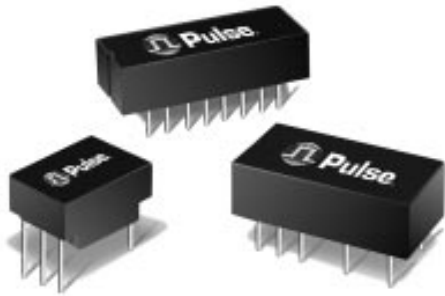


T1/CEPT/ISDN-PRI TRANSFORMERS

Single Through Hole, 1500 Vrms



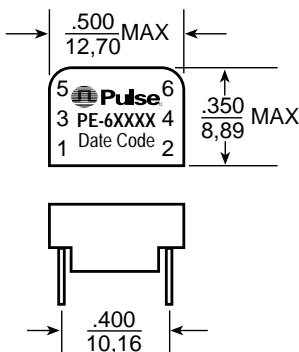
- Extended and standard temperature range
- Dual and single through hole models available
- Models matched to leading transceiver ICs
- UL 1459 and BAPT recognized models available
- Isolation Voltage: 1500 Vrms MIN

Electrical Specifications @ 25°C

Pulse Part Number	Turns Ratio ^B (Pri:Sec ±5%)	OCL @ 25°C (mH MIN)	C _{w/w} (pF MAX)	L _L (μH MAX)	DCR Pri (MAX)	DCR Sec (MAX)	Package/ Schematic	Primary Pins
STANDARD TEMPERATURE RANGE SINGLE TRANSFORMERS – OPERATING TEMPERATURE 0°C TO +70°C								
PE-64931 ^G	1:1:1 (1:2CS)	1.20	25	0.50	0.70	0.70 & 0.70	HC-1/2S	1-2
PE-64933	1CT:3CT	1.20	30	0.50	0.70	1.60	HC-1/4S	1-5
PE-64934	1:1	1.20	25	0.50	0.70	0.70	HC-1/1S	1-2
PE-64936	1CT:1	1.20	25	0.80	0.70	0.70	HC-1/3S	1-5
PE-64937	1:1.36	1.20	35	0.80	0.70	0.80	HC-1/1S	5-6
PE-64940	1.26CS:1 (1:1:1.58)	0.30	30	0.60	0.80	0.60	HC-1/2S	1-4
PE-64941 ^D	1CS:1	0.80	30	0.60	0.80	0.60	HC-1/2S	1-4
PE-64942	1CS:1.31	0.80	30	0.40	0.80	0.60	HC-1/2S	1-4
PE-64943	1CT:2CT	1.20	30	0.30-0.55	0.70	1.20	HC-1/4S	1-5
PE-65351 ^G	1:2CT	1.20	40	0.50	0.70	1.30	HC-1/3S	2-6
PE-65363	1:4CT	0.50	40	1.00	0.50	1.50	HC-1/5S	1-5
PE-65379	1:1.14CT	1.20	35	0.80	0.70	0.80	HC-1/5S	1-5
PE-65388	1:1.15CT	1.50	35	0.60	0.70	0.90	HC-1/3S	2-6
PE-65389 ^E	1:1/1.26	1.50	40	0.40	0.70	0.90	HC-1/3S	2-6
PE-65415	1CT:2CT	1.20	30	0.50	0.70	1.20	HC-1/4S	1-5
PE-65558	1:2.3CT	1.20	35	0.80	0.70	1.40	HC-1/5S	1-5
PE-65586	1:1.36CT	1.20	35	0.80	0.70	0.90	HC-1/5S	1-5
PE-65755	1CT:1CT	1.20	25	0.80	0.80	0.80	HC-1/4S	1-5
PE-68644	1CT:1	0.70	20	0.70	0.20	0.80	HC-1/3S	1-5
PE-68645	1:1.36CT	0.70	20	0.70	0.50	0.40	HC-1/5S	1-5
EXTENDED TEMPERATURE RANGE SINGLE TRANSFORMERS ¹ – OPERATING TEMPERATURE -40°C TO +85°C								
PE-65340	1:1.36	1.20	35	0.80	0.90	1.20	HC-1/1S	5-6
PE-65770	1:1.15CT	1.50	40	0.80	0.90	1.00	HC-1/3S	2-6
PE-65771	1CT:2CT	1.20	50	0.60	1.00	2.00	HC-1/4S	2-6
PE-65778	1CT:1CT	1.20	40	1.00	1.00	1.00	HC-1/4S	1-5
PE-68600	1CT:3CT	1.20	60	0.80	0.90	2.70	HC-1/4S	1-5
PE-68664 ^E	1:1/1.26	1.50	50	0.80	0.90	1.10	HC-1/3S	2-6

