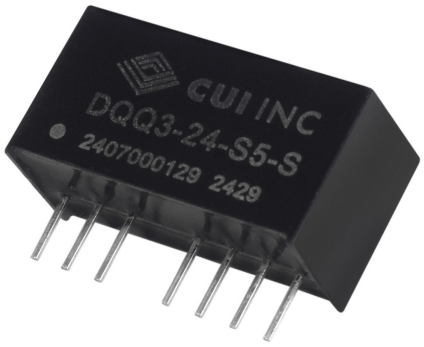
SERIES: DQQ3-S | **DESCRIPTION:** DC-DC CONVERTER

FEATURES

- up to 3 W isolated output
- 4:1 input range (9~36 and 18~75 Vdc)
- single and dual regulated outputs
- 1,500 Vdc isolation
- remote on/off control
- -40 ~ 100 °C with derating
- continuous short circuit and input under voltage protection
- no tantalum capacitor inside
- certified to EN/IEC 62368-1
- EN55032 Class A & Class B with external components



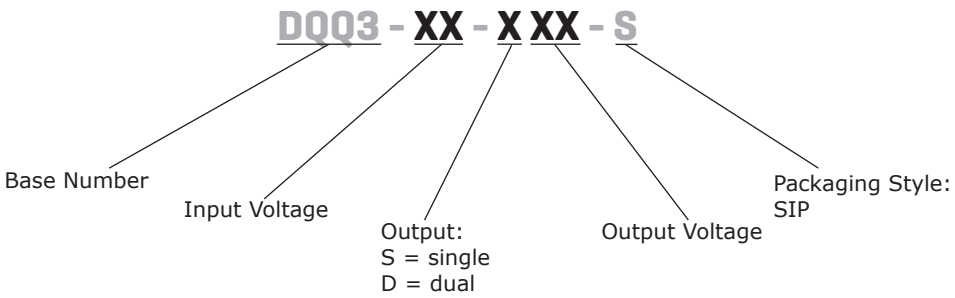
RoHS CE UKCA

MODEL

MODEL	input voltage		output voltage	output current	output power	ripple & noise[1]	efficiency
	typ (Vdc)	range (Vdc)	typ (Vdc)	max (mA)	max (W)	max (mVp-p)	typ (%)
DQQ3-24-S3-S	24	9~36	3.3	700	3	50	79
DQQ3-24-S5-S	24	9~36	5	600	3	50	81
DQQ3-24-S12-S	24	9~36	12	250	3	50	84
DQQ3-24-S15-S	24	9~36	15	200	3	50	84
DQQ3-24-D5-S	24	9~36	±5	±300	3	50	81
DQQ3-24-D12-S	24	9~36	±12	±125	3	50	84
DQQ3-24-D15-S	24	9~36	±15	±100	3	50	83
DQQ3-48-S3-S	48	18~75	3.3	700	3	50	79
DQQ3-48-S5-S	48	18~75	5	600	3	50	82
DQQ3-48-S12-S	48	18~75	12	250	3	50	85
DQQ3-48-S15-S	48	18~75	15	200	3	50	84
DQQ3-48-D5-S	48	18~75	±5	±300	3	50	82
DQQ3-48-D12-S	48	18~75	±12	±125	3	50	84
DQQ3-48-D15-S	48	18~75	±15	±100	3	50	83

Notes:
1. At full load, nominal input, 20 MHz bandwidth oscilloscope.
2. The efficiency is test by nominal input and max. full load at 25°C.
3. All specifications measured at Ta=25°C, nominal input voltage, rated output load, and after warm up unless otherwise specified.

PART NUMBER KEY



INPUT

parameter	conditions/description	min	typ	max	units
input voltage range	24 Vdc input models	9	24	36	Vdc
	48 Vdc input models	18	48	75	Vdc
input current (full load/no load)	24 Vdc input / 3.3 Vdc output model		122/4		mA
	24 Vdc input / 5 Vdc output model		154/4		mA
	24 Vdc ipnut / 12 Vdc output models		150/8		mA
	24 Vdc input / ±12, 15 Vdc output model		150/12		mA
	24 Vdc input / ±5 Vdc output model		154/8		mA
	24 Vdc input / ±15 Vdc output model		151/12		mA
	48 Vdc input / 3.3 Vdc output model		61/3		mA
	48 Vdc input / 5 Vdc output model		76/3		mA
	48 Vdc input / 12 Vdc output model		74/5		mA
	48 Vdc input / 15 Vdc output model		75/5		mA
	48 Vdc input / ±5 Vdc output model		76/5		mA
	48 Vdc input / ±12, ±15 Vdc output models		75/10		mA
surge voltage	at 10 ms max				
	24 Vdc input models		50		Vdc
	48 Vdc input models		100		Vdc
filter	capacitance filter				
remote on/off	module on open circuit				
	module off 0 to < 1.2 Vdc				
	module off (input idle current)			1	mA

