PRELIMINARY

beta dyne

Q25019
15W DC/DC CONVERTER
*36-72Vin, +/-15Vout@+/-500mA*

Key Features

- Efficiency 84%
- Low output noise
- Six-sided shielding
- Input-to-output isolation
- Soft start
- External synchronization
- Short circuit protection
- Thermal protection
- Industry standard pinout

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Beta Dyne is protected under various patents, including but not limited to U.S. Patent numbers: 5,777,519; 6,188,276; 6,262,901; 6,452,818; 6,473,3171.

Functional Description

The Q25019 is a dual DC/DC converter that accepts 36-72Vin and provides +/-15Vout @ +/-500mA. Standard features include input undervoltage protection, thermal protection, and short circuit protection. The converter is designed to synchronize to an external clock frequency of 210kHz or higher. The output rectification is followed by a low dropout linear regulator which makes it possible to achieve up to 84% efficiency with less than 20mV output noise. The converter is packaged in a 1.00x2.00x0.450 inch metal case with six-sided shielding.
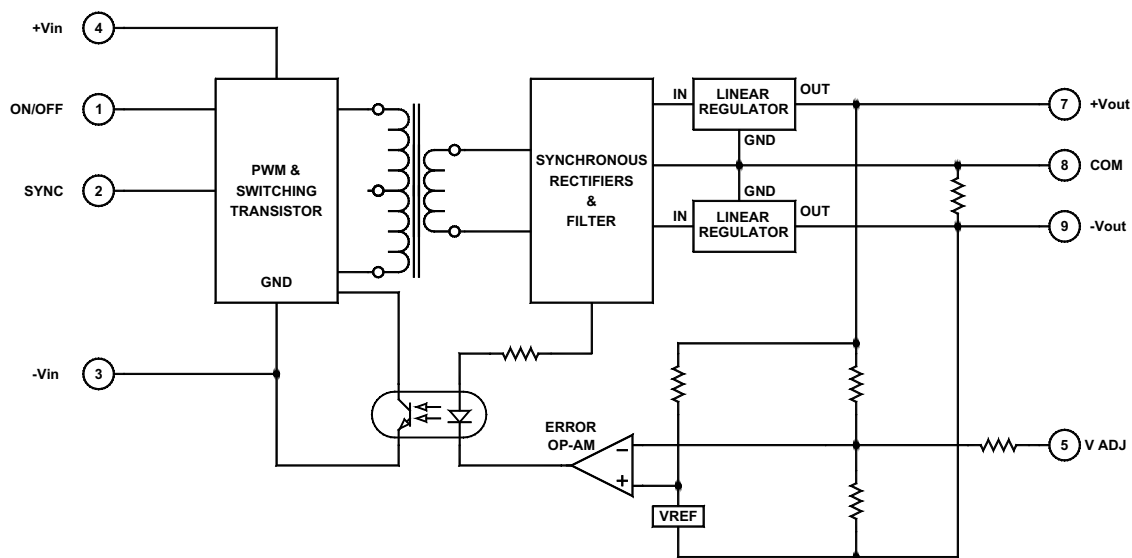
Typical Block Diagram

Electrical Specifications
INPUT SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Input Voltage Range		36	48	72	Vdc
Input Startup Voltage		33			Vdc
Input Overvoltage Shutdown		73			Vdc
Input Filter	C				
No Load Input Current	Vin = 48V		25		mA
Full Load Input Current	Vin = 48V		370		mA
Input Surge Current (20µS Spike)				10	A
Short Circuit Current Limit	120% Of I_{IN} @ Full Load				
Off State Current			20		µA
Remote ON/OFF Control					
Supply ON	Pin 1 Open (Open circuit voltage: 10V Max.)				
Supply OFF	Pin 1 Shorted to GND Pin 3	0		0.6	Vdc
Logic Input Reference	To $-V_{in}$(GND) Pin 3				
Logic Compatability	TTL Open Collector or CMOS Open Drain				

