

# CPS Series DC-DC Converters

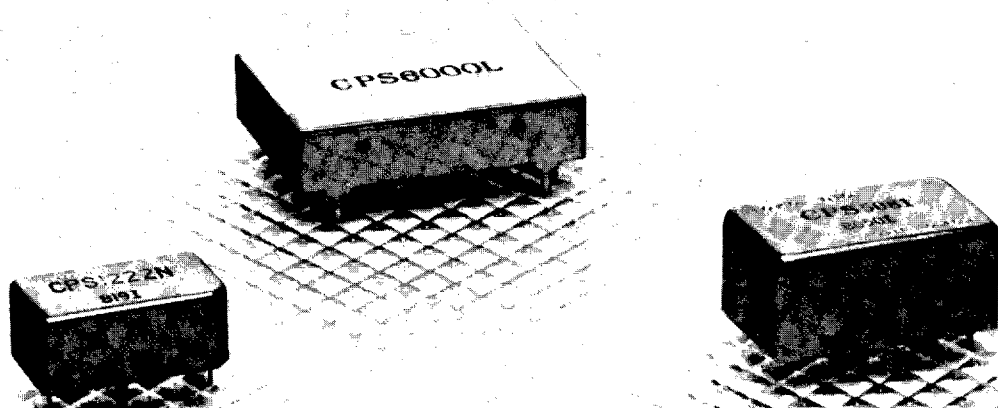
CPS

## ■ OVERVIEW

The CPS series of DC-DC converters are products of Toko's original circuit development with built-in high stability and high reliability characteristics. In the structure, metallic housing is used to reduce interfering noise. A ceramic substrate is used in the CPS1000 and 5000 series to achieve high output power and compact size. These low cost converters deliver up to 1.2W output power in the case of CPS1000, up to 2.4W in the case of CPS5000, and up to 6.0W in the case of CPS6000.

## ■ KEY APPLICATIONS

Battery-powered electronic equipment, computers (laptop, notebook), modem ports, displays (VFD and contrast control of LCD), automotive controllers and displays.



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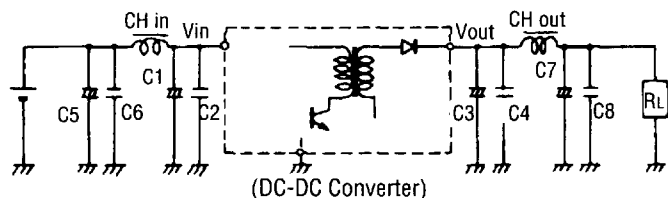
**TOKO DC-DC CONVERTERS**

# CPS Series DC-DC Converters

## ■ FEATURES

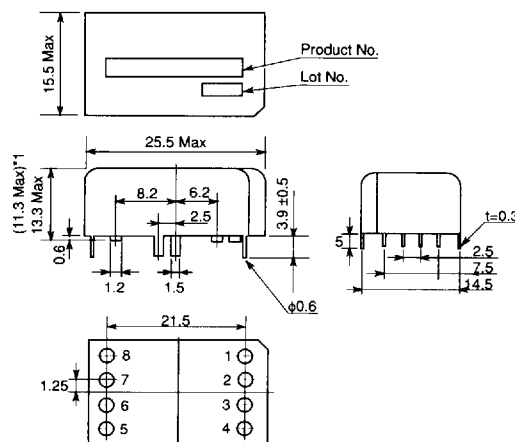
- High power output (1.2-6.0W)
- Small footprint/Low profile
- Low ripple and noise
- Fully shielded structure for low radiated noise
- Utilizes thick-film technology
- Direct PCB mount type