OUTPUT

parameter	conditions/description	min	typ	max	units
maximum capacitive load	3.3 Vdc output models			1,800	µF
	5 Vdc output models			1,000	µF
	12 Vdc output models			220	µF
	15 Vdc output models			120	µF
	±5 Vdc output models			470	µF
	±12 Vdc output models			100	µF
	±15 Vdc output models			47	µF
voltage accuracy				±1.5	%
load regulation	measured from 10~100% load				
	single output models			±0.5	%
	dual output models			±1	%
line regulation	measured from low to high line, full load			±0.5	%
voltage balance (dual)				±1	%
cross regulation[4] (dual)	asymmetrical load 25%/100%			±5	%
transient response deviation	25% step load change			±6	%
start-up time				5	s
transient response recovery				500	µs
temperature coefficient			±0.3		%/°C
switching frequency	at Vin nominal, full load	100			kHz

Notes: 4. For asymmetric loading both channels must be at 25% load or more.

PROTECTIONS

parameter	conditions/description	min	typ	max	units
short circuit protection	continuous				

SAFETY AND COMPLIANCE

parameter	conditions/description	min	typ	max	units
isolation voltage		1,500			Vdc
isolation capacitance			500		pF
safety approvals	certified to 62368-1: EN, IEC				

SAFETY AND COMPLIANCE

parameter	conditions/description	min	typ	max	units
EMI[5]	EN 55032 Class A (Class B with external filter[5])				
ESD	EN 61000-4-2 Level 2: Air ±8 kV, Contact ±4 kV, perf. Criteria A				
radiated immunity	EN 61000-4-3 Level 2: 80~1000 MHz, 3 V/m, perf. Criteria A				
EFT/burst[6]	EN 61000-4-4 Level 2: on power input port, ±0.5 kV, perf. Criteria A				
surge[6]	EN 61000-4-5 Level 2: line to line, ±0.5 kV, perf. Criteria A				
conducted immunity	EN 61000-4-6 Level 2: 0.15~80 MHz, 3 V, perf. Criteria A				
PFMF	EN 61000-4-8 Level 2: 50 or 60 Hz, 3 A/m (rms), perf. Criteria A				
MTBF	as per MIL-HDBK-217F, GB, at 25 °C single output models dual output models		 2,800,000 2,100,000		 hours hours
RoHS	yes				

Notes: 5. See Fig. 6 for external EMI filter.
6. External input TVS required.

ENVIRONMENTAL

parameter	conditions/description	min	typ	max	units
operating temperature	see derating curve	-40		85	°C
storage temperature		-55		125	°C
maximum case temperature[6]				100	°C
operating humidity	non-condensing	-		95	%

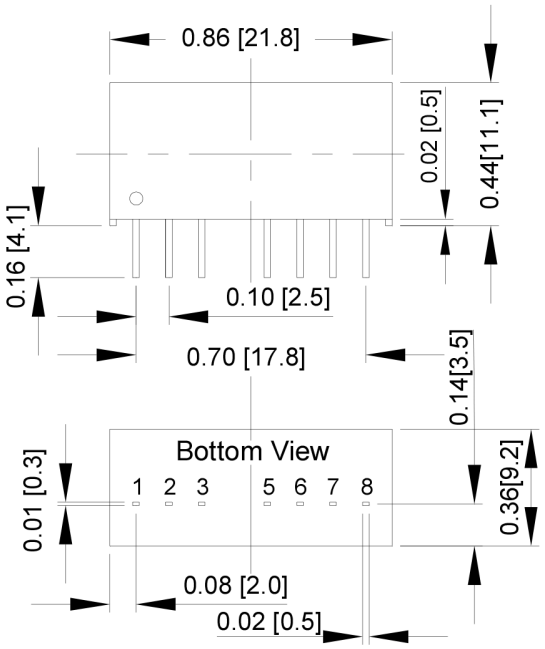
Notes: 6. Maximum case temperature should not exceed 100°C under any conditions.

MECHANICAL

parameter	conditions/description	min	typ	max	units
dimensions	0.86 x 0.36 x 0.44 [21.8 x 9.2 x 11.1 mm]				inches
case material	non-conductive black plastic				
weight			4.8		g
cooling	natural convection				

