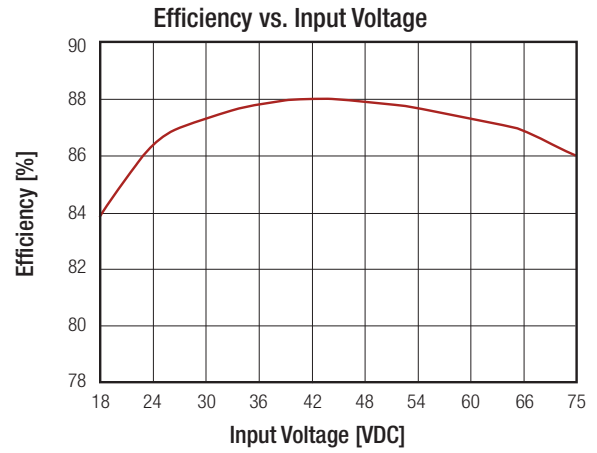
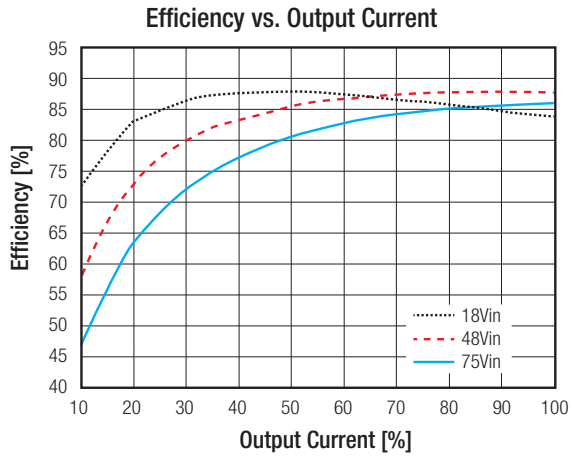
Efficiency vs. Input Voltage



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Specifications measured at Ta = 25°C, nominal input voltage, full load otherwise noted

RP20-4805SFw



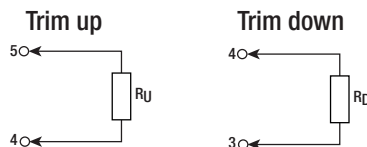
REGULATIONS

Parameter	Condition	Value	
Output Voltage Accuracy		±1.0%	
Voltage Adjustability	Single	±10%	
Line Voltage Regulation	low line to high line at full load	Single Dual	±0.2% ±0.5%
	no load to full load	Single Dual	±0.5% ±1.0%
Cross Regulation	asymmetrical 25%↔100% load	±5%	
Transient Response recovery time	25% load step change	250µs	

External Output Trimming

Output Voltage Trimming

Single output Powerline converters offer the feature of trimming the output voltage over a certain range around the nominal value by using external trim resistors. No general equation can be given for calculating the trim resistors, but the following trimtables give typical values for choosing these trimming resistors. If voltages between the given trim points are required, extrapolate between the two nearest given values to work out the resistor required or use a variable resistor to set the output voltage. Output can be externally trimmed by using the method shown below.



RP20-xx3.3SF

Trim up	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	3.333	3.366	3.399	3.432	3.465	3.498	3.531	3.564	3.597	3.63	Volts
R _U =	57.93	26.16	15.58	10.28	7.11	4.99	3.48	2.34	1.46	0.75	kOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	3.267	3.234	3.201	3.168	3.135	3.102	3.069	3.036	3.003	2.97	Volts
R _D =	69.47	31.23	18.49	12.12	8.29	5.74	3.92	2.56	1.50	0.65	kOhms

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Specifications measured at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted

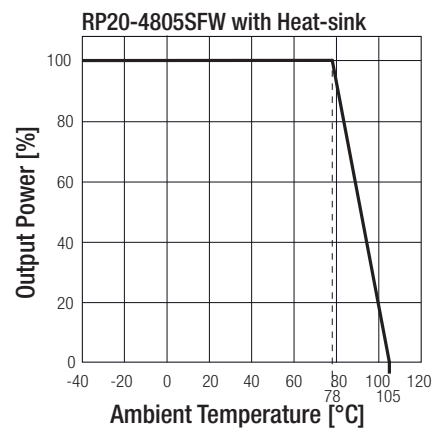
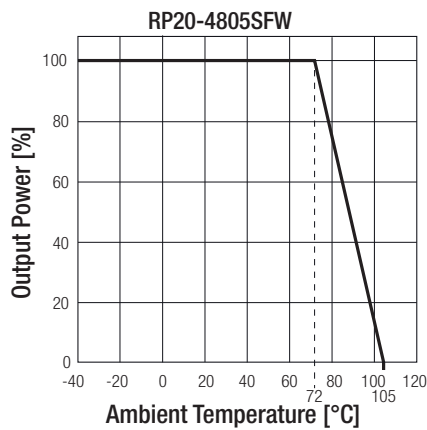
RP20-xx05SFW											
Trim up	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	5.05	5.10	5.15	5.20	5.25	5.30	5.35	5.4	5.45	5.50	Volts
R _u =	36.57	16.58	9.92	6.58	4.59	3.25	2.30	1.59	1.03	0.59	kOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	4.95	4.90	4.85	4.80	4.75	4.70	4.65	4.60	4.55	4.50	Volts
R _d =	45.53	20.61	12.31	8.15	5.66	4.00	2.81	1.92	1.23	0.68	kOhms
RP20-xx12SFW											
Trim up	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	12.12	12.24	12.36	12.48	12.60	12.72	12.84	12.96	13.08	13.20	Volts
R _u =	367.91	165.95	98.64	64.98	44.78	31.32	21.70	14.49	8.88	4.39	kOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	11.88	11.76	11.64	11.52	11.40	11.28	11.16	11.04	10.92	10.8	Volts
R _d =	460.99	207.95	123.60	81.42	56.12	39.25	27.20	18.16	11.13	5.51	kOhms
RP20-xx15SFW											
Trim up	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	15.15	15.3	15.45	15.60	15.75	15.90	16.05	16.20	16.35	16.50	Volts
R _u =	404.18	180.59	106.06	68.80	46.44	31.53	20.88	12.90	6.69	1.72	kOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	14.85	14.70	14.55	14.40	14.25	14.10	13.95	13.80	13.65	13.50	Volts
R _d =	499.82	223.41	131.27	85.20	57.56	39.14	25.97	16.10	8.42	2.282	kOhms

PROTECTIONS		
Parameter	Condition	Value
Short Circuit Protection (SCP)		continuous, automatic recovery
Over Voltage Protection (OVP)	Zener Diode Clamp	3.3V _{out} 5V _{out} 12V _{out} 15V _{out}
		3.9VDC typ. 6.2VDC typ. 15VDC typ. 18VDC typ.
Over Load Protection (OLP)	% of I _{out} rated	150% typ.
Isolation Voltage	I/P to O/P I/P to O/P to case	1.6kVDC/1 minute 1.6kVDC/1 minute
Isolation Resistance	500 VDC	1GΩ min.
Isolation Capacitance		1500pF max.
<p>Notes: Note7: This power module is not internally fused. An input line fuse must always be used.</p>		

Specifications measured at Ta = 25°C, nominal input voltage, full load otherwise noted

ENVIRONMENTAL		
Parameter	Condition	Value
Operating Temperature Range	without derating	-40°C to +72°C
	with derating	-40°C to +105°C
Maximum Case Temperature		+105°C
Temperature Coefficient		±0.02%/°C max.
Thermal Impedance	Natural convection (20LFM)	12°C/Watt
	Natural convection (20LFM) with Heat-sink	10°C/Watt
Operating Humidity		5% - 95% RH
Thermal Shock		MIL-STD-810F
Vibration		MIL-STD-810F
MTBF	MIL-HDBK-217F	1851 x 10 ³ hours
	Bellcore TR-NWT-000332 ⁽⁹⁾	2350 x 10 ³ hours

Derating Graph⁽⁹⁾



Notes:

Note8: BELLCORE TR-NWT-000332. Case I: 50% Stress, Temperature at 40°C (Ground fixed and controlled environment).