OUTPUT SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Voltage			+/-15		Vdc
Output Voltage Accuracy	With balanced loads		1	1.5	%
Output Current			+/-500		mA
Output Voltage Adjustment	See note 3		±5	±10	%
Ripple & Noise	See figure 1		20		mV
Line Regulation	Minimum V_{IN} to maximum V_{IN}		±1		%
Load Regulation	10% to FL, with balanced loads		±1		%
Temperature Coefficient @ FL			.01	.02	%/°C
Transient Response Time	50% FL to FL to 50% FL, within 1% of Vo	100			µS
Short Circuit Protection	By Hiccup Technique				
Output Overvoltage Protection	None				

GENERAL SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Efficiency (at full power)			84		%
Isolation Voltage (1 min.), Input to Output			1000		Vdc
Isolation Resistance			10^9		Ω
Isolation Capacitance			300		pF
Switching Frequency (F_{SW})			200		kHz
External Sync Frequency (F_E)	See Figure 2 & 3		210		kHz

PHYSICAL CHARACTERISTICS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Dimensions (L×W×H)	2.00×1.00×0.450 in. (50.80×25.40×11.43mm)				
Weight	1.3 oz. (37g)				

ENVIRONMENTAL SPECIFICATIONS

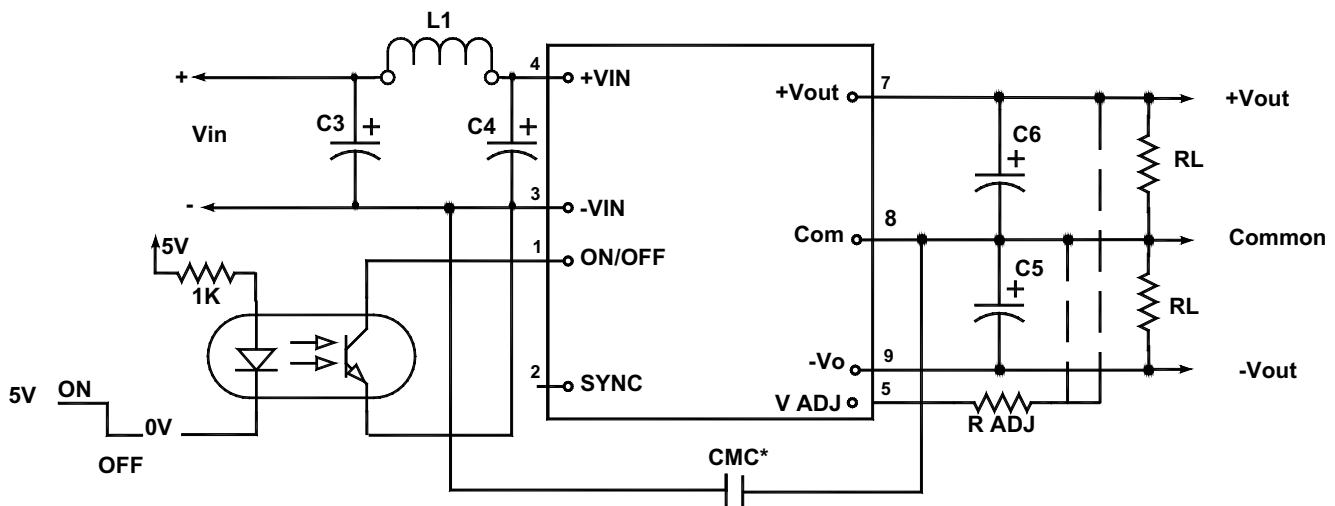| PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Operating Temperature Range (Ambient)[2]		-40		+71	°C
Storeage Temperature Range		-55		+125	°C
Maximum Operating Case Temperature[1]				110	
MTBF	per MIL-HNBK-217F(Ground benign, +25 °C)		1.1×10^6		hours
Shielding Connection	+Vin for 48Vin				

FIGURE 1. Typical connection diagram for Q25019

Part list for Figure 1:

