

RC4136, RM4136, RV4136 QUAD GENERAL-PURPOSE OPERATIONAL AMPLIFIERS

The RM4136 and RV4136 are obsolete and are no longer supplied.

SLOS072A – MARCH 1978 – REVISED JANUARY 2002

- 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 . . . $8 \text{ nV}\sqrt{\text{Hz}}$ Typ at 1 kHz

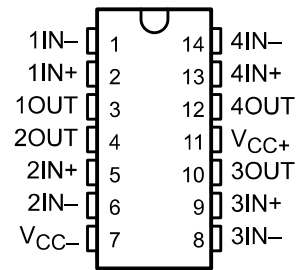
description

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.

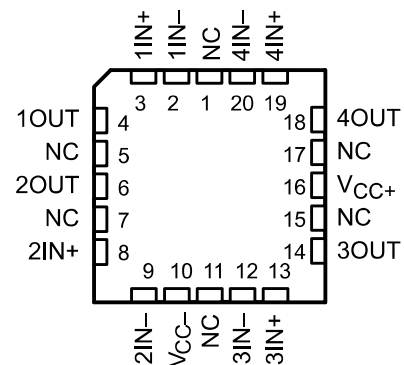
The high common-mode input voltage range and the absence of latch-up make these amplifiers ideal for voltage-follower applications. The devices are short-circuit protected and the internal frequency compensation ensures stability without external components.

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)

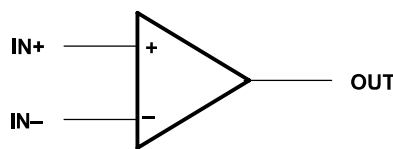


RM4136 . . . FK PACKAGE
(TOP VIEW)



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).



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is 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.

 **TEXAS
INSTRUMENTS**

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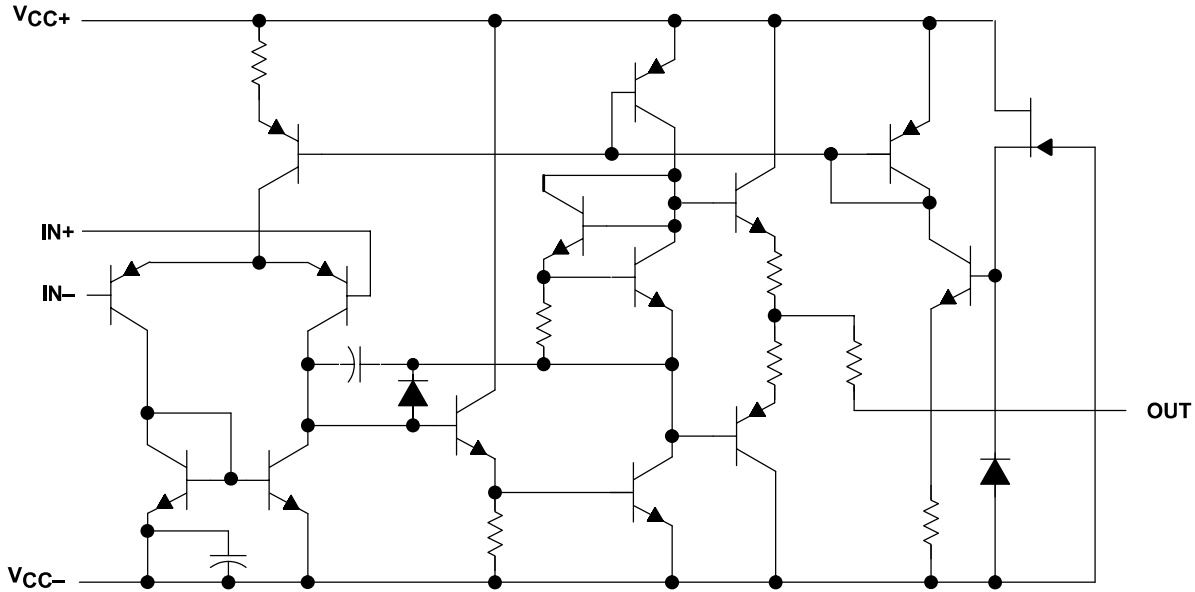
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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

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schematic (each amplifier)



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

Supply voltage (see Note 1): V_{CC+} , RC4136 and RV4136	18 V
V_{CC+} , RM4136	22 V
V_{CC-} , RC4136 and RV4136	-18 V
V_{CC-} , RM4136	-22 V
Differential input voltage, V_{ID} (see Note 2)	± 30 V
Input voltage, V_I (any input) (see Notes 1 and 3)	± 15 V
Duration of output short circuit to ground, one amplifier at a time (see Note 4)	Unlimited
Continuous total dissipation	See Dissipation Rating Table
Package thermal impedance, θ_{JA} (see Note 5): D package	86°C/W
N package	80°C/W
Case temperature for 60 seconds: FK package	260°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D or N package	260°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J or W package	300°C
Storage temperature range, T_{stg}	-65°C to 150°C

† Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- 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.
 5. The package thermal impedance is calculated in accordance with JESD 51-7.

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
FK	800 mW	11.0 mW/°C	77°C	800 mW	715 mW	275 mW
J	800 mW	11.0 mW/°C	77°C	800 mW	715 mW	275 mW
W	800 mW	8.0 mW/°C	50°C	640 mW	520 mW	200 mW



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recommended operating conditions

		MIN	MAX	UNIT
V_{CC+}	Supply voltage	5	15	V
V_{CC-}	Supply voltage	-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	150	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	μV/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√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.



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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	TYP	UNIT
t_r	Rise time	$V_I = 20\text{ mV}$, $C_L = 100\text{ pF}$, $R_L = 2\text{ k}\Omega$	0.13	μs
	Overshoot factor	$V_I = 20\text{ mV}$, $C_L = 100\text{ pF}$, $R_L = 2\text{ k}\Omega$	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	$\text{V}/\mu\text{s}$