MECHANICAL DRAWING

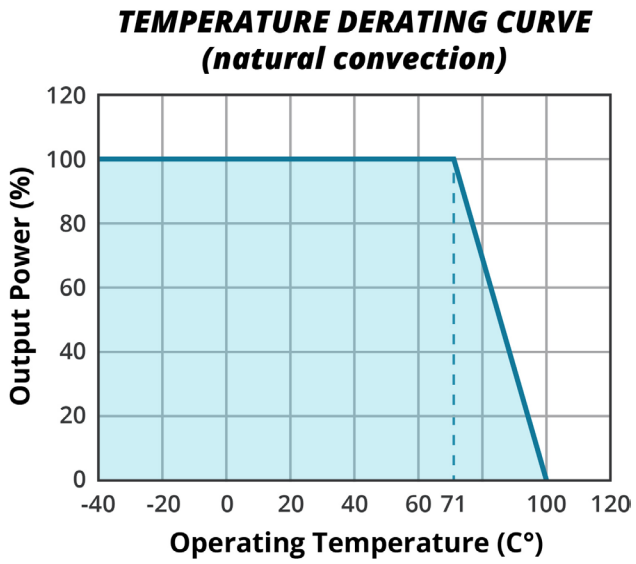
units: inch [mm]
tolerance: inches: x.xx ±0.02
mm: x.x ±0.5
pin tolerance: inches: ±0.002
mm: ±0.05



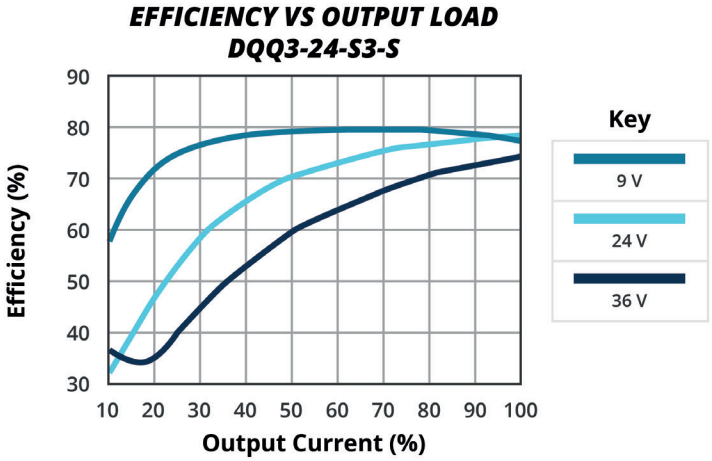
PIN CONNECTIONS		
PIN	Single	Dual
1	-Vin	-Vin
2	+Vin	+Vin
3	on/off	on/off
5	NC	NC
6	+Vout	+Vout
7	-Vout	Common
8	NC	-Vout

