



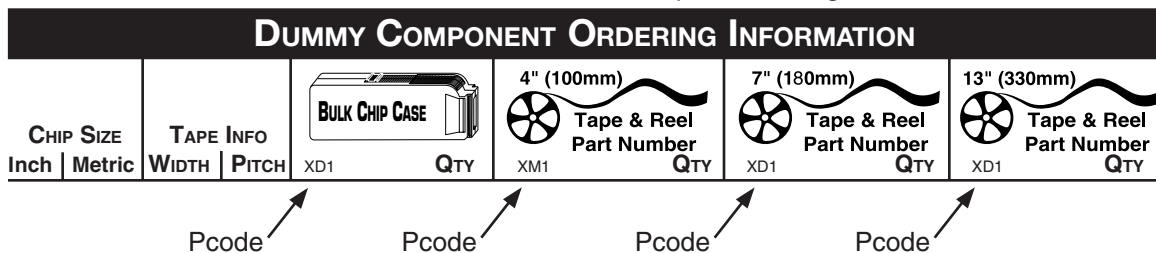
Part Numbering System

| Series | Page | Pcode | Description |
|----------------------|-------|-------|------------------------|
| SC | 4-5 | XD1 | Chips Passives |
| SD | 6-7 | | |
| SE | 8-9 | | |
| SR | 10-11 | | |
| SRM | 12-13 | | |
| SI | 14-15 | | |
| SOT | 16-17 | XD1 | Discrete Semi |
| DPAK | 18-19 | | |
| MELF DIODE | 20-21 | | |
| RECTANGULAR DIODE | 22-23 | | |
| PLCC | 24-25 | XP1 | IC |
| LCC | 26-27 | XL1 | |
| SOIC | 28-29 | XS1 | |
| SOJ | 30-31 | XS1 | |
| FP | 32-33 | XF1 | |
| MSOP | 34-35 | XS1 | |
| SSOP | 36-37 | XS1 | |
| TSSOP | 38-39 | XS1 | |
| TSOP(I) | 40-41 | XO1 | |
| TSOP(II) | 42-43 | XO1 | |
| TQFP | 44-45 | XQ1 | Quad Flat Pack |
| LQFP | 46-47 | | |
| QFP | 48-49 | | |
| CERQUAD | 50-51 | XC1 | Ceramic Quad Flat Pack |
| CLCC | 52-53 | | |
| FC Flip Chips | 54-55 | XI1 | Flip Chip |
| FCW Flip Chip Wafers | 56-57 | | |
| Wafers | 58-59 | XE1 | Wafers & Die |
| Die | 60-61 | | |
| BGA - CSP | 62-63 | XJ1 | Grid Array |
| CBGA | 64-65 | | |
| CLGA - LGA | 66-67 | | |
| SLP, MLF, QFN | 68-69 | XU1 | Leadless |
| DIP | 70-71 | XN1 | Throughhole |
| TO | 72 | XT1 | |
| DO | 73 | XA1 | |

Quick Guide to Product Codes - "Pcode"

| Pcode | Description | Part Number Series (example) |
|-------|-----------------------------------|--|
| XA1 | Axial Lead Component | CF, CS, EA, DO (leaded only) |
| XB1 | Books, Catalog & Reference | |
| XC1 | Ceramic CERQUAD | CERQUAD and CLCC |
| XD1 | Chips, Passives & Discrete Semi | SC, SD, SE, SI, SR, SRM, SOD, SOT, DPAK |
| XE1 | Wafers & Die | WE, WED, WM, WMD and ED, MD |
| XF1 | Flat Packs | FP |
| XG1 | Pin Grid Array | PGA, PPGA, CPGA |
| XH1 | Ceramic DIP | CERDIP |
| XI1 | Flip Chip | FC, FCN, FCW, FCWN |
| XJ1 | Ball Grid Array & Land Grid Array | BGA, CBGA, SBGA, LBGA, eBGA, fBGA, CSP, LGA, CLGA |
| XK1 | Kits, PC Boards, Gerber | 900000 to 999999 series |
| XL1 | Ceramic Leadless Chip Carrier | LCC |
| XM0 | Small Quantity Bulk Pack | 100000 to 102999 series |
| XM1 | Small Reels of Components | 227000 to 230000 series |
| XN1 | Plastic Dual Inline (DIP) | DIP, SDIP |
| XP1 | Plastic Leadless Chip Carrier | PLCC |
| XQ1 | Quad Flat Pack | QFP, BQFP, LQFP, TQFP |
| XR1 | Radial Lead Components | CK, DD, EH, RS, Connector |
| XS1 | SOIC - Small Outline IC | SO, SOL, SOM, SOP, SOX, SOY, SOZ, SOLJ, SOXJ, MSOP, SSOP, TSSOP |
| XT1 | Leaded Transistor | TO |
| XU1 | Leadless Lead Frame Components | SLP, MLF, QFN, MLP, MCC |
| XV1 | -to be defined- | -to be defined- |
| XW1 | -work in progress- | -not for sale- |
| XX1 | -miscellaneous- | -not for sale- |
| XY1 | Tools | HRS, VAMPIRE |
| XZ1 | Packaging Items | TRAY, REEL, TUBE |

Look for the Pcode in the TopLine Catalog



Quick Guide - Reference Info

Lead Pitch

| mm | Mils known in Industry as: | Inch |
|---------|-------------------------------|--------|
| 0.4mm | 15 mils | .0157" |
| 0.5mm | 20 mils | .0197" |
| 0.635mm | 25 mils | .0250" |
| 0.65mm | 25 mils | .0256" |
| 0.8mm | 30 mils | .030" |
| 1.0mm | 40 mils | .040" |
| 1.27mm | 50 mils | .050" |
| 2.54mm | 100 mils | .100" |

Caution: 25mils is not accurate description.
Suggest using metric (mm) for clarity.

Packaging Codes

| Code | Description |
|------|------------------------|
| B | Bulk |
| M | Tube |
| T | Tray |
| C | Carrier |
| F | Bulk Cassette Box |
| E | Plastic Tape (no reel) |
| E4A | Plastic Tape, 4" Reel |
| E7A | Plastic Tape, 7" Reel |
| E13A | Plastic Tape, 13" Reel |
| P | Paper Tape (no reel) |
| P4A | Paper Tape, 4" Reel |
| P7A | Paper Tape, 7" Reel |
| P13A | Paper Tape, 13" Reel |

Industry Jargon

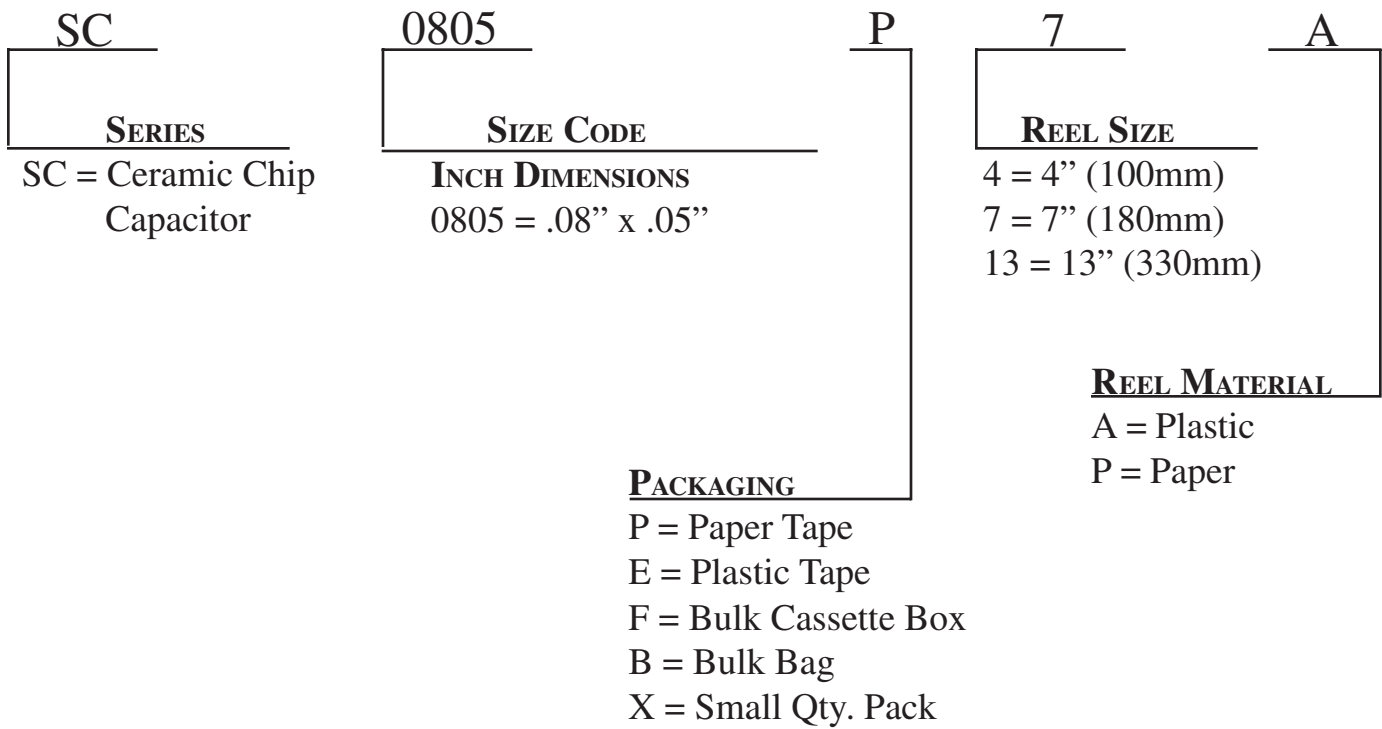
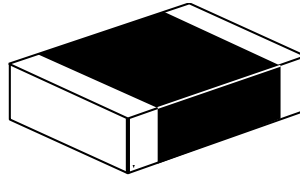
| Jargon | Definition |
|------------|---|
| CSP | Chip Scale Package usually refers to small or fine pitch BGA. Often misused term. |
| Fine-Pitch | Usually means 0.5mm pitch or less |
| Eutectic | Solder melts and solidifies at the same temperature. Misunderstood term. Often used to mean Sn63/Pb37 solder. |
| JEDEC | Industry Standard |
| EIA | USA Industry Association |
| EIAJ | Japan Industry Association |
| CAD | Misused term. Often means pick and place coordinates. |
| Gerber | Software instructions used to make a stencil or a PC board. |
| Lead Free | Alloy with no Pb material |

"Lead Free" Codes (No Pb)

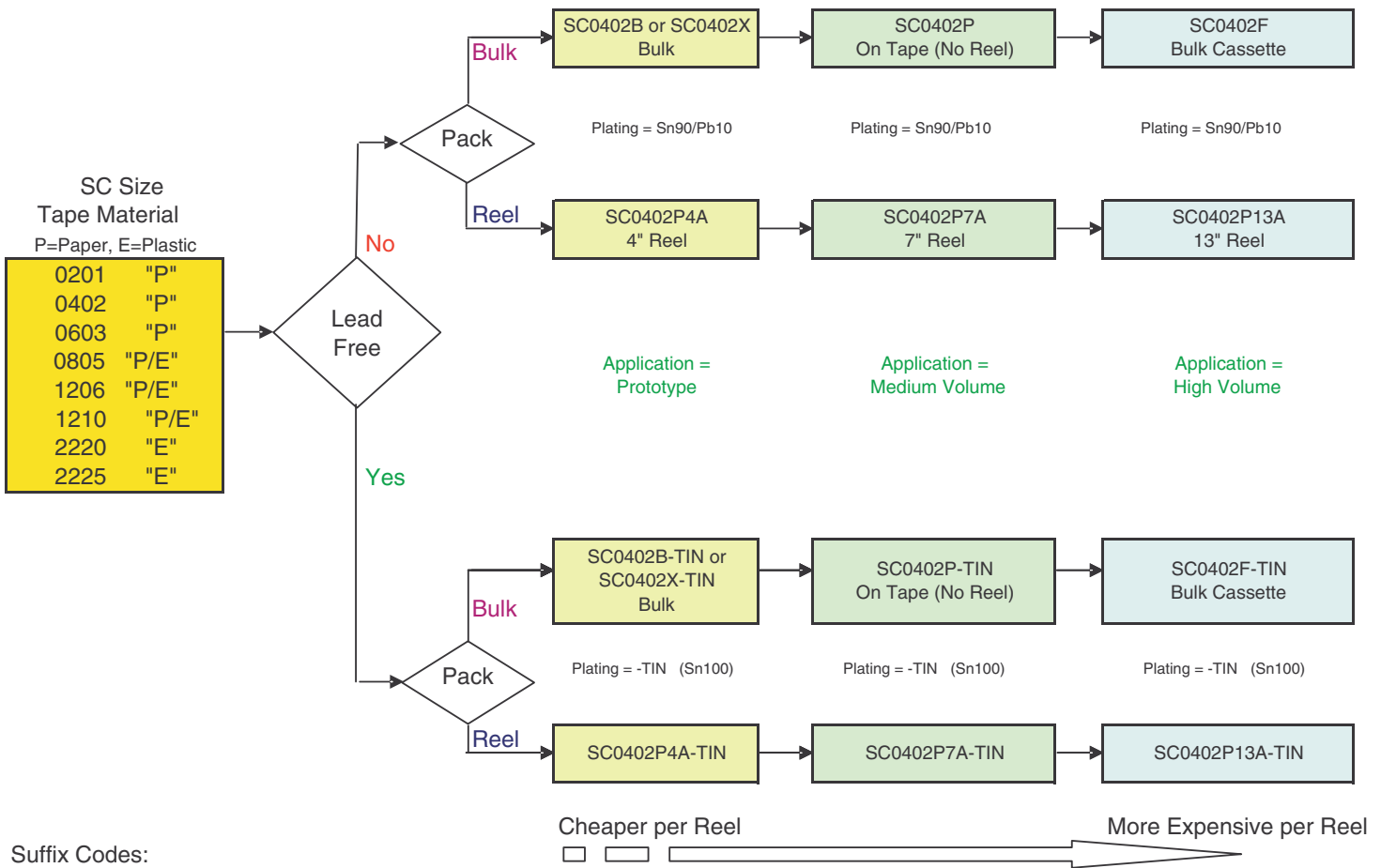
| Code | Lead Alloy Material |
|---------------------------------|---------------------|
| BGA, CSP & Flip Chip | |
| C | Sn/Ag/Cu |
| F | Sn96.5/Au3.5 |
| G | Au Gold |
| Lead Frame Devices | |
| B | Sn/97/Bi3.0 |
| C | Sn98/Cu2.0 |
| F | Ni-Pd |
| T | Sn100 |
| TIN | Sn100 |

Note: Not all alloys available for every device

Ceramic Chip Capacitor



Substituting Chip Capacitors "SC" Series



Suffix Codes:

Lead Free Plating: "TIN" = Sn100

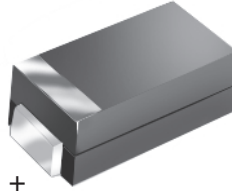
Pack: "B" = Bulk (unspecified pack), "X" = mini Pack Bags, "F" = Bulk Cassette

Paper Tape: P4A = 4" Mini Reel(special), P7A = 7" Reel, P13A = 13" Reels

Plastic Tape: E4A = 4" Mini Reel (special), E7A = 7" Reel, E13A = 13" Reels

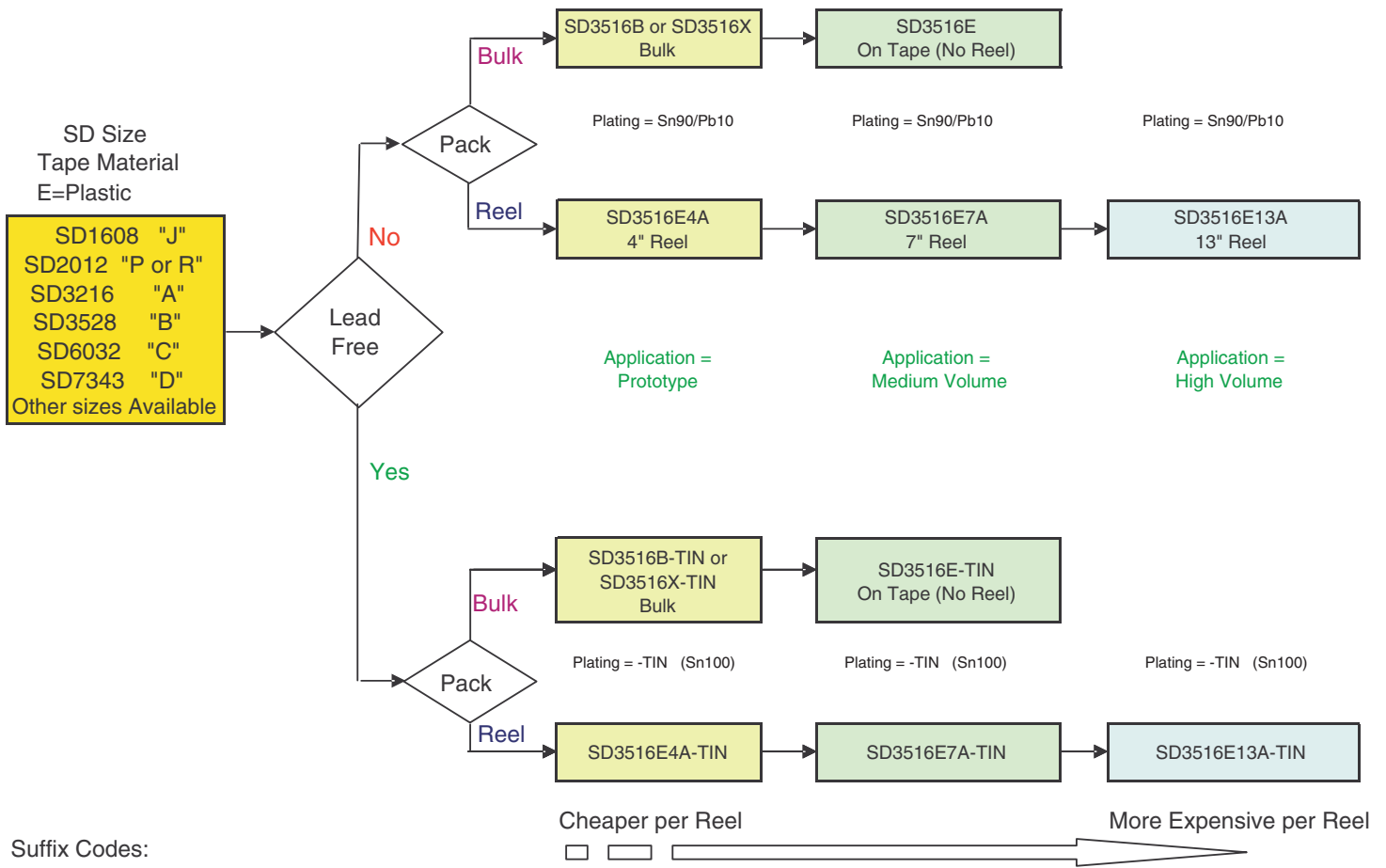
On Tape (No Reel) "E" = Plastic Tape or "P" = Paper Tape

Tantalum Capacitor



| | | | | |
|--|--|--|---|--|
| <p>SD</p> <hr/> <p>SERIES</p> <p>SD = Tantalum Capacitor</p> | <p>3216</p> <hr/> <p>SIZE CODE</p> <p>METRIC DIMENSIONS</p> <p>A = 3216 = 3.2mm x 1.6mm</p> <p>B = 3528 = 3.5mm x 2.8mm</p> <p>C = 6032 = 6.0mm x 3.2mm</p> <p>D = 7343 = 7.3mm x 4.3mm</p> | <p>E</p> <hr/> <p>PACKAGING</p> <p>E = Plastic Tape</p> <p>B = Bulk Bag</p> <p>X = Small Qty. Pack</p> | <p>7</p> <hr/> <p>REEL SIZE</p> <p>4 = 4" (100mm)</p> <p>7 = 7" (180mm)</p> <p>13 = 13" (330mm)</p> | <p>A</p> <hr/> <p>REEL MATERIAL</p> <p>A = Plastic</p> |
|--|--|--|---|--|

Substituting Tantalum Capacitors "SD Series"



Suffix Codes:

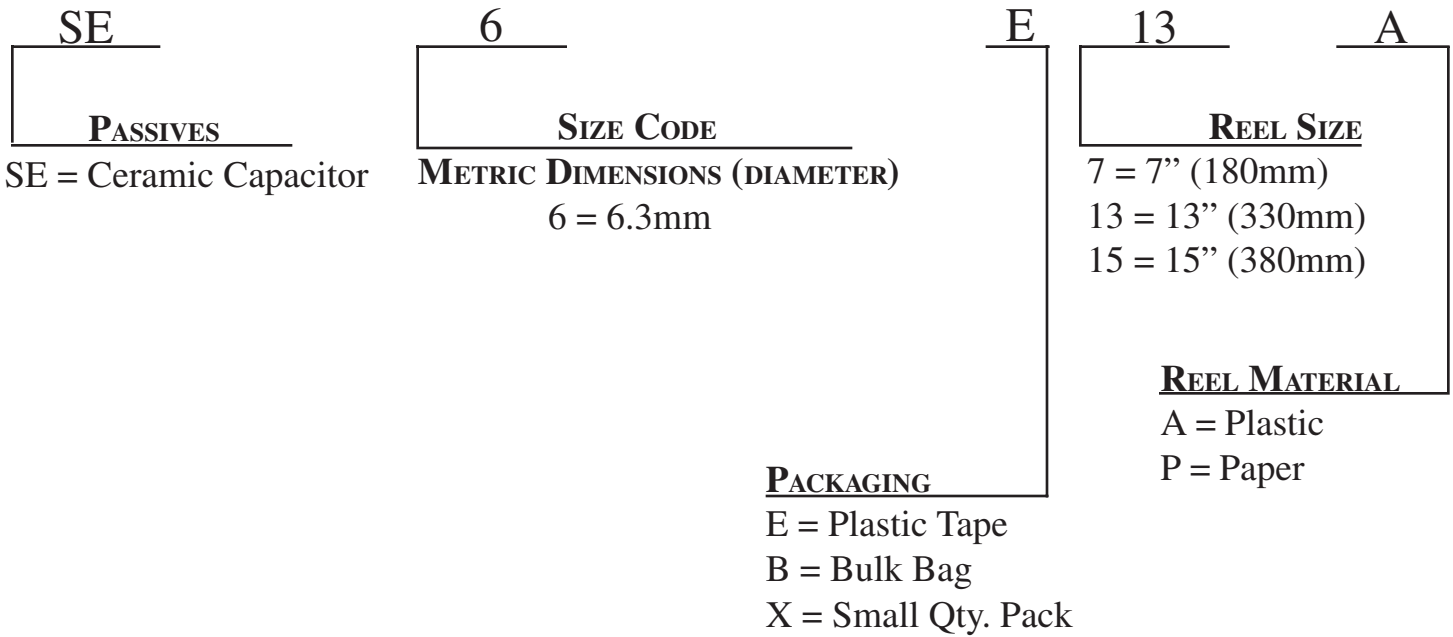
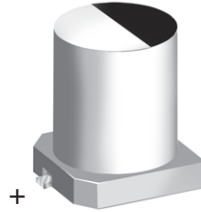
Lead Free Plating: "TIN" = Sn100