## ■ CONNECTIONS

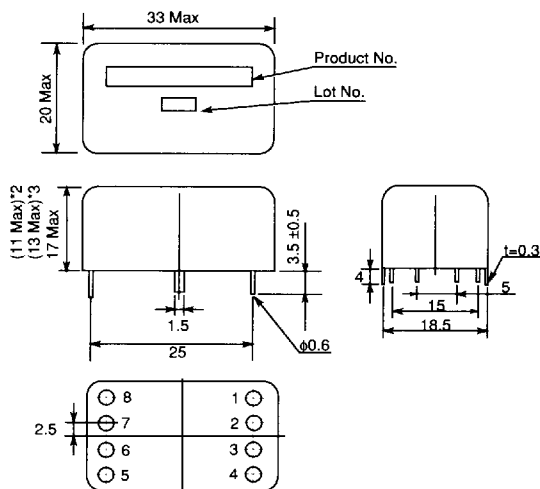


## ■ DIMENSIONS (Unit: mm)

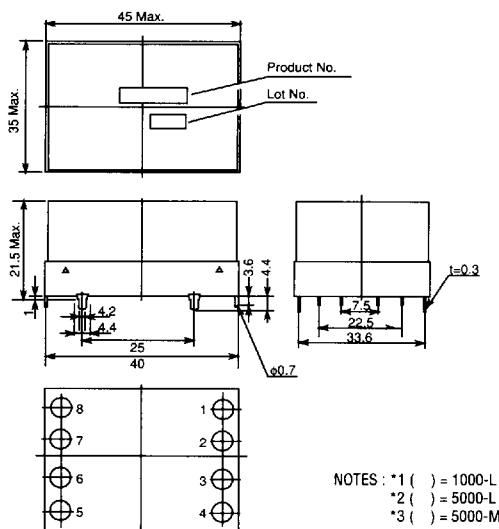
### CPS 1000 Series



### CPS 5000 Series



### CPS 6000 Series



## ■ SPECIFICATIONS

Item	Output Power	Output Voltage			Output Current			Output Current Range		Output Voltage Tolerance		Input Voltage	Input Voltage Range	Conversion Efficiency	Operating Temp. Range	Storage Temp. Range
		V01	V02	V03	I01	I02	I03	I0 DC Max/Min	I0 AC Max/Min	aDC	aAC					
Symbol	P0	V01	V02	V03	I01	I02	I03	I0 DC Max/Min	I0 AC Max/Min	aDC	aAC	Vin	Vin Max/Min typ	η	Top	Testing
CPS 1000	1.2W Max	±5 ~ ±40%	±5 ~ ±40V	AC1 ~ 10 Vrms	80mA Max	80mA Max	120mA Max	40 ~ 100%	60 ~ 100%	±10%	±25%	+1.7 ~ 30V	±30%	≥75%	-20 ~ +65°C	-40 ~ +85°C
CPS 5000	2.4W Max	±5 ~ ±40%	±5 ~ ±40V	AC1 ~ 10 Vrms	80mA Max	80mA Max	120mA Max	40 ~ 100%	60 ~ 100%	±10%	±25%	+1.7 ~ 30V	±30%	≥75%	-20 ~ +65°C	-40 ~ +85°C
CPS 6000	6.0W Max	±5 ~ ±40%	±5 ~ ±40V	AC3 ~ 10 Vrms	300mA Max	50mA Max	300mA Max	40 ~ 100%	60 ~ 100%	±10%	±15%	+4.5 ~ 30V	±30%	≥85%	-20 ~ +65°C	-40 ~ +85°C

NOTES:  $V_{01} : V_{in} Max + |V_{01} Max| \leq 45V$ .  $V_{02} : K \cdot V_{in} Max + |V_{02} Max| \leq 45V$ . (K=transformer winding ratio)