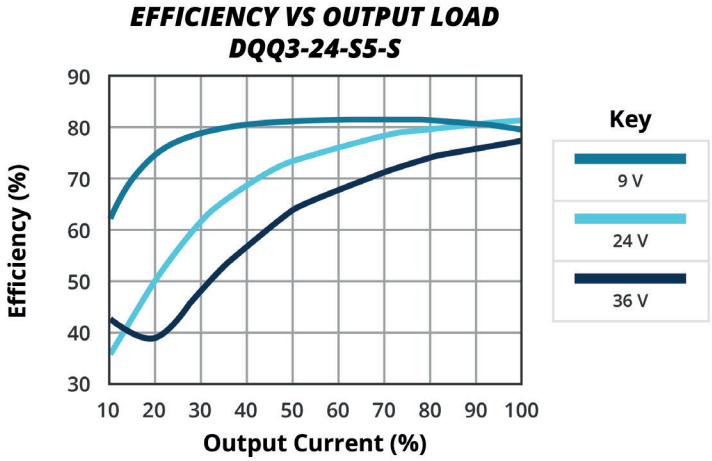
NC = no connection

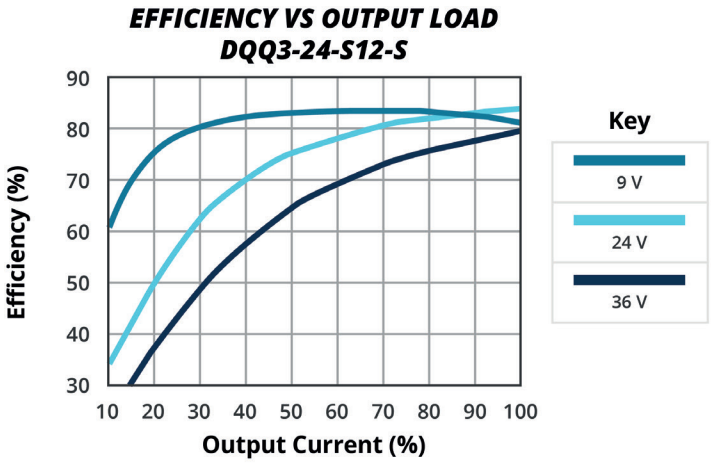
DERATING CURVE

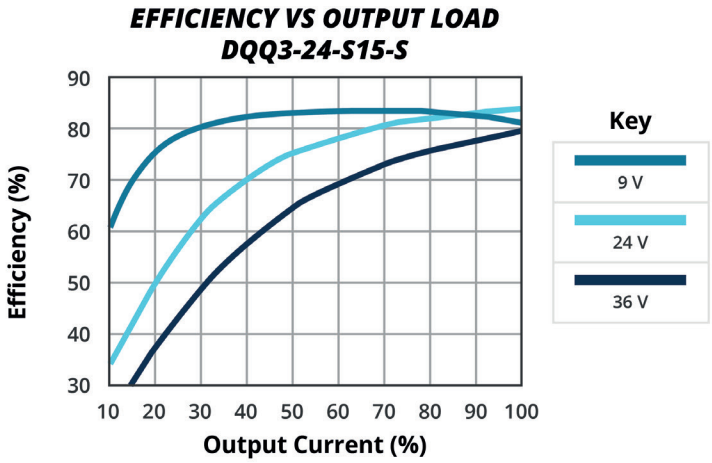


EFFICIENCY CURVES



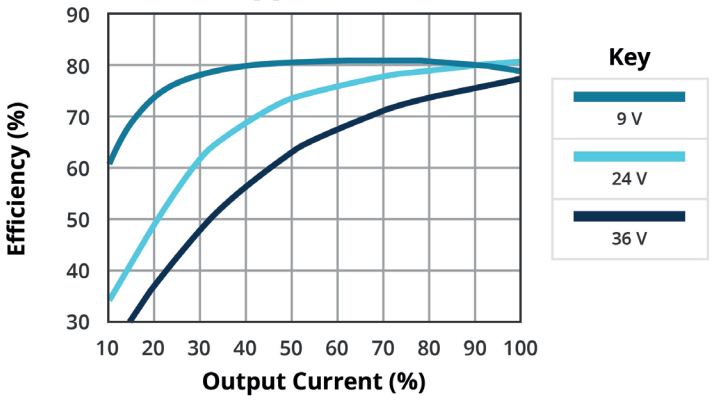




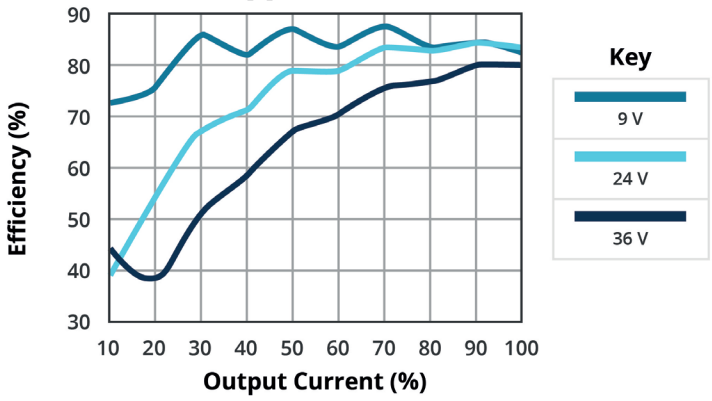


EFFICIENCY CURVES (CONTINUED)