Note9: Derating graphs are valid only for the shown part numbers. If you need detailed derating-information about a part-number not shown here please contact our technical support service at techsupportAT@recom-power.com

SAFETY AND CERTIFICATIONS		
Certificate Type (Safety)	Report / File Number	Standard
UL General Safety	E196683	UL60950-1 1st. Ed.: 2003 C22.2 No. 60950 1st. Ed.: 2003
EMC Compliance	Condition	Standard / Criterion
EMI Standard ⁽¹⁰⁾	with external filter	EN55022, Class A or B
ESD	Air ±8kV and Contact ±6kC	EN61000-4-2, Criteria B
Radiated Immunity	10 V/m	EN61000-4-3, Criteria A
Fast Transient ⁽¹¹⁾	±2kV	EN61000-4-4, Criteria B
Surge ⁽¹¹⁾	±1kV	EN61000-4-5, Criteria A
Conducted Immunity	10 Vr.m.s	EN61000-4-6, Criteria A

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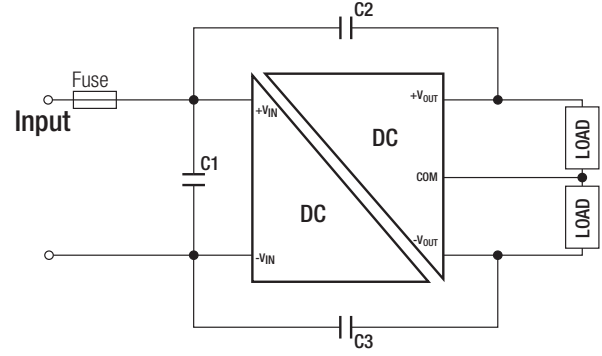
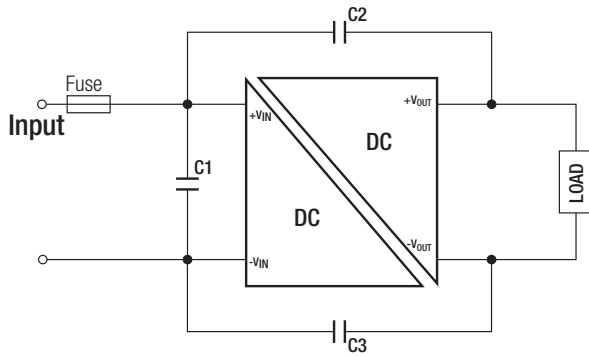
Specifications measured at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted

Notes:

Note10: The standard modules meet EMI Class A or Class B with external components, see filter suggestions below.

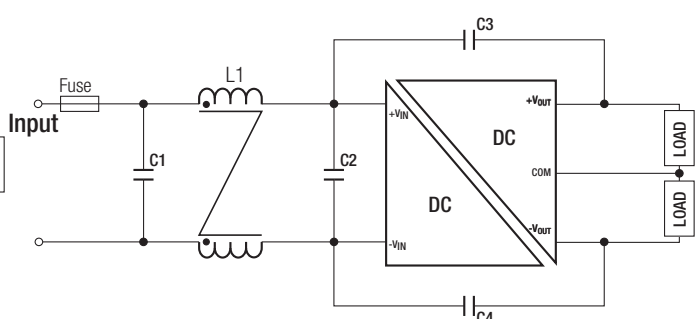
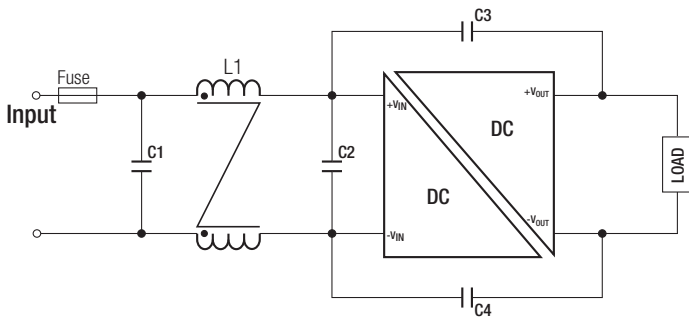
Note11: An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5. The filter capacitor Recom suggests: Nippon chemi-con KY series, 220 $\mu\text{F}/100\text{V}$

EMI Filtering Class A



MODEL	C1	C2	C3
RP20-24xxSFW RP20-24xxDFW	N/A	1000pF/2kV 1808 MLCC	1000pF/2kV 1808 MLCC
RP20-48xxSFW RP20-48xxDFW	1 $\mu\text{F}/100\text{V}$ 1210 MLCC	1000pF/2kV 1808 MLCC	1000pF/2kV 1808 MLCC

EMI Filtering Class B



MODEL	C1	C2	C3/C4	L1
RP20-24xxSF RP20-24xxDF	4.7 $\mu\text{F}/50\text{V}$ 1812 MLCC	N/A	1000pF/2kV 1808 MLCC	CMC: 450 μH ref.: WE 7448227005 ref.: CMC-05
RP20-48xxSF RP20-48xxDF	2.2 $\mu\text{F}/100\text{V}$ 1812 MLCC	2.2 $\mu\text{F}/100\text{V}$ 1812 MLCC	1000pF/2kV 1808 MLCC	CMC: 325 μH ref.: WE 744290321 ref.: CMC-06