Pack: "B" = Bulk (unspecified pack), "X" = mini Pack Bags

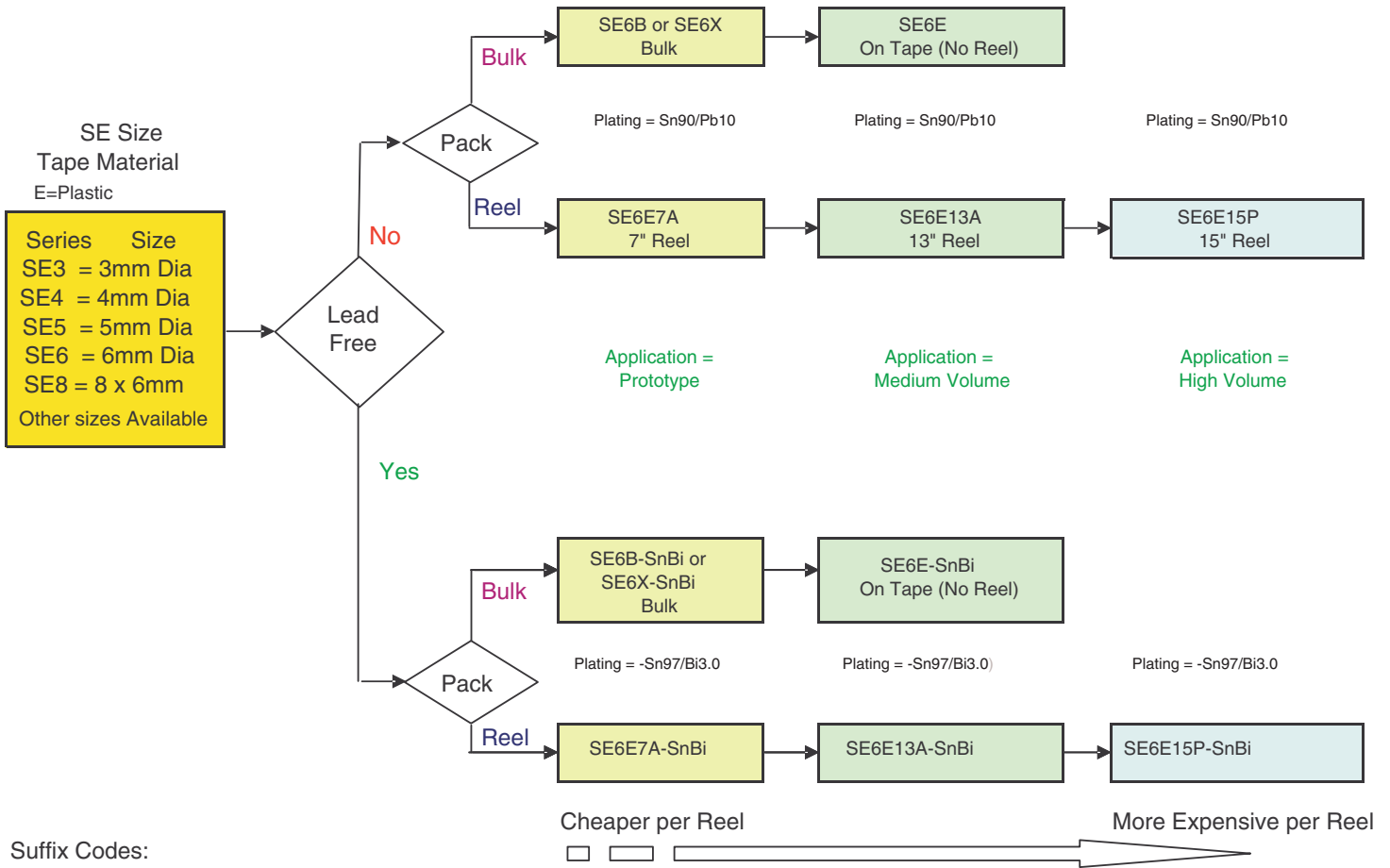
Plastic Tape: E4A = 4" Mini Reel (special), E7A = 7" Reel, E13A = 13" Reels

On Tape (No Reel) "E" = Plastic Tape

Aluminum Capacitor



Substituting Aluminum Capacitors "SE" Series



Suffix Codes:

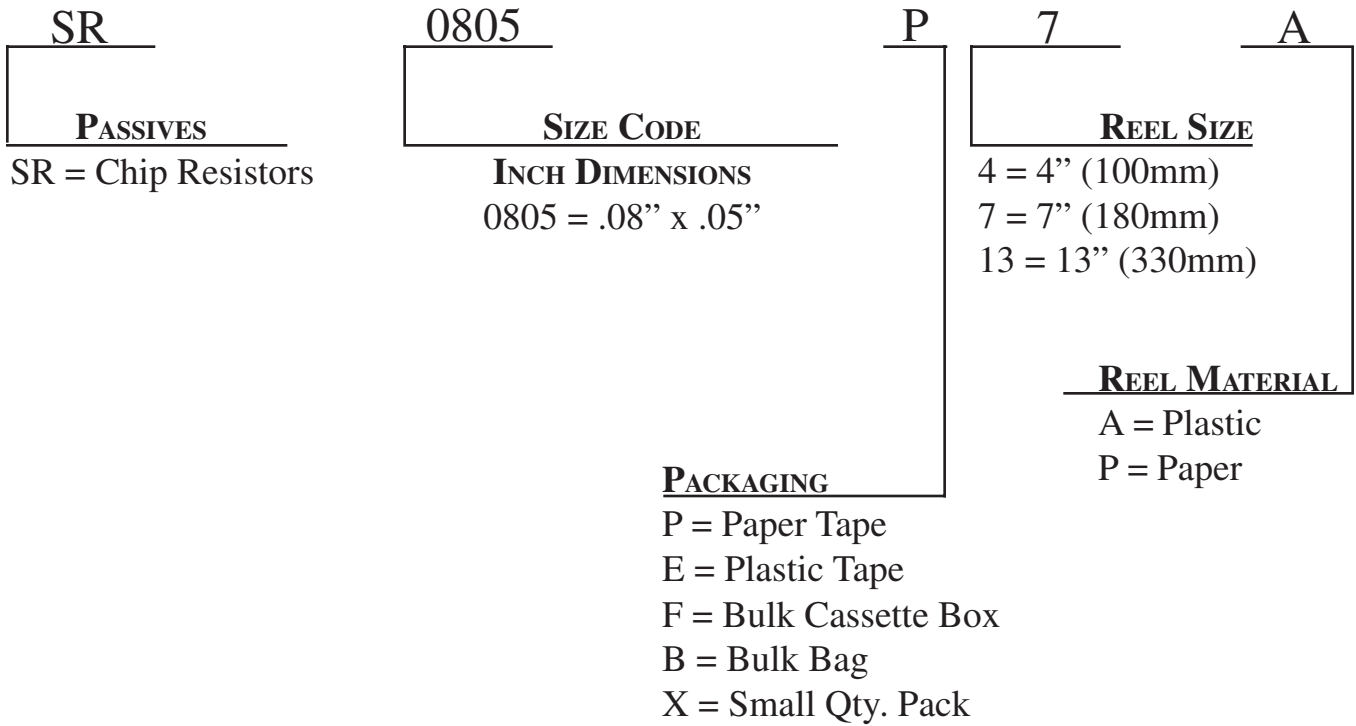
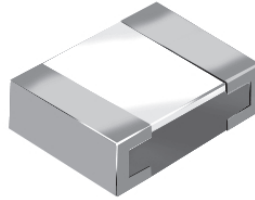
Lead Free Plating: "SnBi" = Sn97/Bi3.0

Pack: "B" = Bulk (unspecified pack), "X" = mini Pack Bags

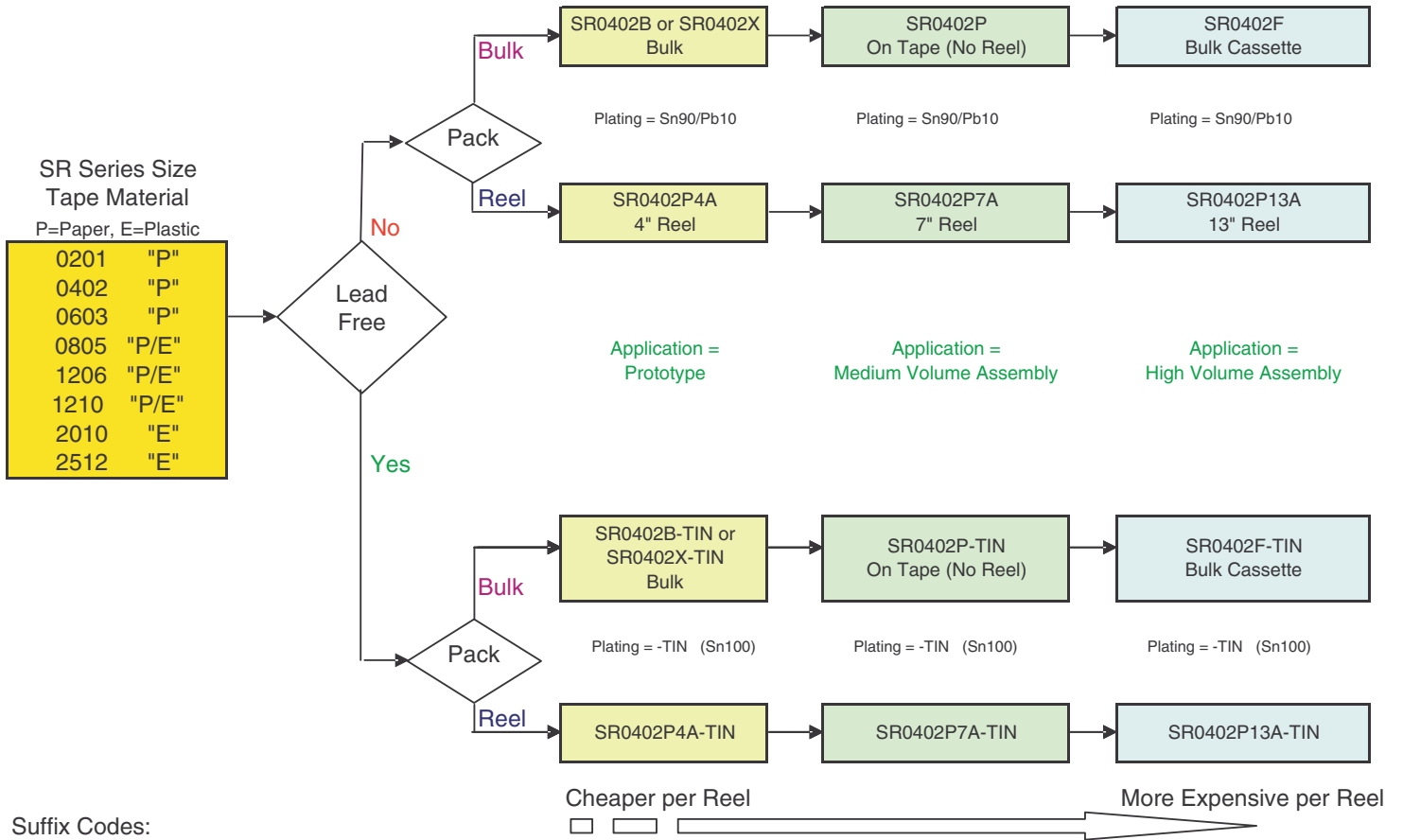
Plastic Tape: E7A = 7" Small Reel (special), E13A = 13" Reel, E15P = 15" Reels

On Tape (No Reel) "E" = Plastic Tape

Chip Resistor



Substituting Chip Resistors "SR" Series



Suffix Codes:

Lead Free Plating: "TIN" = Sn100

Pack: "B" = Bulk (unspecified pack), "X" = mini Pack Bags, "F" = Bulk Cassette

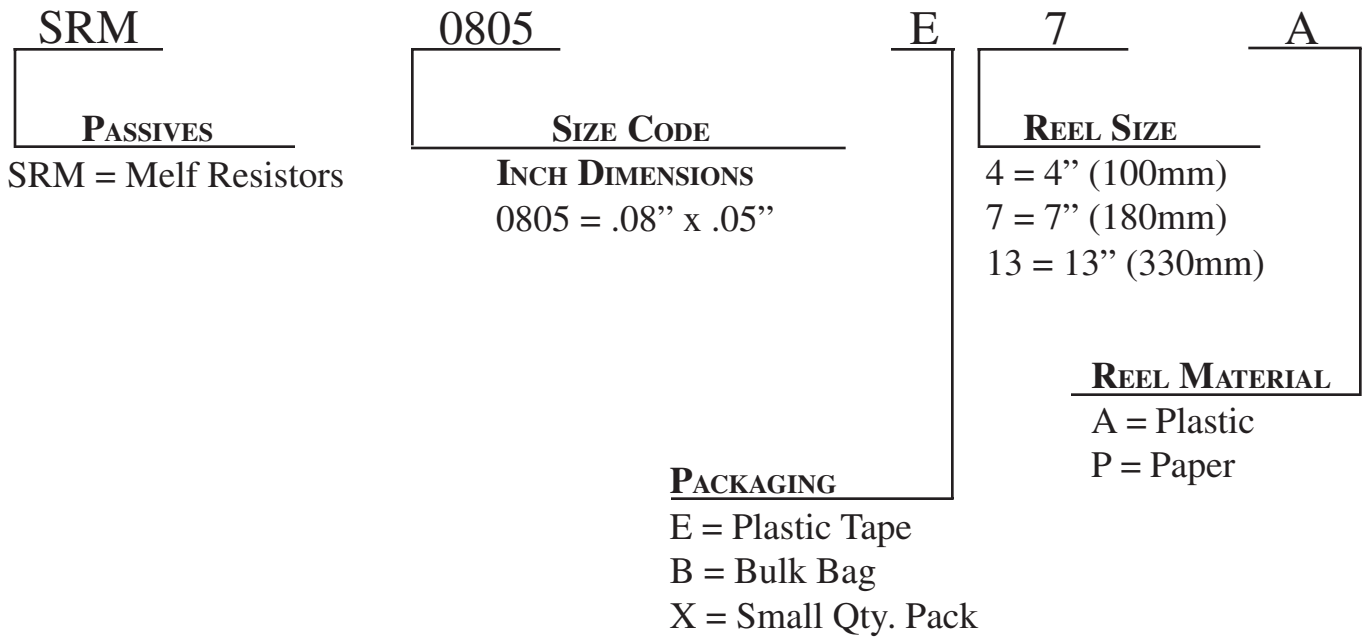
Paper Tape: P4A = 4" Mini Reel (special), P7A = 7" Reel, P13A = 13" Reels

Plastic Tape: E4A = 4" Mini Reel (special), E7A = 7" Reel, E13A = 13" Reels,

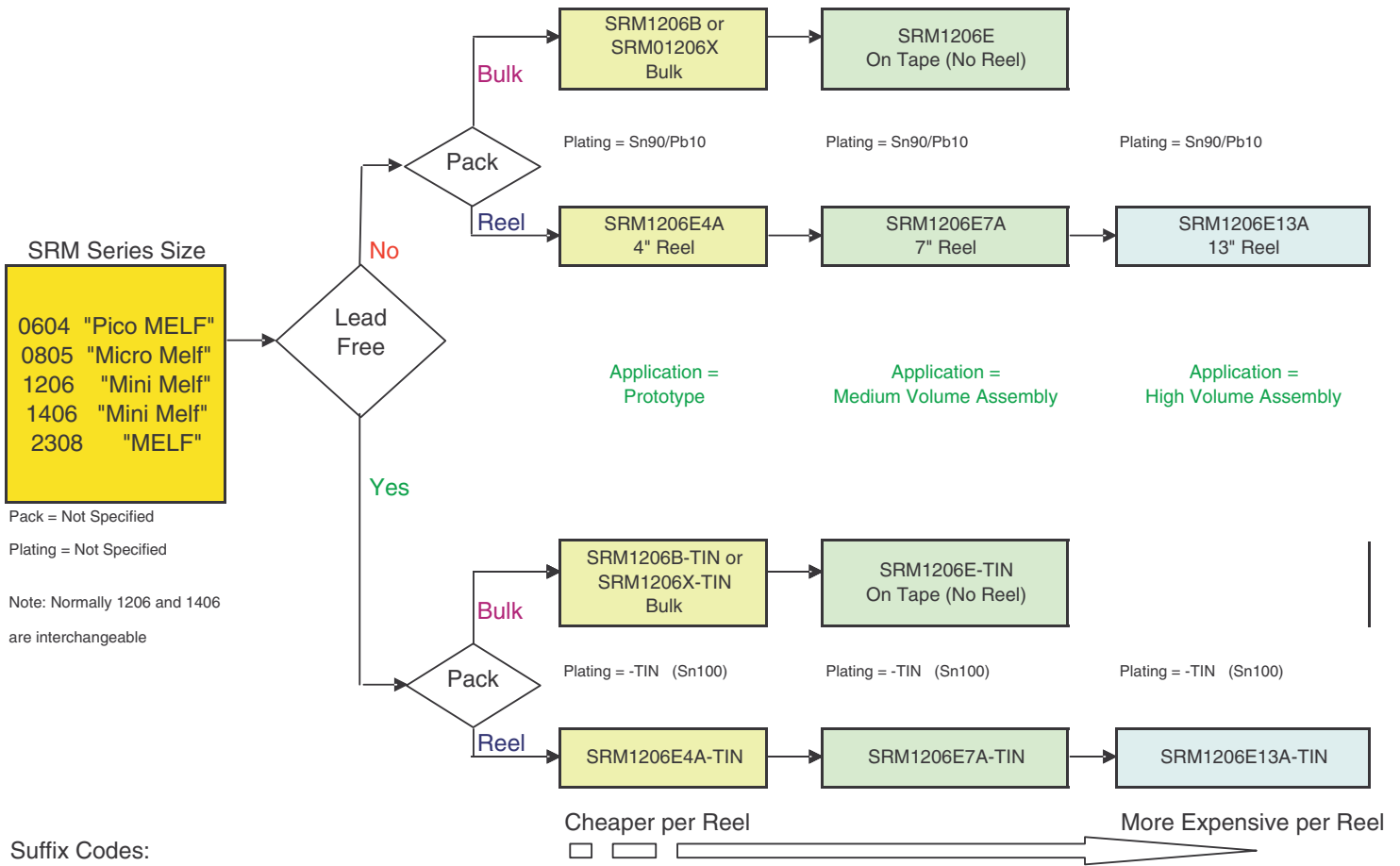
On Tape (No Reel) "E" = Plastic Tape or "P" = Paper Tape

-ZERO = Zero Ohm Resistors

MELF Resistor



Substituting Melf Resistors "SRM" Series



Suffix Codes:

Lead Free Plating: "TIN" = Sn100

Pack: "B" = Bulk (unspecified pack), "X" = mini Pack Bags

Plastic Tape: E13A = 13" Reels, E7A = 7" Reel, E4A = 4" Mini Reel (special)

"E" = On Plastic Tape. No Reel

-ZERO = Zero Ohm Resistors

Chip Inductor



MOLDED CASE



MULTILAYER INDUCTOR

SI

PASSIVES

SI = Inductor

1812

SIZE CODE

INCH DIMENSIONS
1812 = .18" x .12"

E

PACKAGING

E = Plastic Tape
B = Bulk Bag
X = Small Qty. Pack

7

REEL SIZE

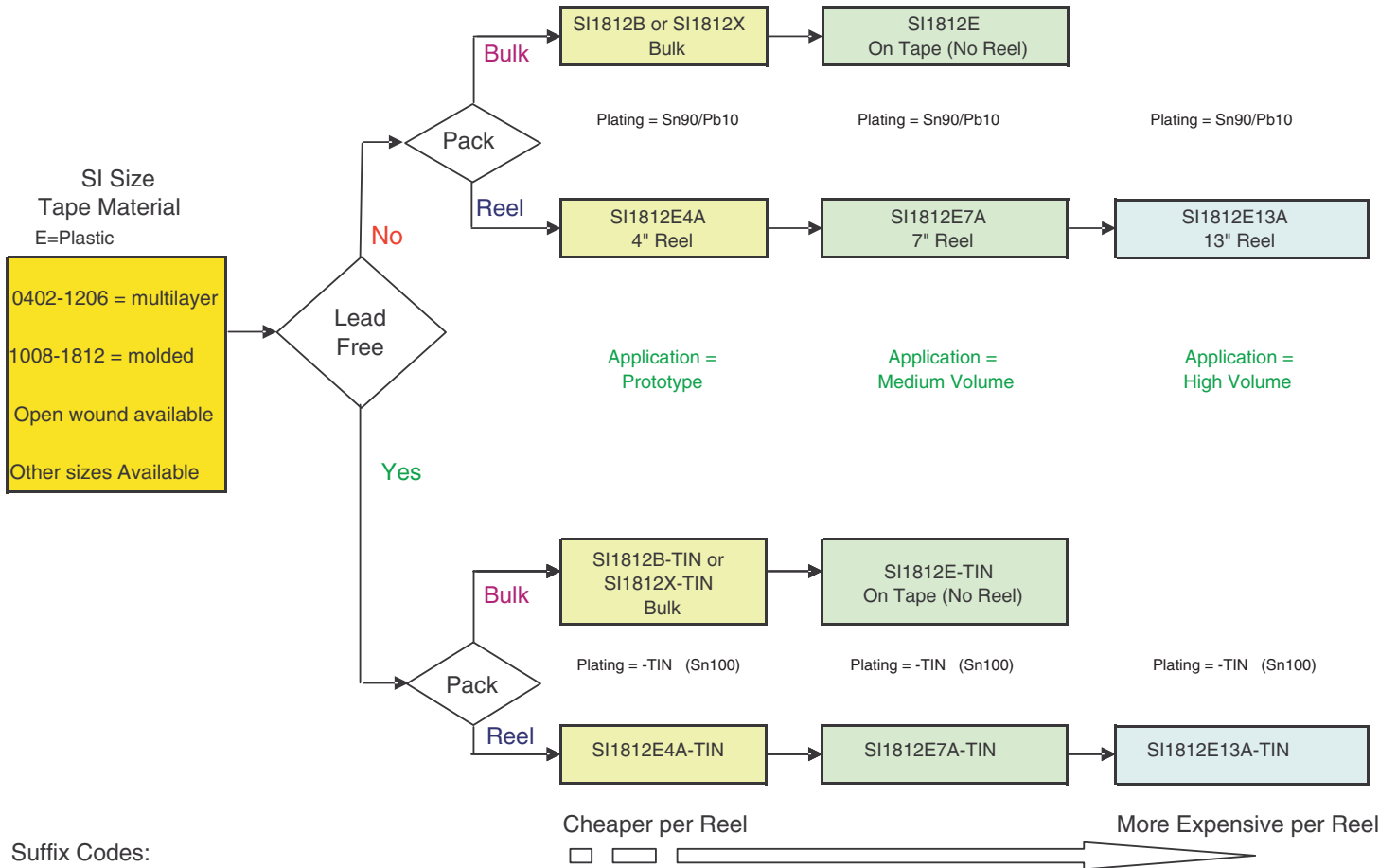
4 = 4" (100mm)
7 = 7" (180mm)
13 = 13" (330mm)

A

REEL MATERIAL

A = Plastic

Substituting Inductors "SI" Series



Suffix Codes:

