

**WORLD CLASS**



# Surface Mount

## MULTI LAYER CERAMIC CAPACITORS

(LCSO, CACT, C-DOT Approved)

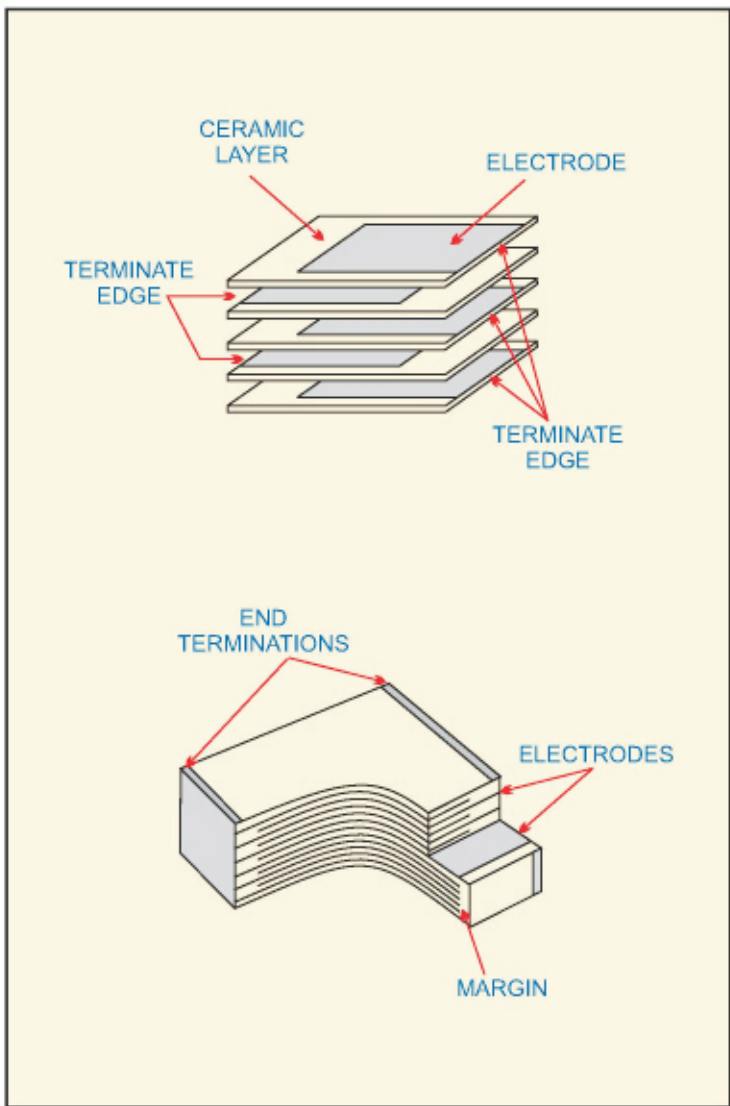


**GUJARAT POLY  
ELECTRONICS LIMITED**



## MULTILAYER CERAMIC CAPACITORS

A Multilayer Ceramic (MLC) Capacitor is a monolithic block of ceramic containing two sets of offset, interleaved planar electrodes that extend to two opposite surfaces of the ceramic dielectric. This simple structure requires a considerable amount of sophistication, both in material and in manufacture, to produce it in the quality & quantities needed in today's electronic equipments. Multilayer Ceramic Capacitors are available in a wide range of characteristics. They are classified into two types : Class I are the Temperature Compensating type and Class II are the General Purpose capacitors with non-linear temperature co-efficients.



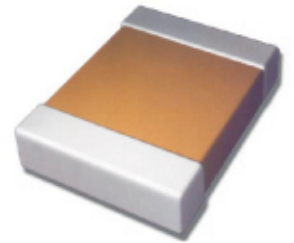
### CLASS-I

Class-I capacitors or Temperature Compensating capacitors are usually made from mixtures of Titanates where Barium Titanate is normally not a major part of the mix. They have predictable temperature coefficients and in general, do not have an aging characteristic. Thus they are the most stable capacitor available. Normally the T.C.s of Class - I Temperature Compensating capacitors are NPO (Negative-Positive zero ppm/ $^{\circ}$ C). These capacitors are used in tuned circuits and filters where low loss and stability are necessary.