# CPS Series DC-DC Converters

CPS

■ SPECIFICATIONS

1. For Use As Primary Power Source In Electronic Equipment

CPS1000 Series

Use	Input (V)	Output 1 : (V/mA)	Output 2 : (V/mA)	Output (mW)	Form	Type No.
1ch +V Output	1.1~1.5	+5±1/10	with/control terminals	60		CPS1108A
	2~2.8	+10±1/15~42	do.	462		CPS1113
	2~3.5	+12±1.2/3~10		132		CPS1088
	2~4	+12±1.2/16~40		528		CPS1179
	2.5~4.5	+9±0.9/6~13		129		CPS1105
	2.7~4.5	+6±0.4/6~12		128		CPS1068
	3.0~4.5	+6.5±0.5/20~50		350		CPS1176
	3.5~6	+5±0.5/3~10		55		CPS1134
	3.5~7	+33±2/1~5		175		CPS1093
	3.8~7	+5±0.65/60~150		848		CPS1171
	4~6	+9±0.9/5~10		99		CPS1080
	4~6	+30±3/5~10		330		CPS1079
	4.2~6.6	+12±1.2/40		528		CPS1077
	4.5~8	+10±1/30~100		1100		CPS1076
	4.5~5.5	+24±2.4/8~20		528		CPS1177
	4.75~5.25	+12.2±0.8/2~5		65		CPS1157
	4.75~5.25	+15±0.75/1~5		79		CPS1117
	4.9~5.1	+37±3.8/1~2		85		CPS1098B
	6~10	+34±3.4/1~5		187		CPS1092
	8~11	+40±4/25~30		1200		CPS1121
9~16	+24±7.4/10~40		1056		CPS1131	
9~16	+31.5±1.5/5~10		330		CPS1170	
9~16	+35±1.75/8~12		735		CPS1129	
8.5~9.5	+15±1.5/40~70		1155		CPS1096	
9.6~14.4	+18±3.5/20~40		860	L	CPS1062A	
10~12	+24±1.2/26~50		1200		CPS1109	
10.4~16	+32±2/3		102		CPS1107	
10.8~13.2	+5±0.25/1~10		53		CPS1085	
1ch -V Output	4~5.5	-5±0.5/48~120		660		CPS1144
	4~5.6	-5±0.6/5~20		120		CPS1089
	4.5~5.5	-5±0.5/25~50		275		CPS1064
	4.5~5.5	-5±0.5/50~100		550		CPS1139
	4.5~5.5	-10±0.5/20~60		600		CPS1012B
	4.5~5.5	-12±1.2/16.8~42		554		CPS1149
	4.5~5.5	-15±1.5/5~10		165		CPS1163
	4.5~5.5	-30±3.0/4~10		330		CPS1158
	4.5~5.5	-34±3.4/9.4~23.7		886		CPS1178
	4.5~5.5	-35±3.5/8~20.5		789		CPS1155
	7~16	-5±0.5/1~50		250		CPS1053
	9~16	-14±1.4/20~80		1200		CPS1116
	9~16	-23.5±2.4/15~51		1200		CPS1067A
	10~12	-12±0.6/26~50		630		CPS1110
10~27	-10.5±0.5/20~120		1200		CPS1070A	
10.8~13.2	-5±0.25/100~250		1250		CPS1166	
10.8~13.2	-12±0.8/1~10		129		CPS1084	
10.8~13.2	-15±0.75/20~34		535		CPS1126	
2ch +V Output	4.5~5.5	+9±0.5/20~40	+16±1.5/2~3	433		CPS1124
	5~6	+28.5±2.5/1~2	+12±1.5/4~10	200		CPS1056
	5.5~7.5	+40±2/5~7	+9±0.8/30~40	686		CPS1125
2ch -V Output	4.75~5.25	-32±1.6/3~10	-4±0.3/3~10	396		CPS1059A
2ch ±V Output	4~6	+12±0.6/30	-12±1/30	768		CPS1099
	4.5~5.5	+12±0.6/20~40	-12±1.2/20~40	1032		CPS1133
	7~9	+10±1.2/6~20	-8±1/10~30	490		CPS1123
	10~13	+12±0.6/26~50	-12±1/26~50	1200		CPS1114
	10~14	-24±2/8~25	+37±3/2~5	850		CPS1130
10~16	-24±2/5~10	+2.2±0.5/40~80	480		CPS1106A	

# CPS Series DC-DC Converters

## CPS5000 Series

Use	Input (V)	Output 1 : (V/mA)	Output 2 : (V/mA)	Output (mW)	Form	Type No.
1ch +V Output	4.5~5.5	+9±0.9/80~200		1980		CPS5074
	4.75~5.25	+12±0.6/90~150		1890		CPS5060
	9~16	+45±4.5/20~30		1485		CPS5066
2ch ±V Output	4.5~5.5	+12±0.6/28~70	-12±1.2/8~20	1146		CPS5082