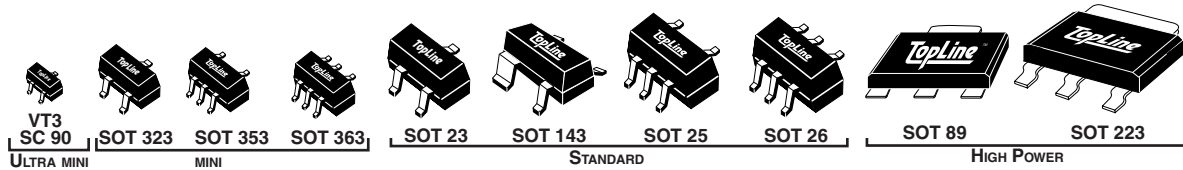
Lead Free Plating: "TIN" = Sn100

Pack: "B" = Bulk (unspecified pack), "X" = mini Pack Bags

Plastic Tape: E4A = 4" Mini Reel (special), E7A = 7" Reel, E13A = 13" Reels

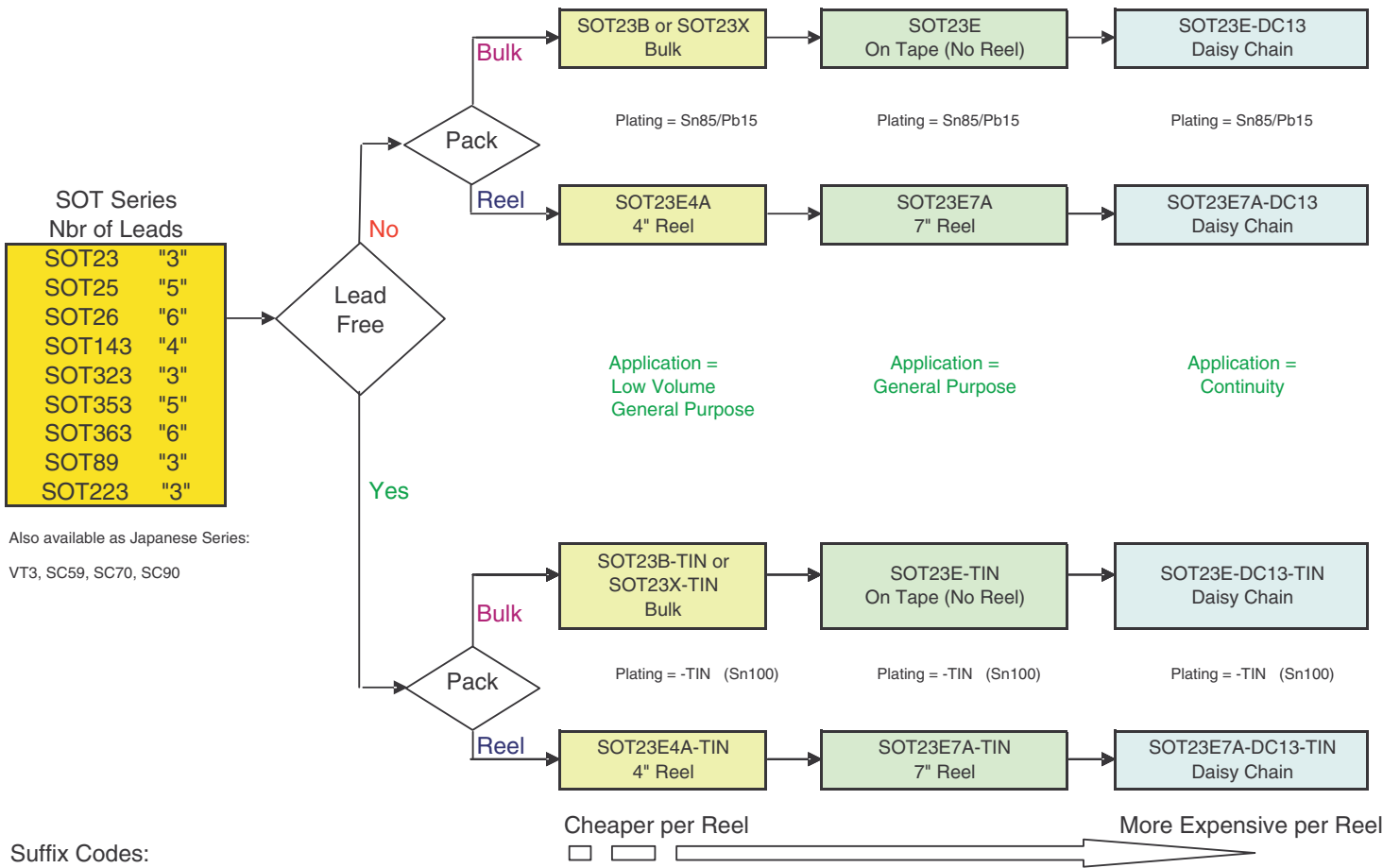
On Tape (No Reel) "E" = Plastic Tape

SOT Transistor



| | | | | |
|---|--|--|--|-----------------|
| <p>SOT</p> <p>DISCRETE DEVICE</p> <p>SOT=Small Outline Transistor SC = Japan Series</p> | <p>23</p> <p>BODY CODE</p> <p>Refer to drawings for outline dimensions</p> | <p>E</p> <p>PACKAGING</p> <p>E = Plastic Tape B = Bulk Bag X = Small Qty. Pack</p> | <p>7</p> <p>REEL SIZE</p> <p>4 = 4" (100mm) 7 = 7" (180mm) 13 = 13" (330mm)</p> <p>REEL MATERIAL</p> <p>A = Plastic</p> | <p>A</p> |
|---|--|--|--|-----------------|

Substituting "SOT Series



Suffix Codes:

Lead Free Plating: "TIN" = Sn100

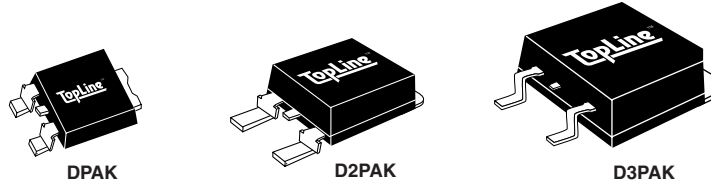
Pack: "B" = Bulk (unspecified pack), "X" = mini Pack Bags

Plastic Tape: E4A = 4" Mini Reel (special), E7A = 7" Reel, E13A = 13" Reels

"E" = On Plastic Tape. No Reel

Daisy Chain: DC13, DC23, etc. See drawing for details

DPAK Power Transistor



D2PAK

DISCRETE DEVICE
 DPAK (small)
 D2PAK (medium)
 D3PAK (large)
 SC = Japan Series

5

NUMBER OF LEADS

E

PACKAGING
 E = Plastic Tape
 B = Bulk Bag
 X = Small Qty. Pack

13

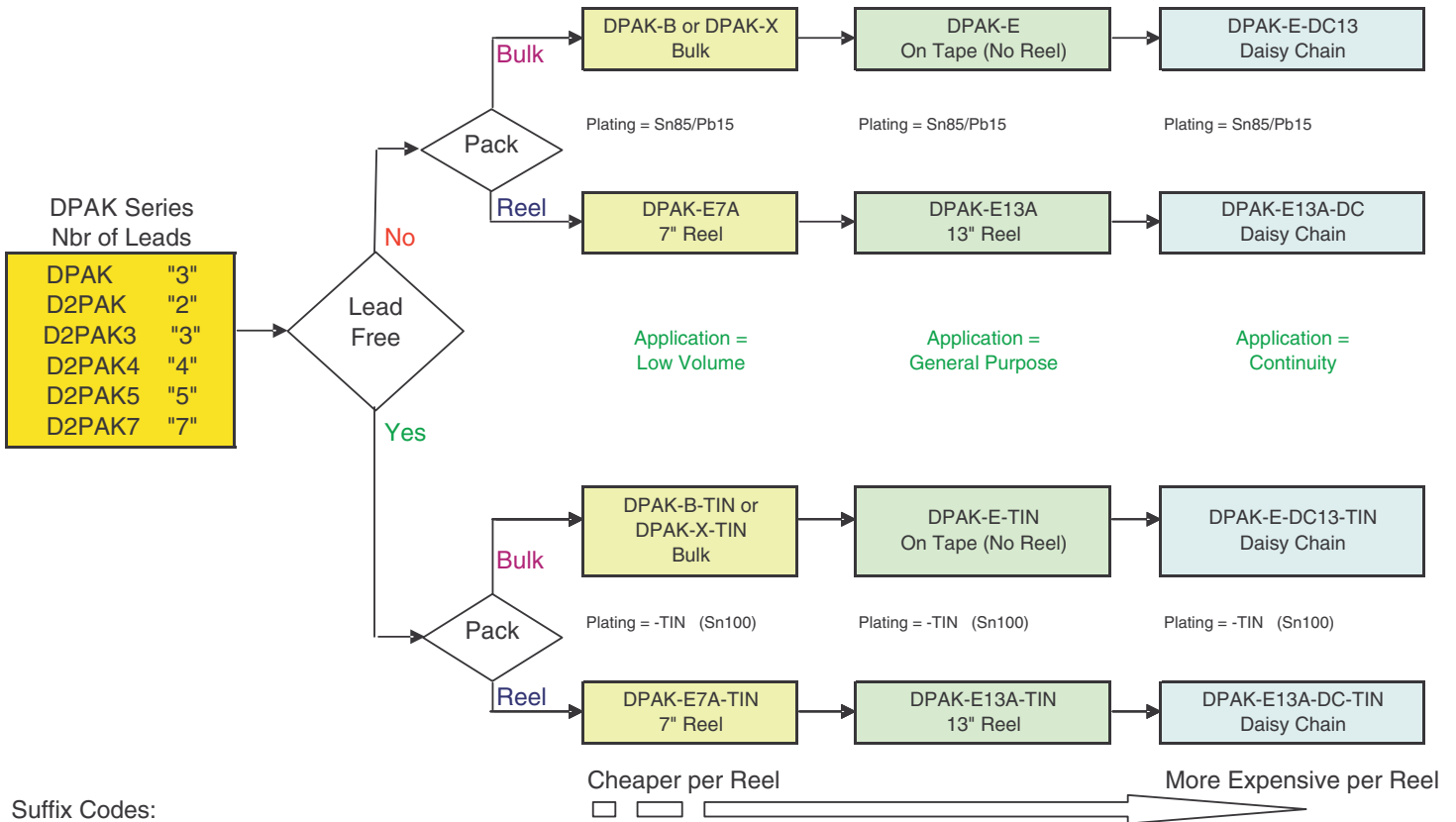
REEL SIZE

4 = 4" (100mm)
 7 = 7" (180mm)
 13 = 13" (330mm)

REEL MATERIAL
 A = Plastic

A

Substituting "DPAK" Series



Suffix Codes:

Lead Free Plating: "TIN" = Sn100

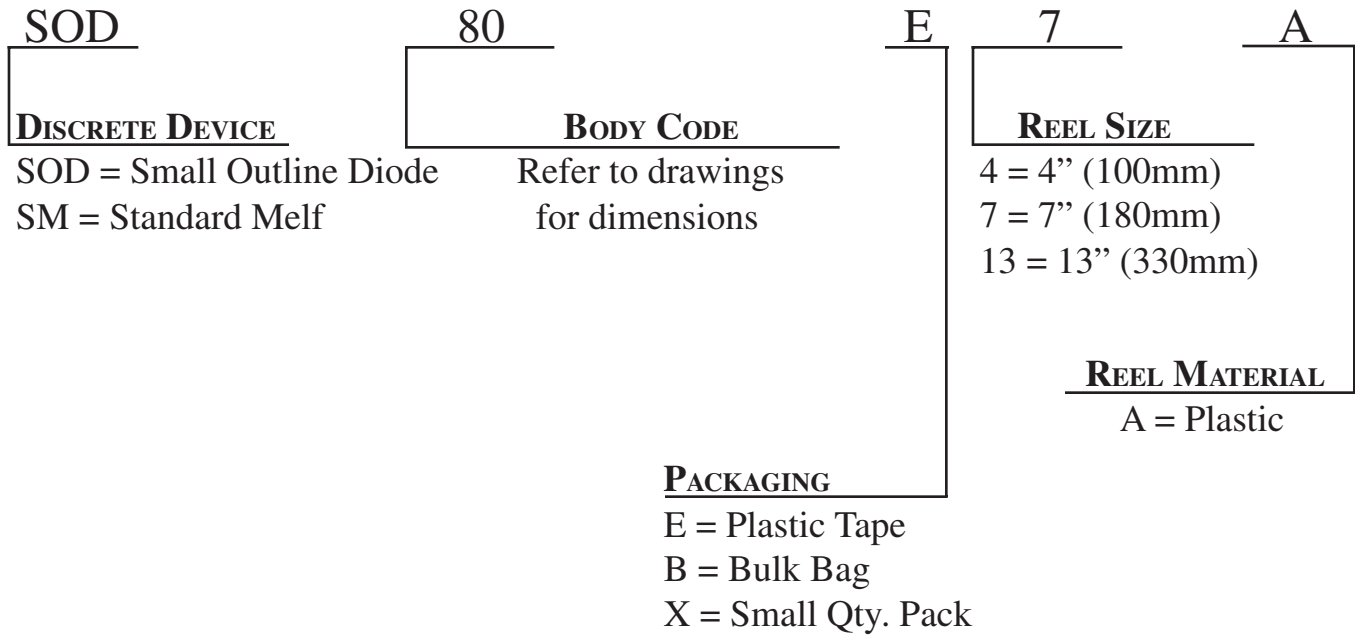
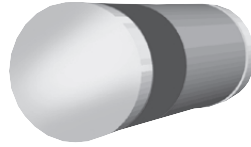
Pack: "B" = Bulk (unspecified pack), "X" = mini Pack Bags

Plastic Tape: E4A = 4" Mini Reel (special), E7A = 7" Reel (Special), E13A = 13" Reels

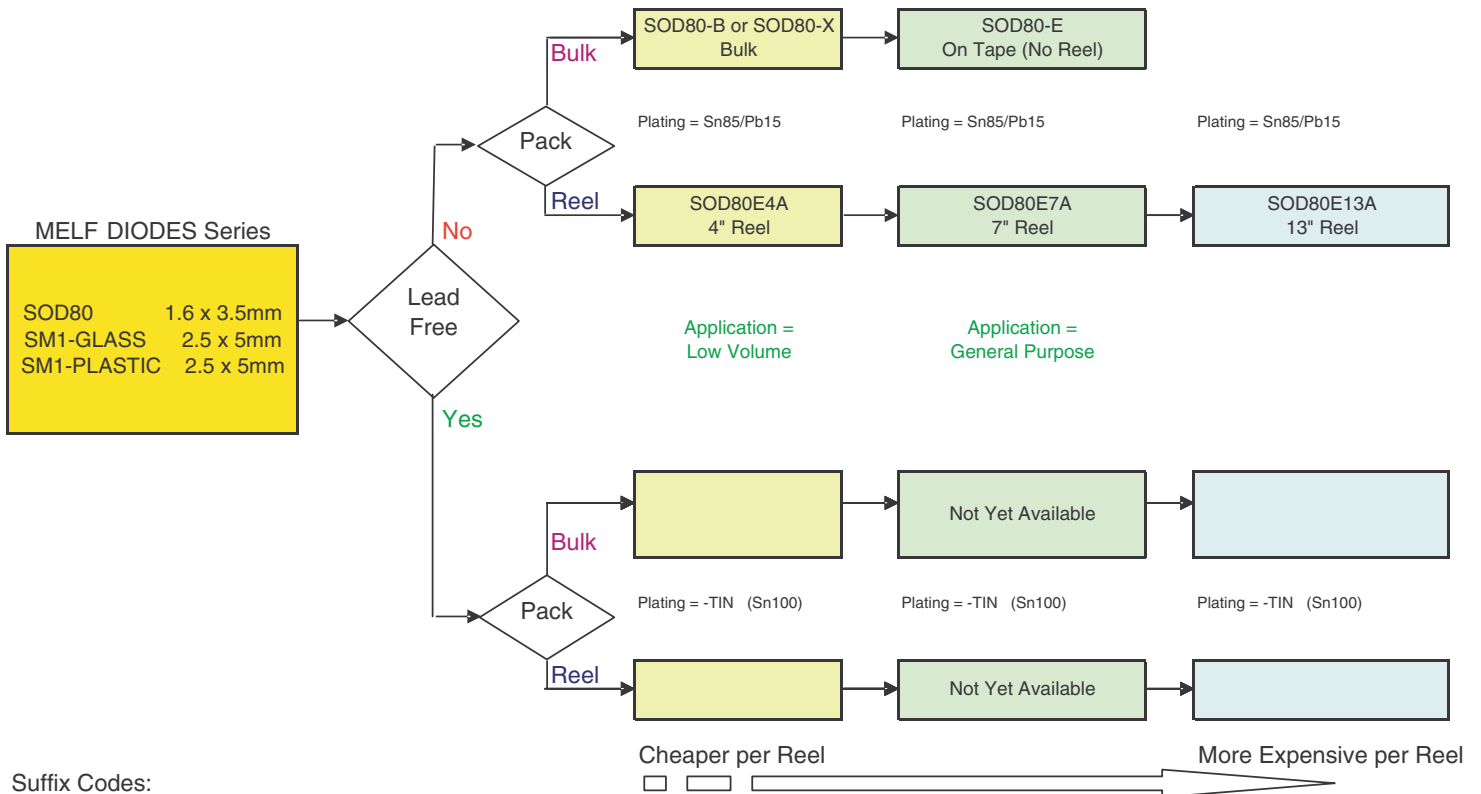
"E" = On Plastic Tape. No Reel

DC = Daisy Chain: See drawing for details

MELF Diode



Substituting "MELF" Diodes



Suffix Codes:

Lead Free Plating: "TIN" = Sn100

Pack: "B" = Bulk (unspecified pack), "X" = mini Pack Bags

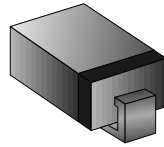
Plastic Tape: E4A = 4" Mini Reel (special), E7A = 7" Reel, E13A = 13" Reels

"E" = On Plastic Tape. No Reel

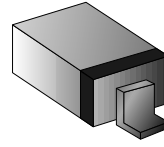
Note: SM1-GLASS = Glass Body SM1-PLASTIC = Epoxy Molded Body

Normally, Glass or Plastic bodies can be substituted for one another.

Rectangular Diode (Rectifier)



**C-BEND
LEAD**



**GULL-WING
LEAD**

SOD

DISCRETE DEVICE

SOD = Small Outline Diode
 SC = Japan Series
 SMAJ = J-lead
 SMAG = Gull Wing
 FM1 = SMAJ

123

BODY CODE

Refer to drawings
 for dimensions

E

PACKAGING

E = Plastic Tape
 B = Bulk Bag
 X = Small Qty. Pack

7

REEL SIZE

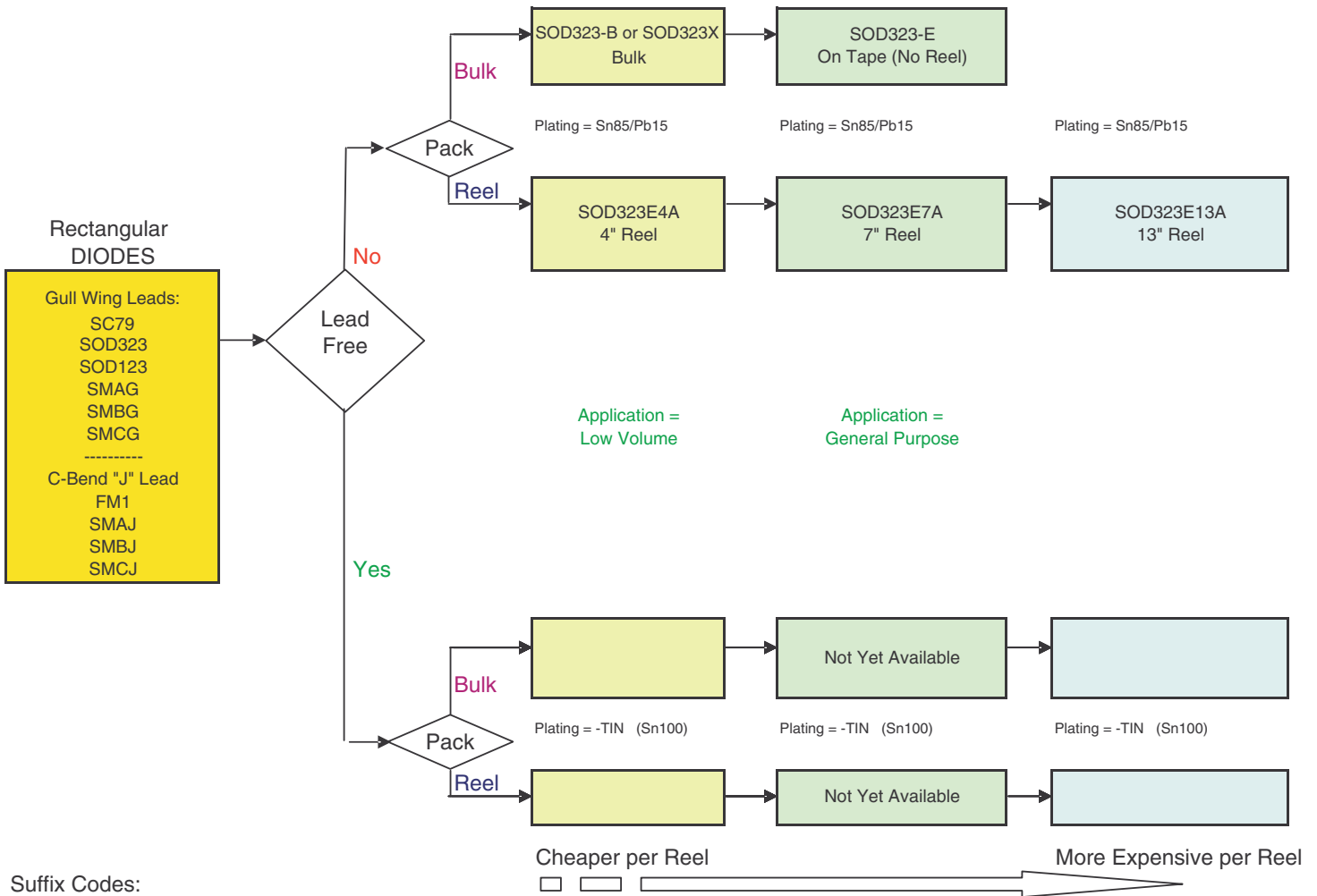
4 = 4" (100mm)
 7 = 7" (180mm)
 13 = 13" (330mm)