(See Pages 6 and 7 for Table Notes)

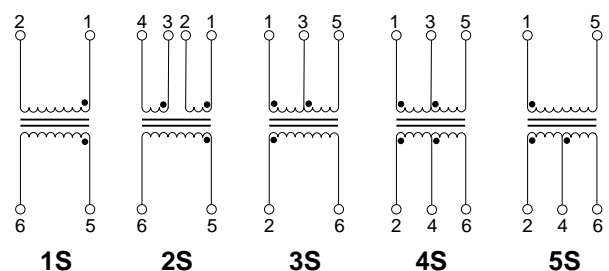
Mechanical



Dimensions: $\frac{\text{Inches}}{\text{mm}}$
 Unless otherwise specified, all tolerances are $\pm \frac{.010}{0,25}$
Notes: Leads are 24 AWG solderable.
 Unused pins not provided.

HC-1

Schematics



Weight 1.2 grams
 Tube60/tube

T1/CEPT/ISDN-PRI TRANSFORMERS

Transformer Selection Guide



Company IC Part Number	Comments	Dual Surface Mount		Single Through Hole				Dual Through Hole		Reinforced 3 KVrms EN60950	
		Std Temp	Ext Temp	Standard Temp		Extended Temp		Std Temp	Ext Temp	Transmit	Receive
		Trans & Rec	Trans & Rec	Transmit	Receive	Transmit	Receive	Trans & Rec	Trans & Rec		
AT&T/Lucent Technologies											
T7288	CEPT	PE-65862	PE-68822	PE-65586	PE-65415	PE-65340	PE-65771	PE-64952	PE-65774	PE-65832	PE-65835
T7289	DS1	PE-65865	PE-68825	PE-65379	PE-65351	PE-65770	PE-65771	PE-65565	PE-65567	PE-65838	PE-65835
T7290	T1 & CEPT	PE-65862	PE-68822	PE-65586	PE-65415	PE-65340	PE-65771	PE-64952	PE-65774	PE-65837	PE-65835
T7290	DS1				PE-65415		PE-65771				
T7690	DS1	PE-65870	PE-68874							PE-65838	PE-65838
T7690	CEPT		PE-68884	PE-65586	PE-65586	PE-65340	PE-65340			PE-65832	PE-65832
Brooktree											
UGA 510-1		PE-68678	PE-68864**	PE-64934	PE-65351	PE-65778	PE-65771	PE-64954		PE-65834	PE-65835
R8069, R8069A, R8069B		PE-68678	PE-68864**	PE-64943	PE-64934			PE-64954		PE-65833	PE-65834
Crystal											
61534, 61544, 61574, 6158, 61535	T1 & PCM-30	PE-65861	PE-68841	PE-65351	PE-65351	PE-65771	PE-65771	PE-64951		PE-65835	PE-65835
61535A, 61574A, 61575, 6158A	T1	PE-65865	PE-68825	PE-65388	PE-65351	PE-65770	PE-65771	PE-65565	PE-65567	PE-65838	PE-65835
61535A, 61574A, 61575, 6158A	PCM-30, 75, 120 ^E	PE-65866	PE-68826	PE-65389	PE-65351	PE-68664	PE-65771	PE-65566	PE-65568	PE-65839	PE-65835
6152		PE-65862	PE-68822	PE-65586	PE-65351	PE-65340	PE-65771	PE-64952	PE-65774	PE-65832	PE-65835
61584	IQ3	PE-65861	PE-68841	PE-65351	PE-65351	PE-65771	PE-65771	PE-64953		PE-65835	PE-65835
61584	IQ5	PE-65870	PE-68874	PE-65388	PE-65388	PE-65770	PE-65770			PE-65838	PE-65838
Dallas											
DS2185, DS2186, DS2187		PE-65862	PE-68822	PE-65586	PE-65351	PE-65340	PE-65771	PE-64952	PE-65774	PE-65832	PE-65835
DS2151, DS2153	T1, E1	PE-65865 ^C	PE-68882	PE-65388	PE-64936	PE-65770	PE-65778	PE-65565 ^C	PE-65567 ^C	PE-65838	PE-65834
DS2151, DS2153	Special Protect			PE-68645	PE-68644						
Exar											
