

6Bit VID Reference Generator

General Description

The RT9401C is digital to analog converter which generates a reference voltage for Intel VR10.x 6-bit VID code respectively. The part is proposed to pair with a series of Richtek's general purpose PWM controllers dedicated for the desktop microprocessor core power voltage regulation. The reference voltage is within 1% high accuracy.

Ordering Information

RT9401C □ □

- Package Type
SP : SOP-8 (Exposed Pad-Option 1)
- Lead Plating System
P : Pb Free
G : Green (Halogen Free and Pb Free)

Note :

Richtek products are :

- ▶ RoHS compliant and compatible with the current requirements of IPC/JEDEC J-STD-020.
- ▶ Suitable for use in SnPb or Pb-free soldering processes.

Marking Information

For marking information, contact our sales representative directly or through a Richtek distributor located in your area.

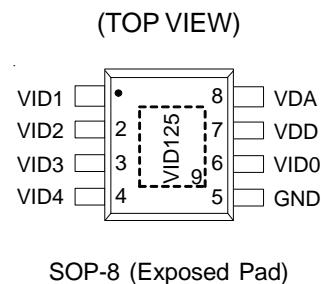
Features

- Support 6bit DAC Voltage Conforming to Intel VRD10.x VID Table
- 1% High Accuracy of V_{REF}
- RoHS Compliant and 100% Lead (Pb)-Free

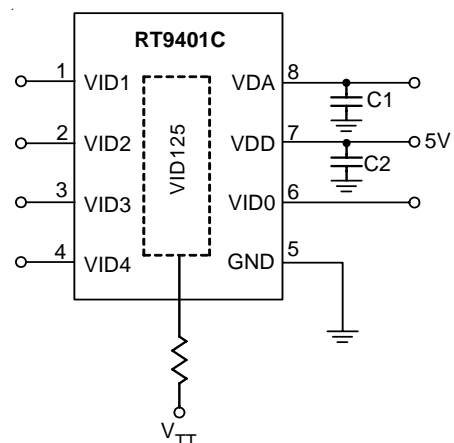
Applications

- Desktop/Motherboard Microprocessor Core Power Regulation
- High Accuracy and Programmable Voltage Power Regulation

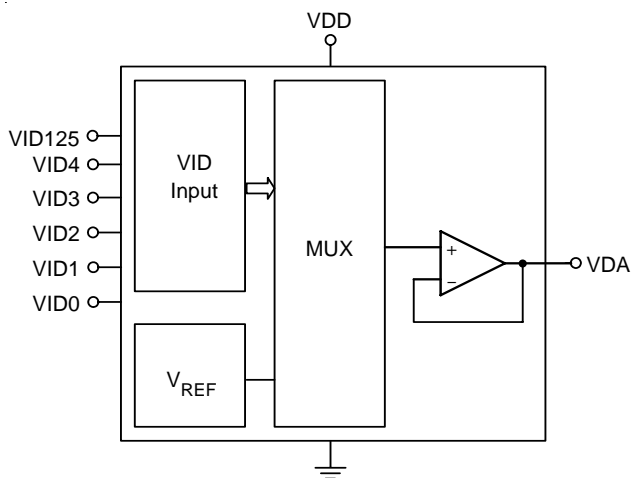
Pin Configurations



Typical Application Circuit



Function Block Diagram



Functional Pin Description

Pin No.	Pin Name	Pin Function
1	VID1	DAC Voltage Identification Inputs.
2	VID2	DAC Voltage Identification Inputs.
3	VID3	DAC Voltage Identification Inputs.
4	VID4	DAC Voltage Identification Inputs.
5	GND	Ground.
6	VID0	DAC Voltage Identification Inputs.
7	VDD	Power Input Pin.
8	VDA	Digital - to - Analog Voltage Output.
Exposed Pad (9)	VID125	DAC Voltage Identification Inputs.

