QS4E_1U series

0.25W - Single Output DC-DC Converter - Isolated & Unregulated

DC-DC Converter 0.25 Watt

- SIP4 package
- 1kVDC Isolation
- Operation temperature range: -40°C ~ +91°C
- Low ripple and noise
- Efficiency up to 74%
- EMI complies with EN55032 Class B
- Industry Standard Pinout
- Non-conductive black plastic case

Introducing our new DC-DC converter QS4E_1U series, designed to meet the highest standards of performance and reliability. Encased in a compact SIP4 package, this module offers 1kVDC isolation and operates efficiently across a wide temperature range of -40°C to +91°C. Engineered for low ripple and noise, it ensures stable and clean power delivery for your sensitive electronic applications. With an impressive efficiency of up to 74%, this converter is both energy-efficient and cost-effective. Compliance with EMI standards, specifically EN55032 Class B, ensures that our module minimizes electromagnetic interference, making it suitable for a variety of industrial and commercial applications. The industry-standard pinout guarantees compatibility and ease of integration into existing systems.

Common specifications

Short circuit protection	Short Term (1 sec.)
Switching frequency	80 kHz
Operating ambient temperature	-40°C~+91°C (depending on the efficiency)
Storage temperature range	-55°C ~+125°C
Maximum case temperature	100°C Max.
Thermal Impedance	70 °C/W
Soldering temperature*	260°C MAX, 1.5 mm from case 10 sec. max.
Storage humidity range	< 95% % rel. humidity
Cooling	Natural convection (30-65 LFM)
Case material	Nonconductive black plastic (UL94V-0 rated)
Pin material	Alloy 42
Potting Material	Epoxy (UL94V-0 rated)
Safety standard	IEC / EN / UL 62368-1 (Designed to meet)
MTBF (MIL-HDFK-217F@25°C)	>1,121,000 hours
Weight	1.5 g, typ.
Dimensions	11.68 x 6.00 x 10.15 mm

* These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability.

Input specifications

Item	Test condition	Min	Typ	Max	Units
Voltage range	3.3 V Input 5 V Input 12 V Input 15 V Input 24 V Input	2.97 4.5 10.8 13.5 21.6	3.3 5 12 15 24	3.63 5.5 13.2 16.5 26.4	VDC
Input Surge Voltage (100 ms)**	3.3 V Input 5 V Input 12 V Input 15 V Input 24 V Input			6 7 15 18 28	VDC
Reflected ripple current*			20		mApk-pk
Start up Time	Nominal Vin and constant resistive load			20	ms
Recommended input fuse (slow blow)	3.3 V & 5 V Input 12 V & 15 V & 24 V Input		0.16 0.1		A
Input filter	Capacitor				

* Measured with a simulated source inductance of 12µH and a source capacitor Cin (47µF, ESR<1.0Ω at 100kHz).

** These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability.

Output specifications

Item	Test condition	Min	Typ	Max	Units
Output voltage accuracy		-3		+3	%
Line regulation (for 1% Vin Change)	QS4E_0303S1U QS4E_0503S1U Other Output	-1.3 -1.3 -1.2		+1.3 +1.3 +1.2	%
Load regulation	20% to 100% load • other output		8		%
Ripple & Noise	20MHz Bandwidth		100		mVpk-pk
Temperature Coefficient		-0.02		+0.02	%/°C
Maximum Capacitive Load	Minimum Vin and constant resistive load		See Table		

Isolation specifications

Item	Test condition	Min	Typ	Max	Units
Isolation voltage (Input-output, and rated for 60 sec.)		1000			VDC
Isolation resistance	Input-output	1000			MΩ
Isolation capacitance	Input-output		60		pF

EMC specifications

CE	EN55032	with external components	Perf.Criteria B
RE	EN55032		Perf.Criteria B
ESD	IEC 61000-4-2	Air: ±8kV / Indirect: ±6kV	Perf.Criteria A
RS	IEC 61000-4-3	10V/m	Perf.Criteria A
EFT	IEC 61000-4-4	±2.0kV with external components	Perf.Criteria A
Surge	IEC 61000-4-5	±0.5kV with external components	Perf.Criteria A
CS	IEC 61000-4-6	10Vrms	Perf.Criteria A
PFMF	IEC 61000-4-8	1A/m	Perf.Criteria A