A

REEL MATERIAL

A = Plastic

Substituting "Rectangular" Diodes



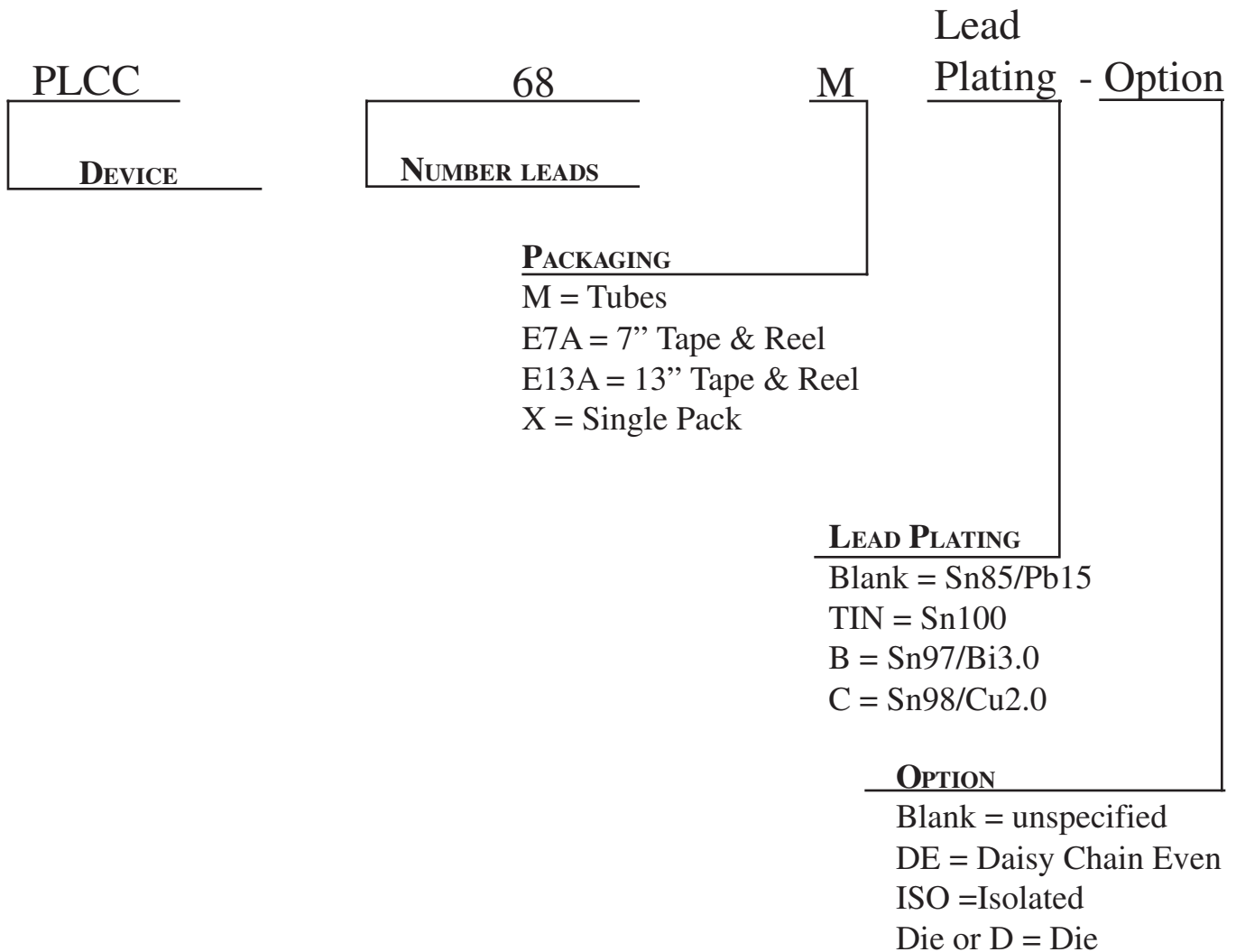
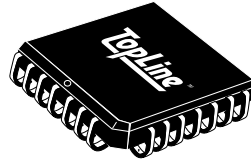
Suffix Codes:

"E" = On Plastic Tape. No Reel

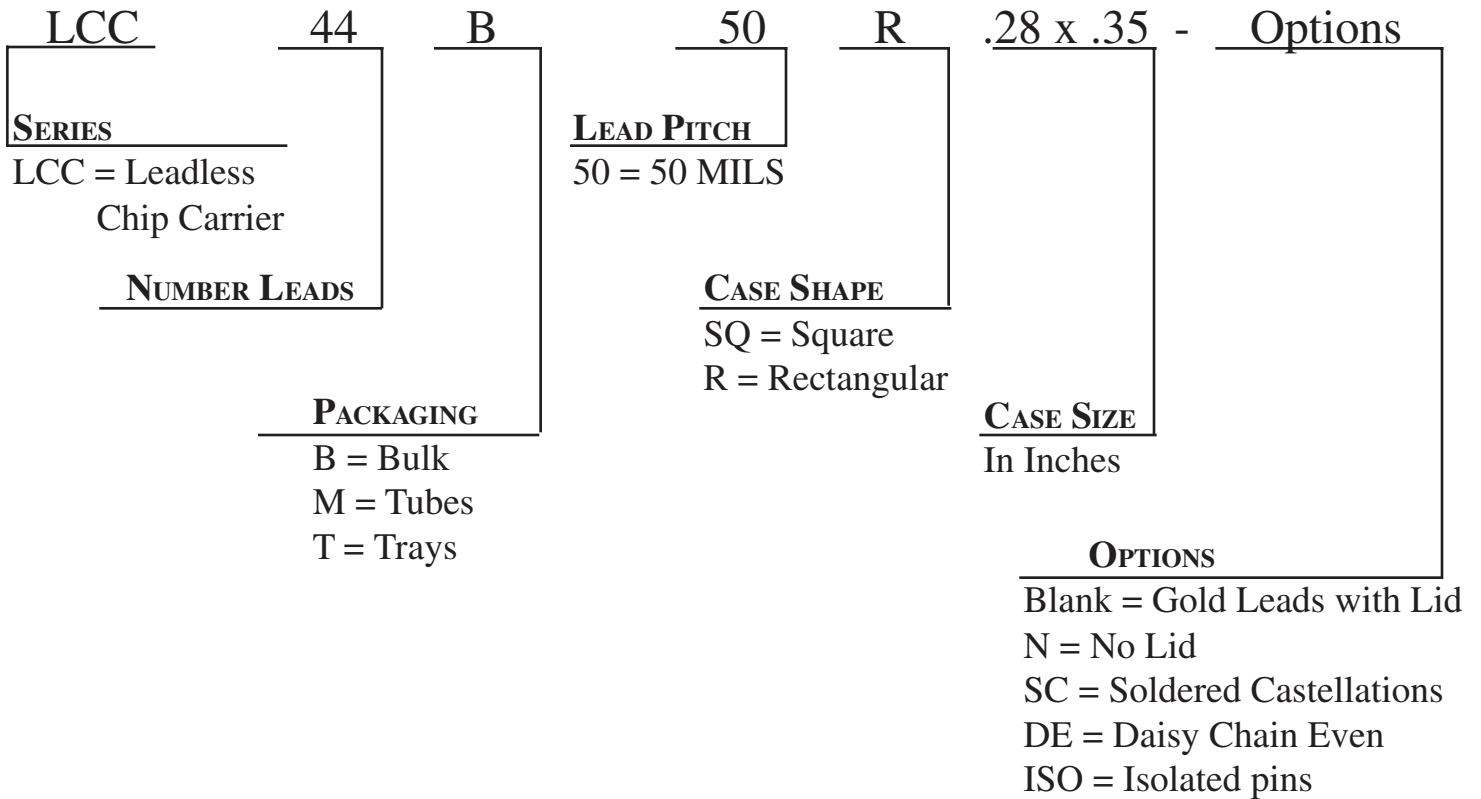
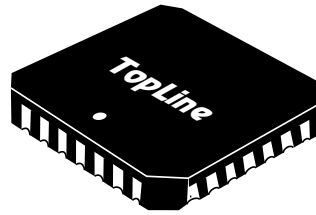
Pack: "B" = Bulk (unspecified pack), "X" = mini Pack Bags

Plastic Tape: E4A = 4" Mini Reel (special), E7A = 7" Reel, E13A = 13" Reels

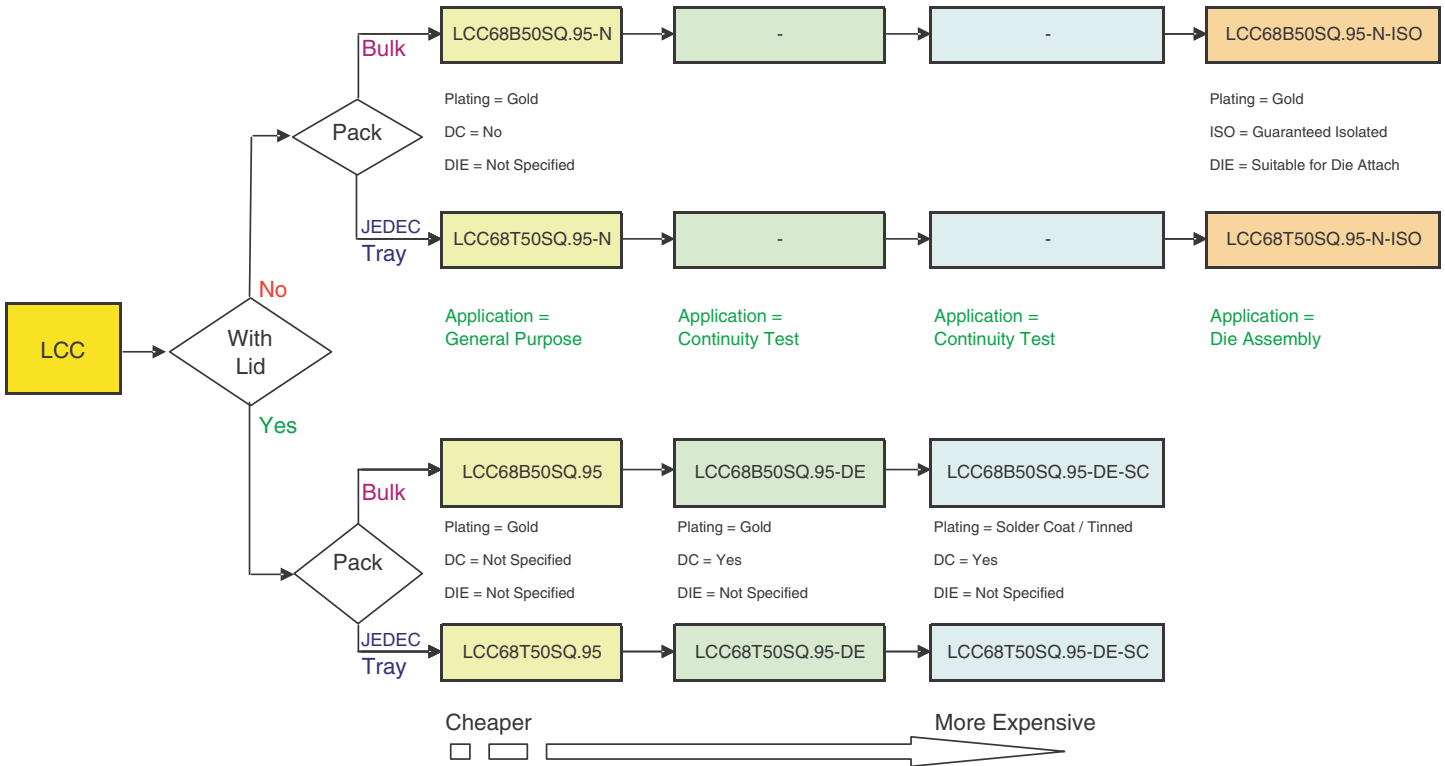
PLCC



LCC Ceramic Leadless Chip Carrier



Substituting LCC



Suffix Codes:

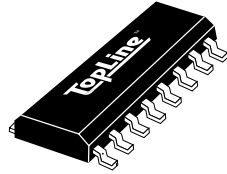
"DE" = Daisy Chain "Even" (1-2, 3-4, 5-6, 7-8, etc) "ISO" = Isolated connections

Plating: Blank = Gold SC = Solder Coated

Pack: "M" = Tubes, B = Bulk or Vacuum formed Trays T = JEDEC MatrixTrays

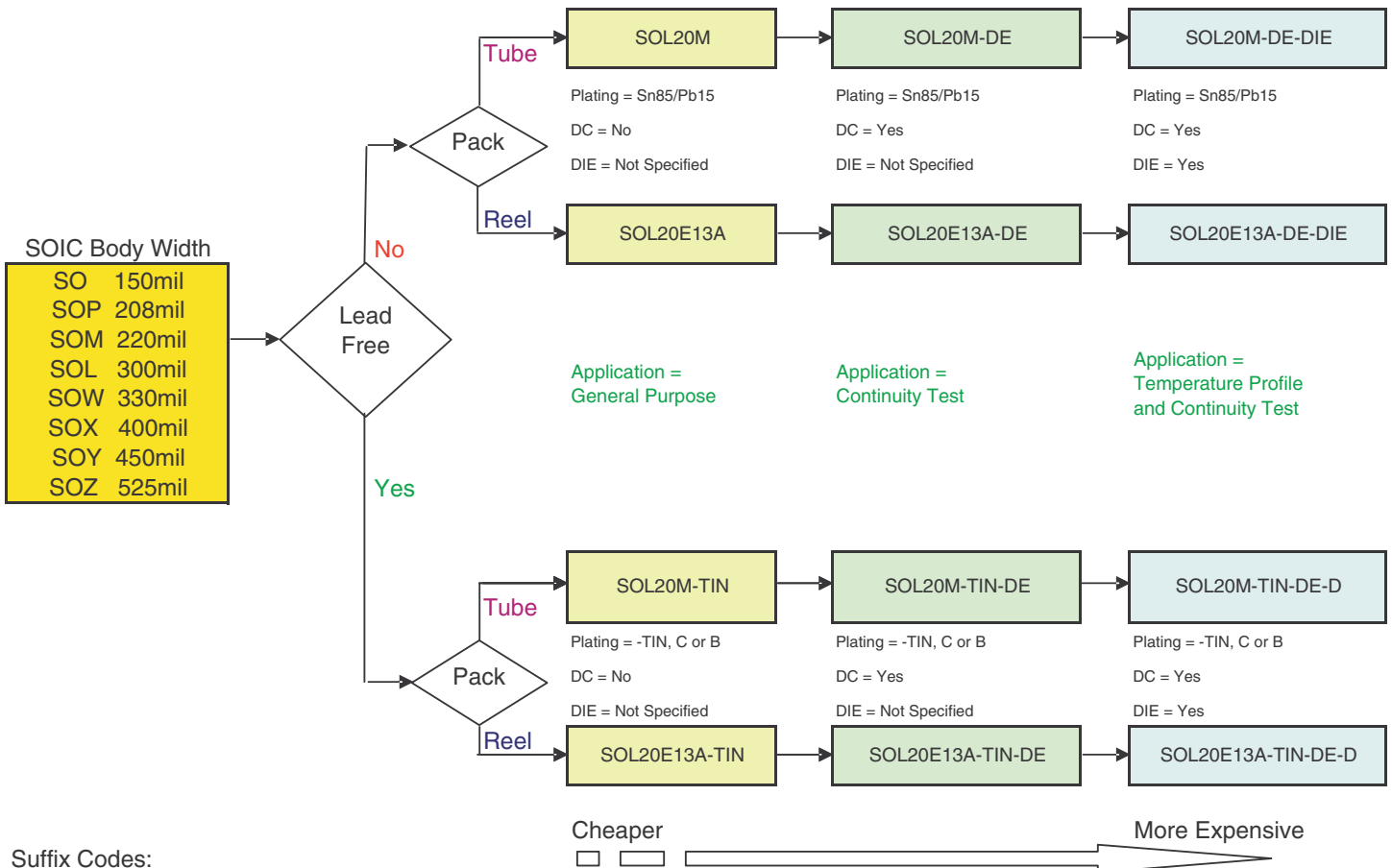
SOIC

Small Outline Circuit - Gull Wing Leads



| SOL | | | 16 | M | Lead Plating | Option |
|----------------------------------|-------------------|-----------|--------------|------------------------|---------------------|-----------------------|
| DEVICE | | | NUMBER LEADS | | | |
| | BODY WIDTH | | | | | |
| SERIES | MILS | MM | | PACKAGING | | |
| SO | 150 | 3.9mm | | M = Tubes | | |
| SOL | 300 | 7.5mm | | E4A = 4" Tape & Reel | | |
| SOM | 220 | 5.6mm | | E7A = 7" Tape & Reel | | |
| SOP | 208 | 5.3mm | | E13A = 13" Tape & Reel | | |
| SOW | 330~350 | 8.4~8.9mm | | X = Small Qty. | | |
| SOX | 400 | 10.0mm | | | | |
| SOY | 450 | 11.4mm | | | | |
| SOZ | 525 | 13.3mm | | | | |
| Pitch = 50 mil (1.27mm) Standard | | | | | LEAD PLATING | |
| | | | | | Blank = Sn85/Pb 15 | |
| | | | | | TIN = Sn100 | |
| | | | | | B = Sn97/Bi3.0 | |
| | | | | | C = Sn98/Cu2.0 | |
| | | | | | | OPTION |
| | | | | | | Blank = unspecified |
| | | | | | | DE = Daisy Chain Even |
| | | | | | | ISO = Isolated |

Substituting SOIC



Suffix Codes:

"DIE" is sometimes abbreviated to "D".

"DE" = Daisy Chain "Even" (1-2, 3-4, 5-6, 7-8, etc) "ISO" = Isolated connections "BUS" = All Leads Connected.

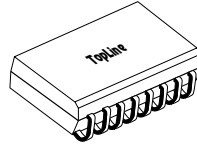
Lead Free Plating: "TIN" = Sn100, B = Sn97/Bi3.0 C = Sn98/Cu2.0

Pack: "M" = Tubes, E13A = 13" Reels, E7A = 7" Reel (special), "X" = mini Pack Bags

Pitch in mils: Always 50mils (1.27mm). No code necessary.

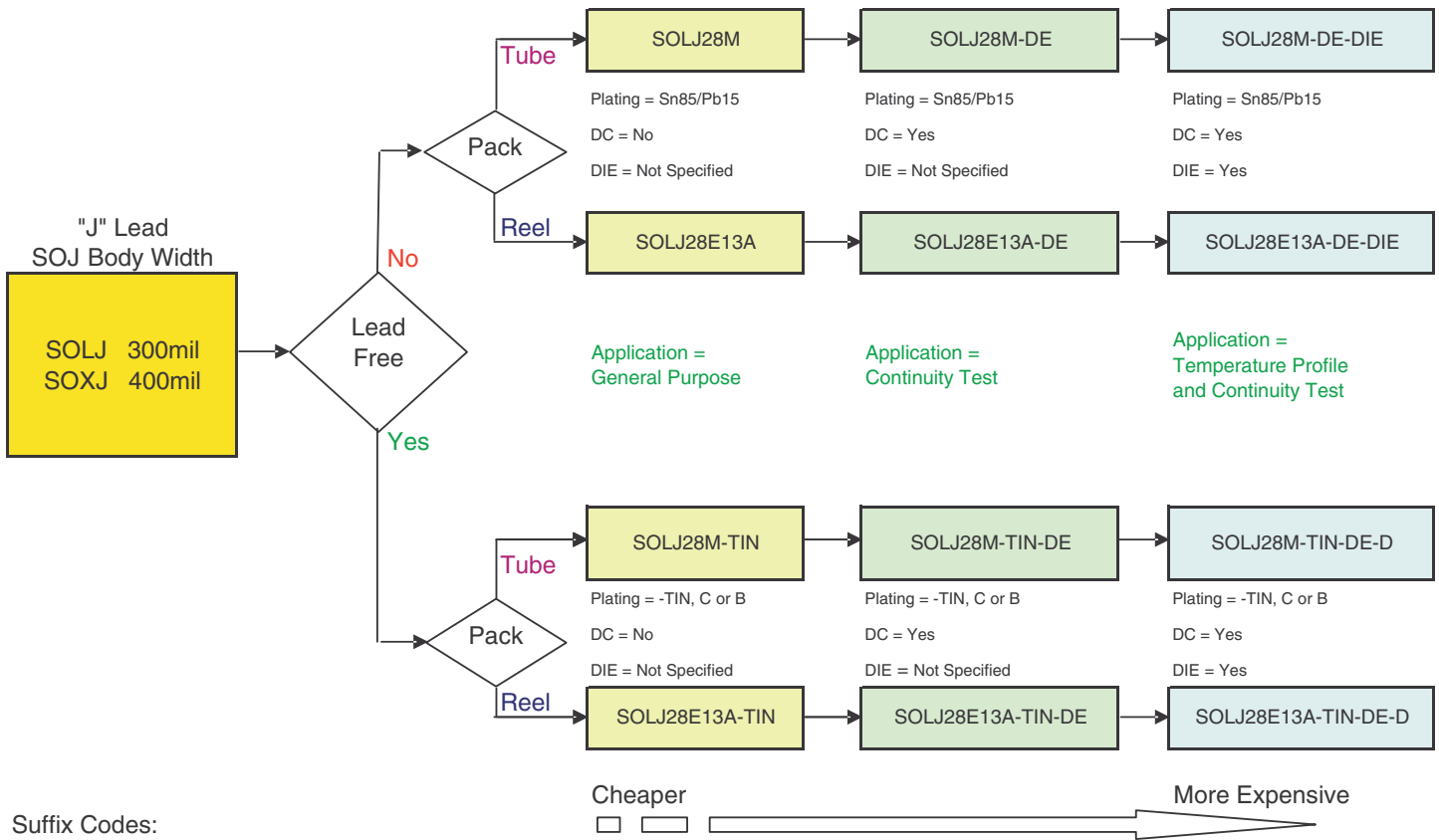
SOJ

Small Outline J-Lead



| <u>SOLJ</u> | | | <u>28</u> | <u>M</u> | <u>Lead Plating - Option</u> |
|----------------------------------|-------------------|-----------|------------------------|---------------------|------------------------------|
| <u>DEVICE</u> | | | <u>NUMBER LEADS</u> | | |
| | <u>BODY WIDTH</u> | | | | |
| <u>SERIES</u> | <u>MILS</u> | <u>MM</u> | | | |
| SOLJ | 300 | 7.5mm | | | |
| SOXJ | 400 | 10mm | | | |
| Pitch = 50 mil (1.27mm) Standard | | | | | |
| | | | <u>PACKAGING</u> | | |
| | | | M = Tubes | | |
| | | | E4A = 4" Tape & Reel | | |
| | | | E7A = 7" Tape & Reel | | |
| | | | E13A = 13" Tape & Reel | | |
| | | | X = Single Pack | | |
| | | | | <u>LEAD PLATING</u> | |
| | | | | Blank = Sn85/Pb 15 | |
| | | | | TIN = Sn100 | |
| | | | | B = Sn97/Bi3.0 | |
| | | | | C = Sn98/Cu2.0 | |
| | | | | | <u>OPTION</u> |
| | | | | | Blank = unspecified |
| | | | | | DE = Daisy Chain Even |
| | | | | | ISO = Isolated |
| | | | | | D = Die |

Substituting SOJ



Suffix Codes:

"DIE" is sometimes abbreviated to "D".