T5650, T5620, T5675, T5681, T5683		PE-65861	PE-68841	PE-65415	PE-65415	PE-65771	PE-65771	PE-64951		PE-65835	PE-65835
56L22, 56L85, C240, C260, C262, C277		PE-65861	PE-68841	PE-65415	PE-65415	PE-65771	PE-65771	PE-64951		PE-65835	PE-65835
T5791, T5793, T5794		PE-65866 ^C	PE-68826 ^C	PE-65389	PE-64934	PE-68664	PE-65778			PE-65839	PE-65834
T5684		PE-65862		PE-65415	PE-64937					PE-65835	PE-65832
T7288		PE-65862	PE-68822	PE-65586	PE-65351	PE-65340	PE-65771	PE-64952	PE-65774	PE-65832	PE-65835
Level One											
LXT 300, LXT 301, LXT 305		PE-65861	PE-68841	PE-65351	PE-65351	PE-65771	PE-65771	PE-64951		PE-65835	PE-65835
LXT 300, LXT 301, LXT 305	MONITOR			PE-65351	PE-65363						
LXT 304A, LXT 305A	T1	PE-65865	PE-68825	PE-65388	PE-65351	PE-65770	PE-65771	PE-65565	PE-65567	PE-65838	PE-65835
LXT 304A, LXT 305A	PCM-30 75, 120 ^E	PE-65866	PE-68826	PE-65389	PE-65351	PE-68664	PE-65771	PE-65566	PE-65568	PE-65839	PE-65835
LXT 304A, LXT 305A	DSX-1, D4			PE-65558							
LXT 310, LXT 311		PE-68678	PE-68877	PE-65351	PE-64936	PE-65771	PE-65778	PE-64954		PE-65835	PE-65835 ^C
LXT 312, LXT 313, LXT 315					PE-65755		PE-65778		PE-68618/64950	PE-65836	PE-65835 ^C
LXT 318, LXT 319		PE-68678	PE-68877	PE-65351	PE-64936	PE-65771	PE-65778	PE-64954		PE-68646	PE-65839
LXT 324, LXT 325	DSX1				PE-65351						
LXT 324, LXT 325	MONITOR				PE-65363						
LXT 332		PE-65861	PE-68841	PE-65351	PE-65351	PE-65771	PE-65771	PE-64951		PE-65835	PE-65835
LXT 332	T1		PE-68881								
PMC-Sierra											
PM4341, PM6341		PE-65862	PE-68822	PE-64937	PE-65351	PE-65340	PE-65771	PE-64952	PE-65774	PE-65832	PE-65835
Siemens											
PEB 2235, PEB 2235A1, PEB 2235B1	T1 ^D			PE-64942	PE-64942			PE-64957			
PEB 2235, PEB 2235A1, PEB 2235B1	CEPT 75 ^D			PE-64940	PE-64940			PE-64955		PE-65830	PE-65830
PEB 2235, PEB 2235A1, PEB 2235B1	CEPT 120 ^D		PE-68827	PE-64941	PE-64941			PE-64956		PE-65831	PE-65831
PEB 2254		PE-68786	PE-68887							PE-68788	PE-68788
VLSI											
VPI4Q574	T1	PE-65865	PE-68825	PE-65388	PE-65351	PE-65770	PE-65771	PE-65565	PE-65567	PE-65838	PE-65835
VPI4Q574	E1	PE-65866	PE-68826	PE-65389	PE-65351	PE-68664	PE-65771	PE-65566	PE-65568	PE-65839	PE-65835
VPI4Q575	T1	PE-65865	PE-68825	PE-65388	PE-65351	PE-65770	PE-65771	PE-65565	PE-65567	PE-65838	PE-65835
VPI4Q575	E1 75	PE-65866	PE-68826	PE-65389	PE-65351	PE-68664	PE-65771	PE-65566	PE-65568	PE-65839	PE-65835
VPI4Q575	E1 120			PE-64940	PE-65351					PE-68646	PE-65835

NOTES FROM TABLES (pages 1 through 6):