Example:
QS4E_0505S1U
Q = 0.25 Watt; S4 = SIP4; E = Pinning; 05 = 5 Vin; 05 = 5Vout;
S = Single Output; 1 = 1kVDC Isolation; U = Unregulated Output

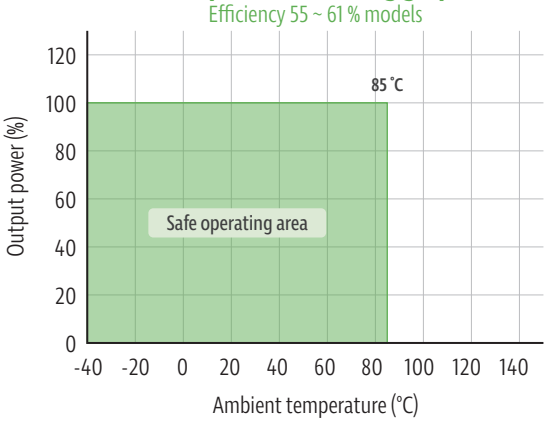
GAPTEC-Electronic GmbH & Co. KG
sales@gaptec-electronic.com – www.gaptec-electronic.com

Product Selection Guide

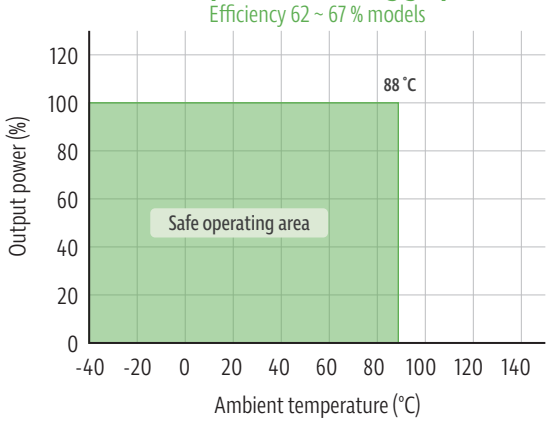
Part Number	Input Voltage [V]	Input current No-Load [mA, max]	Input current Full Load [mA, typ]	Output Voltage [VDC]	Output Current Full Load [mA]	Efficiency @FL [%, typ]	Capacitive load @ FL [µF max]
QS4E_0303S1U	3.3	25	119	3.3	75.7	64	100
QS4E_0305S1U	3.3	25	114	5	50	67	100
QS4E_0307S1U	3.3	25	119	7.2	34.7	64	100
QS4E_0309S1U	3.3	32	110	9	27.7	69	100
QS4E_0312S1U	3.3	40	119	12	20.8	64	100
QS4E_0315S1U	3.3	25	119	15	16.6	64	100
QS4E_0318S1U	3.3	25	115	18	13.8	66	100
QS4E_0324S1U	3.3	20	115	24	10.4	66	100
QS4E_0503S1U	5	20	79	3.3	75.7	64	100
QS4E_0505S1U	5	15	71	5	50	71	100
QS4E_0507S1U	5	18	71	7.2	34.7	71	100
QS4E_0509S1U	5	15	68	9	27.7	74	100
QS4E_0512S1U	5	14	69	12	20.8	73	100
QS4E_0515S1U	5	20	68	15	16.6	74	100
QS4E_0518S1U	5	17	70	18	13.8	72	100
QS4E_0524S1U	5	18	69	24	10.4	73	100
QS4E_1203S1U	12	15	33	3.3	75.7	64	100
QS4E_1205S1U	12	12	34	5	50	62	100
QS4E_1207S1U	12	10	31	7.2	34.7	69	100
QS4E_1209S1U	12	12	34	9	27.7	63	100
QS4E_1212S1U	12	15	33	12	20.8	65	100
QS4E_1215S1U	12	13	33	15	16.6	65	100
QS4E_1218S1U	12	13	32	18	13.8	66	100
QS4E_1224S1U	12	18	38	24	10.4	55	100
QS4E_1503S1U	15	10	26	3.3	75.7	65	100
QS4E_1505S1U	15	8	27	5	50	63	100
QS4E_1507S1U	15	12	28	7.2	34.7	60	100
QS4E_1509S1U	15	12	27	9	27.7	63	100
QS4E_1512S1U	15	12	27	12	20.8	62	100
QS4E_1515S1U	15	13	29	15	16.6	58	100
QS4E_1518S1U	15	12	30	18	13.8	57	100
QS4E_1524S1U	15	15	28	24	10.4	60	100
QS4E_2403S1U	24	8	18	3.3	75.7	61	100
QS4E_2405S1U	24	7	18	5	50	59	100
QS4E_2407S1U	24	8	19	7.2	34.7	57	100
QS4E_2409S1U	24	8	18	9	27.7	61	100
QS4E_2412S1U	24	10	19	12	20.8	57	100
QS4E_2415S1U	24	10	18	15	16.6	58	100
QS4E_2418S1U	24	10	19	18	13.8	56	100
QS4E_2424S1U	24	10	18	24	10.4	61	100