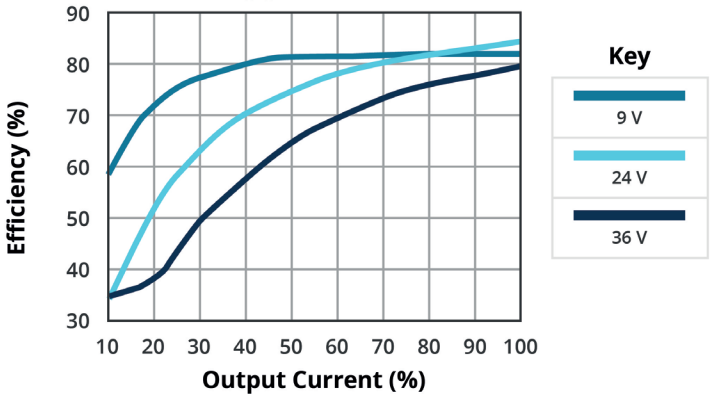
EFFICIENCY VS OUTPUT LOAD
DQQ3-24-D5-S



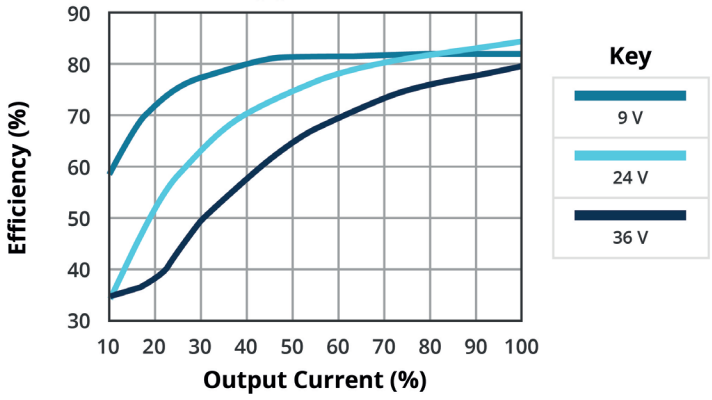
EFFICIENCY VS OUTPUT LOAD
DQQ3-24-D12-S



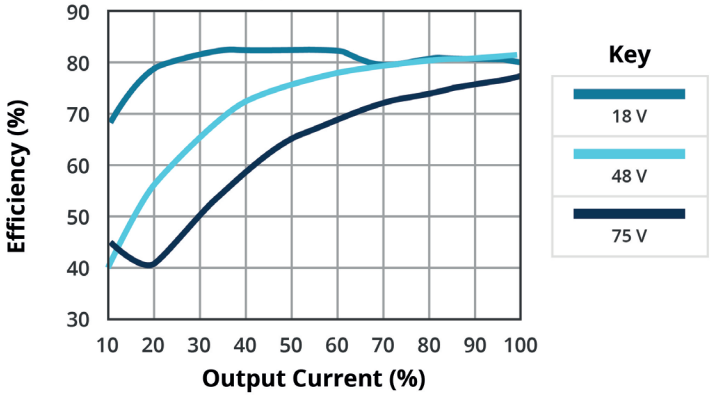
EFFICIENCY VS OUTPUT LOAD
DQQ3-24-D15-S



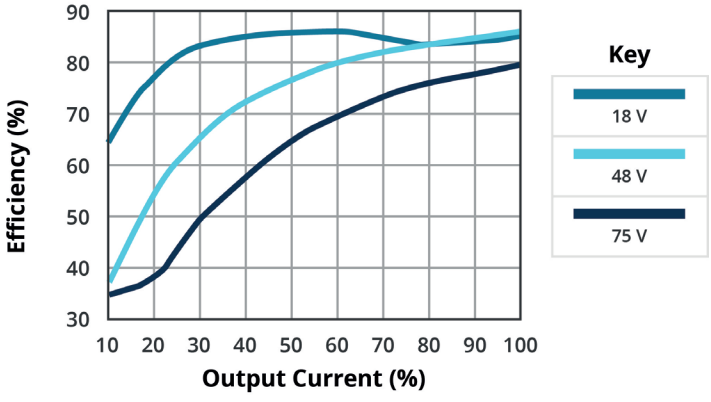
EFFICIENCY VS OUTPUT LOAD