### CLASS-II

General Purpose ceramic capacitors are called Class - II capacitors and have become extremely popular because of the high capacitance values available in very small size. Class - II capacitors are "Ferro electric" and vary in capacitance value under the influence of the environmental and electrical operating conditions. Class - II capacitors are affected by temperature, Voltage (both AC and DC), frequency and time. Temperature effects for Class - II ceramic capacitors and are used in coupling and decoupling circuits particularly in controlled temperature environment and in circuits where change of capacitance with temperature is not of major importance.

GPPEL manufacturing range includes Ultra-stable COG/1B i.e. NPO temperature characteristic in Class I, Stable X7R/2C1 and General-Purpose Y5V/2F4 temperature characteristics in Class - II.

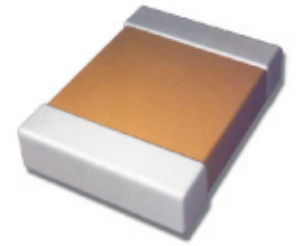


MANUFACTURING RANGE										
DIELECTRIC	COG/1B				X7R/2CI				Y5V/2F4	
SIZE	0603/0805		1206/1210		0603/0805		1206/1210		0603/0805/1206/1210	
CAPCODE	50/63V	100V	50/63V	100V	25/50/63/100V		25/50/63/100V		25/50/63/100V	
1R0-821										
102										
122-222										
272-472										
562-822										
103-153										
183-333	223									
393-104										
124-334										
394-474										
564-105										
225-106								225		

- NOTE: (1) 0201, 0402 AND 1812 SIZES ARE AVAILABLE ON REQUEST.  
 (2) 25V AND 200V WORKING SMD'S AVAILABLE ON SPECIAL REQUEST.  
 (3) ALL RANGES ARE FOR NICKEL BARRIER TERMINATIONS, MANUFACTURED AS PER CECC 32 101 801 SPECS.  
 (4) Z5U AVAILABLE ON REQUEST.  
 (5) HIGH VOLTAGE PARTS UP TO 3KV ARE AVAILABLE IN CERTAIN RANGE ON REQUEST.  
 (6) FLEXI TERMINATION AND AUTOMOTIVE PARTS ARE AVAILABLE ON REQUEST.

DIMENSIONS						
SIZE		0603	0805	1206	1210	1812
(L) LENGTH	MM	1.60 ± 0.15	2.00 ± 0.20	3.20 ± 0.20	3.20 ± 0.25	4.50 ± 0.40
	(IN)	(0.063 ± 0.06)	(0.079 ± 0.008)	(0.126 ± 0.008)	(0.126 ± 0.01)	(0.177 ± 0.016)
(M) WIDTH	MM	0.80 ± 0.12	1.25 ± 0.20	1.60 ± 0.20	2.50 ± 0.25	3.20 ± 0.30
	(IN)	(0.031 ± 0.005)	(0.049 ± 0.008)	(0.063 ± 0.008)	(0.098 ± 0.01)	(0.126 ± 0.012)
(T) THICKNESS	MAX	0.80 ± 0.12	0.50 (0.02)	0.50 (0.02)	0.80 (0.031)	0.80 (0.031)
	MIN	(0.031 ± 0.005)	1.40 (0.055)	1.60 (0.063)	1.60 (0.063)	3.0 (0.118)
(t) TERMINAL	MIN	0.25 (0.010)	0.25 (0.010)	0.25 (0.010)	0.25 (0.010)	0.25 (0.010)
	MAX	0.60 (0.023)	0.75 (0.03)	0.75 (0.03)	0.75 (0.03)	1.00 (0.039)
C	MIN	0.50 (0.02)	0.50 (0.02)	1.40 (0.055)	1.40 (0.055)	2.20 (0.09)

