RT9232 Data Sheet

RichTek Technology Corp. RDS-232-009A Rev. 2
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Programmable Synchronous PWM Buck Converter with 1.5V/2.5V Dual Low Dropout Linear Regulator Controller and Reference Output

General Description

The RT9232 integrates a PWM controller and two low-dropout linear regulators into a single chip. The PWM controller provides the CPU core voltage controlled by a 5-bit DAC and the linear section regulates power for GTL bus, clock driver, or other circuits on motherboards. The PWM controller provides an adjustable Intel-compatible 1.3V~3.5V output voltage. The synchronous N-MOSFET driver with 200 KHz switching frequency optimizes the efficiency, device size, and cost. The built-in over–voltage and current-limiting protection prevents the CPU from damage. Power-good signal is sent when the core voltage is within ± 10% of the setting point.

The linear section is a low dropout regulator which drives low cost NPN transistors to supply the 1.5V and 2.5V regulated output powers. The 1.265V reference is available for external linear regulators.

Features

- 3 Regulated Voltages
- N-MOSFET Driver for High Efficiency Switching Section
- Power-good, Over-voltage, and Current-limiting Protection for Switching Section
- 1.5V and 2.5V Fixed Output Voltages for Linear Section
- 1.265V Reference Voltage Output
- Capable of Driving Low Cost NPN Transistor as Power Device
- TTL-compatible 5-bit DAC Core Output Voltage

Applications

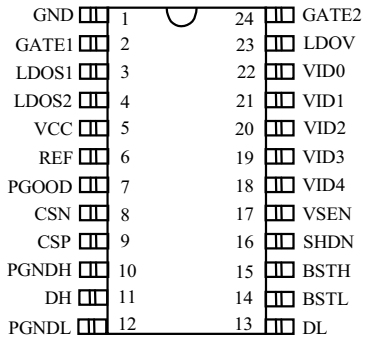
- Power Supply for Pentium, Pentium Pro™, Pentium II™, PowerPC™, K6™, 6x86™, and Alpha™ Microprocessors
- Flexible Motherboard Power Supplies
- Low-voltage Distributed Power Supplies
- Programmable Power Supplies

Ordering Information

RT9232-□ □

- Package Type
  - S: SOP-24
- Operating Temperature Range
  - C: Commercial standard
  - M: Military standard

Pin Configurations

Part Number	Pin Configurations
RT9232-CS	

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Absolute Maximum Ratings

- VCC to GND (V_{IN}) ---------- -0.3 to +5.5V
- PGND to GND ---------- ± 0.3V
- BSTH and BSTL to GND ---------- -0.3 to +14V
- Ambient Temperature Range (T_A) ---------- 0 to +70℃
- Junction Temperature Range (T_J) ---------- 0 to +125℃
- Storage Temperature Range (T_{STG}) ---------- -65 to +150℃
- Lead Temperature (Soldering) 10 seconds (T_L) ---------- 300℃
- Thermal Impedance Junction to Ambient (θ_{JA}) ---------- 80℃/W
- Thermal Impedance Junction to Case (θ_{JC}) ---------- 25℃/W