Absolute Maximum Ratings (Note 1)

- Supply Input Voltage, V_{DD} ----- 7V
- Power Dissipation, P_D @ $T_A = 25^\circ\text{C}$
 SOP-8 (Exposed Pad) ----- 1.1W
- Package Thermal Resistance (Note 2)
 SOP-8 (Exposed Pad), θ_{JA} ----- 86°C/W
- Lead Temperature (Soldering, 10 sec.) ----- 260°C
- Storage Temperature Range ----- -65°C to 150°C
- ESD Susceptibility (Note 3)
 HBM (Human Body Mode) ----- 2kV
 MM (Machine Mode) ----- 200V

Recommended Operating Conditions (Note 4)

- Supply Input Voltage, V_{DD} ----- 5V \pm 10%
- Junction Temperature Range ----- -40°C to 125°C

Electrical Characteristics

($V_{DD} = 5\text{V}$, $T_A = 25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
V_{DD} Supply Current						
Nominal Supply Current	I_{DD}	VDA open	--	2	5	mA
Reference & DAC						
Output Voltage Program	See Table 1					
DAC Output Voltage Accuracy		$VDA \geq 1\text{V}$	-1	--	+1	%
		$VDA < 1\text{V}$	-10	--	+10	mV
VID(4:0) & VID125 Input Low			--	--	0.4	V
VID(4:0) & VID125 Input High			1.05	--	--	V
VID[4:0] Internal Pull-High Current Source Capability			18	--	--	μA
VID[4:0] Internal Pull-High Voltage		When select AMD CPU	2.2	2.4	2.5	V
		When select Intel CPU	1	1.1	1.2	V
Output Buffer						
DC Gain		Capacitor Load Only	--	70	--	dB
Bandwidth	GBW	CL=1nF	--	1.64	--	MHz
Slew Rate	SR	CL=0.1 μF	--	9.5	--	mV/ μs
Impedance	R_{OUT}		60	--	110	Ω

Note 1. Stresses listed as the above "Absolute Maximum Ratings" may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibility to affect device reliability.

Note 2. θ_{JA} is measured in the natural convection at $T_A = 25^\circ\text{C}$ on a low effective thermal conductivity test board of JEDEC 51-3 thermal measurement standard.

Note 3. Devices are ESD sensitive. Handling precaution recommended.

Note 4. The device is not guaranteed to function outside its operating conditions.

Table 1. Output Voltage Program (VR 10)

Pin Name						Nominal Output Voltage DACOUT
VID4	VID3	VID2	VID1	VID0	VID125	
1	1	1	1	1	X	No CPU
0	1	0	1	0	0	0.8375V
0	1	0	0	1	1	0.850V
0	1	0	0	1	0	0.8625V
0	1	0	0	0	1	0.875V
0	1	0	0	0	0	0.8875V
0	0	1	1	1	1	0.900V
0	0	1	1	1	0	0.9125V
0	0	1	1	0	1	0.925V
0	0	1	1	0	0	0.9375V
0	0	1	0	1	1	0.950V
0	0	1	0	1	0	0.9625V
0	0	1	0	0	1	0.975V
0	0	1	0	0	0	0.9875V
0	0	0	1	1	1	1.000V
0	0	0	1	1	0	1.0125V
0	0	0	1	0	1	1.025V
0	0	0	1	0	0	1.0375V
0	0	0	0	1	1	1.050V
0	0	0	0	1	0	1.0625V
0	0	0	0	0	1	1.075V
0	0	0	0	0	0	1.0875V
1	1	1	1	0	1	1.100V
1	1	1	1	0	0	1.1125V
1	1	1	0	1	1	1.125V
1	1	1	0	1	0	1.1375V
1	1	1	0	0	1	1.150V
1	1	1	0	0	0	1.1625V
1	1	0	1	1	1	1.175V
1	1	0	1	1	0	1.1875V
1	1	0	1	0	1	1.200V
1	1	0	1	0	0	1.2125V