Typical characteristics

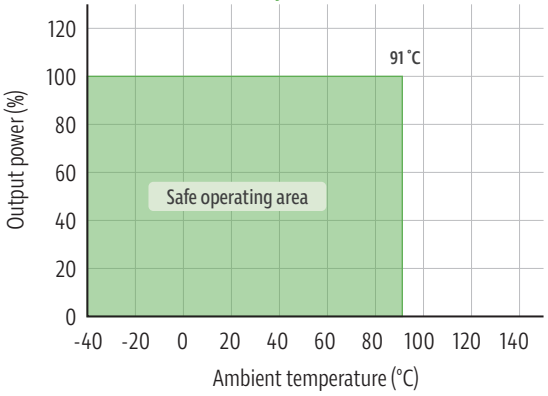
Temperature derating graph
Efficiency 55 ~ 61 % models



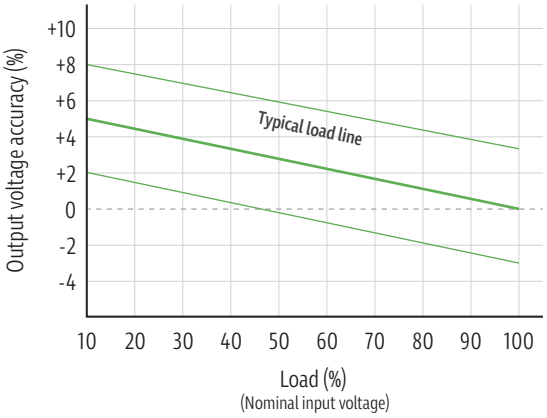
Temperature derating graph
Efficiency 62 ~ 67 % models



Temperature derating graph
Efficiency 68 ~ 74 % models

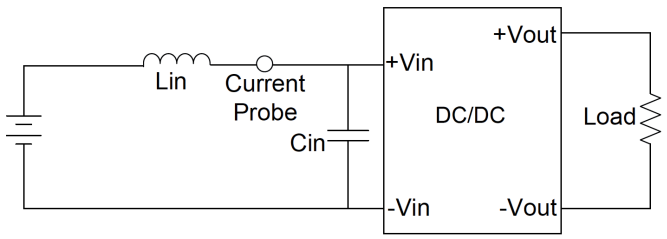


Output voltage tolerance envelope curve



Recommended test circuit

Input Reflected Ripple Current Test Step
Input reflected ripple current is measured with a source inductor Lin (12µH) and a source capacitor Cin (47µF, ESR<1.0Ω at 100kHz) at nominal input and full load.



GAPTEC-Electronic GmbH & Co. KG
sales@gaptec-electronic.com – www.gaptec-electronic.com

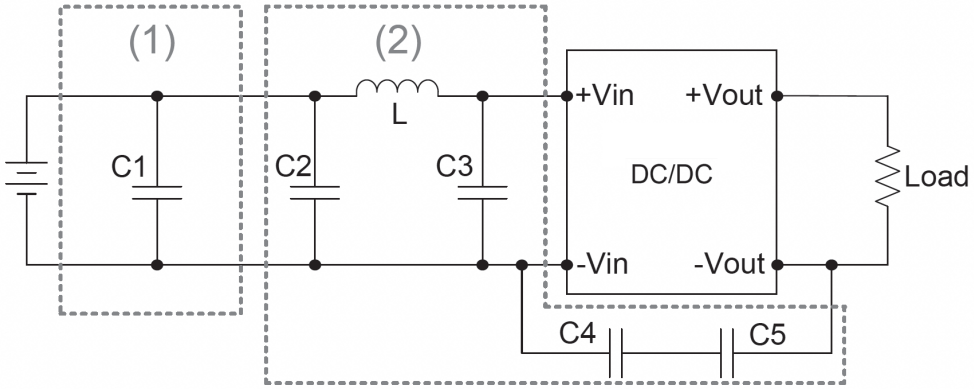
Design & feature configurations

Isolation Voltage
This series is designed to meet the functional insulation of UL, both input and output should be maintained within SELV limits (less than 42.4V peak, or 60VDC).
The isolation test voltage represents a measure of immunity to transient voltages and the part should never be used as an element of a safety isolation system. The part could be expected to function correctly with hundreds of volts offset applied continuously across the isolation barrier; but then the circuitry on both sides of the barrier must be regarded as operating at an unsafe voltage and further isolation/insulation systems must form a barrier between these circuits and any user-accessible circuitry according to safety standard requirements.

