

RC4136, RM4136, RV4136 QUAD HIGH-PERFORMANCE OPERATIONAL AMPLIFIERS

SLOS072 – D2142, 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 Typical**
- **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**

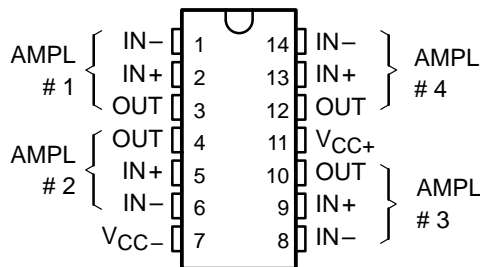
description

The RC4136, RM4136, and RV4136 are quad high-performance operational amplifiers with each amplifier electrically similar to the uA741 except that offset null capability is not provided.

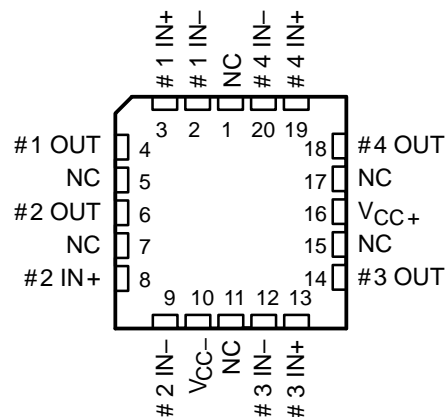
The high common-mode input voltage range and the absence of latch-up make these amplifiers ideal for voltage-follower applications. The devices are short-circuit protected and the internal frequency compensation ensures stability without external components.

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.

**RM 4136 . . . J OR W PACKAGE
ALL OTHERS . . . D OR N PACKAGE
(TOP VIEW)**

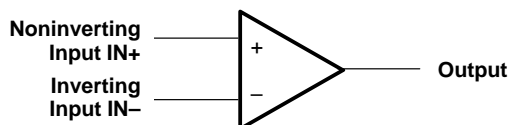


**RM4136
FK CHIP CARRIER PACKAGE
(TOP VIEW)**



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					
-40°C to 85°C		RC4136D	—	—	RC4136N	—
-55°C to 125°C	6 mV	RV4136D	—	—	RV4136N	—

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

RM4136W

PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

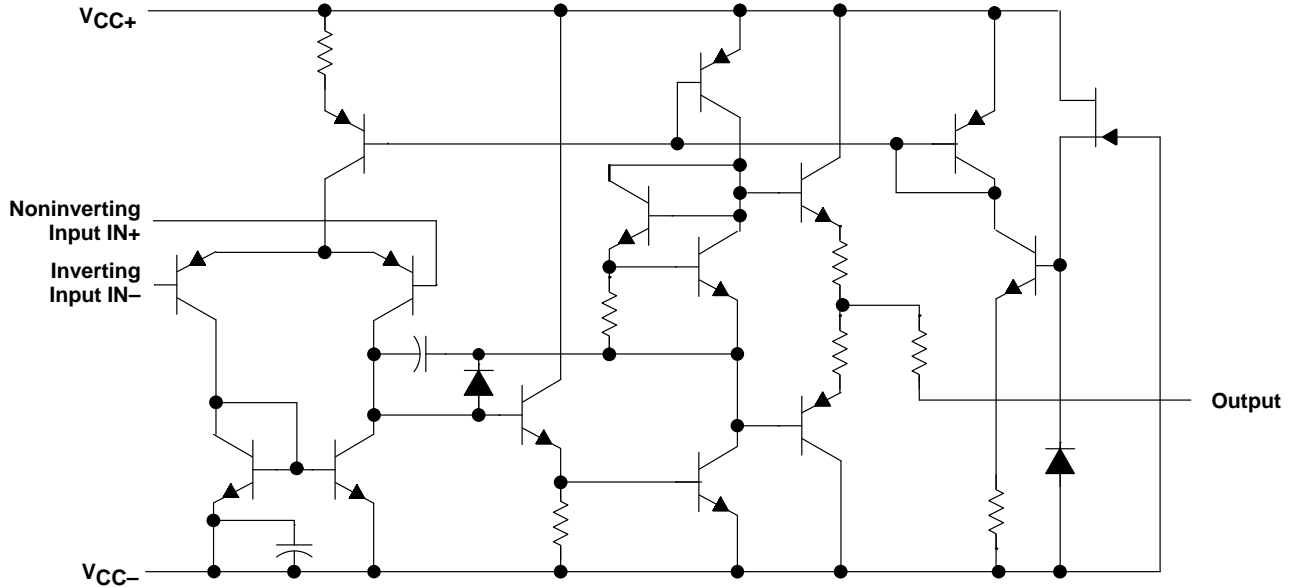


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RC4136, RM4136, RV4136 QUAD HIGH-PERFORMANCE OPERATIONAL AMPLIFIERS

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	260	—	$^{\circ}\text{C}$
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds	J or W package	300	—	$^{\circ}\text{C}$
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	D or N package	260	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 the noninverting input terminal with respect to the inverting input terminal.
 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	NOM	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 CONDITION [†]	RC4136			RM4136			RV4136			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO} 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	MΩ		
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		$\text{nV}/\sqrt{\text{Hz}}$		
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			
V_{01}/V_{02} Crosstalk attenuation	$A_{VD} = 100$, 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.

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	$V_I = 20\text{ mV}$, $C_L = 100\text{ pF}$	$R_L = 2\text{ k}\Omega$	0.13			0.13			μs
	Overshoot factor			5%			5%			
SR	Slew rate at unity gain	$V_I = 10\text{ V}$, $C_L = 100\text{ pF}$	$R_L = 2\text{ k}\Omega$	1.7			1.7			$\text{V}/\mu\text{s}$

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