** Standard temperature range

- A. Toleranced leakage inductance: .30 µH min to .55 µH max.
- B. OCL (primary inductance) and L_L (leakage inductance) are measured at the primary winding. Turns ratio is specified primary: secondary. (CT = Center Tap; CS = Split Center Tap).
- C. To make a 1CT:1 ratio from a 1CT:2CT ratio, use only one-half of the secondary (2CT) winding.
- D. It is possible to use the same transformer model for the three impedance levels of T1 (100 Ω) and CEPT (75 Ω & 120 Ω). The values of the resistors at the transmit end are then calculated according to Siemens Application Note 12.90 Just a Single Line Transformer Type for All IPAT (PEB 2235) Applications.
- E. Dual Ratio Transformers — These transformers have tapped secondary windings to provide two turns ratios

(T/R). Use the entire primary winding and connect the secondary pins listed below to obtain the desired turns ratio:

Part Number	Turns Ratio 1	Secondary Pins	Turns Ratio 2	Secondary Pins
PE-65839	1:1	3-5	1:1.26	1 - 5
PE-65866	1:1	2-3	1:1.26	1 - 3
PE-68646	1:1.58	3-5	1:2	1 - 5
PE-65389	1:1	3-5	1:1.26	1 - 5
PE-65566	1:1	2-3	1:1.26	1 - 3
PE-65568	1:1	2-3	1:1.26	1 - 3
PE-68866	1:1	2-3	1:1.26	1 - 3
PE-68826	1:1	2-3	1:1.26	1 - 3
PE-68664	1:1	3-5	1:1.26	1 - 5
PE-68836	1:1	2-3/5-6	1:1.26	1-3/4-6

F. Standard packaging for the surface mount "AN-1" and "LA-1" package is anti-static tubes. Optional tray packaging can be ordered by adding an "R" suffix to the part number, (i.e. PE-65857R). Optional tape & reel packaging can be ordered by adding a "T" suffix to the part number, (i.e. PE-65857T).

G. PE-64931 and PE-65351 are electrically equivalent, but have different schematics. PE-65351 is both UL 1459 and BABT recognized and is recommended for new designs because the 3S schematic provides greater physical separation between the primary and secondary pins.

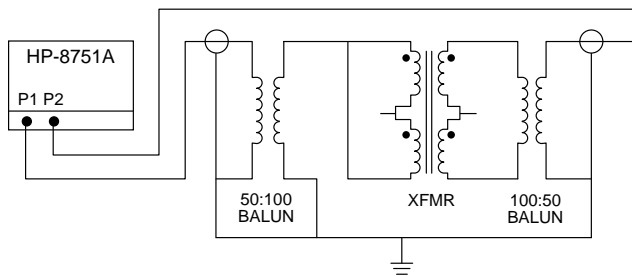
H. PE-68618 and PE-64950 — The fault locate winding is (7-8).

T1/CEPT/ISDN-PRI TRANSFORMERS

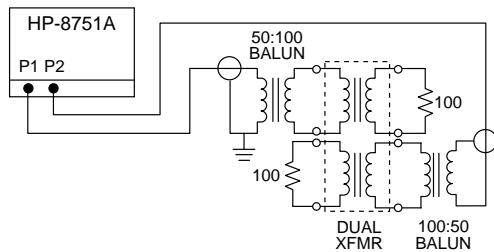
Application Notes



- Extended Temperature Range Models** — For extended temperature range transformers (-40°C to +85°C operating temperature range), OCL (Open Circuit Inductance for the primary winding) is specified at both -40°C and +25°C. At -40°C, OCL is 600 μH minimum for all low temperature models with the exception of PE-68827 which is 800 μH minimum and PE-65836 which is 300 μH minimum. All other parameters are specified at +25°C only. Standard temperature range is 0°C to +70°C.
- ET Product** — All coils have an ET product of 10 V-μsec minimum.
- Flammability** — Materials used in the products are recognized as UL94-V0 approved. Products meet the requirements of IEC 695-2-2 (Needle Flame Test).
- Balance Characteristics** — The transformers meet the requirements for longitudinal balance of FCC part 68.
- Common Mode Rejection Ratio** — the CMRR for all transformers is better than 50 dB at 1 MHz. A typical test circuit is shown below.



- Crosstalk Attenuation** — In the dual packages, which contain transmit and receive transformers side by side, sufficient crosstalk attenuation is achieved by the inherent characteristics of the toroid cores as well as by their proper positioning. The crosstalk attenuation is typically 50 dB or better from 100 KHz to 10 MHz. This result was established with the test circuit shown below.