NOTE : DIMENSIONS IN MILLIMETERS, DIMENSIONS IN PARENTHESIS ARE IN INCHES



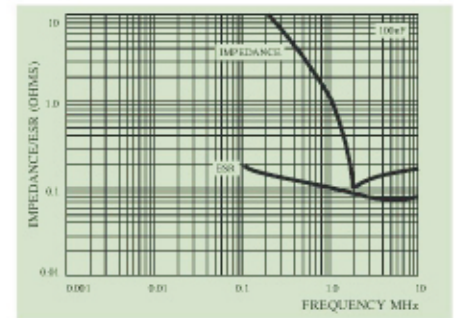
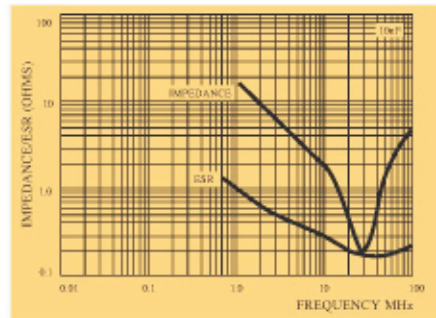
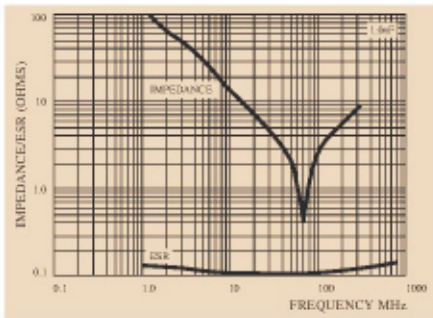
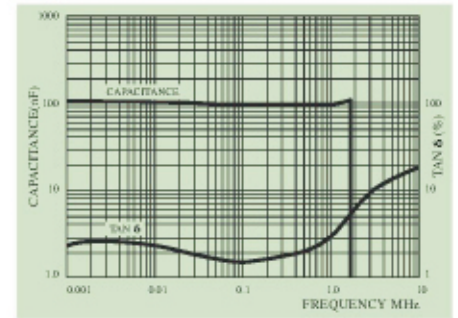
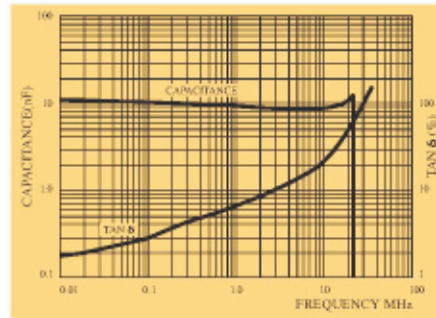
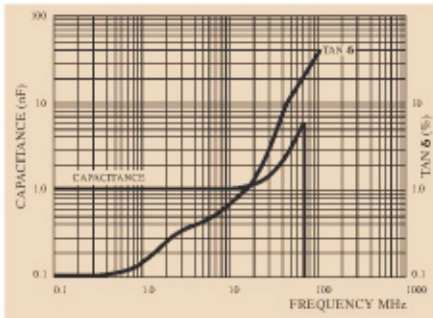
The variation of capacitance and impedance under circuit operating conditions is dependent on the type of dielectric used. Typical graphs of the performance of these materials are given below.

## 1B/COG

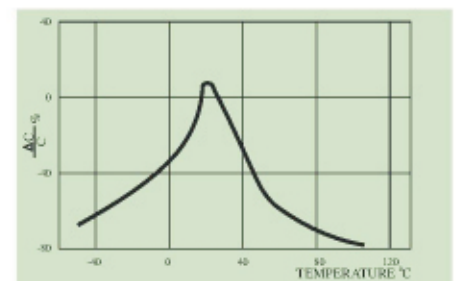
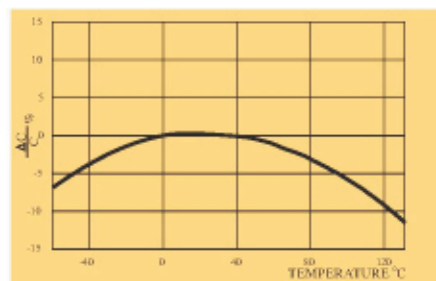
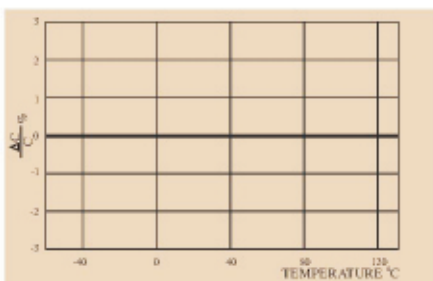
## 2C1/X7R

