EFD Style Transformer

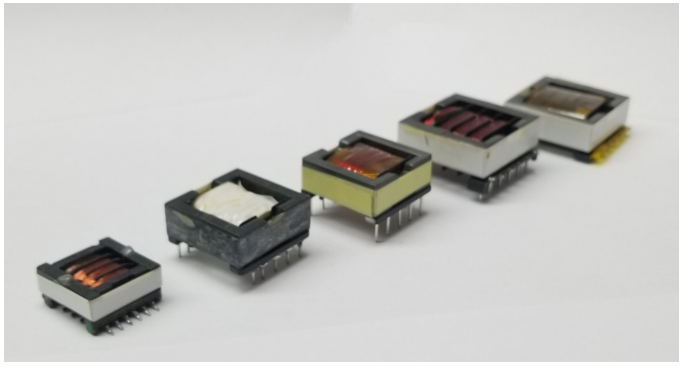
The EFD style transformers are a very miniturized geometry. These transformers are optimized for applications where the circuit board space is at a premium. The EFD (Economic Flat Design) implies the EFD's build height is minimized in relation to its volume and weight.

Power vs. Operating Frequency[1,2]

ETD Type	Transformer Finished Size			WaAc	20kHz	50kHz	100kHz	250kHz	500kHz
	Length (mm)	Width (mm)	Height (mm)	(cm^4)	(watts)	(watts)	(watts)	(watts)	(watts)
EFD10	11.7	18.7	5.7	.003	<1	<1	<1	1	<2
EFD15	15.1	21.3	7.8	.024	2	3	4	7	13
EFD20	21.7	27.7	10.5	.084	7	12	16	30	44
EFD25	25.2	31.7	12.9	.226	18	28	43	84	120
EFD30	30.3	33.3	13.2	.354	30	49	70	137	188

Values are for Surface Mount Coilforms

The EFD series is definded by its very low profile. This extreme flatness is achieved by flattening the center pole of the core and centering it in the finished transformer to maximize the winding area. Every EFD transformer has the lowest build height when compared to any other geometry with the same magnetic volume. All these features combined with a very high throughput power-density for frequencies up to 1MHz make the EFD series very popular on todays crowded PCBs. The EFD style has coil formers that can be purchased in SMD or Through-hole styles, along with a system of clips and caps to hold and secure the cores to the bobbins.



A_L Values for Common Cores

ETD Type	Mag R	Mag P	Mag F	FC 3C90	FC 3C94	FC 3C96	FC 3C95	FC 3F3	TDK N87	TSC7070
EFD10	585	622	698	585	585	525	700	500	450	N/A
EFD15	893	973	1170	950	950	850	1140	780	780	1065
EFD20	1300	1633	1881	1300	1300	1200	1540	1200	1200	1740
EFD25	2093	2280	2730	2200	2200	2000	2660	2000	2000	2755
EFD30	2200	2695	3137	2100	2100	1900	2520	1900	2050	2745

A_L values are for ungapped cores and are +/- 25%, measured in nH/T2

EFD Style Transformer

The EFD style geometry consists of a high throughput power density at the mimimum possible height. All the dimensions are optimized to reduce the footprint on crowded circuit boards and at the same time still have the minimum height for each of their perspective magnetic volume.

Technical Data (Surface Mount)

ETD Type	Ve	Ae/Ac	Le	Wa	WaAc	Bobbin Wind	Bobbin Wind	Mean Length
	(mm^3)	(mm^2)	(mm)	(mm^2)	(cm^4)	Width (mm)	Height (mm)	Turn (mm)
EFD10	171	7.2	23.7	4.2	0.003	6.0	0.8	14.8
EFD15	510	15.0	34.0	16.0	0.024	8.9	1.8	26.0
EFD20	1460	31.0	47.0	27.2	0.084	13.3	2.4	34.9
EFD25	3300	58.0	57.0	39.0	0.226	16.4	3.0	46.4
EFD30	4700	69.0	68.0	51.8	0.340	20.0	2.8	52.7

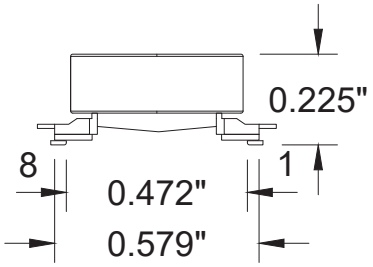
Some manufacturer's core values are slightly different. Check mfg data sheets for exact values.

1. Selection of core size is typically done by evaluating the WaAc (Product of core and window area). This value is used along with some industry recognized formulas developed in A.I. Pressman's book "Switching Power Supply Design". Along with this equation, assumptions of several parameters are usually made to help narrow the core selection.
For this evaluation, the most efficient method of operation is assumed, push-pull square wave. Assuming a Core loss to be approximately 100mW/cm^3. Bmax (flux density) is selected as such: @20kHz - 2000 gauss, @50kHz - 1300 gauss, @100kHz - 900 gauss, @250kHz - 700, @500kHz - 500 gauss.
2. The power handling capabilities are for push-pull topologies. Typically for flyback topologies these values must be de-rated by a factor of 3 or4. For feed-forward topologies de-rate by a factor of 2.

