



CURRENT SENSE TRANSFORMERS

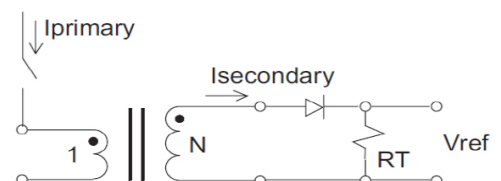
FOR SWITCH MODE POWER APPLICATIONS

With the increased focus on end-product efficiency the need to accurately monitor current in electronic circuits is paramount. By accurately knowing the current in the system it is possible to identify issues, optimize efficiency and re-direct current flow as required. Broadly speaking current sense applications can be broken up into DC current applications (battery monitoring), low frequency sinusoidal applications (50/60Hz electrical transmission, distribution and storage systems) and high frequency applications (switch mode power supply circuits operating >40kHz). Within these broad groups there are a variety of current sense technologies available (basic shunt resistors, Hall Effect, magnetic transformer and AMR) and each has trade-offs in terms of complexity, size, cost, efficiency, accuracy and isolation. Perhaps the most versatile solution, for non-DC applications, is the use of a transformer and Pulse Electronics is a leader in market lead in both low frequency (<https://egston.com/>) and high frequency switch mode power solutions (<https://www.pulseelectronics.com/current-sense-magnetics/>). Transformer solutions are inherently electrically isolated and can be designed to easily comply with relevant safety standards, they offer very low loss, excellent accuracy over temperature and time and the cost and complexity are quite low.

When selecting a current sense transformer it is important to know:

- * The maximum rms current that is going to be measured so that a thermally appropriate transformer can be identified.
- * The isolation voltage required
- * The insulation level (functional, basic, reinforced)
- * Specific mechanical constraints.

In any practical application the only real "limit" to the current sense operation is thermal. If too much current is applied to the primary it (and the secondary winding) may overheat so it is important to make the correct selection and test the transformer at maximum current and ambient temperature. Although users often worry about saturating the transformer it is almost impossible, in any realistic application, to do so as the saturation current is not related to large primary current (as this energy is not stored in the core) but rather the relatively low sensed voltage divided by the secondary turns and frequency. As long as the frequency is not too low (<kHz) then saturation is not an issue. However, this does highlight that switch mode power current sense magnetics cannot be used in 50/60/400Hz type applications.



TYPICAL APPLICATION CIRCUIT

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SMT Solutions											
Dimensions (mm)			Series	Isolation Voltage (Hi-pot)	Insulation Type	UL Creepage Distance (Pri-Sec)	Current Rating	Primary DCR (MAX)	Available Turns Ratios	IATF	
L	W	H									
	8.4	7.2	5.5	P820x	500Vrms	Functional	-	10Arms	6.0 mOhms	1:20 to 1:125	-
	8.4	7.2	5.5	PA1005, PM2165	500Vrms	Functional	-	20Arms	0.75 mOhms	1:20 to 1:125	Yes*
	8.4	8.4	3.3	PA0368	500Vrms	Functional	-	4Arms	4.0 mOhms	1:50 to 1:125	-
	12.8	9.7	7.2	PH9494	2250Vdc	Functional	-	30Arms	0.35 mOhms	1:50 to 1:200	-
	13.6	12.8	14.4	PH9505	3000Vrms	Reinforced	6.5mm	30Arms	0.5 mOhms	1:50 to 1:180	-
	14.0	13.0	8.8	PH9500	4400Vdc	Basic	8.2mm	10Arms	3.0 mOhms	1:65 to 1:100	-
	14.6	12.6	7.1	PE-682xx	500Vrms	Functional	-	15Arms	1.15 mOhms	1:1:50 to 1:1:200	-
	19.9	14.5	10.0	PB002x	1000Vdc	Functional	-	35Arms	0.42 mOhms	1:50 to 1:200	-
	20.5	12.8	14.4	PAS6322	3500Vrms	Reinforced	10mm	50Arms	0.5mOhms	1:30 to 1:200	
	19.0	14.0	19.0	PE-67xxx	4250Vrms	Reinforced	8mm	20Arms	1.0 mOhms	1:50 to 1:300	-
	20.6	14.7	19.0	P058x	3000Vrms	Reinforced	8mm	20Arms	1.7 mOhms	1:1:50 to 1:1:200	-
	17.2	9.5	20.4	FIS1x1	2500Vrms	Reinforced	8mm	15Arms	-	x:50 to x:200	-
	17.6	15.2	12.0	FIS1xx5	4000Vdc	Reinforced	8mm	25Arms	1.2 mOhms	1:50 to 1:1000	-
	17.2	9.9	20.4	PE-5168x PE-5171x	3000Vrms	Reinforced	8mm	25Arms	-	1:50 to 1:200 1:50CT to 1:200CT	-
	22.9	17.8	17.8	PE-6358x PE-6361x PE-64xxx	3000Vdc	Reinforced	8mm	20Arms	1.1 mOhms	1:50 to 1:200 1:50CT to 1:200CT 1:1:50 to 1:1:200	-