## 2F4/Y5V

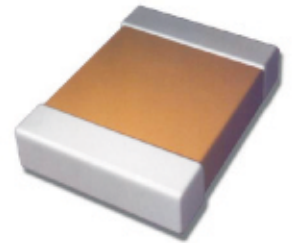
### 1. FREQUENCY



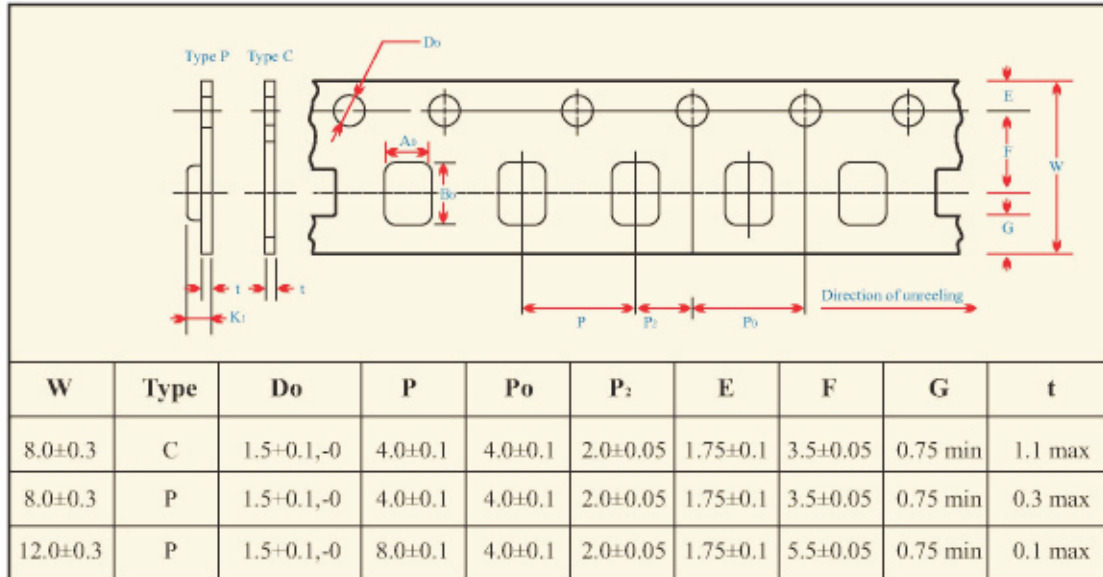
### 2. TEMPERATURE



**Note:** GPEL reserves the right to change the information herein without prior notice.

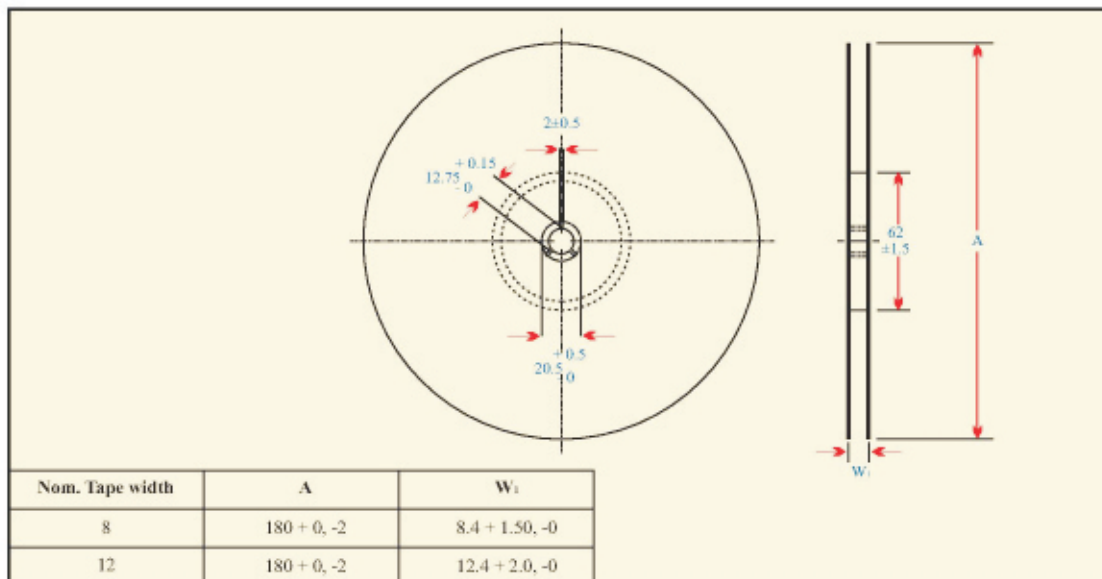


### TAPE DIMENSIONS (mm)



NOTE : The nominal Dimensions of the component compartment (A<sub>0</sub>, B<sub>0</sub>, K<sub>1</sub>) are derived from the component size.  
C = PAPER P = PLASTIC