## 2. For Driving Fluorescent Indicators

## CPS1000 Series

Use	Input (V)	Output 1 : (V/mA)	Output 2 : (V/mA)	AC Out : (Vrms/mA)	Output (mW)	Form	Type No.	
DC 1ch output	4.5~5.5	-29±2.9/6~20		1.8±0.27/117~143	930		CPS1118	
	5.05~4.95	-7±0.7/23.4		1.4±0.14/140	395		CPS1058	
	9~16	-24±2.4/0.5~1.5		3.7±1.0/10.8~13.2	102		CPS1063	
	9~16	-22±2.2/1.0~5.5		1.3±0.4/47~58	232		CPS1061	
	9~16	-24±3/5.6~32		2.4±0.5/67~86	1050		CPS1052B	
	9~16	-30±3/5~20		4.2±1.0/64~80	1076		CPS1082C	
	AC 1ch output	9~16	-23.5±2.4/25~40		2.8±0.6/40~80	1200		CPS1027A
		9~16	+28±2/25~35		2.8±0.6/40~70	1200		CPS1128A
		10.8~13.2	+22±2.2/5~15		2.2±0.4/68~83	579		CPS1075
		11.7~15.9	-26±2.6/15~32		2.6±0.4/90~110	1200		CPS1127
		14~16	-24±2.4/10~30		2.5±0.5/80~100	1100		CPS1087A
14~16		-27±2.7/10~30		2.8±0.56/80~100	1200		CPS1087B	
4.5~5.5		-26±2.6/2~6.5	-20±2/1.3~4.4	4.9±0.98/19~25	430		CPS1071	
4.5~5.5	-24.75±1.23/1~7.35	-18.75±1.87/1.3~6.5	4.9±0.49/19~23	450		CPS1104		
4.5~5.5	-15±0.75/6~28	-28±2.8/1.35~9.5	4.9±0.24/20~25	869		CPS1104A		
4.5~5.5	-31±3.1/1	-25±2.5/7~23	2.3±0.3/67~83	880		CPS1090		
4.5~5.5	-31±3.1/7~23	-25±2.5/1	2.3±0.3/67~83	1027		CPS1102		
4.5~5.5	-47±4.7/1	-40±4/3~11	6.8±0.8/70~86	1180		CPS1091		
4.5~5.5	-47±4.7/3~11	-40±4/1	6.8±0.8/70~86	1200		CPS1103		
DC 2ch output	8~14	-21±2.1/0~7	-27.3±2.8/1.4~3	3.5±0.35/20~25	348		CPS1051B	
	9~16	-24±2.4/1~3	-30±3/1.5~4.5	5.5±1.0/14.8~18.2	346		CPS1069	
	9~16	-20±2/5~20	-24±2.4/3~6	3.4±0.8/10~14	658		CPS1049	
	AC 1ch output	9~16	-35±3.5/3~9	-30±3/2~7	3.8±0.95/50~60	850		CPS1078
		9~16	-10±0.8/12~35	-22±3/3~13	2.4±0.75/40~65	910		CPS1023B
		9~16	-10±0.8/12~35	-22±3/3~13	3±0.75/40~65	950	L	CPS1033A
		9~16	-25±2.5/2.8~7	-21±2.1/12~30	3±0.75/40~80	1050		CPS1037A
		9~16	-20±2/4~10	-16±1.6/16~40	3±0.75/40~80	1080		CPS1038A
		9~16	-18±1.8/4~10	-14±1.4/20~50	2.6±0.65/40~80	1090		CPS1040
		9~16	-26±2.6/10~25	-30±3/2.8~7	3±0.75/40~80	1100		CPS1036A
		9~16	-20±2/4~10	-16±1.6/18~45	2.4±0.6/40~80	1110		CPS1039A
		10~14	-28±2/8~25	+38±3/2~5	3±0.6/40~80	1200		CPS1132A
		10~16	-10±1/15~35	-31±5/7~13	2.8±0.28/70~86	994		CPS1060
	10~16	-22/ —	-34±4/12.5~19	3±0.7/97~110	1130	L	CPS1047A	

