

PLANAR POWER TRANSFORMER

P6140

Features

- * Planar windings
- * 4mm height above PCB
- * Low leakage inductance
- * High frequency operation
- * Externally configurable
- * 18–70V input capability
- * Auxiliary winding
- * Lead-free (Pb-free)

Applications

- * DC-DC converters
- * Flyback converters
- * 48V or 24V systems
- * 15V @ 1A output
- * 5V @ 3A output

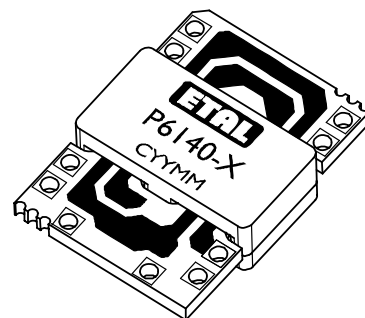
DESCRIPTION

P6140 is a planar power transformer using multilayer PCB technology. It is intended for low profile high frequency discontinuous flyback DC-DC converters up to 500kHz. With careful design, output power exceeding 20W is achievable.

P6140 has split primaries that can be configured in series or parallel for nominal 48V and 24V systems respectively, with nominal 15V output. The recommended input voltage range is 18V to 70V. Additionally, an auxiliary winding is provided on the primary side.

The contacts to the host circuit board are made by solder connection to large plated-through holes in the P6140 PCB, thus ensuring low resistance connection. The ferrite is intended to sit within a PCB cut-out, giving a height above board of 4mm.

P6140 is lead-free (Pb-free) and suitable for conventional and lead-free processing.



SPECIFICATIONS

Electrical

Typical values at T = 25°C, unless otherwise stated.

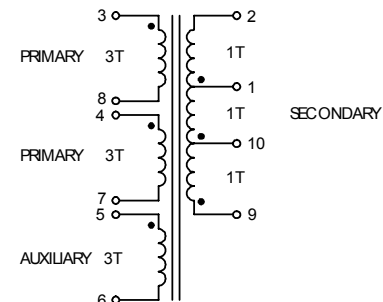
Parameter	Conditions	Min	Typ	Max	Units
Primary Inductance	100kHz, 100mV Each primary winding 3-8, 4-7				
	P6140-1	2.0	2.25	2.50	μH
	P6140-2	2.4	2.8	3.25	μH
Leakage Inductance	500kHz, 100mV (3, 4)-(7, 8); link 1, 2, 9, 10; link 5, 6	-	-	100	nH
Primary/Secondary voltage isolation	(3+4+5):2	500	-	-	Vrms
Interwinding capacitance	100kHz, 1V	-	325	-	pF
Total transformer losses	Vout = 15V at Iout = 1A 400kHz	-	0.6	-	W
DCR	Primaries 3-8, 4-7	12	16	20	mΩ
	Auxiliary	53	70	87	mΩ
	Secondary: each section 2-1, 1-10, 10-9	3.4	4.5	5.6	mΩ
Turns Ratio	(3-8):(4-7)	-	1.0	-	-
	(3-8):(5-6)	-	1.0	-	-
	(3-8):(9-2)	-	1.0	-	-
	(9-10):(10-1)	-	1.0	-	-
	(9-10):(1-2)	-	1.0	-	-
Operating range:	Ambient temperature				
		Functional	-40	-	+85
Storage		-40	-	+85	°C

Typical Magnetic Core Coefficients

C ₁	Core factor	0.514mm ⁻¹
V _e	Effective volume	800mm ³
l _e	Effective length	20.3mm
A _e	Effective area	39.5mm ²
μ _e	Effective permeability	123 (P6140-1) 154 (P6140-2)
m	Mass	4.1g

Transformer schematic

Fig 1



APPLICATION SCHEMATICS

In the flyback converter topology, the transformer operates as an energy storage element, and the ferrite core of P6140 is gapped to avoid saturation. The variants P6140-1 and P6140-2 differ in their gap sizes to suit particular applications and switching frequencies. P6140-1 is recommended for frequencies from 100kHz to 350kHz; P6140-2 is recommended for frequencies from 350kHz to 500kHz

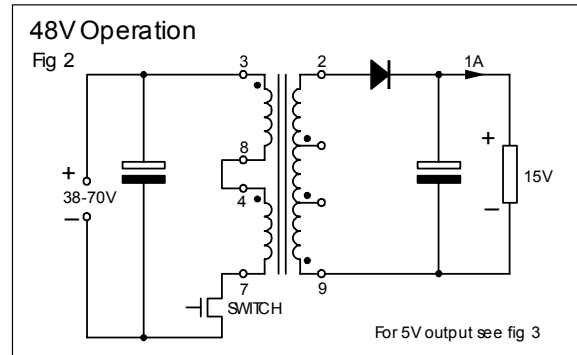
Note that in the discontinuous conduction flyback mode, the output load current flows when the switch is open. Observe winding polarities.

The auxiliary winding may be used to provide a power rail for switching and control circuits. In the schematics below, switch drive circuitry and feedback components are omitted for simplicity.

48V operation (38–70V)

For 48V operation the transformer primaries are connected in series, giving nominal primary inductance of $9\mu\text{H}$ (P6140-1) and $11.3\mu\text{H}$ (P6140-2), and primary DCR of $33\text{m}\Omega$.