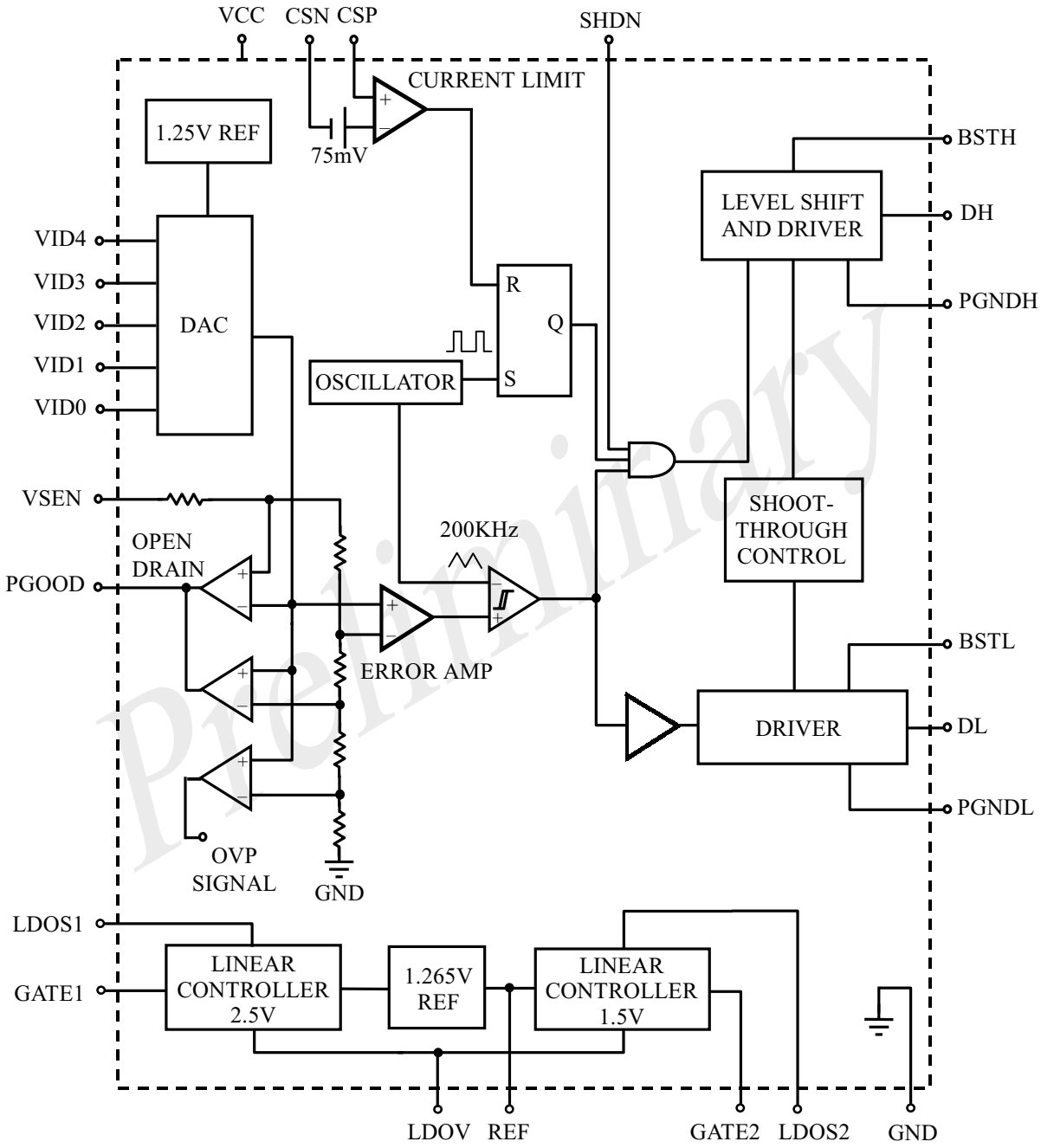
Electrical Characteristics

VCC = 5V; GND = 0V; PGNDH = PGNDL = 0V; VSEN = VOUT; 0mV < (V_{CSP}-V_{CSN}) <60mV; T_A = 25 °C

Parameter	Test Conditions	Min	Typ	Max	Units
Switching Section					
Output Voltage	I_O = 2A		(1)		
Supply Voltage	VCC	4.5	-	5.5	V
Supply Current		-	3	6	mA
Load Regulation	I_O = 0.8A to 15A	-	1	-	%
Line Regulation	VCC = 4.75V to 5.25V	-	0.5	-	%
Power On Reset Trip Point	VCC Rising	-	4.2	-	V
Current Limit Voltage	V_{CSP} - V_{CSN}	-	75	-	mV
Oscillator Frequency		170	200	230	KHz
Oscillator Max Duty Cycle		90	95	-	%
DH Source	$V_{BSTH} - V_{DH}$ = 1V	-	3.5	-	Ω
DH Sink	$V_{DH} - V_{PGNDH}$ = 1V	-	3.5	-	Ω
DL Source	$V_{BSTL} - V_{DL}$ = 3V	-	2	-	Ω
DL Sink	$V_{DL} - V_{PGNDL}$ = 1V	-	2	-	Ω
OVP Threshold Voltage		-	120	-	%
Power Good Threshold Voltage	VSEN Rising	92	-	108	%
Linear Sections					
Quiescent Current	LDOV = 12V	-	-	5	mA
Output Voltage (LDO1 RT9232)		2.450	2.500	2.550	V
Output Voltage (LDO2 RT9232)		1.470	1.500	1.530	V
Gain (A_{OL})	LDOS (1,2) to GATE (1,2)	-	65	-	dB
Load Regulation	I_O = 0 to 5A	-	1	-	%
Line Regulation	LDOV = 11.4V to 12.6V	-	1	-	%
Reference Voltage	Iref <= 100μA	1.240	1.265	1.290	V

Note: (1) See output voltage table.