# CPS Series DC-DC Converters

CPS

## CPS5000 Series

Use	Input (V)	Output 1 : (V/mA)	Output 2 : (V/mA)	AC Out : (Vrms/mA)	Output (mW)	Form	Type No.
DC 1ch output	9~16	-30±3/9~30		2.7±0.54/63~210	1670		CPS5037
AC 1ch output	9~16	-30±3/9~30		2.7±0.54/132~440	2400		CPS5035A
DC 1ch output	12~14	-20±2/5~15		2.7±0.27/65~79	560	L	CPS5056B
AC 1ch output	12~14	-20±2/5.5~25		3.7±0.55/112~137	1132	M	CPS5059B
(Int. capacitor AC output Choke fil. in )							
DC 2ch output	9.5~10.5	-27.5±2.8/2~6	-20±2/7~62	6.5±1.2/50~110	2400		CPS5019
AC 1ch output	9~16	-30±3/9~30	-10±1/1.5~5	2.3±0.46/90~300	1873		CPS5036A
	12~14	-34±1/5~15	+50±5/5~15	3.4±0.5/30~100	1700		CPS5049

## CPS6000 Series

Use	Input (V)	Output 1 : (V/mA)	Output 2 : (V/mA)	AC Out : (Vrms/mA)	Output (mW)	Form	Type No.
DC 1ch output AC 1ch output	4.5 ~ 5.5	-43.5±4.4/15.1~37.7		9.2±1.4/75~125	3131		CPS6007
	4.5 ~ 5.5	+43.5±4.4/15.1~37.7		9.2±1.4/75~125	3131		CPS6008
	4.5 ~ 5.5	-43.0±4.3/27.4~68.5		7.5±1.1/90~150	4534		CPS6009
	4.5 ~ 5.5	+43.0±4.3/27.4~68.5		7.5±1.1/90~150	4534		CPS6010
	4.5 ~ 5.5	-40.0±4.0/19.7~49.3		6.4±1.0/90~150	3272		CPS6011
	4.5 ~ 5.5	+40.0±4.0/19.7~49.3		6.4±1.0/90~150	3272		CPS6012
	4.5 ~ 5.5	-45.0±4.5/19.9~49.8		8.0±1.2/90~150	3845		CPS6013
	4.5 ~ 5.5	+45.0±4.5/19.9~49.8		8.0±1.2/90~150	3845		CPS6014
	4.5 ~ 5.5	-57.0±5.7/17.4~43.5		8.1±1.2/60~100	3659		CPS6015
	4.5 ~ 5.5	+57.0±5.7/17.4~43.5		8.1±1.2/60~100	3659		CPS6016
	4.5 ~ 5.5	-42.0±4.2/19.6~49.1		5.3±0.8/165~275	3945		CPS6019
	4.5 ~ 5.5	+42.0±4.2/19.6~49.1		5.3±0.8/165~275	3945		CPS6020
	4.5 ~ 5.5	-52.5±5.3/17.2~43.0		5.5±0.8/147~245	4033		CPS6021
	4.5 ~ 5.5	+52.5±5.3/17.2~43.0		5.5±0.8/147~245	4033		CPS6022
	4.5 ~ 5.5	-55.0±5.5/13.6~34.0		7.8±1.2/90~150	3403		CPS6023
	4.5 ~ 5.5	+55.0±5.5/13.6~34.0		7.8±1.2/90~150	3403		CPS6024
	4.5 ~ 5.5	-59.5±6.0/13.4~33.6		4.8±0.7/86~144	2994		CPS6031
	4.5 ~ 5.5	+59.5±6.0/13.4~33.6		4.8±0.7/86~144	2994		CPS6032
	4.5 ~ 5.5	-50.5±5.1/12.7~31.7		7.5±1.1/75~125	2839		CPS6033
	4.5 ~ 5.5	+50.5±5.1/12.7~31.7		7.5±1.1/75~125	2839		CPS6034
	4.5 ~ 5.5	-40.5±4.1/15.4~38.4		6.3±0.9/90~150	2797		CPS6035
	4.5 ~ 5.5	+40.5±4.1/15.4~38.4		6.3±0.9/90~150	2797		CPS6036
	4.5 ~ 5.5	-42.5±4.3/15.0~37.5		9.2±1.4/75~125	3076		CPS6037
	4.5 ~ 5.5	+42.5±4.3/15.0~37.5		9.2±1.4/75~125	3076		CPS6038
	4.5 ~ 5.5	-43.0±4.3/17.4~43.5		5.3±0.8/54~90	2606		CPS6039
	4.5 ~ 5.5	+43.0±4.3/17.4~43.5		5.3±0.8/54~90	2606		CPS6040
	4.5 ~ 5.5	-43.0±4.3/14.6~36.5		6.7±1.0/75~125	2690		CPS6041
	4.5 ~ 5.5	+43.0±4.3/14.6~36.5		6.7±1.0/75~125	2690		CPS6042

NOTE: Other models with variations in board pattern and pin diameter are also available.