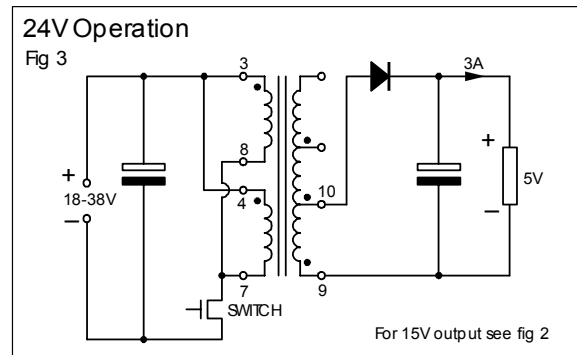
Fig 2 shows a typical schematic with a 15V @ 1A output. For a 5V output, use the output tap as shown in fig 3.



24V operation (18–38V)

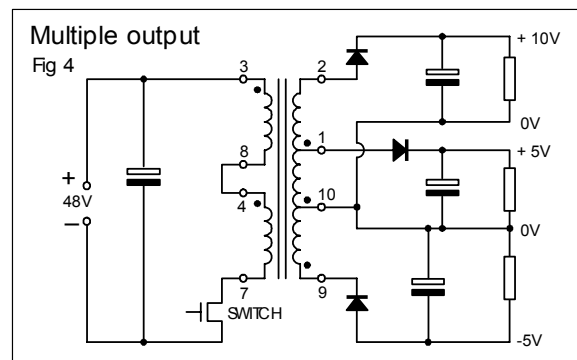
For 24V operation the transformer primaries are connected in parallel, giving nominal primary inductance of $2.25\mu\text{H}$ (P6140-1) and $2.84\mu\text{H}$ (P6140-2), and primary DCR of $8\text{m}\Omega$.

Fig 3 shows a typical schematic with a 5V @ 3A output. For a 15V output, use the output tap as shown in fig 2.

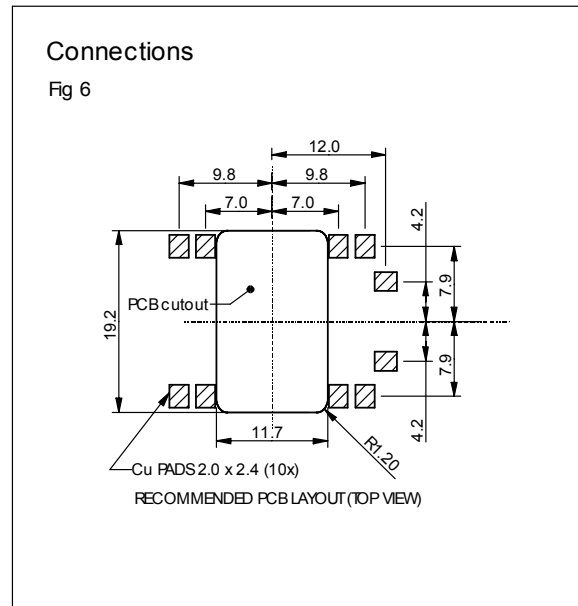
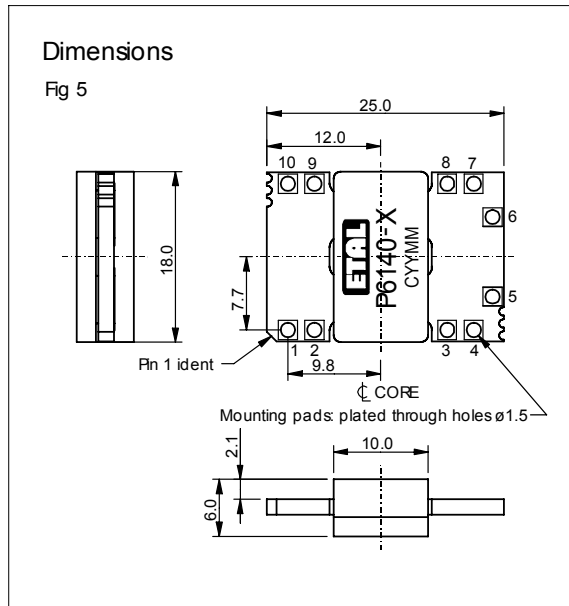


Multiple output

Following the examples given in figs 2 and 3, the secondary taps can be utilized to provide multiple output voltages. For example, fig 4 shows a 48V input flyback converter with $+10\text{V}$ and $\pm 5\text{V}$ outputs. Other combinations are possible.

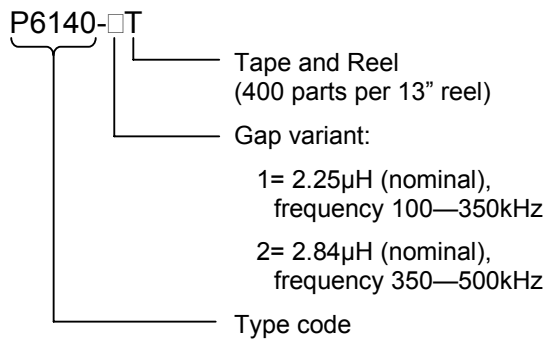


CONSTRUCTION



Dimensions shown are in millimetres.
Terminal finish is 0.1µm max gold (Au) over nickel (Ni).

ORDERING CODE



ABSOLUTE MAXIMUM RATINGS

(Ratings of components independent of circuit).

Short term isolation voltage (1s)	500Vrms
Peak primary Current	8A (primaries in series) 16A (primaries in parallel; 8A per primary winding)
V.µs per primary winding	24V.µs (for B=200mT)
Storage temperature	+85°C
Magnetic Core temperature	120°C
Reflow temperature (10s)	260°C