DQQ3-48-S3-S



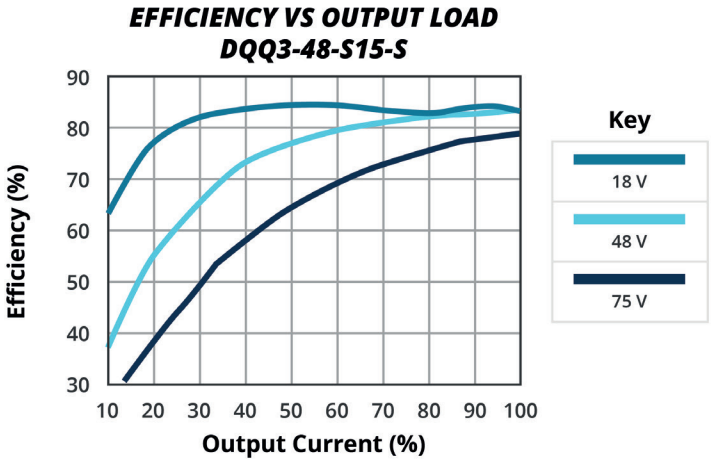
EFFICIENCY VS OUTPUT LOAD
DQQ3-48-S5-S

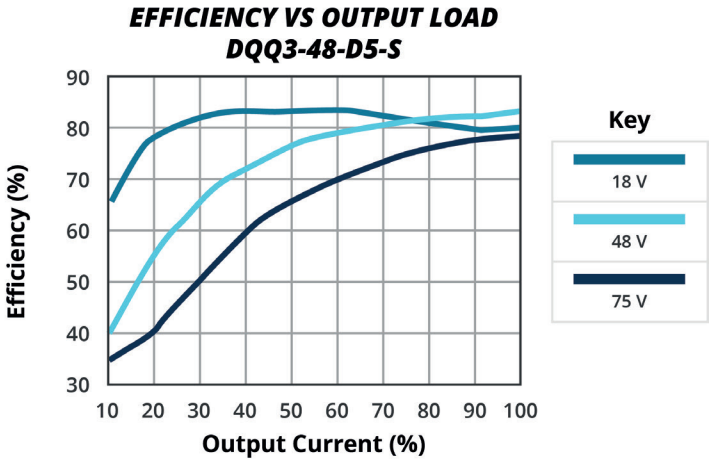


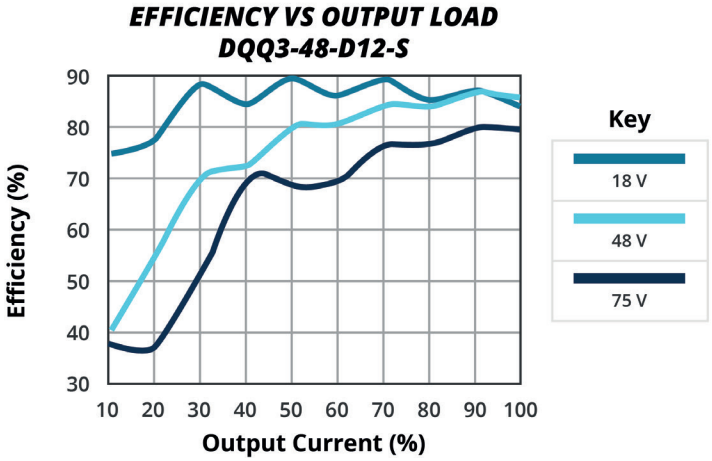
EFFICIENCY VS OUTPUT LOAD
DQQ3-48-S12-S

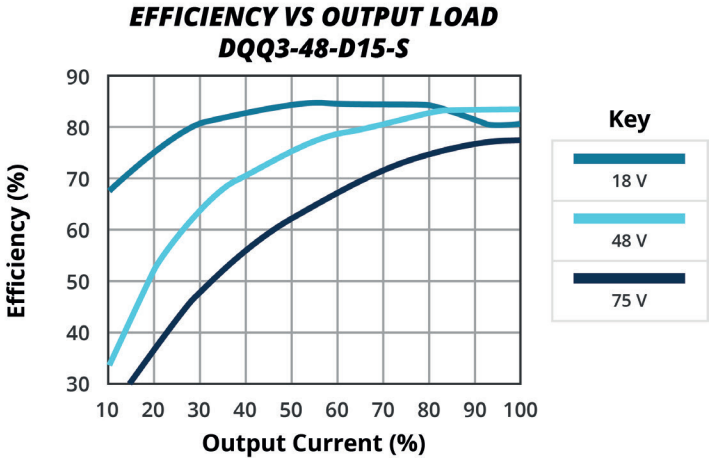


EFFICIENCY CURVES (CONTINUED)









