

RC4136, RM4136, RV4136 QUAD GENERAL-PURPOSE OPERATIONAL AMPLIFIERS

SLOS072 – MARCH 1978 – REVISED SEPTEMBER 1990

- Continuous-Short-Circuit Protection
- Wide Common-Mode and Differential Voltage Ranges
- No Frequency Compensation Required
- Low Power Consumption
- No Latch-Up
- Unity Gain Bandwidth . . . 3 MHz Typ
- Gain and Phase Match Between Amplifiers
- Designed To Be Interchangeable With Raytheon RC4136, RM4136, and RV4136
- Low Noise . . . 8 nV $\sqrt{\text{Hz}}$ Typ at 1 kHz

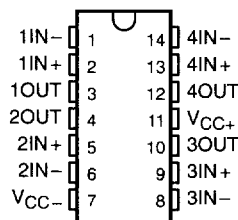
description

The RC4136, RM4136, and RV4136 are quad general-purpose operational amplifiers with each amplifier electrically similar to the $\mu\text{A}741$ except that offset null capability is not provided.

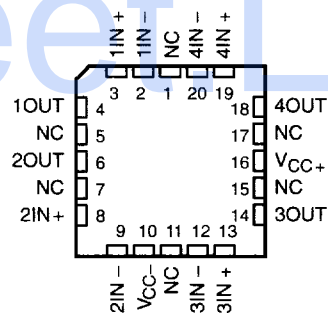
The high common-mode input voltage range and the absence of latch-up make these amplifiers ideal for voltage-follower applications. The devices are short circuit protected and the internal frequency compensation ensures stability without external components.

The RC4136 is characterized for operation from 0°C to 70°C, the RM4136 is characterized for operation over the full military temperature range of -55°C to 125°C, and the RV4136 is characterized for operation from -40°C to 85°C.

RM4136 . . . J OR W PACKAGE
ALL OTHERS . . . D OR N PACKAGE
(TOP VIEW)

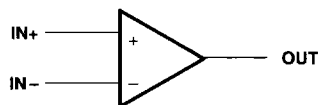


RM4136 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

symbol (each amplifier)



AVAILABLE OPTIONS

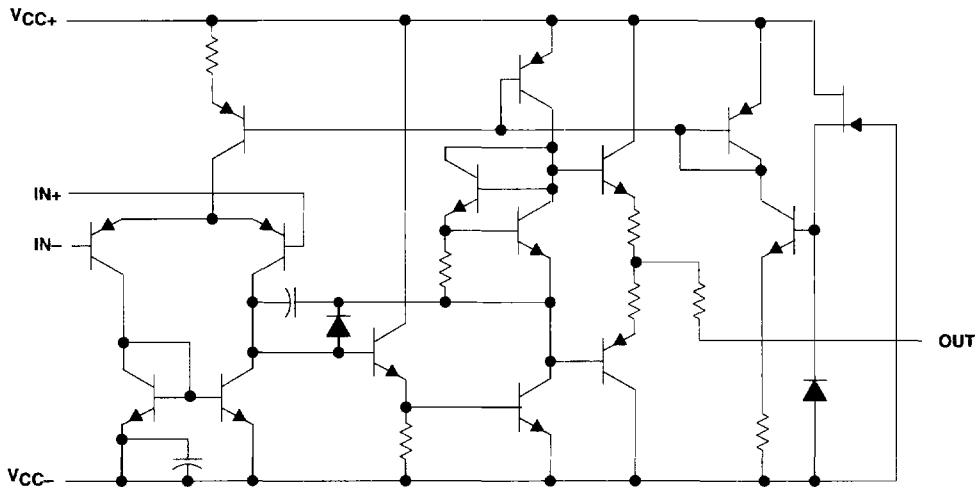
T _A	V _{IO} max AT 25°C	PACKAGE				
		SMALL OUTLINE (D)	CHIP CARRIER (FK)	CERAMIC DIP (J)	PLASTIC DIP (N)	FLAT (W)
0°C to 70°C	6 mV	RC4136D	—	—	RC4136N	—
-40°C to 85°C	6 mV	RV4136D	—	—	RV4136N	—
-55°C to 125°C	4 mV	—	RM4136FK	RM4136J	—	RM4136W

The D packages are available taped and reeled. Add the suffix R to the device type (e.g., RC4136DR).

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schematic (each amplifier)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

	RC4136	RM4136	RV4136	UNIT
Supply voltage V_{CC+} (see Note 1)	18	22	18	V
Supply voltage V_{CC-} (see Note 1)	-18	-22	-18	V
Differential input voltage (see Note 2)	± 30	± 30	± 30	V
Input voltage (any input, see Notes 1 and 3)	± 15	± 15	± 15	V
Duration of output short circuit to ground, one amplifier at a time (see Note 4)	unlimited	unlimited	unlimited	
Continuous total dissipation	See Dissipation Rating Table			
Operating free-air temperature range	0 to 70	-55 to 125	-40 to 85	$^{\circ}\text{C}$
Storage temperature range	-65 to 150	-65 to 150	-65 to 150	$^{\circ}\text{C}$
Case temperature for 60 seconds		FK package	—	$^{\circ}\text{C}$
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds		J or W package	—	$^{\circ}\text{C}$
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds		D or N package	260	$^{\circ}\text{C}$