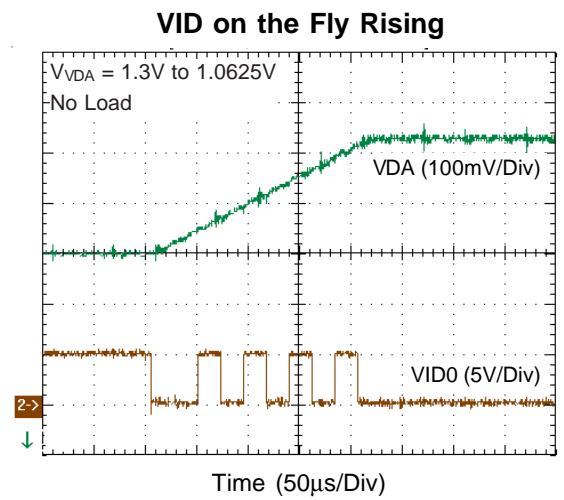
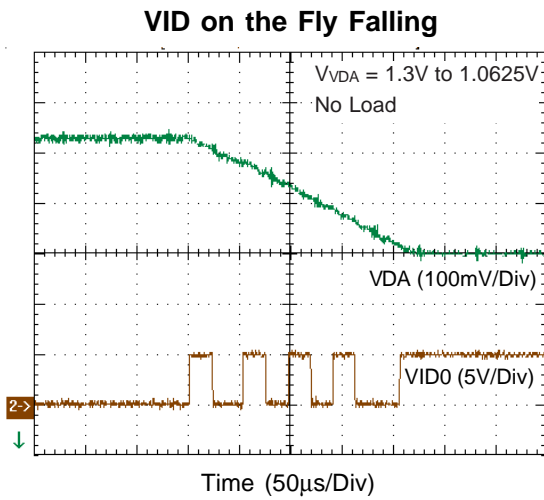
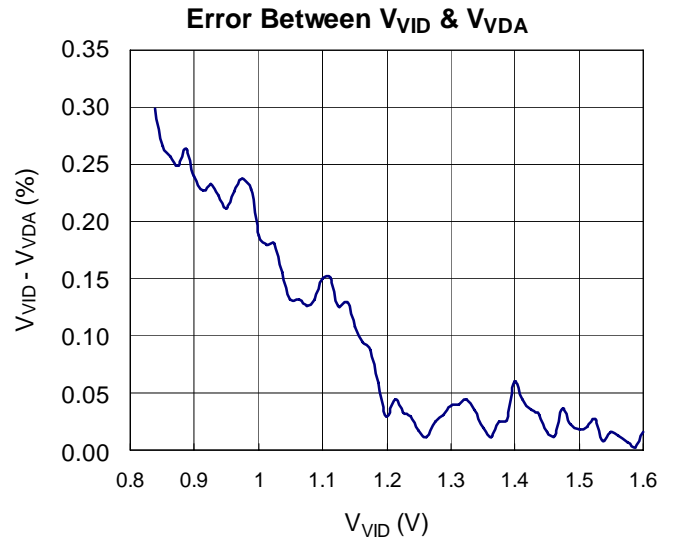
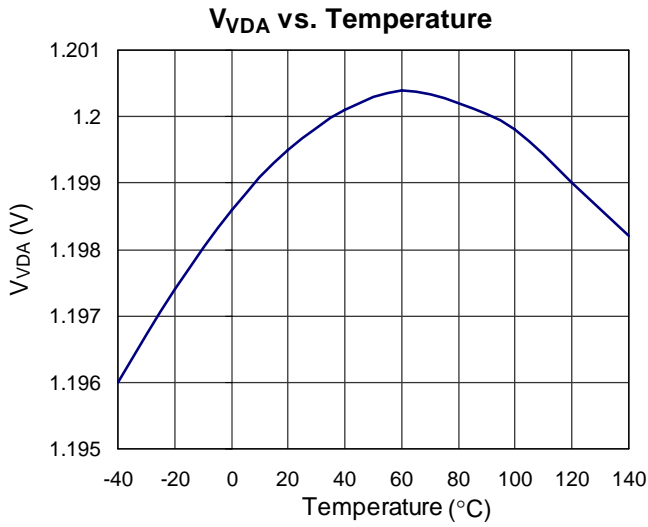
To be continued