ELECTRICAL BLOCK DIAGRAM

Figure 1
Single output models

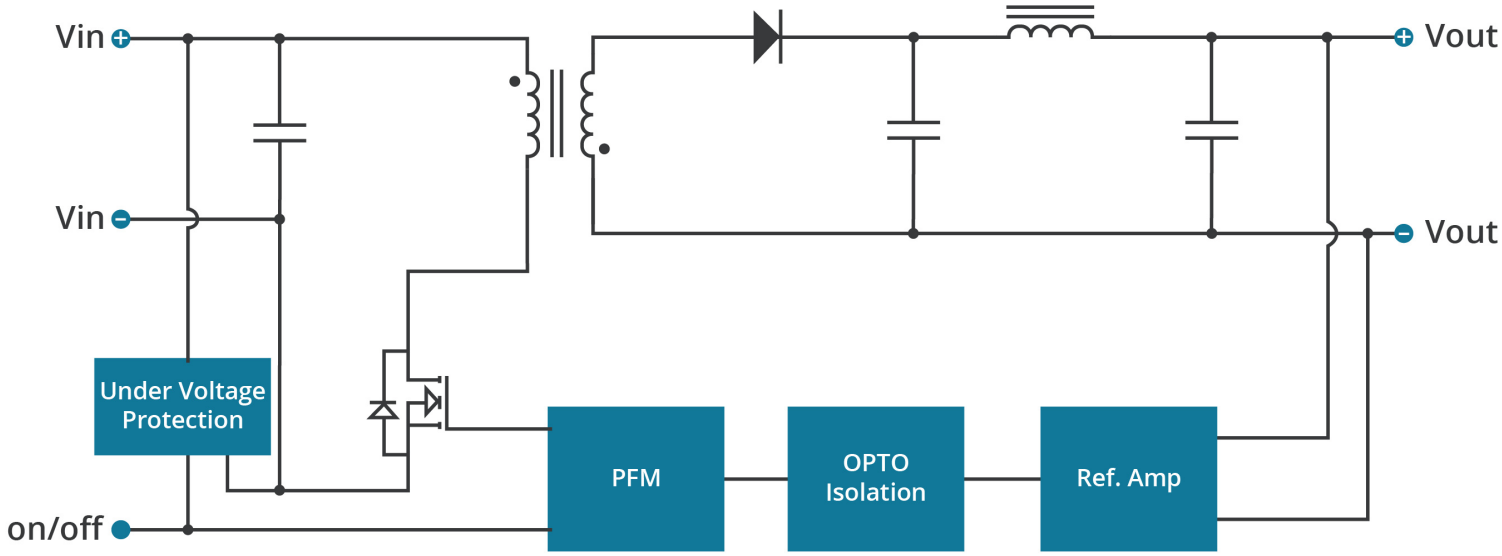
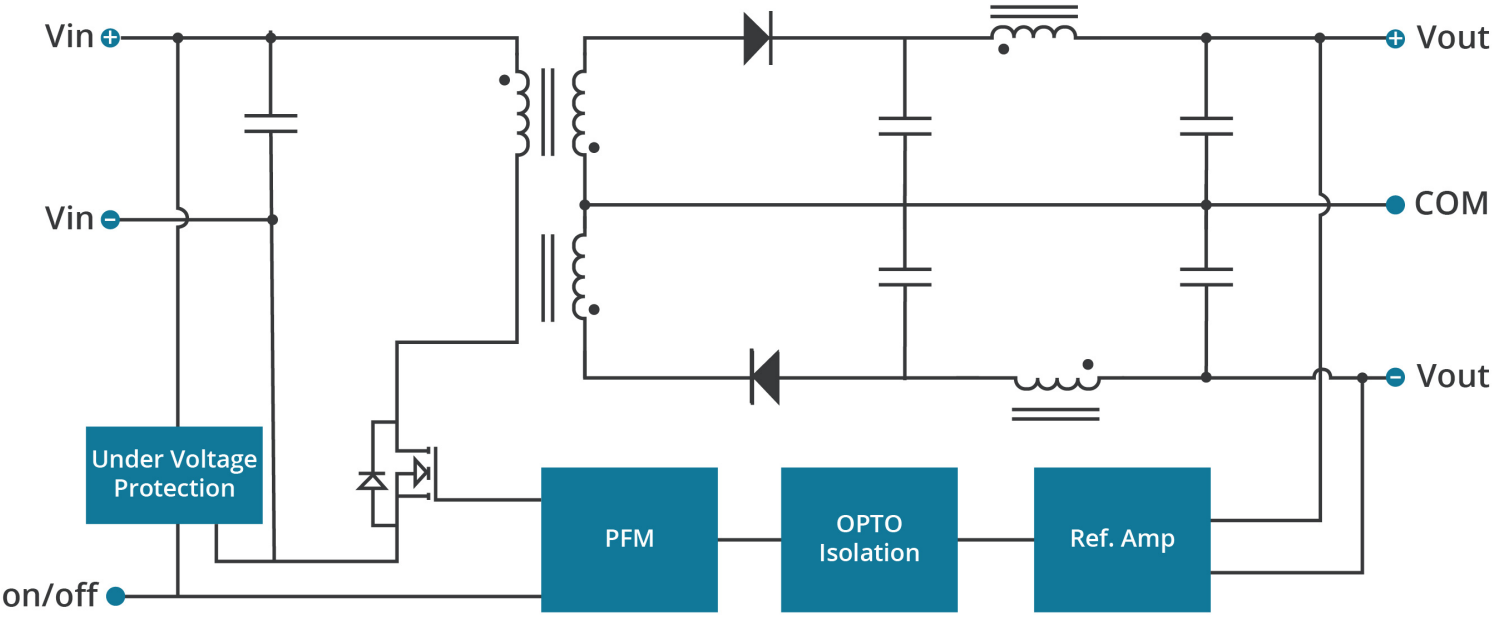


Figure 2
Dual output models



APPLICATION NOTES

Input Capacitance at the Power Module
The converters must be connected to low AC source impedance. To avoid problems with loop stability source inductance should be low. Also, the input capacitors (Cin) should be placed close to the converter input pins to de-couple distribution inductance. However, the external input capacitors are chosen for suitable ripple handling capability. Low ESR capacitors are good choice. Circuit as shown in Figure 3 represents typical measurement methods for reflected ripple current. C1 and L1 simulate a typical DC source impedance. The input reflected-ripple current is measured by current probe to oscilloscope with a simulated source Inductance (L1).