Function Block



Pin Description

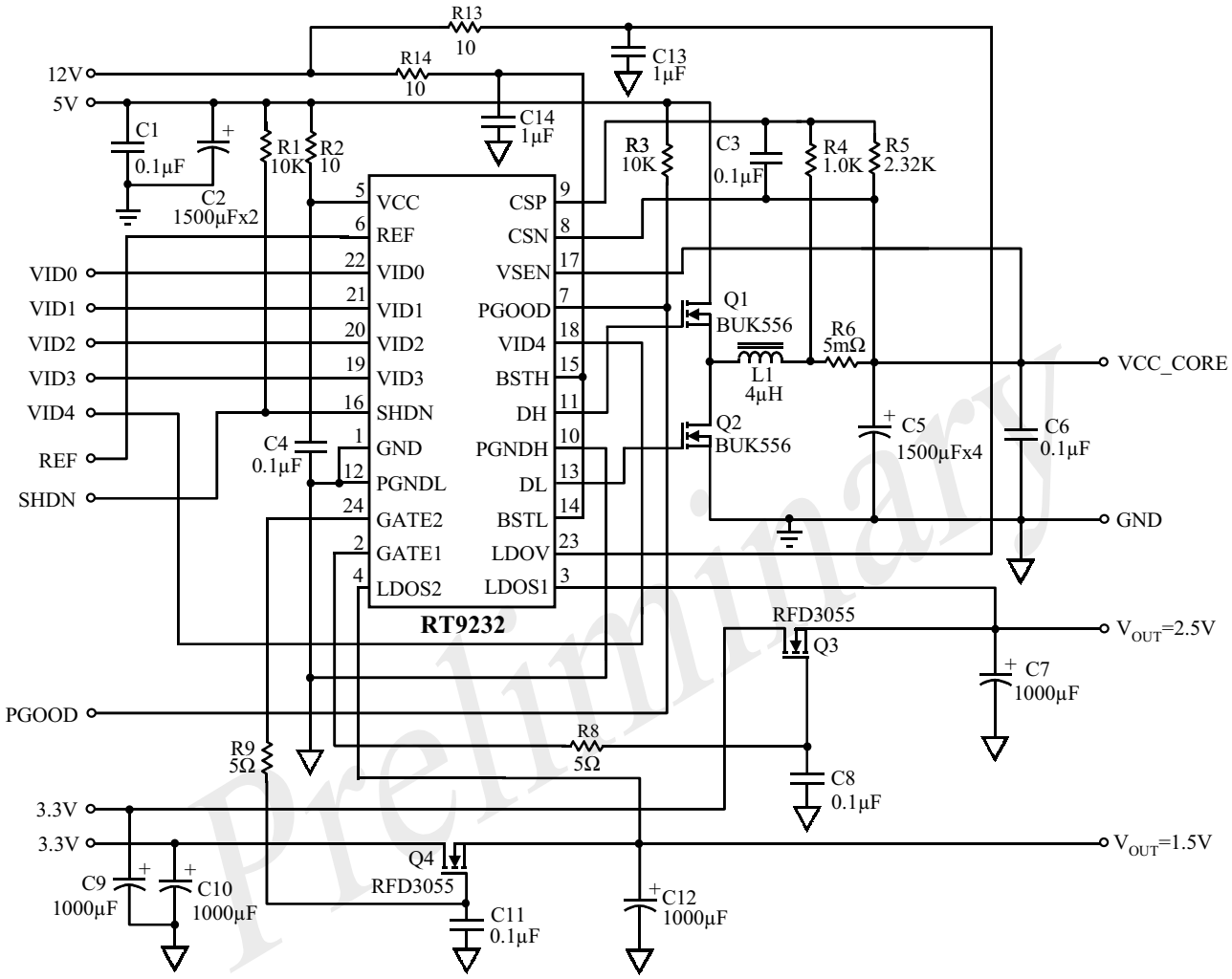
Pin No.	Pin Name	Pin Function
1	GND	Small signal analog and digital ground
2	GATE1	LDO1 gate drive output
3	LDOS1	LDO1 sense input
4	LDOS2	LDO2 sense input
5	VCC	Input voltage
6	REF	Buffered Reference Voltage Output
7	PGOOD(1)	Open collector logic output; High if V_O within 10% of setpoint
8	CSN	Current sense input (Negative)
9	CSP	Current sense input (Positive)
10	PGNDH	Power ground for high side switch
11	DH	High side driver output
12	PGNDL	Power ground for low side switch
13	DL	Low side driver output
14	BSTL	Supply for low side driver
15	BSTH	Supply for high side driver
16	SHDN(1)	Logic low shutdown the converter
17	VSEN	Top end of internal feedback chain
18	VID4(1)	Programming input (MSB)
19	VID3(1)	Programming input
20	VID2(1)	Programming input
21	VID1(1)	Programming input
22	VID0(1)	Programming input (LSB)
23	LDOV	+12V for LDO section
24	GATE2	LDO2 gate drive output

Note: (1) All logic level inputs and outputs are TTL compatible.