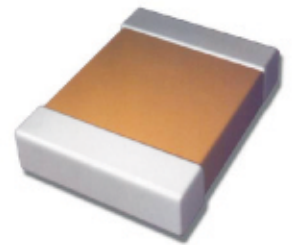
### REEL DIMENSIONS (mm)



### PACKAGING

CHIP STYLE	TAPE & REEL (PAPER & PLASTIC)	MAX. QTY. PER BAG	SPOOL SIZE
0805	4000/3000*	5K	180 mm
1206	4000/3000*	5K	180 mm

\* For chip >1.5mm thick



## APPLICATION NOTES

### GENERAL

Surface mounting chip multilayer ceramic capacitors are designed for soldering on printed circuit boards or other substrates. The construction of the components is such that they will withstand the time/temperature profiles used in both wave and reflow soldering methods.

### HANDLING

Chip capacitors should be handled with care to avoid damage or contamination from perspiration and skin oils. The use of tweezers or vacuum pick ups is strongly recommended for individual components. Bulk handling should ensure that abrasion and mechanical shock are minimised. For automatic equipment taped and reeled product gives the ideal medium for direct presentation to the placement machine.

### PREHEAT

It is important to avoid the possibility of thermal shock during soldering and a carefully controlled preheat is therefore required. The rate of preheat should not exceed 4°C/second and a target preheat of 2°C/second is recommended.

Recent developments mean that for capacitors of 1206 size and below with a maximum thickness of 1.25 mm, it is now permissible to allow a temperature differential between the component surface and the soldering temperature of 150°C (Maximum). In all other cases this differential should not exceed 100°C.

### SOLDERING

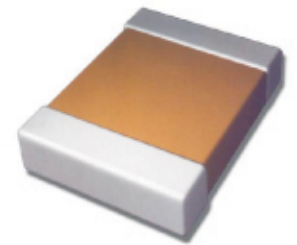
Mildly activated rosin fluxes are preferred. The minimum amount of solder to give a good joint should be used. Excessive solder can lead to damage from the stresses caused by the difference in coefficients of expansion between solder, chip and substrate. Poly Electronics terminations are suitable for all wave and reflow soldering systems. Hand soldering is permissible. The most preferable technique is to use hot air soldering tools. Where a soldering iron is used, a temperature controlled model, not exceeding 30 watts should be used and set to not more than 260°C. Direct contact may be made to the metallisation but must not be made to the ceramic body.

### COOLING

Natural Cooling in air is the most preferred condition as this minimises stresses within the soldered joint. Where forced cooling is used it should not exceed 4°C/second. Quenching is not recommended but if used, maximum temperature differentials should be observed according to the preheat conditions above.

### CLEANING

Flux residues may be hygroscopic or acidic and must therefore be removed. All chlorinated solvents are suitable for use with ceramic capacitors and particularly good results have been obtained using ultrasonic cleaning at the boiling point of the solvent. Some water cleaning systems have also proved very successful. It may be noted here that a particular advantage of reflow soldering techniques is that flux (usually as part of a solder cream) is only applied to the joints and thus cleaning is far easier than for wave systems where the whole assembly is fluxed.



## HOW TO ORDER

### PART NUMBER EXPLANATION

EXAMPLE : 0805A 101 JA700J

0805   Size (L"xW") 0603 0805 1206 1210 1812	1   Voltage 1=100VDC 2=200VDC 3=25/30VDC 5=50/63VDC 6=10VDC T=60VDC	A   Dielectric A=COG/1B C=X7R/2C1 G=Y5V/2F4	101   Capacitance code (2 significant digits + no. of zeros)** Examples: 10pF=100 100pF=101 1,000pF=102 22,000pF=223 220,000pF=224 1 μF=105	J   Capacitance Tolerance C=±.25 pF+ D=±.50 pF+ F=±.1% G=±2% J=±5% K=±10% M=±20% Z=(+80,-20)%	A   Specification Code	7   Packaging O=Packed in vials 3=Packed in bags (5 K for 0805, 1206 & 1812) 7=Taped & reeled in paper # 8=Taped & reeled in plastic #	OO   Reserved Digits (for internal Use)	J   Termination Code J=Nickel Barrier, Solder plated For other, consult GPEL
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# Spool size is normally 180 mm (7")