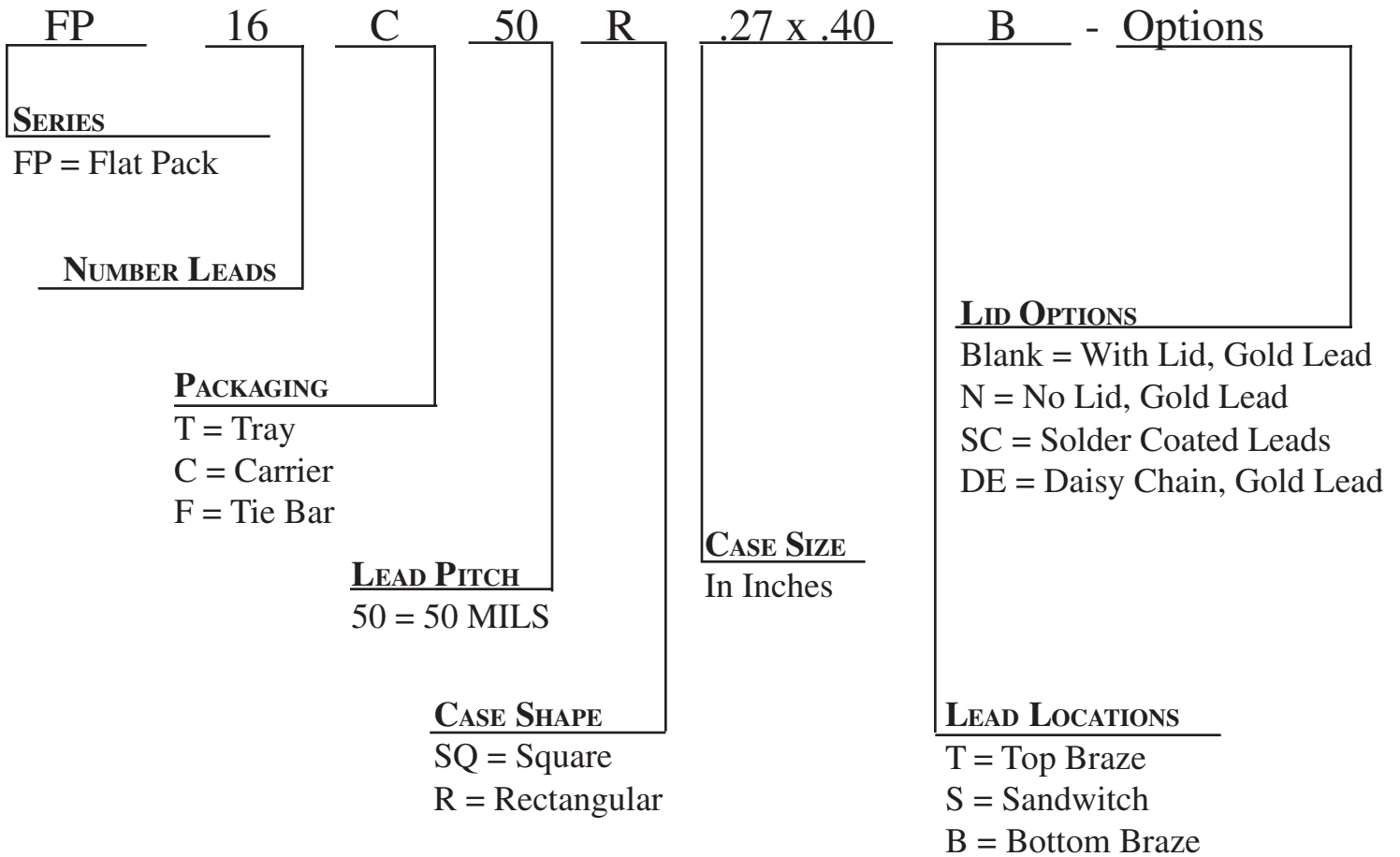
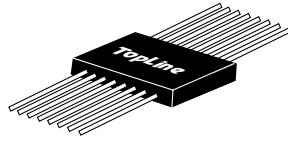
"DE" = Daisy Chain "Even" (1-2, 3-4, 5-6, 7-8, etc) "ISO" = Isolated connections "BUS" = All Leads Connected.

Lead Free Plating: "TIN" = Sn100, B = Sn97/Bi3.0 C = Sn98/Cu2.0

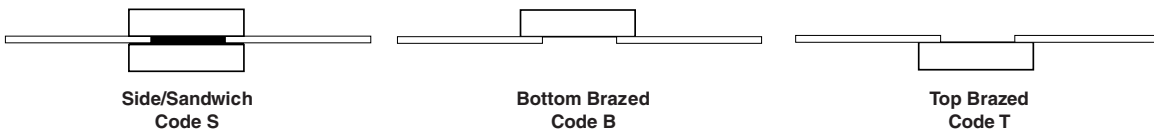
Pack: "M" = Tubes, E13A = 13" Reels, E7A = 7" Reel (special), "X" = mini Pack Bags

Pitch in mils: Always 50mils (1.27mm). No code necessary.

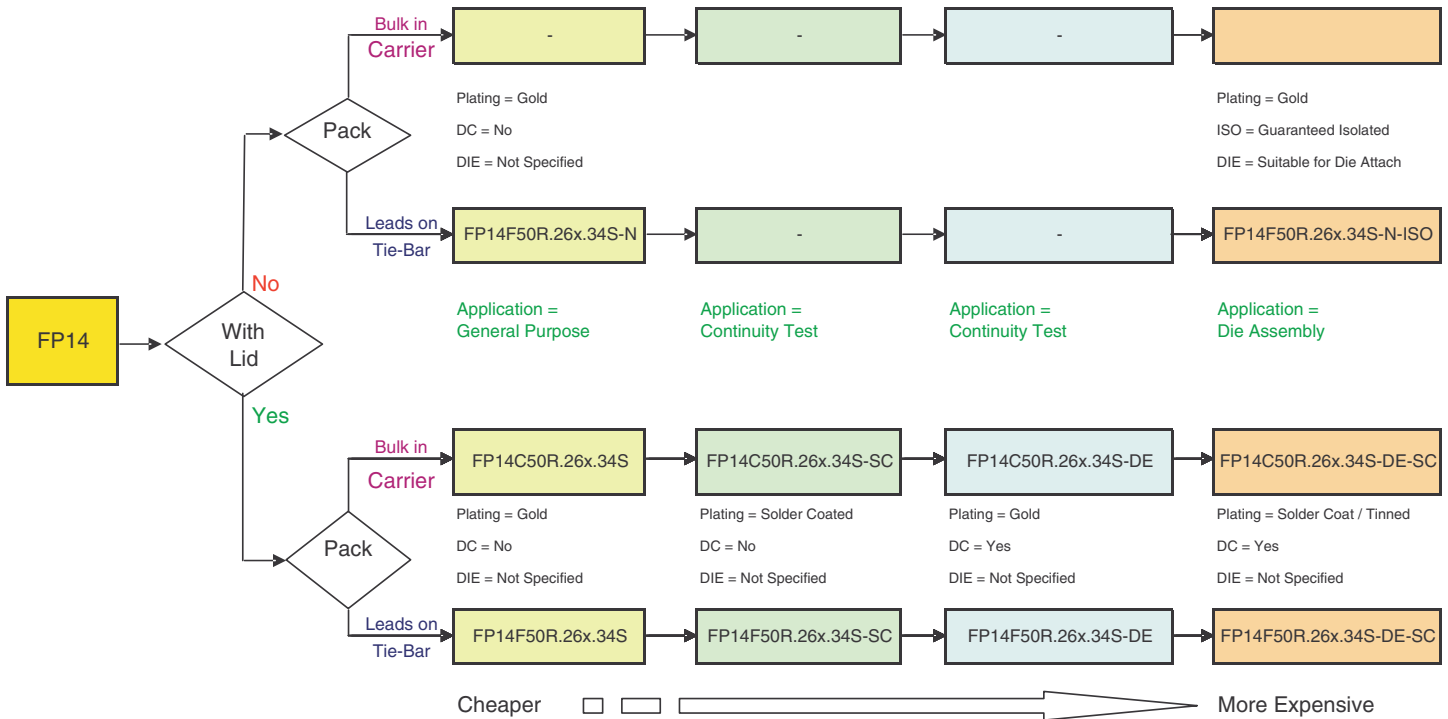
Flat Packs



LEAD LOCATIONS



Substituting "FP" Flat Pack



Suffix Codes:

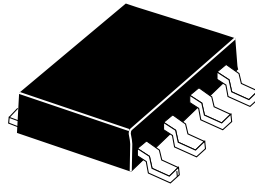
"DE" = Daisy Chain "Even" (1-2, 3-4, 5-6, 7-8, etc) "ISO" = Isolated connections

Plating: Blank = Gold SC = Solder Coated or Tinned Sn63 Solder

Pack: "C" = Trimmed Leads in Plastic Carrier "F" = Leads on Tie-Bar. Must be trimmed and formed prior to assembly.

Lead Location: "S" = Side Brazed / Sandwich "T" = Top Brazed "B" = Bottom Brazed

MSOP



MSOP

| DEVICE | |
|---------|--------|
| LEADS | PITCH |
| 8 lead | 0.65mm |
| 10 lead | 0.5mm |

8

| NUMBER LEADS | PACKAGING |
|--------------|-----------|
| 8 | M |

PACKAGING

M = Tubes
 E4A = 4" Reel
 E7A = 7" Reel
 X = Small Pack
 E = Carrier (No Reel)

M

Lead Plating

LEAD PLATING

Blank = Sn85/Pb15
 TIN = Sn100

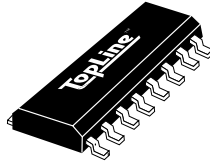
Option

OPTION

Blank = unspecified
 DE = Daisy Chain Even
 ISO = Isolated
 D = Die

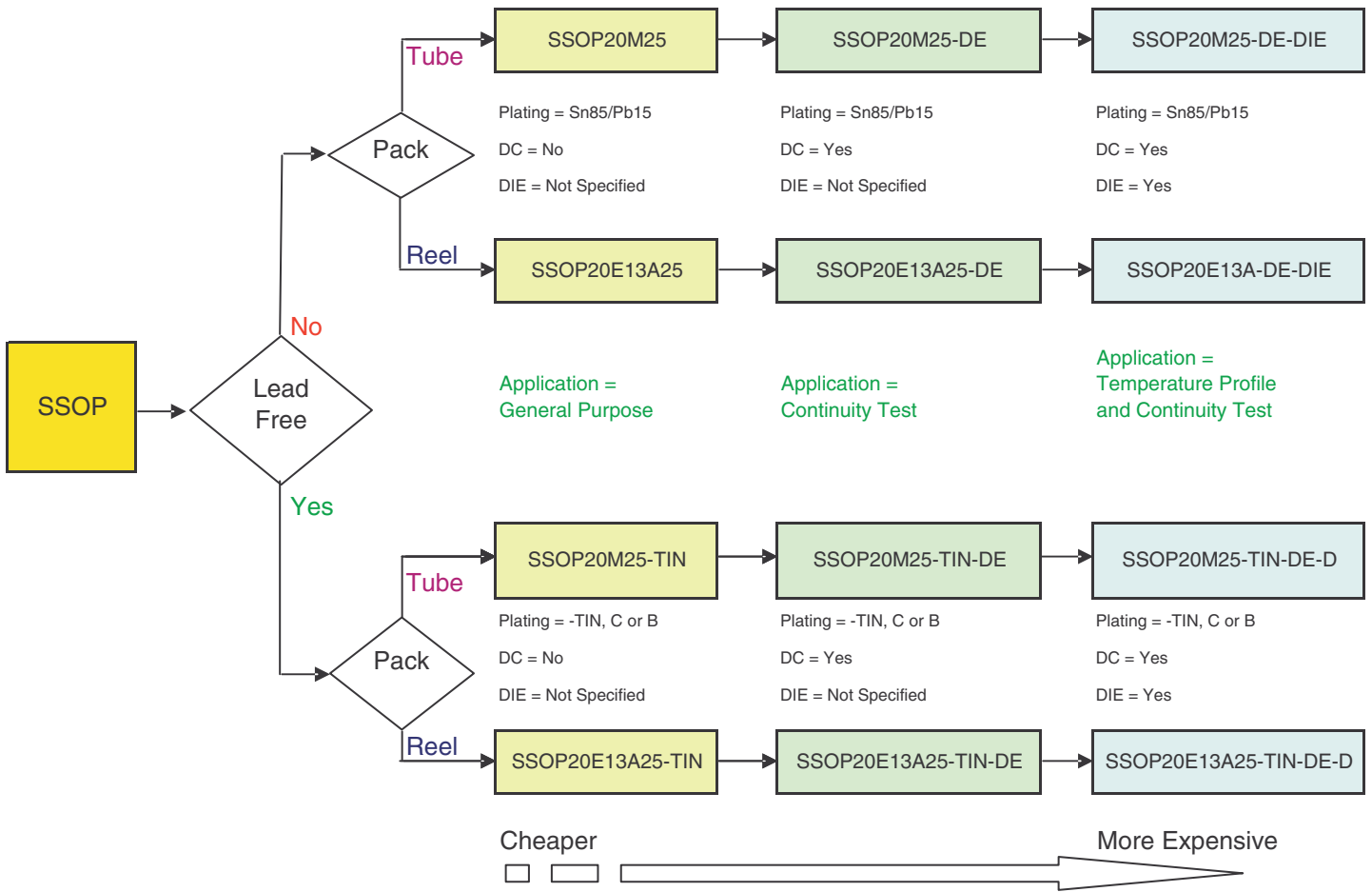
(Temporary Blank Page)

SSOP



| <u>SSOP</u> | | | <u>16</u> | <u>M</u> | <u>Pitch</u> | <u>Lead Plating</u> - <u>Option</u> | |
|-------------------|-------------|-----------|----------------------------|----------|--------------|-------------------------------------|--|
| <u>DEVICE</u> | | | <u>NUMBER LEADS</u> | | | | |
| <u>BODY WIDTH</u> | | | | | | | |
| <u>SERIES</u> | <u>MILS</u> | <u>MM</u> | <u>PACKAGING</u> | | | | |
| QSOP | 150 | 4.0mm | M = Tubes | | | | <u>LEAD PLATING</u> Blank = Sn85/Pb15 TIN = Sn100 B = Sn97/Bi3.0 |
| SSOP | 208 | 5.3mm | E4A = 4" Tape & Reel | | | | |
| SSOP | 300 | 7.5mm | E7A = 7" Tape & Reel | | | | |
| | | | E13A = 13" Tape & Reel | | | | <u>OPTION</u> Blank = unspecified DE = Daisy Chain Even ISO = Isolated D = Die |
| | | | X = Small Pack | | | | |
| | | | E = Carrier (No Reel) | | | | |
| | | | <u>PITCH (MILS)</u> | | | | |
| | | | 25 = 0.65mm (0.635mm QSOP) | | | | |
| | | | 30 = 0.8mm | | | | |
| | | | 40 = 1.0mm | | | | |

Substituting SSOP



Suffix Codes:

"DIE" is sometimes abbreviated to "D".

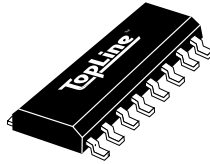
"DE" = Daisy Chain "Even" (1-2, 3-4, 5-6, 7-8, etc) "ISO"= Isolated connections "BUS" = All Leads Connected.

Lead Free Plating: "TIN" = Sn100, B = Sn97/Bi3.0 C = Sn98/Cu2.0

Pack: "M" = Tubes, E13A = 13" Reels, E7A = 7" Reel (special), "X" = mini Pack Bags

Pitch in mils: 15.7 = 0.4mm, 19.7 = 0.5mm, 25 = 0.65mm, 31.5 = 0.8mm, 40 = 1.0mm

TSSOP



TSSOP

24

M

25

**Lead
Plating - Option**

| DEVICE | | |
|-------------------|-------------|-----------|
| BODY WIDTH | | |
| SERIES | MILS | MM |
| TSSOP | 173 | 4.4mm |
| TSSOP | 240 | 6.1mm |

| NUMBER LEADS |
|---------------------|
| PACKAGING |

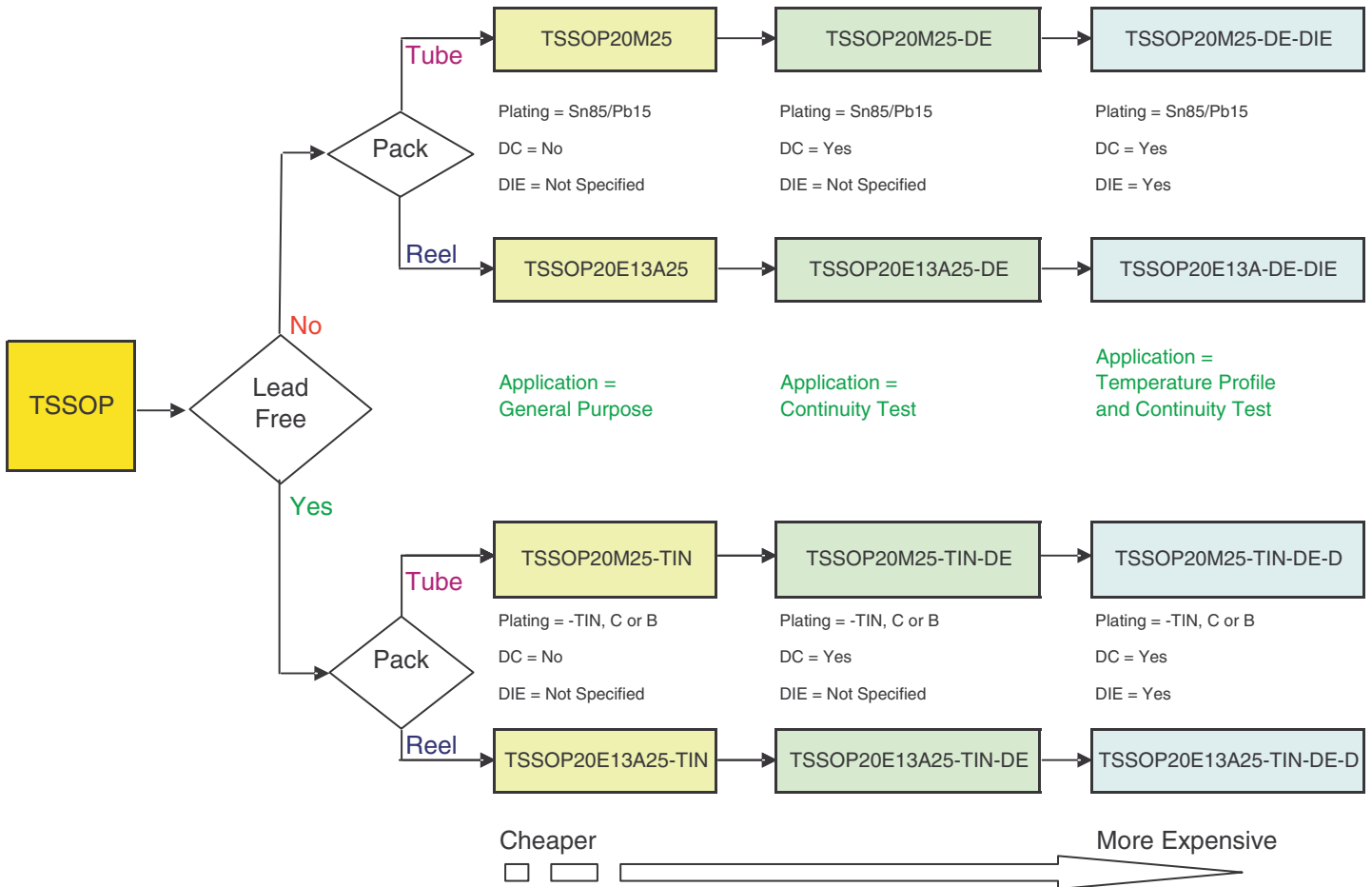
M = Tubes
 E4A = 4" Reel
 E7A = 4" Reel
 E13A = 13" Reel
 X = Small Pack
 E = Carrier (No Reel)

| PITCH (MILS) |
|---------------------|
| 15.7 = 0.4mm |
| 19.7 = 0.5mm |
| 25 = 0.65mm |

LEAD PLATING
 Blank = Sn85/Pb15
 TIN = Sn100
 B = Sn97/Bi3.0

OPTION
 Blank = unspecified
 DE = Daisy Chain Even
 ISO = Isolated
 D = Die

Substituting TSSOP



Suffix Codes:

"DIE" is sometimes abbreviated to "D".

"DE" = Daisy Chain "Even" (1-2, 3-4, 5-6, 7-8, etc) "ISO" = Isolated connections "BUS" = All Leads Connected.

Lead Free Plating: "TIN" = Sn100, B = Sn97/Bi3.0 C = Sn98/Cu2.0

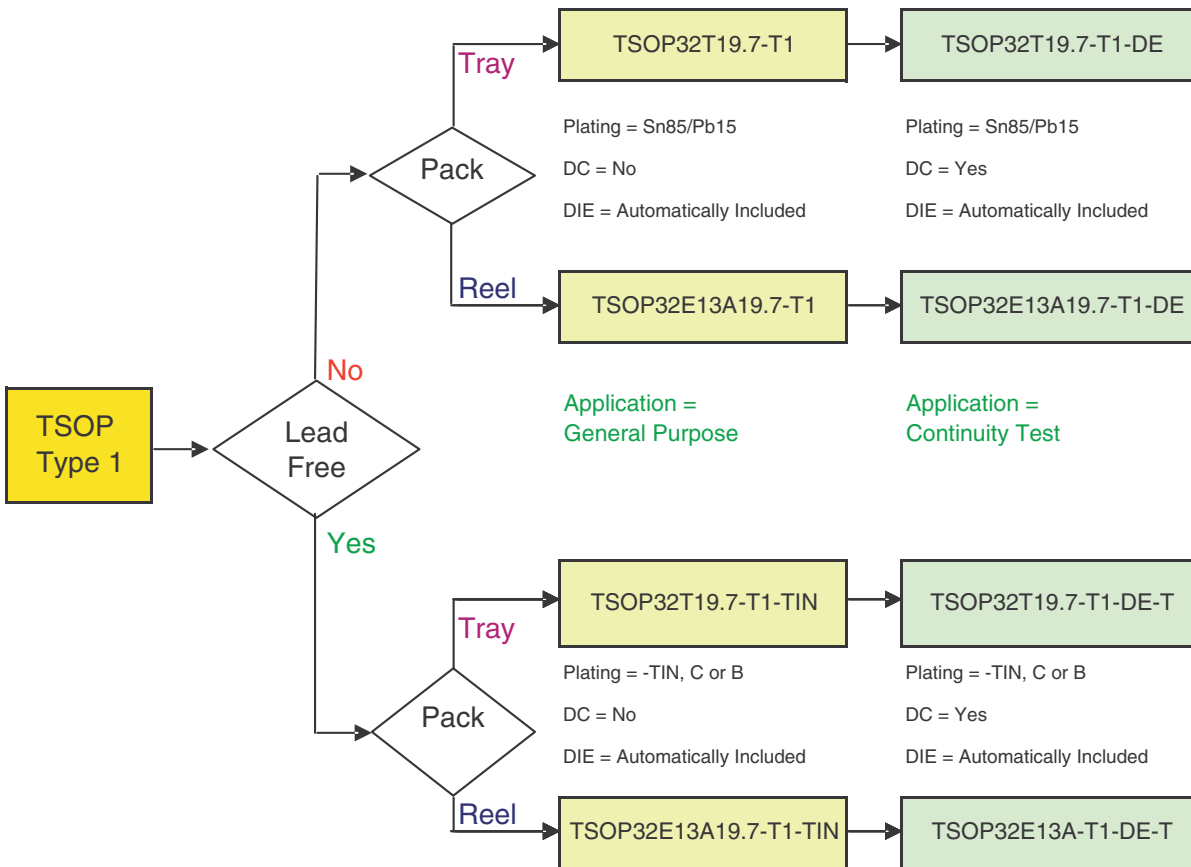
Pack: "M" = Tubes, E13A = 13" Reels, E7A = 7" Reel (special), "X" = mini Pack Bags

TSOP (Type 1)



| | | | | |
|---|--|--|--|-------------------------------------|
| <p>TSOP</p> <hr/> <p>DEVICE TSOP</p> <hr/> <p>NUMBER LEADS 32 = 32 leads 28/32 = 28 leads on 32 lead body (4 leads missing)</p> <hr/> <p>BODY LENGTH Blank = Standard S = Short (stunt)</p> | <p>32</p> <hr/> <p>S</p> | <p>T</p> <hr/> <p>PACKAGING T = Tray E7A = 7" Reel E13A = 13" Reel X = Single Pack E = Carrier (No Reel)</p> <hr/> <p>PITCH (MILS) 19.7 = 0.5mm 21.6 = 0.55mm</p> | <p>19.7 - T1</p> <hr/> <p>TYPE T1 = Leads on narrow ends</p> <hr/> <p>LEAD PLATING Blank = Sn85/Pb15 TIN = Sn100 B = Sn97/Bi3.0</p> <hr/> <p>OPTION Blank = unspecified DE = Daisy Chain Even ISO = Isolated</p> | <p>Lead Plating - Option</p> |
|---|--|--|--|-------------------------------------|

Substituting TSOP (Type 1)



Cheaper

 More Expensive

Suffix Codes:

"DE" = Daisy Chain "Even" (1-2, 3-4, 5-6, 7-8, etc) "ISO" = Isolated connections "BUS" = All Leads Connected.