- NOTES: 1. All voltage values, unless otherwise noted, are with respect to the midpoint between V_{CC+} and V_{CC-} .
 2. Differential voltages are at $IN+$ with respect to $IN-$.
 3. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 V, whichever is less.
 4. Temperature and/or supply voltages must be limited to ensure that the dissipation rating is not exceeded.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^{\circ}\text{C}$ POWER RATING	DERATING FACTOR	DERATE ABOVE T_A	$T_A = 70^{\circ}\text{C}$ POWER RATING	$T_A = 85^{\circ}\text{C}$ POWER RATING	$T_A = 125^{\circ}\text{C}$ POWER RATING
D	800 mW	7.6 mW/ $^{\circ}\text{C}$	45 $^{\circ}\text{C}$	608 mW	494 mW	—
FK	800 mW	11.0 mW/ $^{\circ}\text{C}$	77 $^{\circ}\text{C}$	800 mW	715 mW	275 mW
J	800 mW	11.0 mW/ $^{\circ}\text{C}$	77 $^{\circ}\text{C}$	800 mW	715 mW	275 mW
N	800 mW	9.2 mW/ $^{\circ}\text{C}$	63 $^{\circ}\text{C}$	736 mW	598 mW	—
W	800 mW	8.0 mW/ $^{\circ}\text{C}$	50 $^{\circ}\text{C}$	640 mW	520 mW	200 mW



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recommended operating conditions

	MIN	MAX	UNIT
Supply voltage, V_{CC+}	5	15	V
Supply voltage, V_{CC-}	-5	-15	V

electrical characteristics at specified free-air temperature, $V_{CC+} = 15\text{ V}$, $V_{CC-} = -15\text{ V}$

PARAMETER	TEST CONDITIONS†	RC4136			RM4136			RV4136			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_{IL} Input offset voltage	$V_O = 0$	25°C	0.5	6	0.5	4	0.5	6	mV		
		Full range		7.5		6		7.5			
I_{IO} Input offset current	$V_O = 0$	25°C	5	200	5	1.50	5	200	nA		
		Full range		300		500		500			
I_{IB} Input bias current	$V_O = 0$	25°C	140	500	140	400	140	500	nA		
		Full range		800		1500		1500			
V_i Input voltage range		25°C	±12	±14	±12	±14	±12	±14	V		
V_{OM} Maximum peak output voltage swing	$R_L = 10\text{ k}\Omega$	25°C	±12	±14	±12	±14	±12	±14	V		
	$R_L = 2\text{ k}\Omega$	25°C	±10	±13	±10	±13	±10	±13			
	$R_L \geq 2\text{ k}\Omega$	Full range	±10		±10		±10				
A_{VD} Large-signal differential voltage amplification	$V_O = \pm 10\text{ V}$, $R_L \geq 2\text{ k}\Omega$	25°C	20	300	50	350	20	300	V/mV		
		Full range	15		25		15				
B_1 Unity-gain bandwidth		25°C		3		3.5		3	MHz		
r_i Input resistance		25°C	0.3*	5	0.3*	5	0.3*	5	M Ω		
CMRR Common-mode rejection ratio	$V_O = 0$, $R_S = 50\ \Omega$	25°C	70	90	70	90	70	90	dB		
k_{SVS} Supply voltage sensitivity ($\Delta V_{IO}/\Delta V_{CC}$)	$V_{CC} = \pm 9\text{ V}$ to $\pm 15\text{ V}$, $V_O = 0$	25°C		30 150		30 150		30 150	$\mu\text{V/V}$		
V_n Equivalent input noise voltage (closed-loop)	$A_{VD} = 100$, BW = 1 Hz, f = 1 kHz, $R_S = 100\ \Omega$	25°C		8		8		8	nV $\sqrt{\text{Hz}}$		
I_{CC} Supply current (all four amplifiers)	$V_O = 0$, No load	25°C		5 11.3		5 11.3		5 11.3	mA		
		MIN T_A		6 13.7		6 13.3		6 13.7			
		MAX T_A		4.5 10		4.5 10		4.5 10			
P_D Total power dissipation (all four amplifiers)	$V_O = 0$, No load	25°C		150 340		150 340		150 340	mW		
		MIN T_A		180 400		180 400		180 400			
		MAX T_A		135 300		135 300		135 300			
Crosstalk attenuation (V_{O1}/V_{O2})	$A_{VD} = 100$, f = 10 kHz, $R_S = 1\text{ k}\Omega$	25°C		105		105		105	dB		

* This parameter is not production tested.

† All characteristics are measured under open-loop conditions with zero common-mode input voltage unless otherwise specified. Full range is 0°C to 70°C for RC4136, -55°C to 125°C for RM4136, and -40°C to 85°C for RV4136. Minimum T_A is 0°C for RC4136, -55°C for RM4136, and -40°C for RV4136. Maximum T_A is 70°C for RC4136, 125°C for RM4136, and 85°C for RV4136.



**RC4136, RM4136, RV4136
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operating characteristics, $V_{CC+} = 15\text{ V}$, $V_{CC-} = -15\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	RC4136, RV4136			RM4136			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
t_r	Rise time	$V_I = 20\text{ mV}$, $R_L = 2\text{ k}\Omega$ $C_L = 100\text{ pF}$	0.13			0.13			μs
	Overshoot factor		5%			5%			
SR	Slew rate at unity gain	$V_I = 10\text{ V}$, $R_L = 2\text{ k}\Omega$ $C_L = 100\text{ pF}$	1.7			1.7			$\text{V}/\mu\text{s}$