- Return Loss** — ITU-T G.703 and European national regulatory documents specify minimum return loss levels. The transformers will allow these limits to be complied within the situations where they are applicable.

Frequency	50-100 KHz	100 KHz-2 MHz	2-3 MHz
Return Loss			
XMIT	9 dB	15 dB	11dB
REC	12 dB	18 dB	14 dB

- Surge Voltage Capability** — All transformers and chokes meet surge voltage tests according to the most stringent regulatory documents:

Metallic Voltage: 800 V peak, 10/560 μsec
 Longitudinal Voltage: 2,400 V peak, 10/700 μsec

- Isolation Voltage** — 100% of transformers are tested during production to the specified isolation voltage level.

- Safety Agency Recognition**

Underwriter Laboratories, UL 1459 file E133523 (S)

PE-64933	PE-64955	PE-65415	PE-65771
PE-64934	PE-65956	PE-65558	PE-65774
PE-64936	PE-65957	PE-65565	PE-65778
PE-64937	PE-65340	PE-65566	PE-68644
PE-64943	PE-65351	PE-65567	PE-68645
PE-64951	PE-65363	PE-65568	PE-64950
PE-64952	PE-65379	PE-65586	PE-68618
PE-64953	PE-65388	PE-65755	
PE-64954	PE-65389	PE-65777	

British Approvals Board for Telecommunications

BABT BS 6301:1989/BS 415 and BS EN 41003:1991/EN 60 950, supplementary insulation.

CR/0091

PE-64933	PE-65351	PE-65415	PE-65778
PE-64934	PE-65352	PE-65558	PE-68600
PE-64936	PE-65363	PE-65586	PE-68640
PE-64937	PE-65379	PE-65755	PE-68644
PE-64943	PE-65388	PE-65770	PE-68645
PE-65340	PE-65389	PE-65771	PE-68664

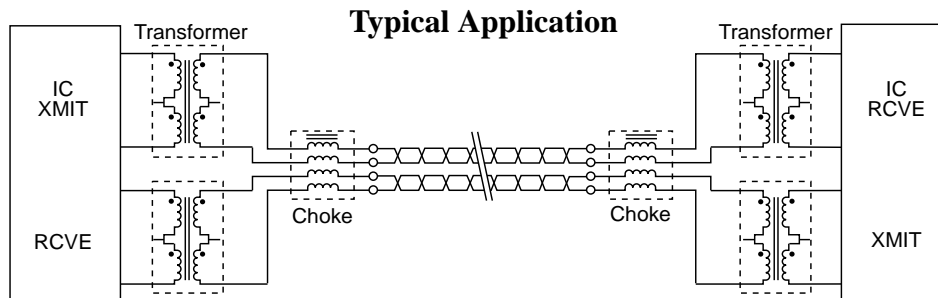
Transformers with Reinforced Insulation according to IEC950 series PE-68630—PE-68646 (page 6) are certified by the following organizations:

Code Certificate Information

C	CSA, C22.2 #950 & #225, Cert. LR 76802-3, reinforced insulation.
T	TÜV, EN 60 950/EN 41003, Cert. R9371358, reinforced insulation.
U	UL 1459/UL1950, File E133523 (S), reinforced insulation.
B	BABT EN41003/EN60950, Cert. CR0079, reinforced insulation.

- General Information** — The transformers are specifically designed for use in 1.544 MBPS (T1), 2.048 MBPS (CEPT) and ISDN Primary rate (PRI) interface applications. They are matched to the majority of the line interface transceiver ICs currently available. Use of the proper transformer allows the interface circuit to comply with ITU-T G.703 and other standards regarding pulse waveform, return loss, and balance.

- Common Mode Chokes** — The “high-frequency” 4-lines common mode chokes shown in this data sheet provide an effective means of compliance with national and international regulations on EMI. They are designed to be used in conjunction with Pulse’s T1/CEPT transformers as shown in the typical application below. Crosstalk is typically -70 db at 1 MHz and -55 dB at 10 MHz.