Lead Free Plating: "TIN" = "T" = Sn100, B = Sn97/Bi3.0 C = Sn98/Cu2.0

Pack: "T" = Tray, E13A = 13" Reel, E7A = 7" Reel, "E" = Carrier Tape without Reel, "X" = mini Pack Bags

Silicon Dummy DIE is automatically included. No need to add Suffix -DIE

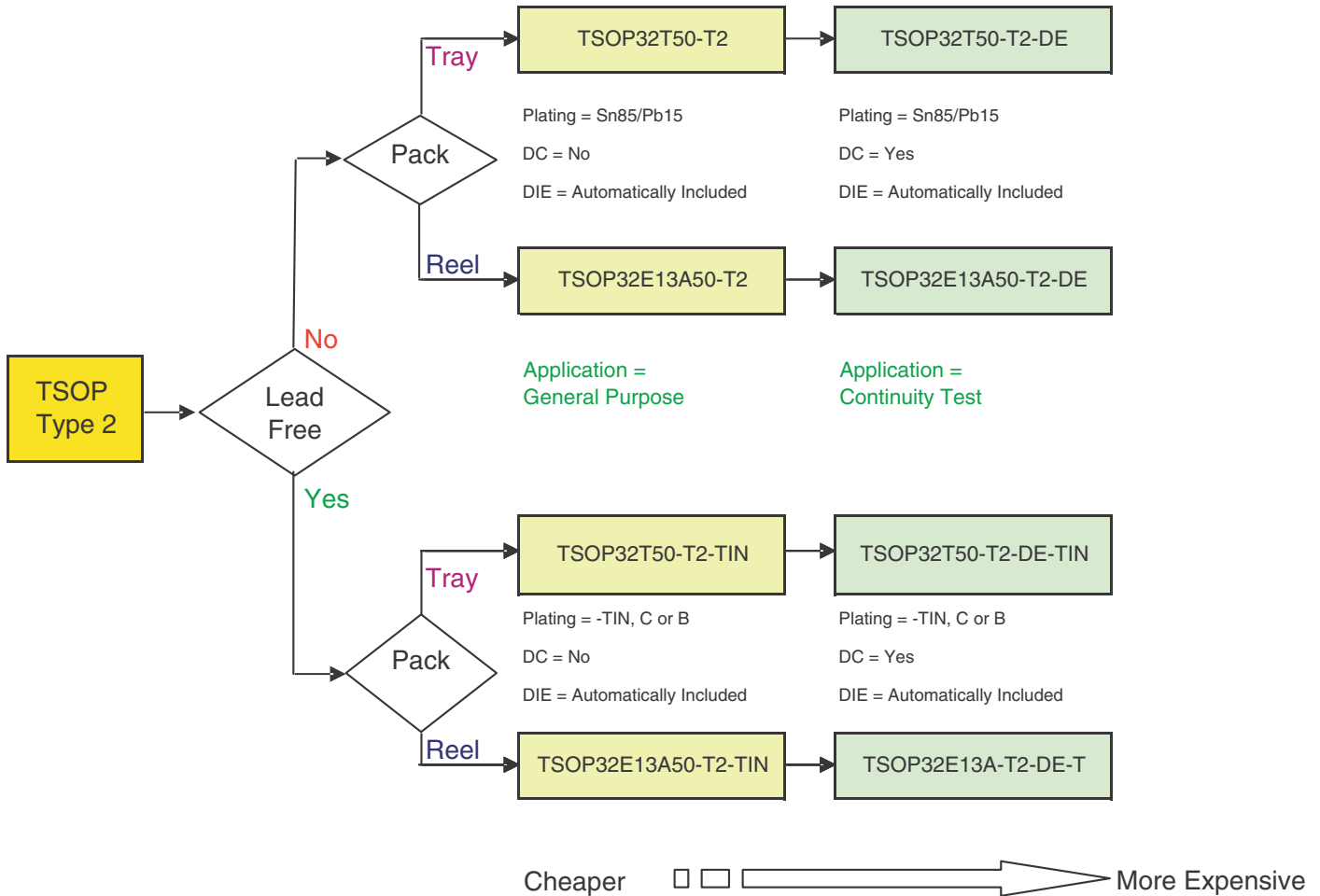
Pitch: 19.7mils (21.6 = 0.55mm, 19.7 = 0.5mm)

TSOP (Type II)



| <u>TSOP</u> | <u>32</u> | <u>T</u> | <u>19.7</u> | <u>T2</u> | <u>Lead Plating</u> | <u>Option</u> |
|---|-----------|---|---|--|---|--|
| <p>DEVICE TSOP</p> <p>NBR. LEADS 32 = 32 leads 40/44 = 40 leads on 44 lead body (4 leads missing)</p> | | <p>PACKAGING T = Tray E7A = 7" Reel E13A = 13" Reel X = Small Pack E = Carrier (No Reel)</p> | <p>PITCH (MILS) 25 = 0.65mm 30 = 0.8mm 50 = 1.27mm</p> | <p>TYPE T2 = Leads on wide side</p> | <p>LEAD PLATING Blank = Sn85/Pb15 TIN = Sn100 B = Sn97/Bi3.0</p> | <p>OPTION Blank = unspecified DE = Daisy Chain Even</p> |

Substituting TSOP (Type II)



Suffix Codes:

"DE" = Daisy Chain "Even" (1-2, 3-4, 5-6, 7-8, etc) "ISO" = Isolated connections "BUS" = All Leads Connected.

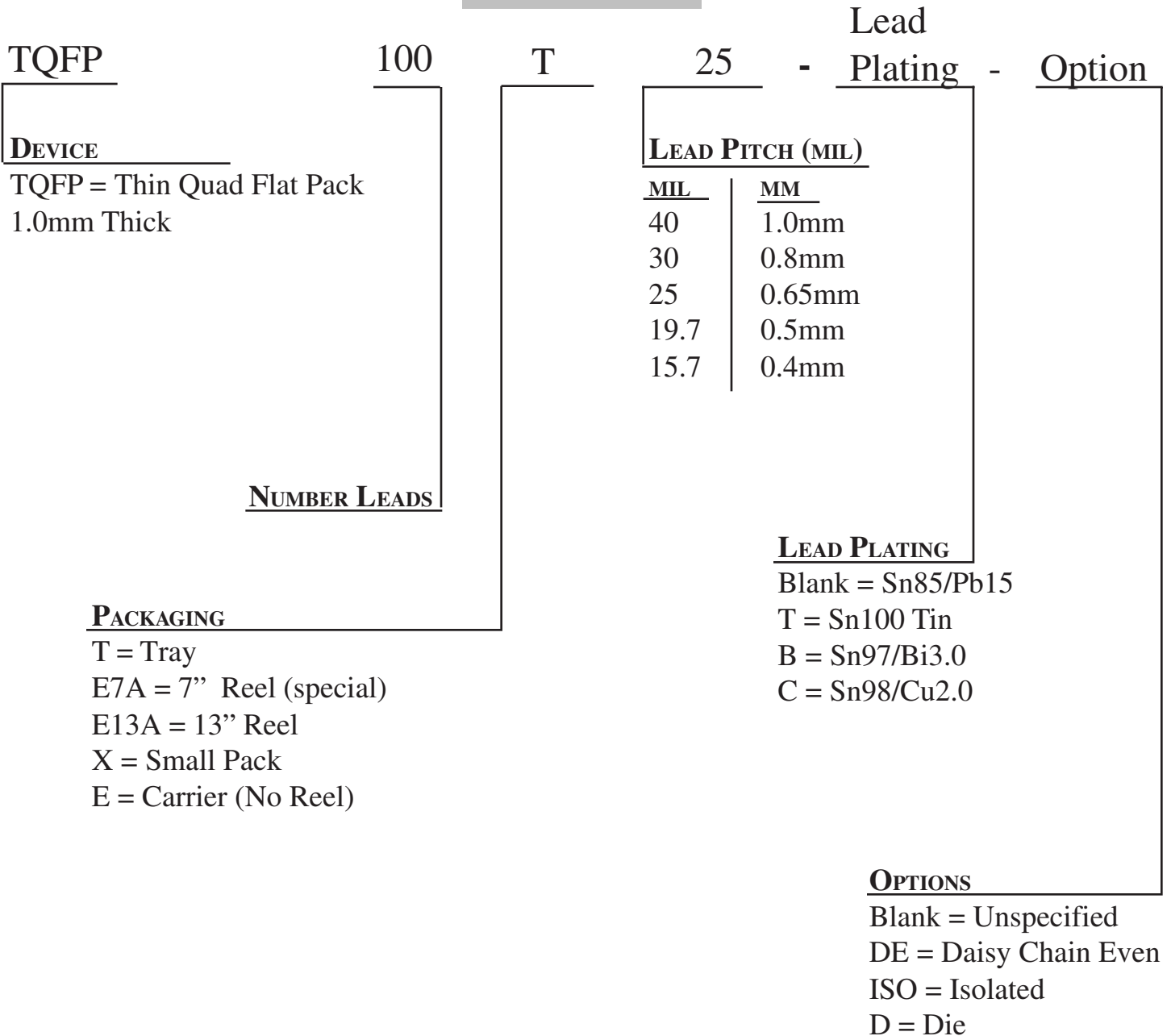
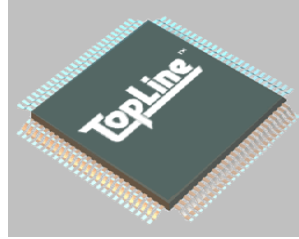
Lead Free Plating: "TIN" = "T" = Sn100, B = Sn97/Bi3.0 C = Sn98/Cu2.0

Pack: "T" = Tray, E13A = 13" Reel, E7A = 7" Reel, "E" = Carrier Tape without Reel, "X" = mini Pack Bags

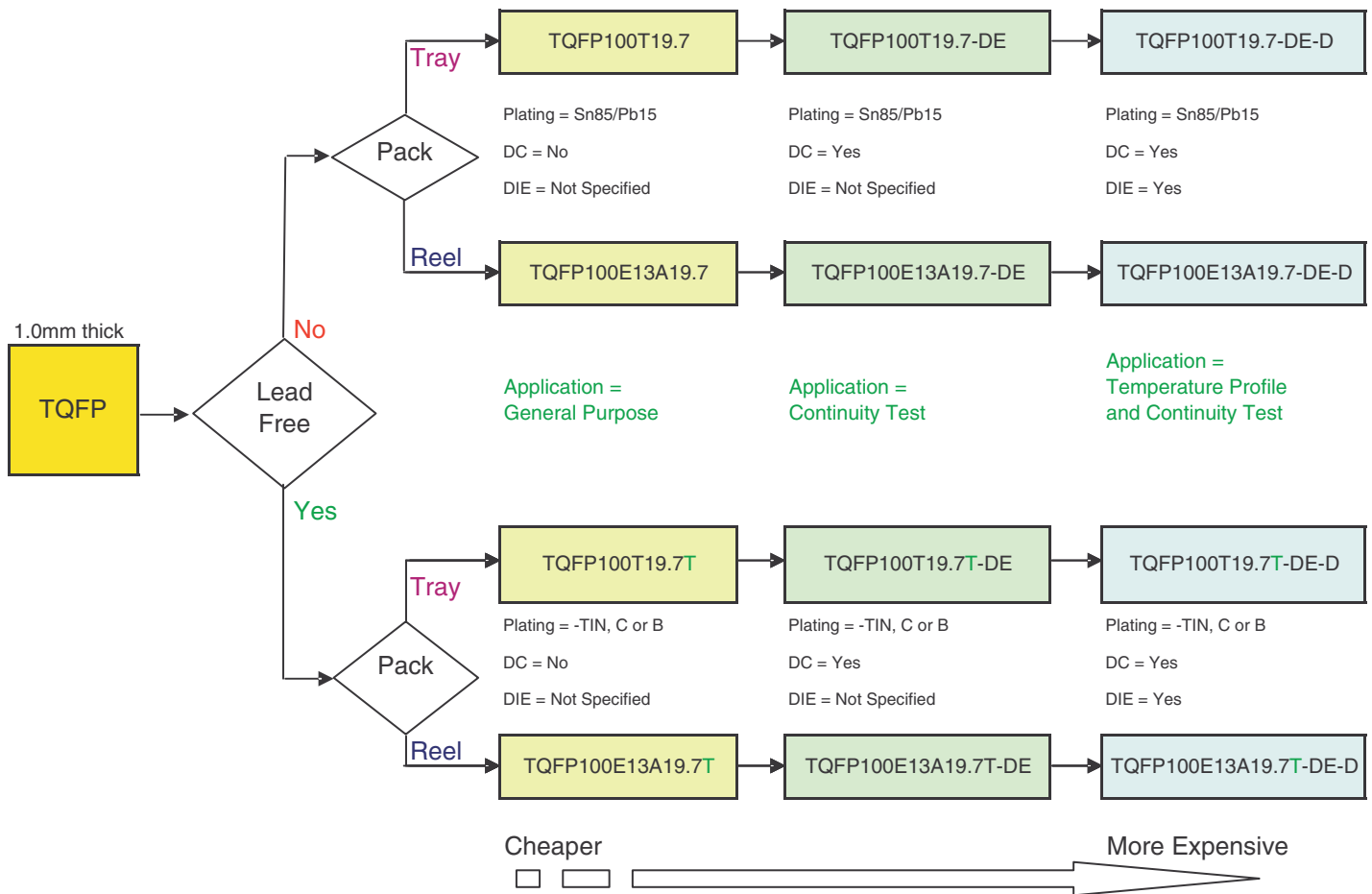
Silicon Dummy DIE is automatically included. No need to add Suffix -DIE

Pitch in mils: (50 = 1.27mm, 30 = 0.8mm)

TQFP Thin Quad Flat Pack



Substituting TQFP



Suffix Codes:

"DE" = Daisy Chain "Even" (1-2, 3-4, 5-6, 7-8, etc) "ISO" = Isolated connections "BUS" = All Leads Connected.

Lead Free Plating: "TIN" = "T" = Sn100, B = Sn97/Bi3.0 C = Sn98/Cu2.0

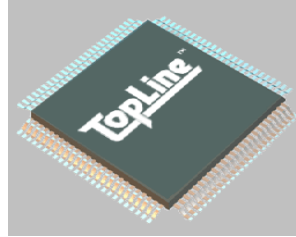
Pack: "T" = Tray, E13A = 13" Reel, E7A = 7" Reel, "E" = Carrier Tape without Reel, "X" = mini Pack Bags

"D" = Silicon Dummy DIE

Footprint Adder assumed 2.0mm.

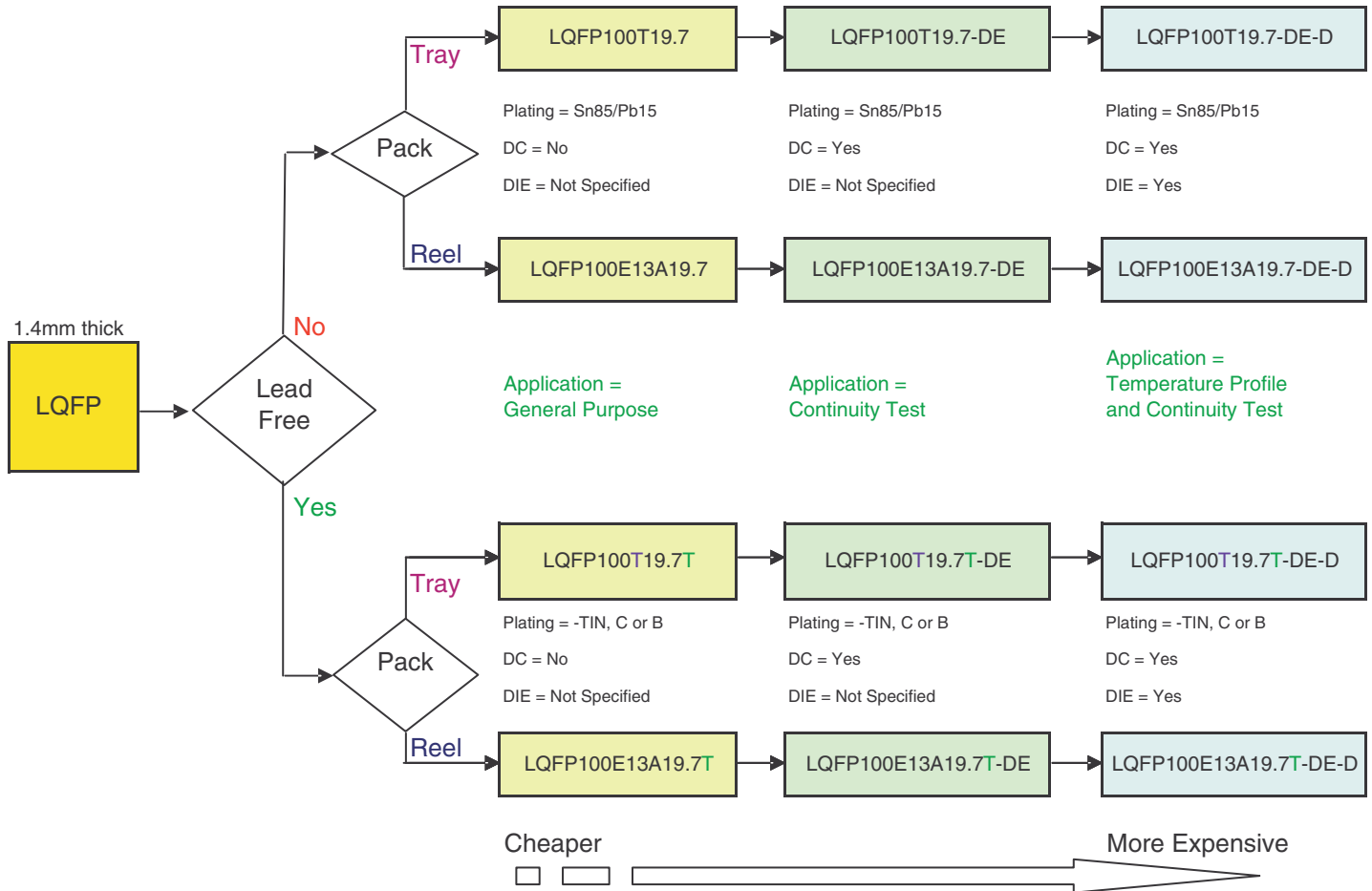
Pitch in mils: 15.7 = 0.4mm, 19.7 = 0.5mm, 25 = 0.65mm, 30 = 0.8mm, 40 = 1.0mm

LQFP Low Quad Flat Pack



| LQFP <u>DEVICE</u> LQFP = Low Quad Flat Pack 1.4mm Thick <u>NUMBER LEADS</u> | 100 | T | 25 | - Lead Plating - | Option | | | | | | | | | | | | | | |
|---|------------|----------|--|-------------------------|---------------|----|-------|----|-------|----|--------|------|-------|------|-------|------|-------|--|--|
| | | | <u>LEAD PITCH (MIL)</u> | | | | | | | | | | | | | | | | |
| | | | <table border="1"> <thead> <tr> <th>MIL</th> <th>MM</th> </tr> </thead> <tbody> <tr> <td>40</td> <td>1.0mm</td> </tr> <tr> <td>30</td> <td>0.8mm</td> </tr> <tr> <td>25</td> <td>0.65mm</td> </tr> <tr> <td>19.7</td> <td>0.5mm</td> </tr> <tr> <td>15.7</td> <td>0.4mm</td> </tr> <tr> <td>11.8</td> <td>0.3mm</td> </tr> </tbody> </table> | MIL | MM | 40 | 1.0mm | 30 | 0.8mm | 25 | 0.65mm | 19.7 | 0.5mm | 15.7 | 0.4mm | 11.8 | 0.3mm | | |
| MIL | MM | | | | | | | | | | | | | | | | | | |
| 40 | 1.0mm | | | | | | | | | | | | | | | | | | |
| 30 | 0.8mm | | | | | | | | | | | | | | | | | | |
| 25 | 0.65mm | | | | | | | | | | | | | | | | | | |
| 19.7 | 0.5mm | | | | | | | | | | | | | | | | | | |
| 15.7 | 0.4mm | | | | | | | | | | | | | | | | | | |
| 11.8 | 0.3mm | | | | | | | | | | | | | | | | | | |
| | | | <u>LEAD PLATING</u> | | | | | | | | | | | | | | | | |
| <u>PACKAGING</u> T = Tray E7A = 7" Reel E13A = 13" Reel X = Small Pack E = Carrier (No Reel) | | | Blank = Sn85/Pb15 T = Sn100 Tin B = Sn97/Bi3.0 C = Sn98/Cu2.0 | | | | | | | | | | | | | | | | |
| | | | <u>OPTIONS</u> Blank = Unspecified DE = Daisy Chain Even ISO = Isolated D = Die | | | | | | | | | | | | | | | | |

Substituting LQFP



Suffix Codes:

"DE" = Daisy Chain "Even" (1-2, 3-4, 5-6, 7-8, etc) "ISO" = Isolated connections "BUS" = All Leads Connected.

Lead Free Plating: "TIN" = "T" = Sn100, B = Sn97/Bi3.0 C = Sn98/Cu2.0

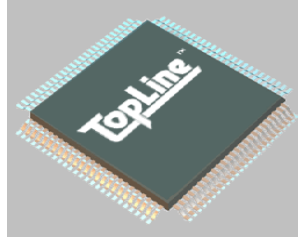
Pack: "T" = Tray, E13A = 13" Reel, E7A = 7" Reel, "E" = Carrier Tape without Reel, "X" = mini Pack Bags

"D" = Silicon Dummy DIE

Footprint Adder assumed 2.0mm.

Pitch in mils: 15.7 = 0.4mm, 19.7 = 0.5mm, 25 = 0.65mm, 30 = 0.8mm, 40 = 1.0mm

QFP Quad Flat Pack



QFP

100

T

25

-

3.9

-

Options

DEVICE

QFP = Quad Flat Pack
also known as
PQFP and MQFP

NUMBER LEADS

LEAD PITCH (MIL)

| MIL | MM |
|------|--------|
| 40 | 1.0mm |
| 30 | 0.8mm |
| 25 | 0.65mm |
| 19.7 | 0.5mm |
| 15.7 | 0.4mm |

FOOTPRINT

Add to body for
total tip to tip
dimensions.