L1 = 2.2µH
C3 = 50µF@100V Electrolytic
C4 = 50µF@100V Electrolytic
C5,C6 = 47µF@25V Low ESR Tantalum
CMC* = Typically Not Used, Common Mode Capacitor
CMC = .01µF@Vcmc
Vcmc >= Than required isolation, voltage can be up to 1500Vdc max
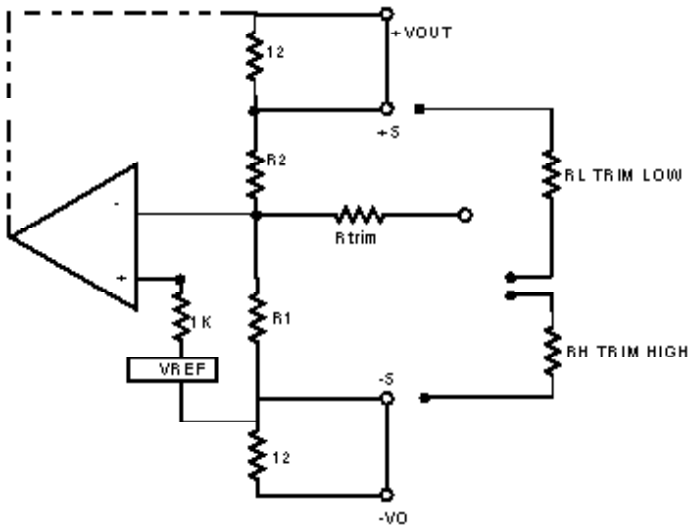
$$* \quad RL = \frac{(Vo-Vref)R1*R2}{Vref(R1+R2) -VoR1} \; - \; Rt \qquad \text{in } k\Omega$$

$$* \quad RH = \frac{Vref(R1*R2)}{VoR1-Vref(R1 + R2)} \; - \; Rt \qquad \text{in } k\Omega$$

VO	VREF	R2	R1	Rtrim
3.3V	1.225	4.22K	2.49K	15K
5V	2.5	2.49K	2.49K	9.53K
12V	2.5	9.53K	2.49K	20K
15V	2.5	15K	3.01K	23.7K

* Use the same formulas for the dual converters where -V$_o$ of the single converters becomes the common of the dual converters.

NOTES:

[1] **When converter enters thermal protection mode, its duty cycle is reduced momentarily and will resume after its internal temperature drops down a few degrees (ºC). The converter's output behaves similar to hiccup short circuit mode.**
[2] **Contact factory for -55° to +85°C operating temperature range.**
[3] **Vout adjustment is referenced to output common (Pin#8).**