# CPS Series DC-DC Converters

## APPLICATION NOTES

### 1. External Parts

The output circuit in the CPS Series is shown within dashed lines in Fig. 1. The rectified output waveform is the pulsed condition and an output filtering capacitor should be used. On the other hand, since the switching operation is applied at the input side, the input current will be in square waveform and use of a capacitor is advised. Further, use of a filter, capacitor or capacitor-choke combination is recommended. This filter will prevent line noise from entering the converter and, conversely, the converter noise into external circuits. In this manner, low ripple and low spike noise will be realized. When the impedance looking from the converter to the line side is very low or there is no problem with regard to noise, components other than capacitor,  $C_1$ , are not required.

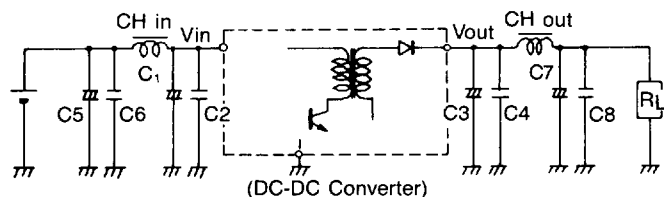


Fig. 1

### 2. Recommended External Parts

As previously mentioned, it is necessary to use filter capacitor or capacitor combined with choke coil when using the CPS series converters. Electrolytic capacitors which have good high frequency characteristics are recommended (if, however, there is sufficient h-f bypassing, then ceramic capacitors should be connected in parallel.) The minimum capacitance of the electrolytics should be at least 47  $\mu$ F. The voltage rating should be greater than 1.2 times the impressed voltage for aluminum electrolytics. For tantalum types, the rating should be greater than 1.4 times. On the other hand, the choke coil in the L-C filter structure is used to reduce the ripple voltage to a negligible amount. Large values of the choke coil inductance will considerably reduce the ripple voltage — however, it must be noted that there is a limitation in the current capacity.

### 3. PCB Pattern Design

The oscillation frequency of the CPS series converters is in the 50 ~ 400 kHz range, with square waveform output. Consequently, long external leads of external parts will cause induced effects and nullify the filtering conditions. For this reason, the heavy lines shown in Fig. 2 should be made as short as possible, not longer than 20mm. This applies particularly in the design of the pattern on the PCB.

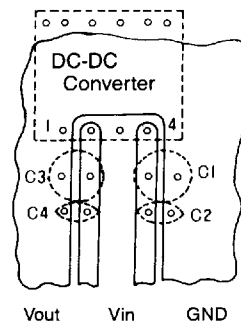


Fig. 2

### 4. Measures Against Noise

Noise generated from DC-DC converters can be classed into two groups, the normal and common modes.

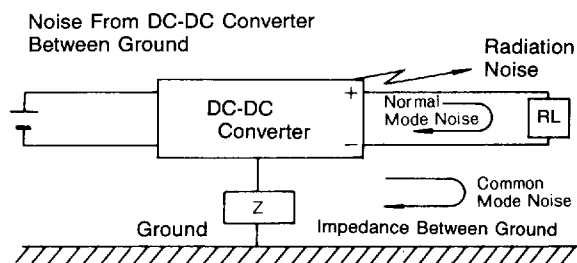


Fig. 3

In the normal mode, noise is induced by two wires in the go-return circuit; the frequency is low in this case. The common mode noise is the high frequency noise generated between the wiring and ground. In addition, there is noise radiated directly from the converter circuit to the surroundings. When the converter is used in circuits which are noise-sensitive, analog systems for example, the following measures should be considered —

- Physical placement: Change in direction of installation.
  - Grounding: Use of larger area of grounding pattern underneath the converter's lower surface.
- Noise generation depends on many factors, such as measuring instruments, wiring, etc. It is advised that extreme care is exercised in use of the converters.