+ C&D tolerance from 1.0 pF to 9.1 pF

\*\* For values below 10 pF, use "R" in place of decimal point, e.g., 8.2 pF-8R2

GPEL Multilayer Ceramic Chips Capacitors, SMDs are normally supplied unmarked, Marked chip capacitors are available on special request.

## GENERAL SPECIFICATIONS

Dielectric	COG/1B (A)	X7R/2C1 (C)	Y5V/2F4 (G)
Capacitance Range	See Individual Parts Specification	See Individual Parts Specification	See Individual Parts Specification
Capacitance Tolerance	C=±.25 pF, D=±.5 pF, F=±1%, G=±2%, J=±5%, K=± 10%, M=±20%	J ± 5% K=±10%, M=±20%	M=±20%, Z=+80%, -20%
Operating Temperature Range	-55°C to + 125°C	-55°C to + 125°C	-25°C to +85°C
Temperature Characteristic	0±30 ppm/°C for C>20pF As per CECC 32-101-801 for C≤20pF	±15%	+30%, -80%
Voltage Ratings (DC)	63/50V, 100V	63/50V, 100V	63/50V
Dissipation Factor	<0.001% for C>50pF <(150/C+7)×10 <sup>-4</sup> for C≤ 50pF 1MHz, 1VRMS (±0.2) for C≤ 1000pF 1KHz, 1VRMS (±0.2) for C> 1000pF	2.5% max at 1 KHz 1VRMS (±0.2)	3% max. at 1KHz 0.3 VRMS (±0.1)
Insulation Resistance at rated voltage DC	> 100G ohms or 1000 sec. whichever in less	> 100G ohms or 1000 sec. whichever in less	> 10G ohms or 100 sec. whichever in less
Dielectric Strength	250% of rated Voltage DC	250% of rated Voltage DC	200% of rated Voltage DC

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## **PLANT VIEW**

GUJARAT POLY ELECTRONICS LIMITED (GPEL) has been promoted jointly by Polychem Ltd. and Gujarat Industrial Investment Corporation Limited (GIIC).

POLYCHEM LIMITED is a pioneer in the production of Plastics in India.

GPEL manufactures Multilayer Ceramic Capacitors in Chip and Leaded (Radial & Axial) configurations, Single Layer Ceramic Capacitors. Capacitors are manufactured on highly sophisticated automatic machines.

GPEL standards are set to meet the challenging and steadily increasing demands of the Electronics industry, with the concept of Total Quality Management.

GPEL Capacitors are approved by C-DOT, ITI, RDSO and major OEM's.

# **GUJARAT POLY ELECTRONICS LTD.**

### **PLANT & REGD. OFFICE**

B-18, GANDHINAGAR  
ELECTRONIC ESTATE,  
GANDHINAGAR - 382 025.  
PHONE : 079 - 23287162 / 23287163  
E-mail : zhl@kilachand.com

### **HEAD OFFICE**

7, JAMSHEDJI TATA ROAD,  
CHURCHGATE RECLAMATION,  
MUMBAI - 400 020.  
PHONE : 022 - 22820048.  
FAX : 022 - 22850606.  
E-mail : zhl@kilachand.com  
; vkp@kilachand.com

[www.gpelindia.com](http://www.gpelindia.com)

### **NEW DELHI**

306, 3rd Floor,  
Competent House, Middle Circle,  
Connaught Place, New Delhi - 110001,  
Tel No. - 011-23716843, 23350846  
E-mail : rms@kilachand.com

### **BANGALORE**

"SHIVA MANJU" # 2359,  
1ST - C, MAIN ROAD, RPC LAY-OUT,  
VIJAYANAGAR, 2ND STAGE,  
BANGALORE - 580040.  
PHONE : 080 - 23104208  
FAX : 080 - 23100238  
E-mail : bnl@kilachand.com

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