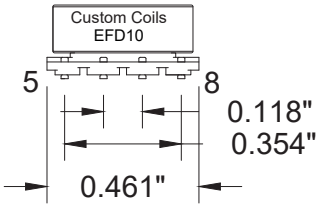
Schematics

EFD Style Transformers

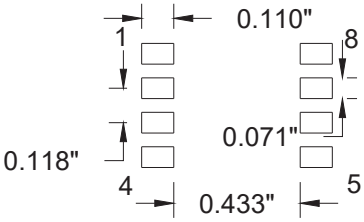
EFD10 FRONT VIEW



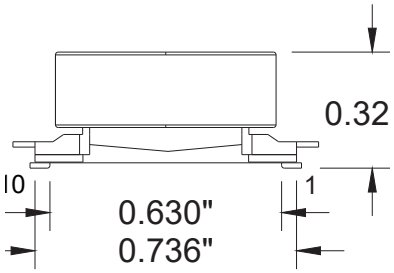
EFD10 SIDE VIEW



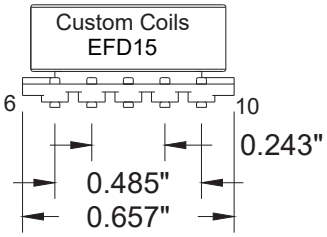
EFD10 FOOTPRINT



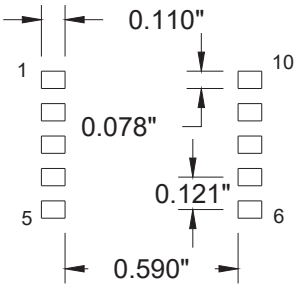
EFD15 FRONT VIEW



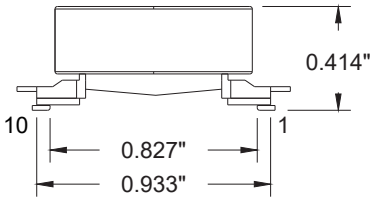
EFD15 SIDE VIEW



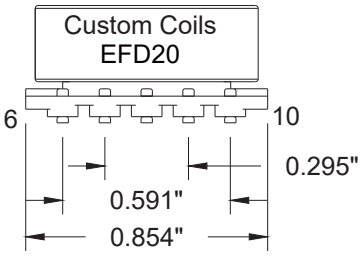
EFD15 FOOTPRINT



EFD20 FRONT VIEW



EFD20 SIDE VIEW



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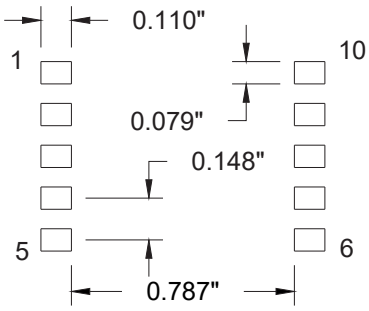
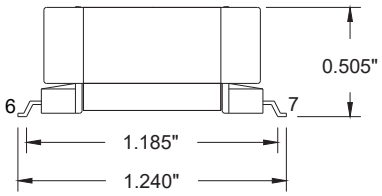
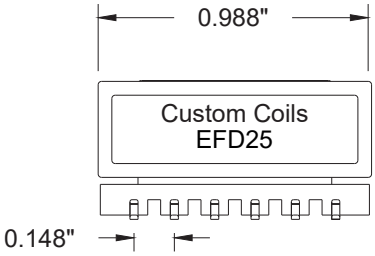


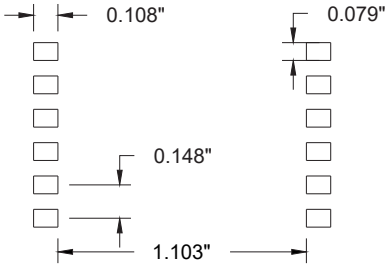
EFD25 FRONT VIEW



EFD25 SIDE VIEW



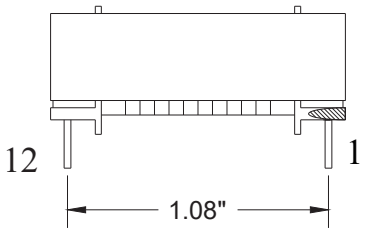
EFD25 FOOTPRINT



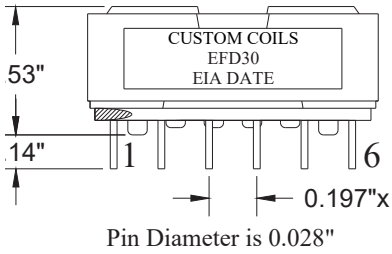
Schematics

ETD Style Transformers (cont)

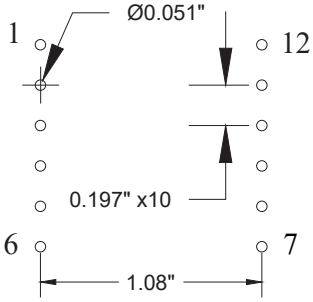
EFD30
FRONT VIEW



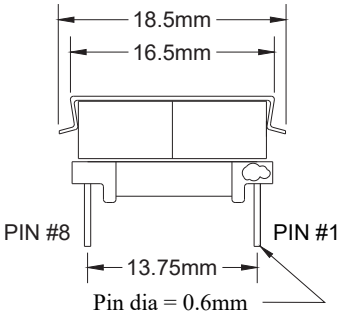
EFD30
SIDE VIEW



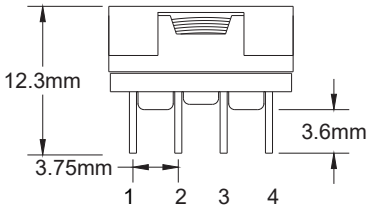
EFD30
FOOTPRINT



EFD15
FRONT VIEW



EFD15
SIDE VIEW



EFD15
FOOTPRINT