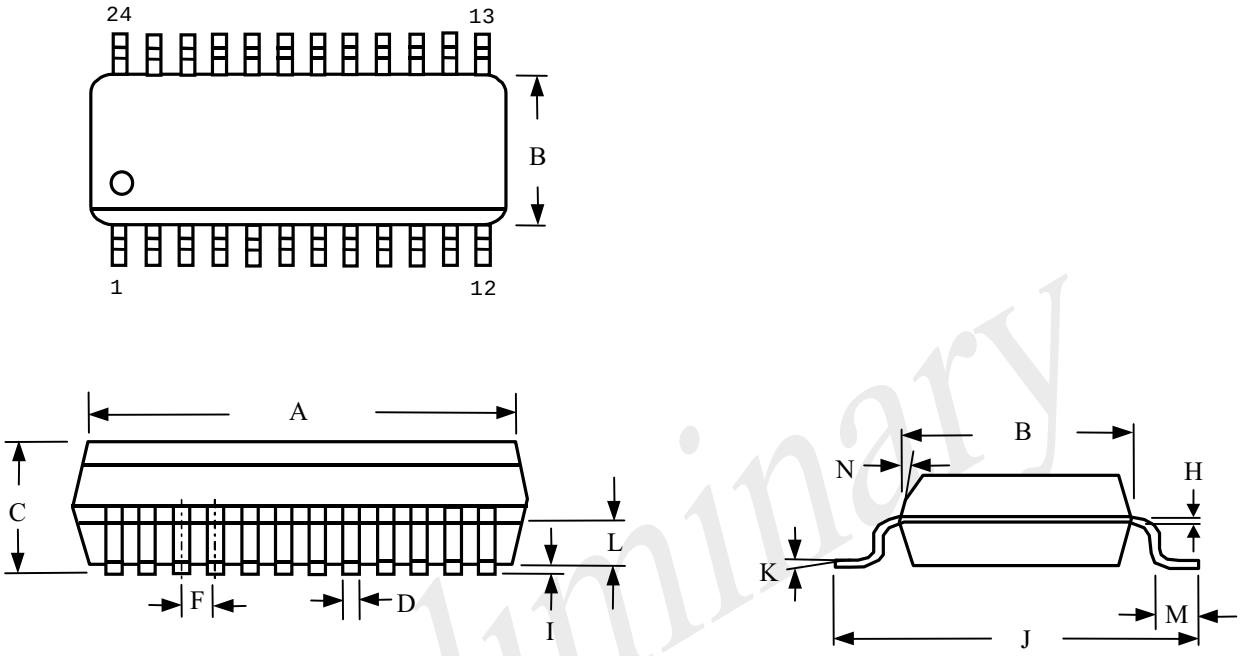
Output Voltage

Test Item	Conditions	VID 43210	Min	Typ	Max	Units
Output Voltage	I_O = 2A in application circuit	01111	1.274	1.300	1.326	V
		01110	1.323	1.350	1.377	
		01101	1.372	1.400	1.428	
		01100	1.421	1.450	1.479	
		01011	1.478	1.500	1.523	
		01010	1.527	1.550	1.573	
		01001	1.576	1.600	1.624	
		01000	1.625	1.650	1.675	
		00111	1.675	1.700	1.726	
		00110	1.724	1.750	1.776	
		00101	1.773	1.800	1.827	
		00100	1.822	1.850	1.878	
		00011	1.872	1.900	1.929	
		00010	1.921	1.950	1.979	
		00001	1.970	2.000	2.030	
		00000	2.019	2.050	2.081	
		11111	1.940	2.000	2.060	
		11110	2.058	2.100	2.142	
		11101	2.156	2.200	2.244	
		11100	2.254	2.300	2.346	
		11011	2.352	2.400	2.448	
		11010	2.450	2.500	2.550	
		11001	2.548	2.600	2.652	
		11000	2.646	2.700	2.754	
		10111	2.744	2.800	2.856	
		10110	2.813	2.900	2.987	
		10101	2.910	3.000	3.090	
		10100	3.007	3.100	3.193	
		10011	3.104	3.200	3.296	
		10010	3.201	3.300	3.399	
		10001	3.298	3.400	3.502	
		10000	3.395	3.500	3.605	

Typical Application Circuit



Package Information



Symbols	Dimensions In Inches			Dimensions In Millimeter		
	Min	Norm	Max	Min	Norm	Max
A	0.606	0.608	0.610	15.392	15.443	15.494
B	0.298	0.300	0.302	7.569	7.620	7.671
C	0.098	0.100	0.102	2.489	2.540	2.591
D	--	0.016	--	--	0.406	--
F	--	0.050	--	--	1.270	--
H	--	0.010	--	--	0.254	--
I	0.006	--	--	0.152	--	--
J	0.406	0.410	0.414	10.312	10.414	10.516
K	--	5º	--	--	5º	--
L	0.039	0.041	0.043	0.991	1.041	1.092
M	0.030	0.032	0.034	0.762	0.813	0.864
N	--	7º	--	--	7º	--

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