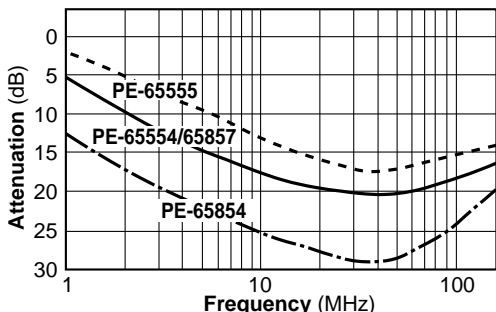
COMMON MODE CHOKES FOR TELECOM APPLICATIONS

For EMI Reduction



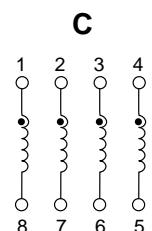
Electrical Specifications @ 25°C — Operating Temperature 0°C to 70°C

Pulse Part Number	Turns Ratio (±5%)	OCL (μH MIN)	C _{w/w} (pF MAX)	L _L (μH MAX)	DCR (MAX)	Isolation (Vrms MIN)	Package/ Schematic
PE-65554	1:1:1:1	24.0	15	.20	0.30	500	IN-1/C (Through Hole)
PE-65555	1:1:1:1	8.0	10	.20	0.25	500	IN-1/C (Through Hole)
PE-65854	1:1:1:1	47.0	16	.20	0.30	500	SH-4/C (Surface Mount)
PE-65857	1:1:1:1	24.0	15	.23	0.30	500	LA-1/C (Surface Mount)



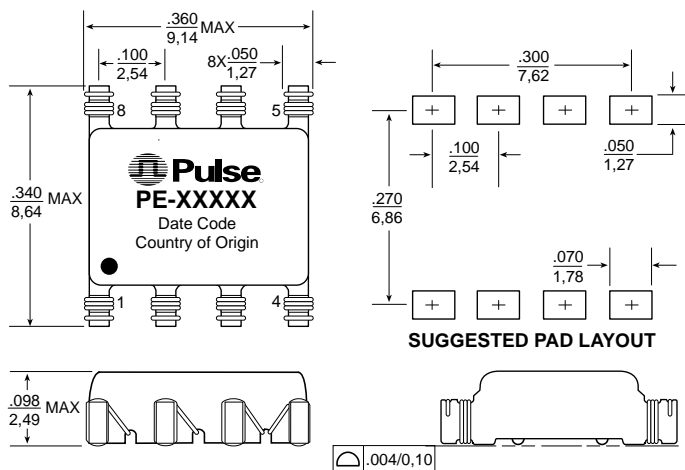
Typical common mode attenuation for high frequency common mode chokes based on a 100 system.

Schematic

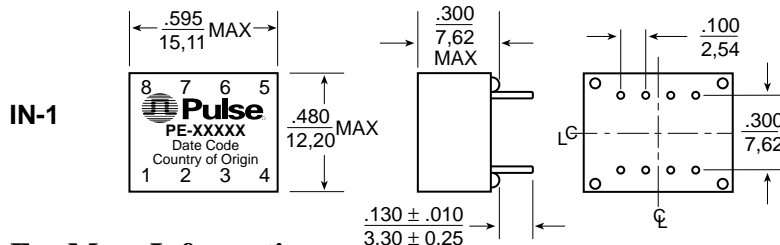
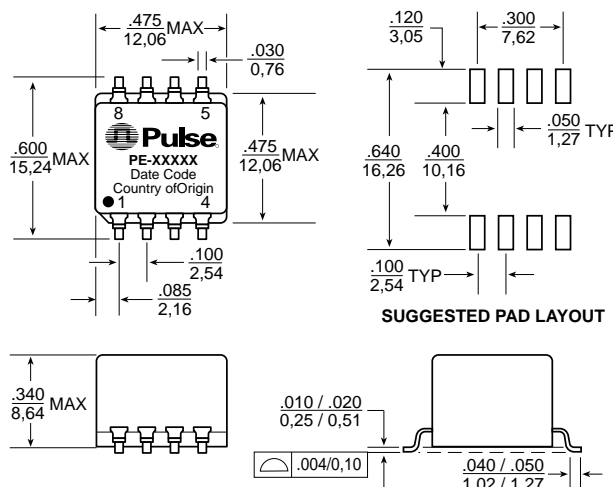


Mechanicals

SH-4 – “Shasta 4”



LA-1 – “Laguna”



	SH-4	LA-1	IN-1
Weight	.0.3 grams	.2 grams	.2.5 grams
Tape & Reel	.1500/reel	.250/reel	.NA
Tube	.25/tube	.30/tube	.35/tube
Dimensions:	Inches / mm		
Unless otherwise specified all tolerances are ± .010 / 0.25			

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Distributor

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