2.6 = 2.6mm

3.2 = 3.2mm

3.9 = 3.9mm

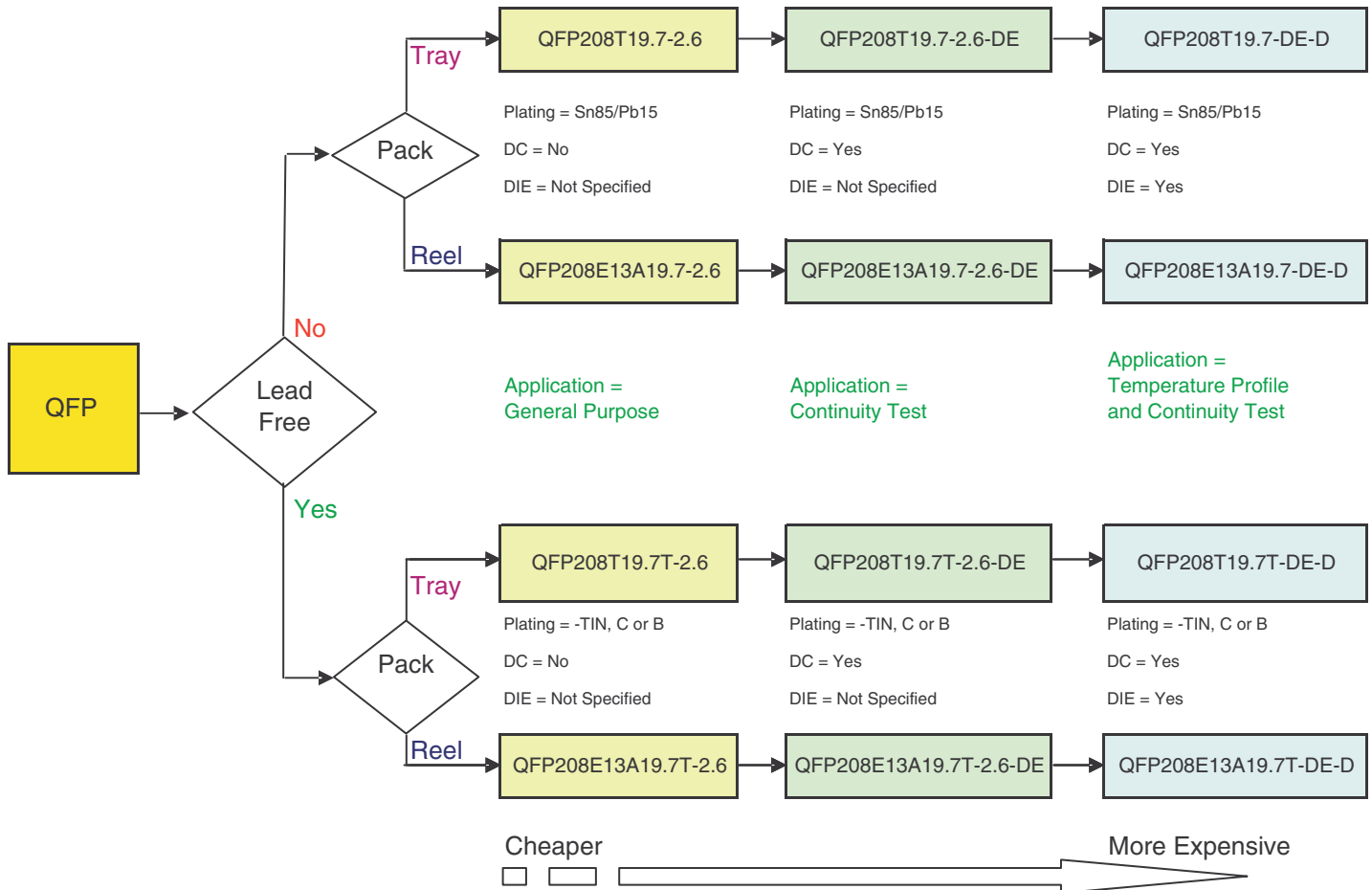
PACKAGING

T = Tray
E7A = 7" Tape & Reel
E13A = 13" Tape & Reel
X = Single Pack

OPTIONS

Blank = Unspecified
DE = Daisy Chain Even
ISO = Isolated
D = Die

Substituting QFP



Suffix Codes:

"DE" = Daisy Chain "Even" (1-2, 3-4, 5-6, 7-8, etc) "ISO" = Isolated connections "BUS" = All Leads Connected.

Lead Free Plating: "TIN" = "T" = Sn100, B = Sn97/Bi3.0 C = Sn98/Cu2.0

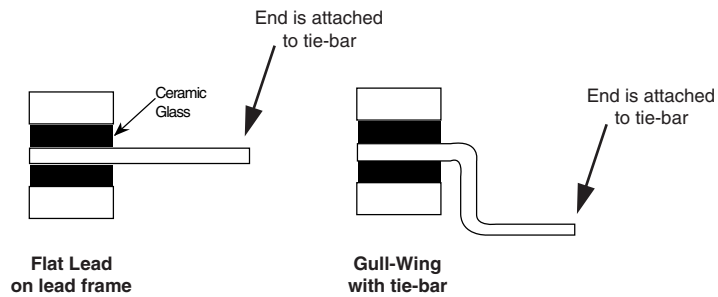
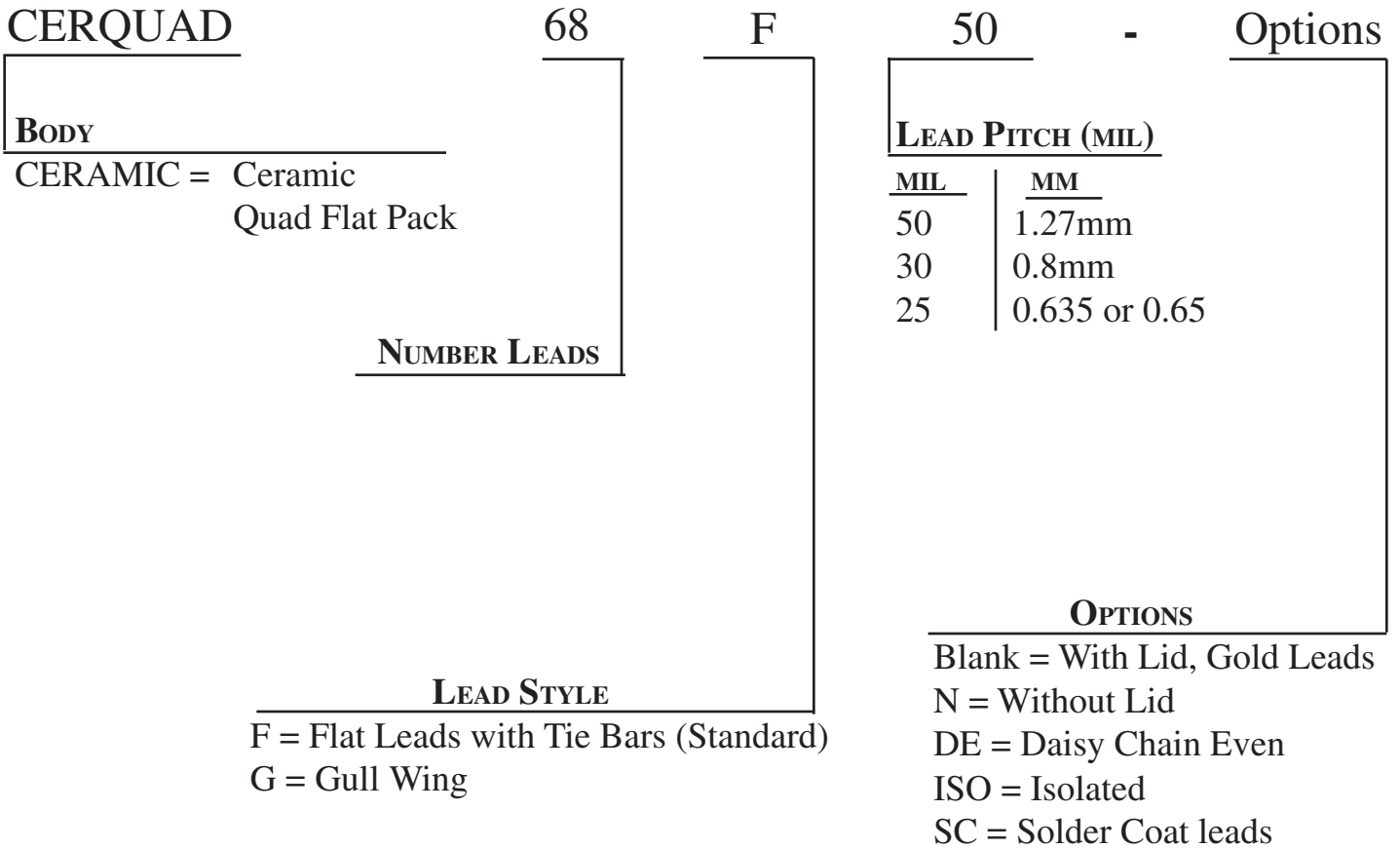
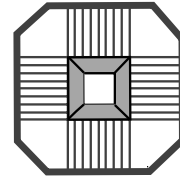
Pack: "T" = Tray, E13A = 13" Reel, E7A = 7" Reel, "E" = Carrier Tape without Reel, "X" = mini Pack Bags

"D" = Silicon Dummy DIE

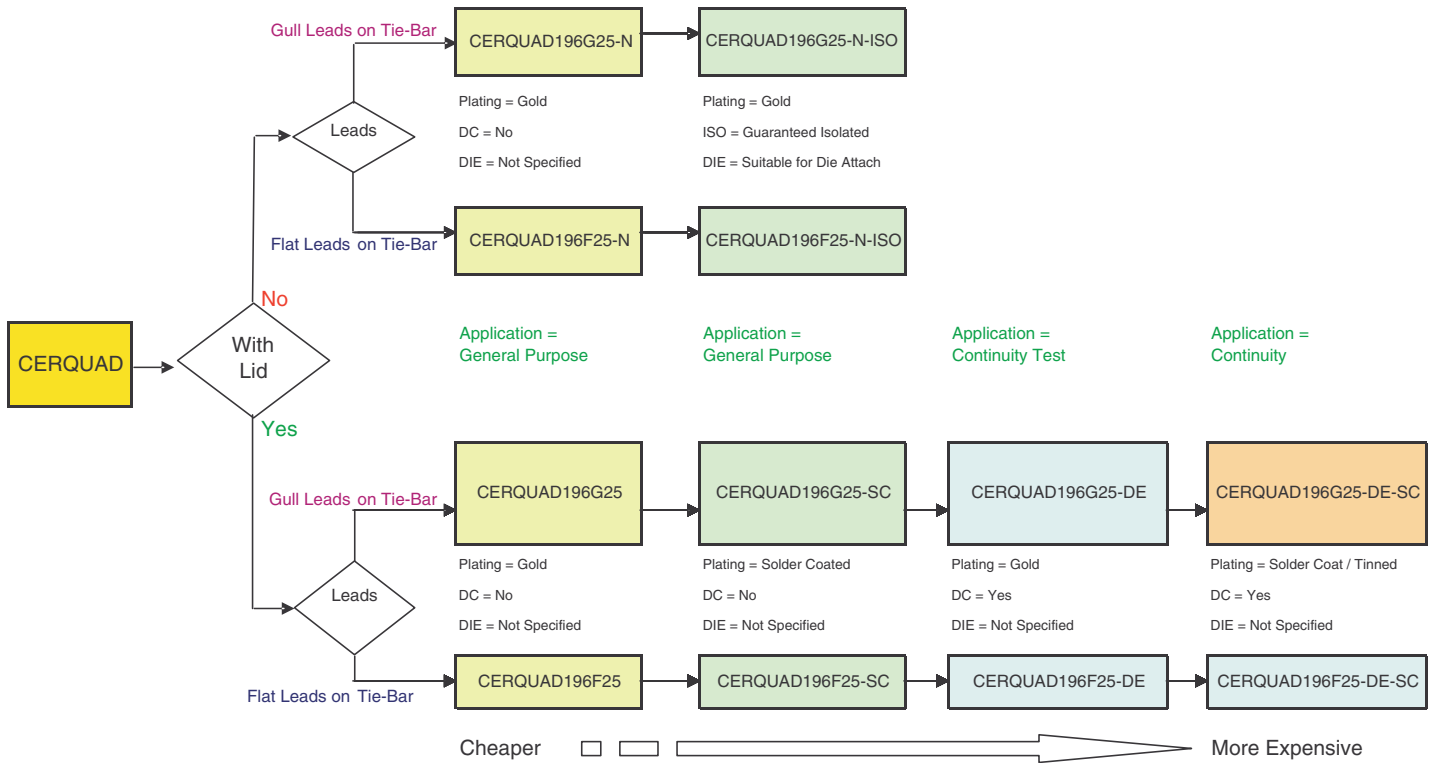
"2.6" = Footprint Adder (mm) (Typically: 2.6, 3.2 or 3.9 depending on lead count & body size)

Pitch in mils: 15.7 = 0.4mm, 19.7 = 0.5mm, 25 = 0.65mm, 30 = 0.8mm, 40 = 1.0mm

CERQUAD Ceramic Quad Flat Pack

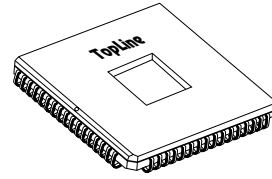


Substituting "CERQUAD"

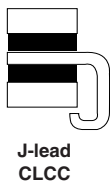


Suffix Codes:
 "DE" = Daisy Chain "Even" (1-2, 3-4, 5-6, 7-8, etc) "ISO" = Isolated connections
 Plating: Blank = Gold SC = Solder Coated with Tinned Sn63 Solder
 Pack: "G" = Gull Wing Leads on Tie Bar "F" = Flat Leads on Tie-Bar.
 Note: "F" and "G" Leads must be trimmed and formed by customer prior to assembly.

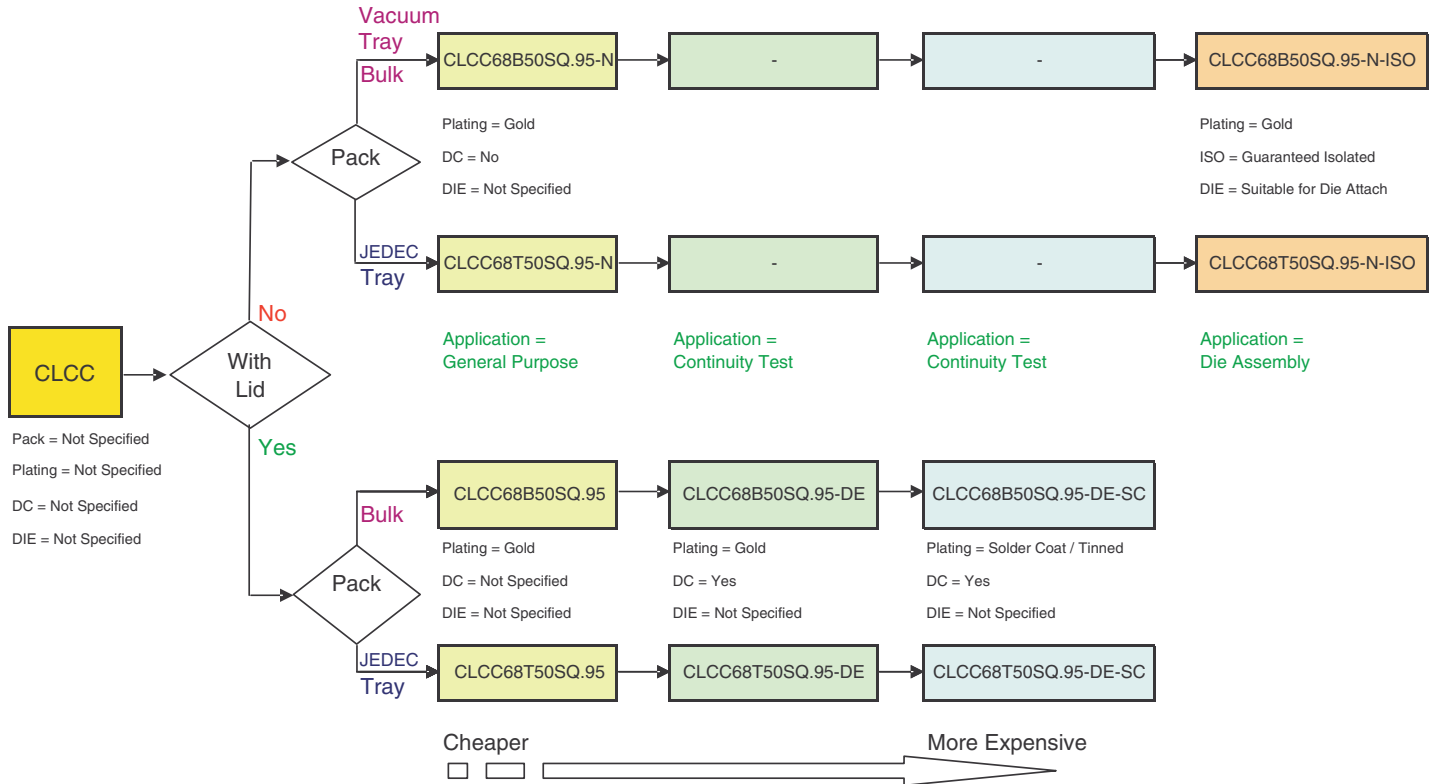
CLCC "J" Lead Carrier



| | | | | | | | | |
|--|--|-------------------|---|------------|-----------|----|--------|--|
| CLCC <hr/> BODY CERAMIC = Ceramic Quad Flat Pack <div style="text-align: right;"><u>NUMBER LEADS</u></div> | 68 <hr/> <div style="text-align: center;"><u>LEAD STYLE</u></div> J = J-Bend Leads (Standard) | J <hr/> | 50 <hr/> LEAD PITCH (MIL) <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;"><u>MIL</u></td> <td style="text-align: center;"><u>MM</u></td> </tr> <tr> <td style="text-align: center;">50</td> <td style="text-align: center;">1.27mm</td> </tr> </table> | <u>MIL</u> | <u>MM</u> | 50 | 1.27mm | - <hr/> Options <div style="text-align: center;"><u>OPTIONS</u></div> Blank = With Lid, Gold Leads (Standard) N = Without Lid DE = Daisy Chain Even ISO = Isolated SC = Solder Coat Leads |
| <u>MIL</u> | <u>MM</u> | | | | | | | |
| 50 | 1.27mm | | | | | | | |



Substituting CLCC

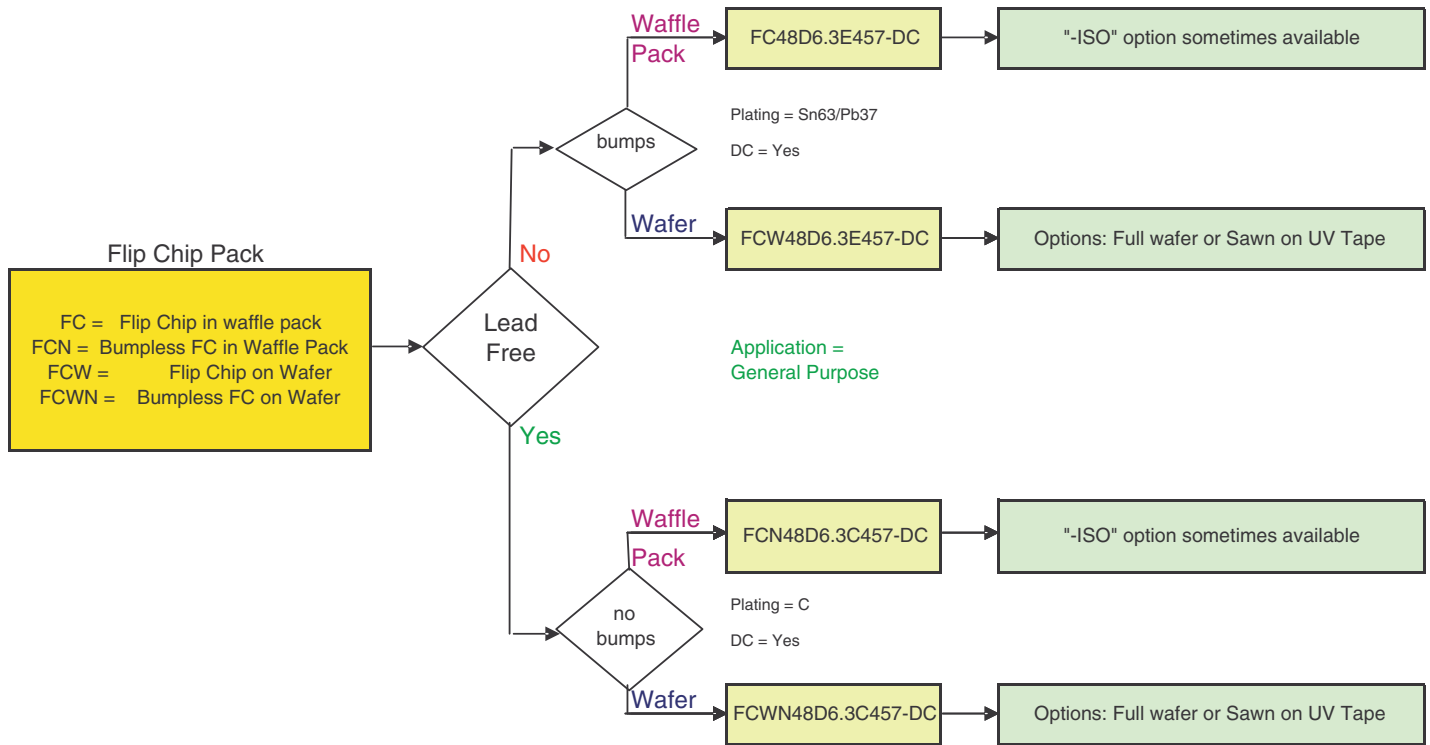


Suffix Codes:
 "DE" = Daisy Chain "Even" (1-2, 3-4, 5-6, 7-8, etc) "ISO" = Isolated connections
 Plating: Blank = Gold SC = Solder Coated
 Pack: "M" = Tubes, B = Bulk or Vacuum formed Trays T = JEDEC MatrixTrays

Flip Chip

| | | | | | |
|---|-------------------------------|--|---|---|---|
| <p><u>FC</u></p> <p>SERIES</p> <p>FC = Flip Chip (standard) FCN = Bumpless FCW = Bump Wafer FCWN = Bumpless Wafer</p> | <p>48</p> <p>BUMPS</p> | <p>D</p> <p>BUMP SIZE</p> <p>C = 165µm D = 190µm G = 135µm H = 105µm</p> | <p>5.08</p> <p>DIE SIZE</p> <p>millimeter (mm)</p> | <p>E</p> <p>BUMP COMPOSITION</p> <p>E = Eutectic 63/37 N = Nickel G = Gold C = Sn/Ag/Cu</p> | <p>457 - DC</p> <p>BUMP PITCH</p> <p>micron (µm)</p> <p>OPTION</p> <p>DC = Daisy Chain UVR = Sawn on UV Tape with ring UV = Sawn on UV Tape E7A = Tape & Reel</p> |
|---|-------------------------------|--|---|---|---|