Table 1. Output Voltage Program (VR 10)

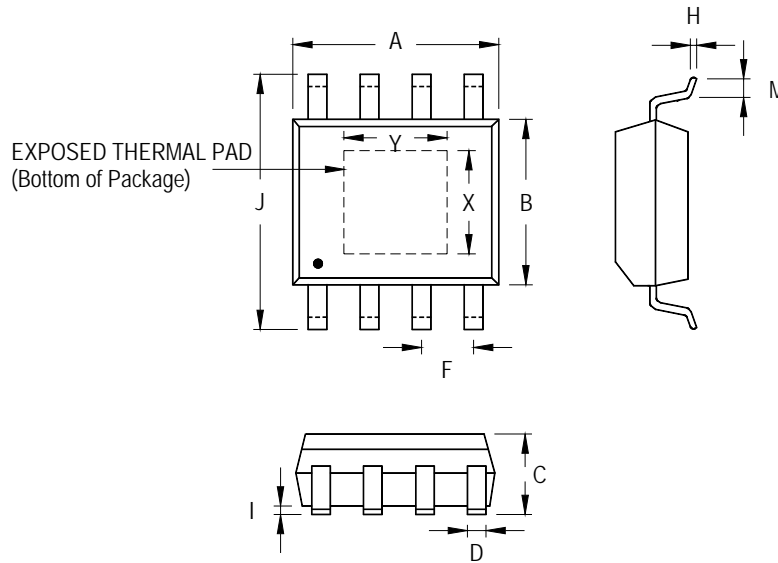
Pin Name						Nominal Output Voltage DACOUT
VID4	VID3	VID2	VID1	VID0	VID125	
1	1	0	0	1	1	1.225V
1	1	0	0	1	0	1.2375V
1	1	0	0	0	1	1.250V
1	1	0	0	0	0	1.2625V
1	0	1	1	1	1	1.275V
1	0	1	1	1	0	1.2875V
1	0	1	1	0	1	1.300V
1	0	1	1	0	0	1.3125V
1	0	1	0	1	1	1.325V
1	0	1	0	1	0	1.3375V
1	0	1	0	0	1	1.350V
1	0	1	0	0	0	1.3625V
1	0	0	1	1	1	1.375V
1	0	0	1	1	0	1.3875V
1	0	0	1	0	1	1.400V
1	0	0	1	0	0	1.4125V
1	0	0	0	1	1	1.425V
1	0	0	0	1	0	1.4375V
1	0	0	0	0	1	1.450V
1	0	0	0	0	0	1.4625V
0	1	1	1	1	1	1.475V
0	1	1	1	1	0	1.4875V
0	1	1	1	0	1	1.500V
0	1	1	1	0	0	1.5125V
0	1	1	0	1	1	1.525V
0	1	1	0	1	0	1.5375V
0	1	1	0	0	1	1.550V
0	1	1	0	0	0	1.5625V
0	1	0	1	1	1	1.575V
0	1	0	1	1	0	1.5875V
0	1	0	1	0	1	1.600V

Note: (1) 0 : Connected to GND
 (2) 1 : Open
 (3) X : Don't Care

Typical Operating Characteristics



Outline Dimension



Symbol	Dimensions In Millimeters		Dimensions In Inches		
	Min	Max	Min	Max	
A	4.801	5.004	0.189	0.197	
B	3.810	4.000	0.150	0.157	
C	1.346	1.753	0.053	0.069	
D	0.330	0.510	0.013	0.020	
F	1.194	1.346	0.047	0.053	
H	0.170	0.254	0.007	0.010	
I	0.000	0.152	0.000	0.006	
J	5.791	6.200	0.228	0.244	
M	0.406	1.270	0.016	0.050	
Option 1	X	2.000	2.300	0.079	0.091
	Y	2.000	2.300	0.079	0.091
Option 2	X	2.100	2.500	0.083	0.098
	Y	3.000	3.500	0.118	0.138

8-Lead SOP (Exposed Pad) Plastic Package

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