Figure 3

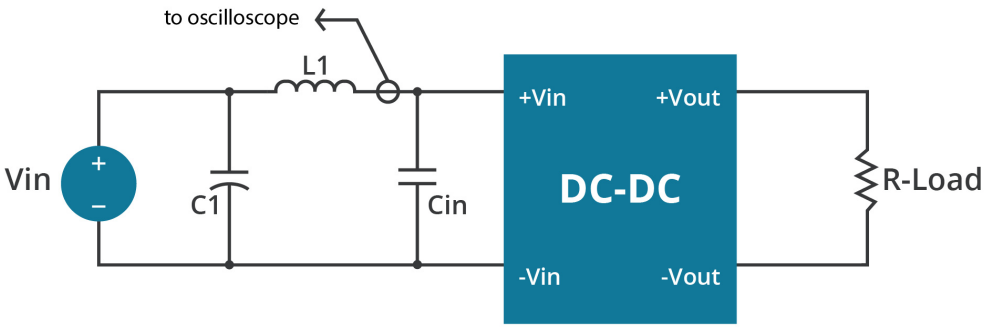


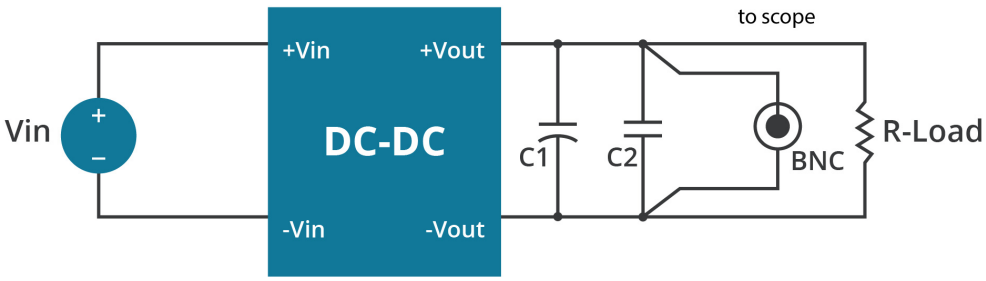
Table 1

Components	
L1	12 µF
C1	none
Cin	33 µF ESR < 0.7 Ω

RIPPLE AND NOISE MEASUREMENT

The test set-up for noise and ripple measurements is shown in Figure 4. A coaxial cable was used to preventimpedance mismatch reflections disturbing the noisereadings at higher frequencies. Measurements are taken with output appropriately loaded and all ripple/noise specifications are from DC to 20MHz Band Width.

Figure 4



INPUT FUSING AND SAFETY CONSIDERATIONS

The DQQ3-S Series converters have not an internal fuse. To ensure optimal safety and system protection, always incorporate an input line fuse. It's recommended to use a time delay fuse 1 A for 24 Vin models and 500 mA for 48 Vin models. Figure 5 circuit is recommended by a Transient Voltage Suppressor diode across the input terminal to protect the unit against surge or spike voltage and input reverse voltage.

Figure 5

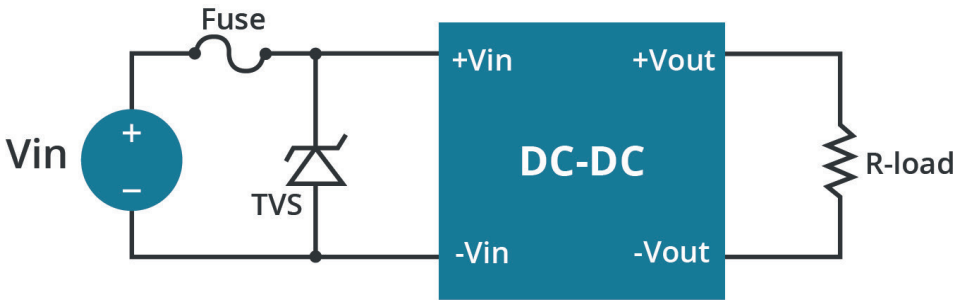


Table 2

Recommended fuses			
Models	Description	MFR	Part Number
DQQ3-24-XXX-S	1 A, 125 V, Slow-blow, SMD	Bel Fuse Inc.	0680L1000-05
DQQ3-48-XXX-S	500 mA, 125 V, Slow-blow, SMD	Bel Fuse Inc.	0680L0500-05

EMI RECOMMENDED CIRCUIT FOR EN 55022 CLASS A/B

Figure 6

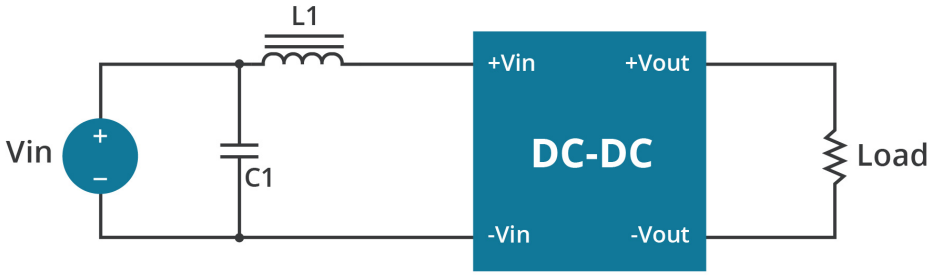


Table 3

Recommended EMI Filter Values				
Vin	Class A		Class B	
	C1	L1	C1	L1
24	2.2 uF, 50 V, 1210 MLCC	10 µH	2.2 uF, 50 V, 1812 MLCC	18 µH
48	2.2 uF, 100 V, 1210 MLCC	15 µH	6.8 uF, 100 V, 1812 MLCC	56 µH

Note: All of capacitors are ceramic capacitors and 1210 size for EN 55022 class A, and 1812 size for EN 55022 class B.

REVISION HISTORY

rev.	description	date
1.0	initial release	11/18/2024

The revision history provided is for informational purposes only and is believed to be accurate.

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