EXTERNAL SYNCHRONIZATION

The SYNC pin can be used to synchronize the internal oscillator to external clock. An open drain output is the recommended interface between the external clock to the Q25019 SYNC pin as shown in Figure 2. The clock pulse width must be greater than 15ns. The external clock frequency must be greater 5% to 10% than the frequency of the Q25019.
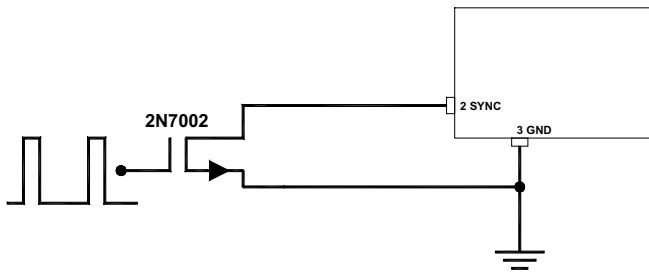
Multiple Q25019 converters can be synchronized together simply by connecting the converter's SYNC pins together as shown in Figure 3. Care should be taken to ensure the ground potential differences between the converters are minimized. Without the external MOSFET 2N7002, 5 units can be synchronized by connecting all SYNC pins together. In this configuration all the converters will be synchronized to the highest frequency device. The SYNC pin is a CMOS buffer with pull-up current limited to 200micro amps. If the external device forces the SYNC pin low before the internal oscillator ramp completes its charging cycle, the ramp will reset and another cycle begins. If the SYNC pins of multiple Q25019 converters are connected together, the first SYNC pin that pulls low will reset the oscillator ramp of all the other converters. All converters will operate in phase when synchronized using the SYNC feature. Up to five devices can be synchronized using this method.
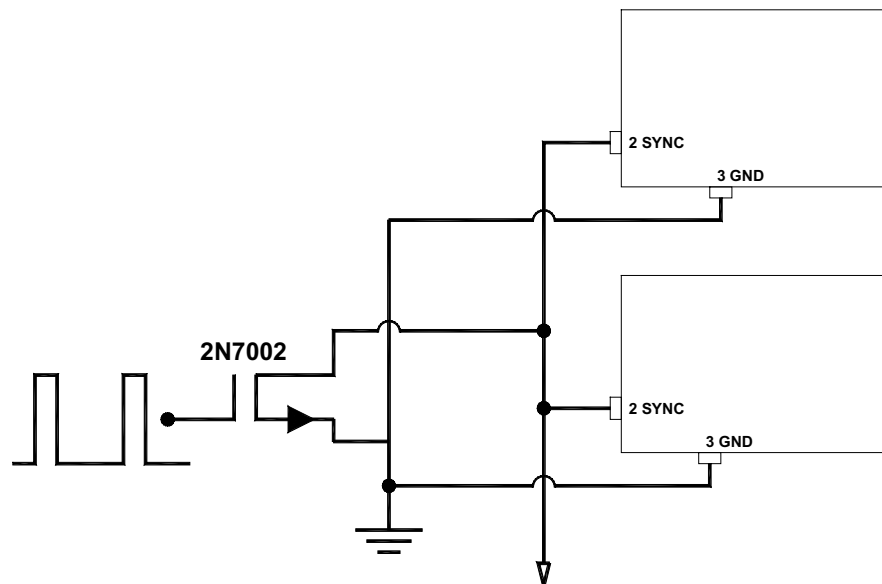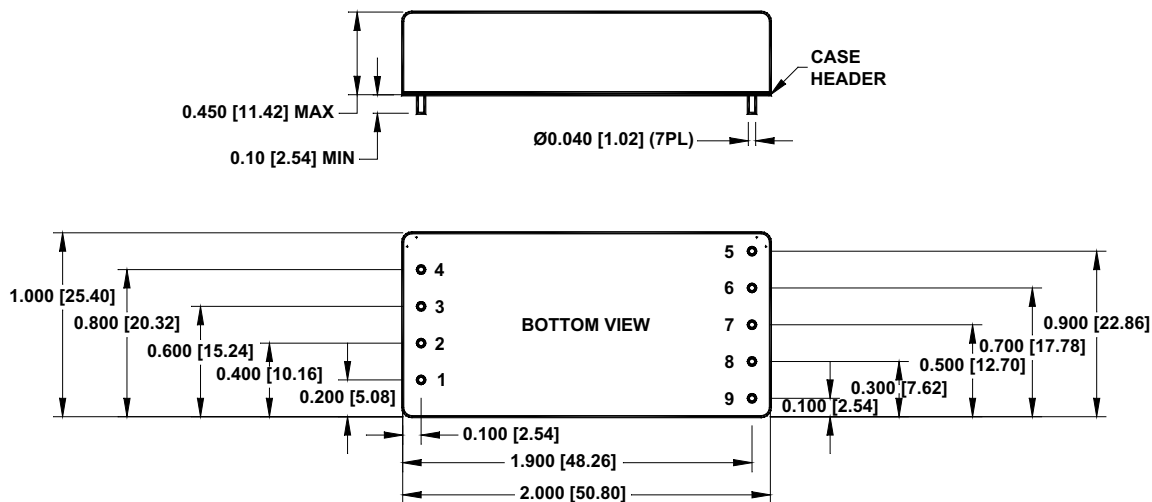
FIGURE 2. SYNC from external clock for Q25019

FIGURE 3. SYNC of multiple devices of Q25019

MECHANICAL SPECIFICATIONS

CASE HEADER

0.450 [11.42] MAX

0.10 [2.54] MIN

Ø0.040 [1.02] (7PL)

1.000 [25.40]
0.800 [20.32]
0.600 [15.24]
0.400 [10.16]
0.200 [5.08]

BOTTOM VIEW

0.900 [22.86]
0.700 [17.78]
0.500 [12.70]
0.300 [7.62]
0.100 [2.54]

0.100 [2.54]
1.900 [48.26]
2.000 [50.80]

DIMENSIONS ARE IN INCH(mm)
TOLERANCE: XX ±.02(.508)
XXX ±.01(.254)

Pin	Function
DUAL	
INPUT	
1	ON/OFF
2	SYNC IN
3	$-V_{IN}$
4	$+V_{IN}$
OUTPUT	
5	V_{ADJ}
6	No Pin
7	$+V_{OUT}$
8	Common
9	$-V_{OUT}$