Repeated High-Voltage Isolation Testing
Repeated high-voltage isolation testing of a barrier component can actually degrade isolation capability, to a lesser or greater degree depending on materials, construction and environment.
This series has isolation transformers without additional insulation between primary and secondary windings of enameled wire.
While parts can be expected to withstand several times the stated test voltage, the isolation capability does depend on the wire insulation.
Any material including the enamel (typically polyurethane) is susceptible to eventual chemical degradation when subject to very high applied voltage, thus implying that the number of tests should be strictly limited.
We strongly advise against repeated high voltage isolation testing, but if it is absolutely required, the isolation test voltage should be reduced by 20% from specified test voltage.

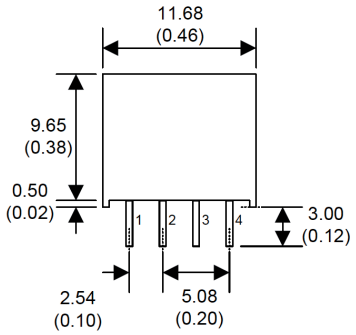
EMC filter

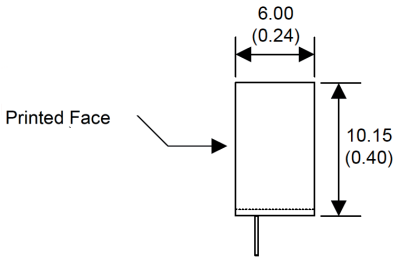
The part (1) Circuit is used to meet Surge & EFT test, and the part (2) Circuit is used to meet EMI test.



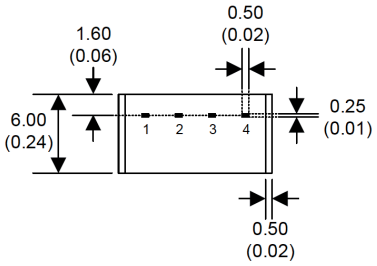
	C1	C2	L	C3	C4	C5
QS4E_03XXS1U	NIPPON Chemi-con KY Series 470µF, 100V	MLCC 2.2µF, 100V	18µH			
QS4E_05XXS1U						
QS4E_12XXS1U						
QS4E_15XXS1U						
QS4E_24XXS1U				MLCC 2.2µF, 100V	MLCC 470pF, 2kV	
QS4E_24XXS1U					MLCC 820pF, 2kV	MLCC 820pF, 2kV

Mechanical dimensions





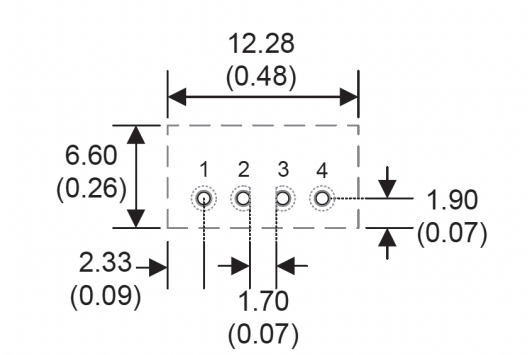
PIN Connection	
PIN	Single
1	-Vin
2	+Vin
3	-Vout
4	+Vout



Notes:

All dimensions are typical in millimeters (inches).
1. Pin dimension tolerance: ±0.05 (±0.002)
2. Pin pitch and length tolerance: ±0.35 (±0.014)
3. Pin to case tolerance: ±0.5 (±0.02)
4. Case tolerance: ±0.5 (±0.02)

Recommended footprint details



Notes:

1. All dimensions are typical in millimeters (inches).
Through hole (black) 1~4:Ø0.80 (0.031)
Top view pad (green) 1~4:Ø1.00 (0.039)
Bottom view pad (pink) 1~4:Ø1.60 (0.063)