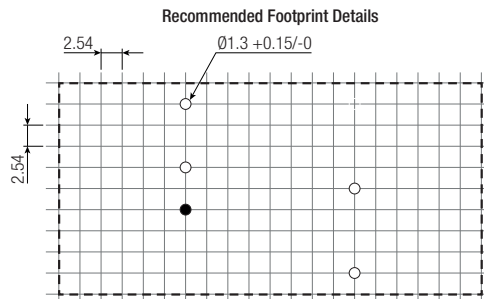
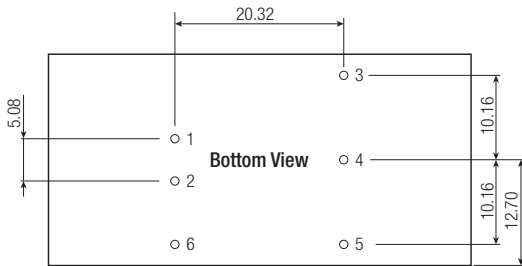
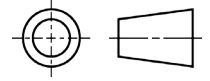
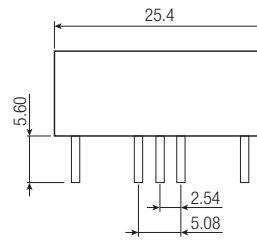
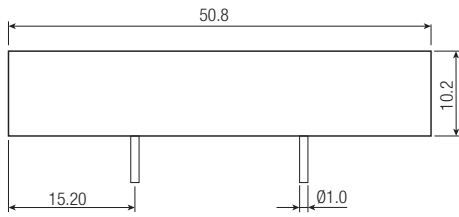
DIMENSIONS and PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	Case	Nickel coated copper
	Base	FR4 PCB
	Potting	Epoxy (UL94-V0)
Package Dimensions (LxWxH)	without Heat-sink	50.8 x 25.4 x 10.2mm
	with Heat-sink	56.8 x 25.4 x 16.8mm
Package Weight	without Heat-sink	27g
	with Heat-sink	37.89g

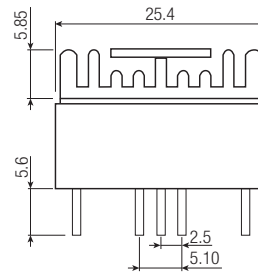
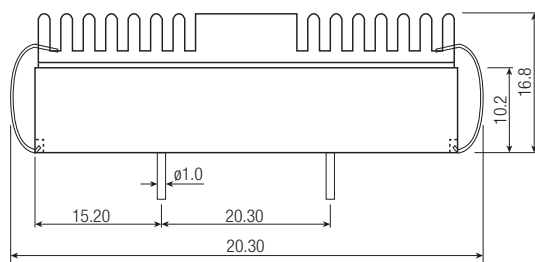
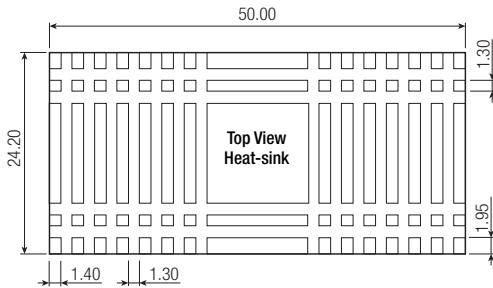
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Specifications measured at Ta = 25°C, nominal input voltage, full load otherwise noted

Dimension Drawing (mm)



Dimension Drawing (mm) with Heat-sink



Pin Connections

Pin #	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	+Vout	+Vout
4	Trim	Com
5	-Vout	-Vout
6	CTRL	CTRL

Pin Pitch Tolerance ± 0.25 mm
Pin Dimension Tolerance ± 0.1 mm
Tolerance: X.X ± 0.5 mm
X.XX ± 0.25 mm

PACKAGING INFORMATION

Parameter	Type		Value
	without Heat-sink	with Heat-sink	
Packaging Quantity	Tube	Tray	9pcs. 20pcs.
Storage Temperature Range			-55°C to +125°C
Storage Humidity			5% - 95% RH

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