Substituting FC



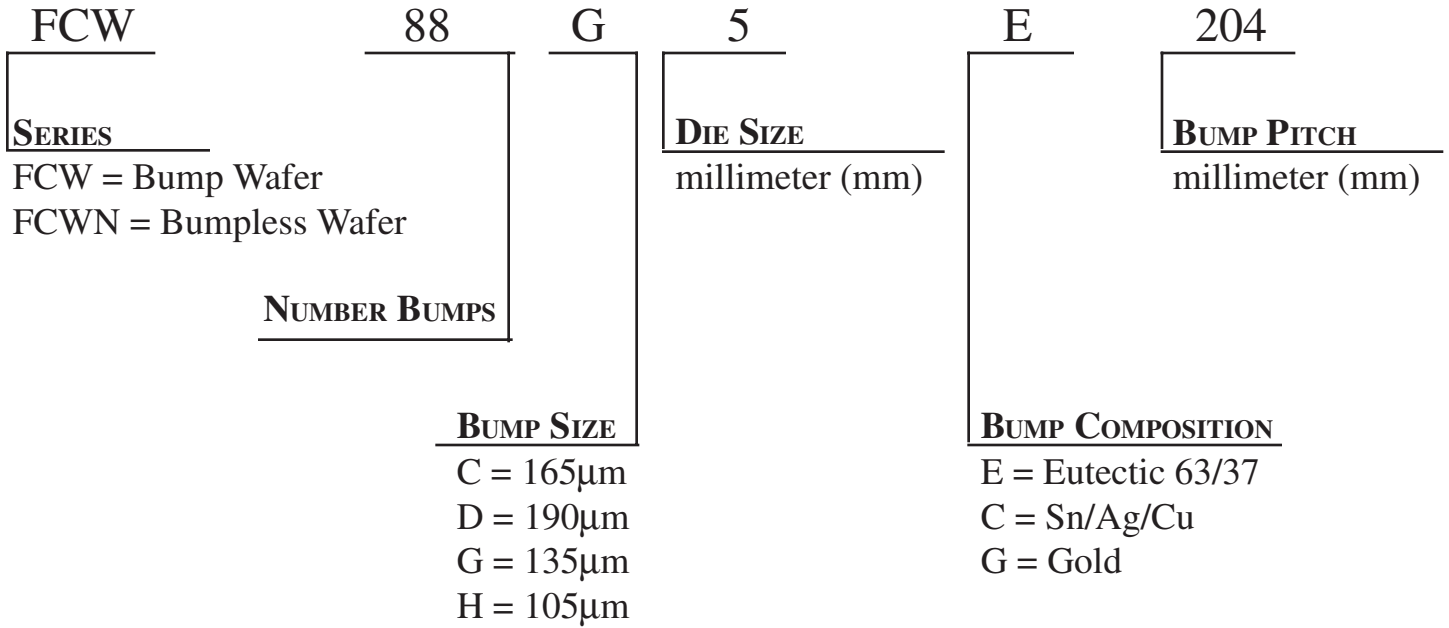
Suffix Codes:

"DC" = Daisy Chain (See Drawing for Details) "ISO"= Isolated connections

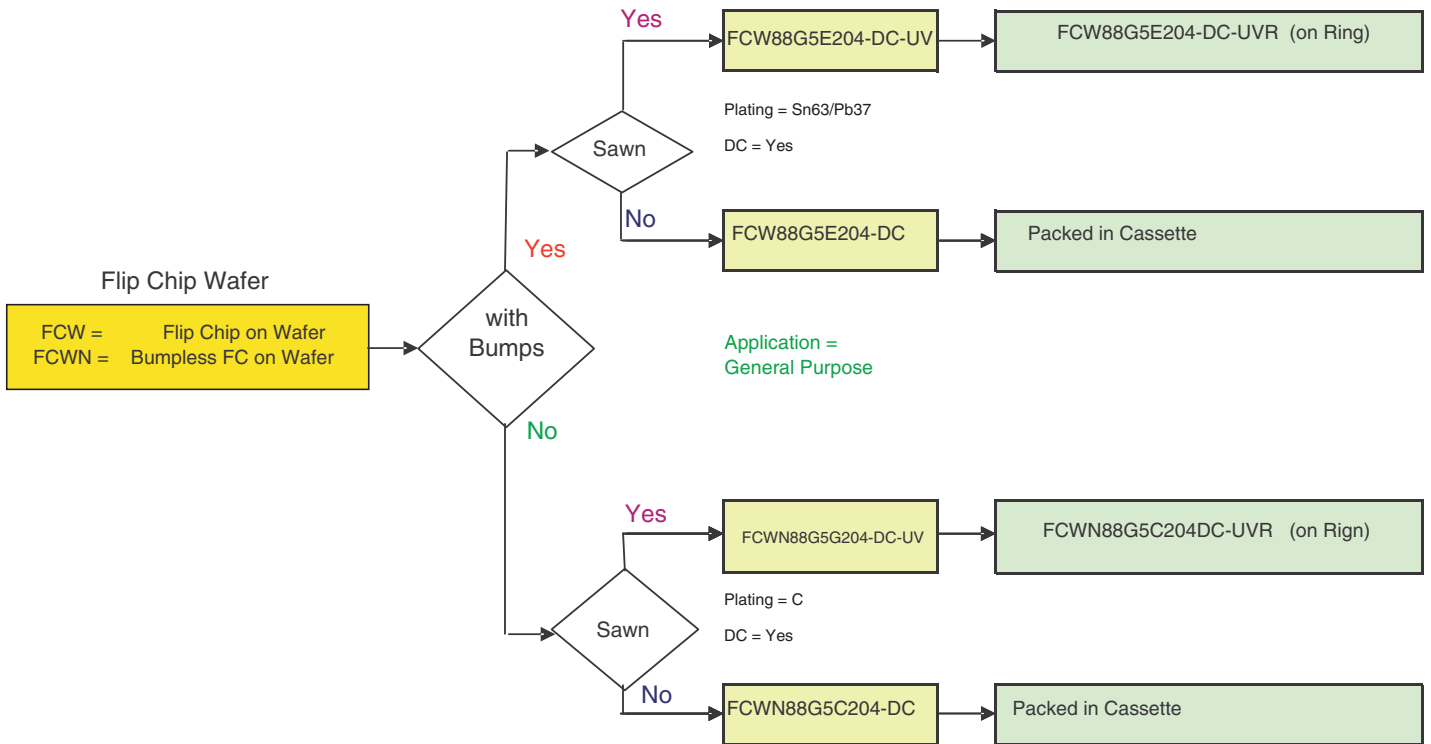
Plating: "E" = Sn63/Pb37, G = Gold C = 95.5Sn/3.5Ag/1.0Cu

Pack: Normally in 2" Square Waffle Packs

Flip Chip Wafers

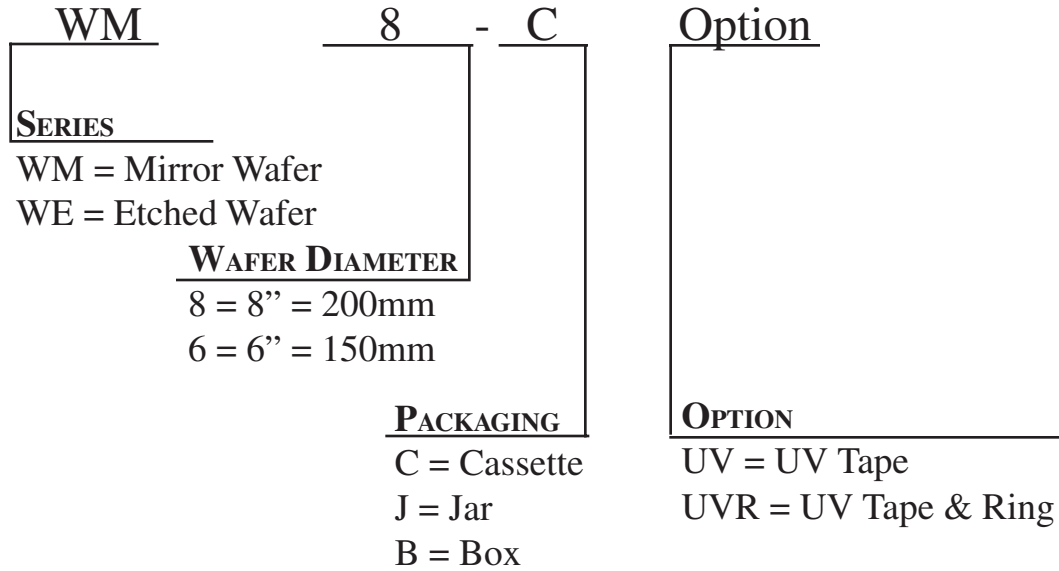


Substituting Flip Chip Wafers

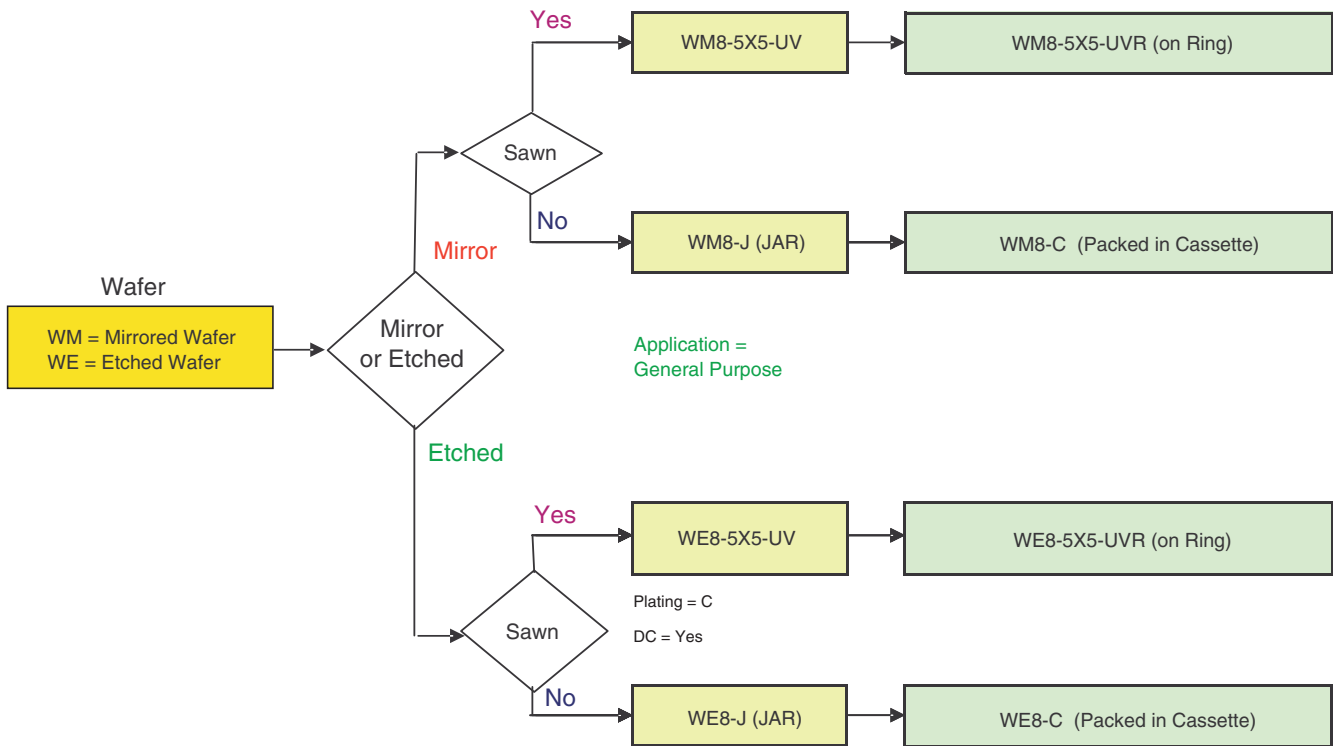


Suffix Codes:
 "DC" = Daisy Chain (See Drawing for Details) "ISO" = Isolated connections
 Plating: "E" = Sn63/Pb37, G = Gold C = 95.5Sn/3.5Ag/1.0Cu
 Pack: Normally in 2" Square Waffle Packs

Silicon Wafer



Substituting Silicon Wafers



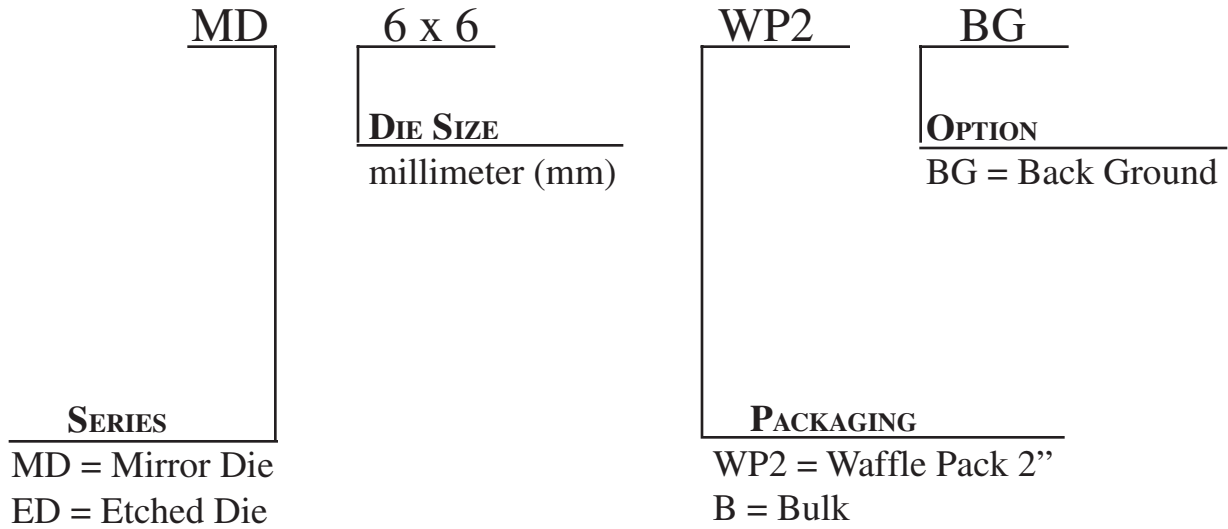
Suffix Codes:

"DC" = Daisy Chain (See Drawing for Details) "ISO" = Isolated connections

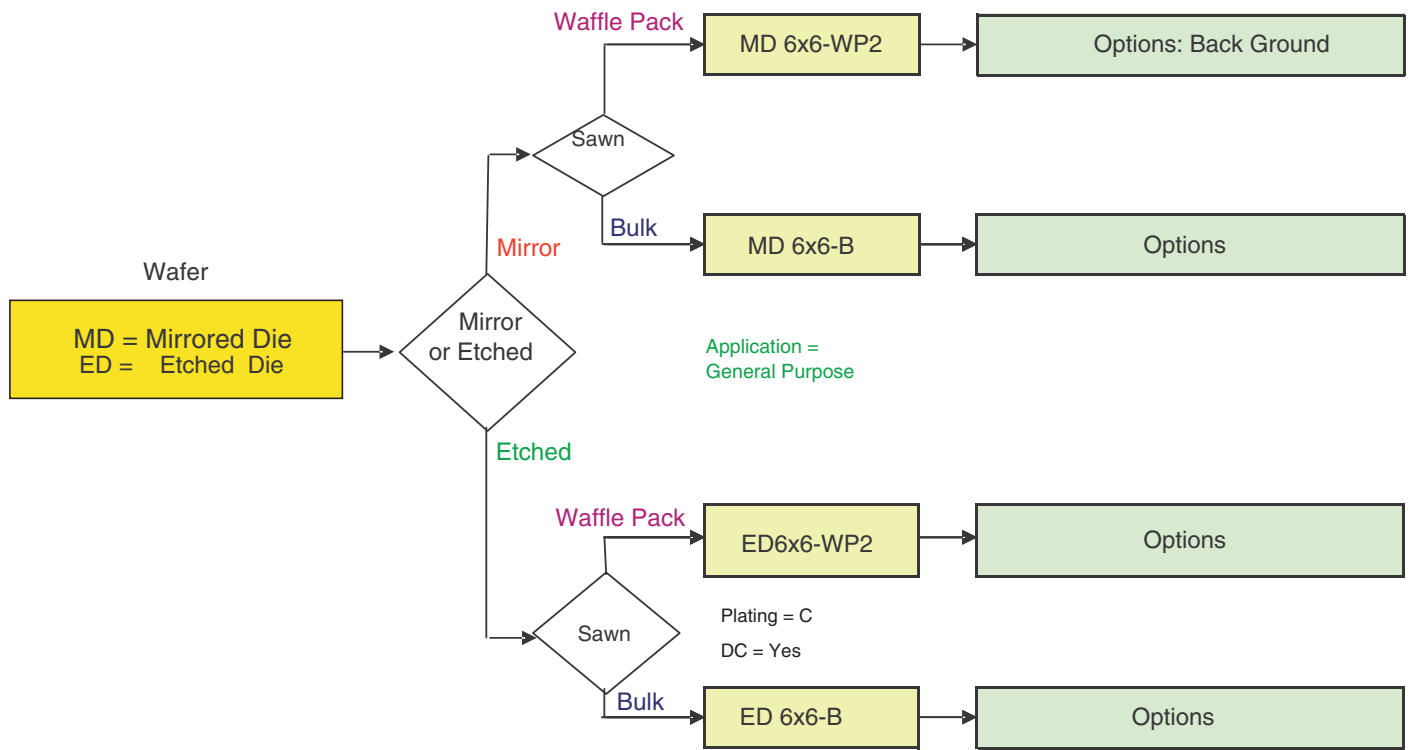
Plating: "E" = Sn63/Pb37, G = Gold C = 95.5Sn/3.5Ag/1.0Cu

Pack: Normally in 2" Square Waffle Packs

Silicon Die



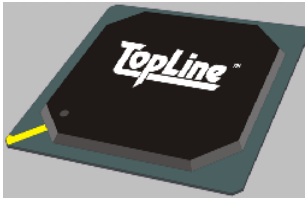
Substituting Silicon Die



Suffix Codes:

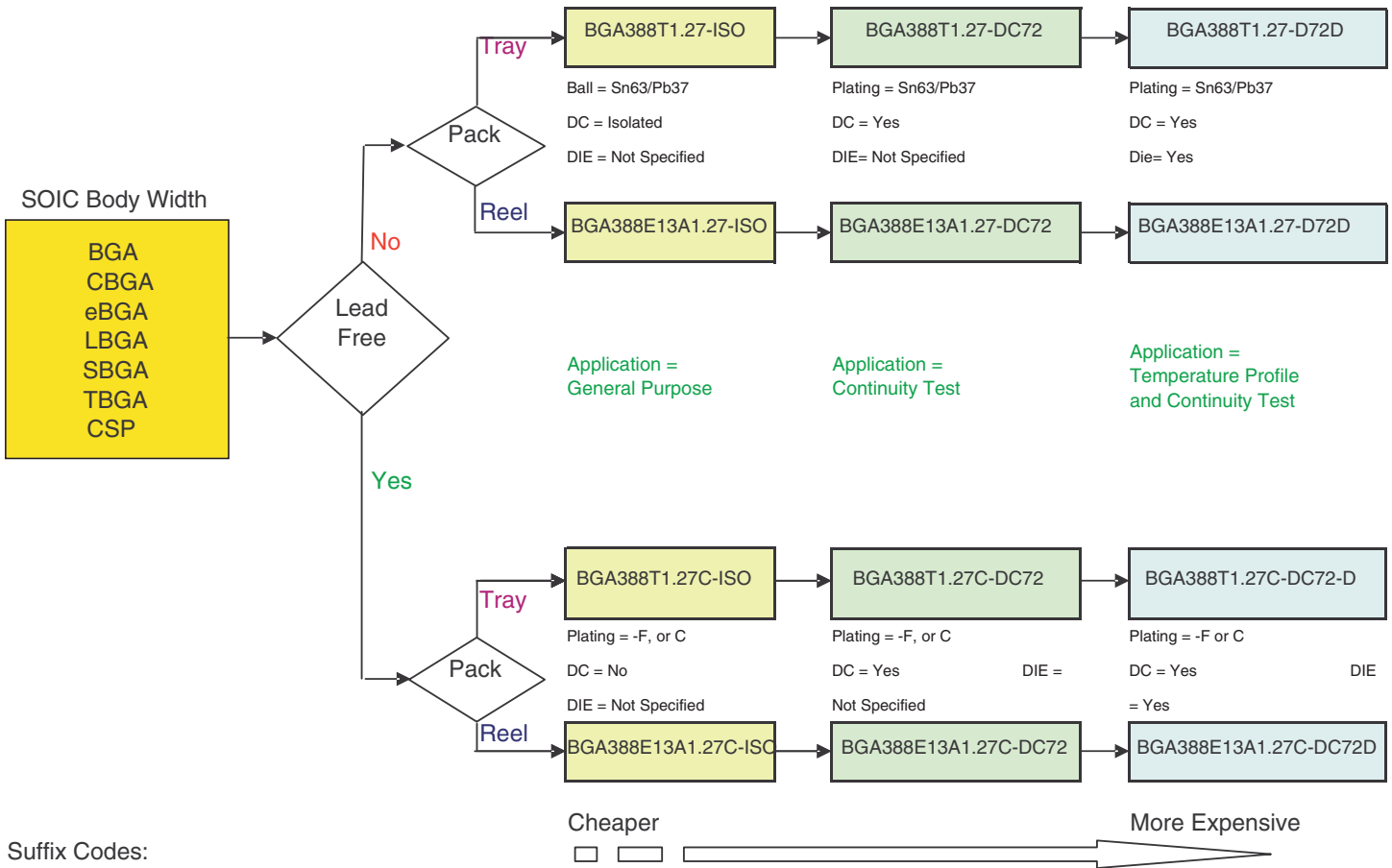
Pack: Normally in 2" Square Waffle Packs

BGA Ball Grid Array



| <u>BGA</u> | <u>225</u> | <u>T</u> | <u>1.5</u> | <u>Ball</u> | <u>Option</u> | <u>-</u> | <u>DC15</u> | <u>-</u> | <u>D</u> |
|----------------------|------------------------|----------|-------------------|----------------------------|---------------|----------|-------------|----------|----------|
| DEVICE | NBR. BALLS | | PITCH (MM) | DAISY CHAIN | | | | | |
| BGA = Plastic | | | 1.5 | Refers to a drawing number | | | | | |
| CBGA = Ceramic | | | 1.27 | | | | | | |
| SBGA = Heat Spreader | | | 1.00 | | | | | | |
| CSP = Chip Scale | | | .8 | | | | | | |
| | | | .75 | | | | | | |
| | | | .5 | | | | | | |
| | PACKAGING | | | CODE | | | | | |
| | T = Trays | | | CBGA | | | | | |
| | E7A = 7" Tape & Reel | | | Blank = Sn10/Pb90 Standard | | | | | |
| | E13A = 13" Tape & Reel | | | High Temperature | | | | | |
| | X = Single Pack | | | L = Sn62/Pb34/Ag2 | | | | | |
| | | | | Low Temperature Option | | | | | |
| | | | | LEAD FREE (NO Pb) | | | | | |
| | | | | F = Sn96.5/Ag3.5 | | | | | |
| | | | | C = Sn96.3/Ag3.2/Cu0.5 | | | | | |
| | | | | or Sn95.5/Ag4.0/Cu0.5 | | | | | |
| | | | | BGA, SBGA, eBGA, LBGA | | | | | |
| | | | | Blank = Sn63 Standard | | | | | |
| | | | | SOLDER BALL | | | | | |
| | | | | Blank = Unspecified | | | | | |
| | | | | D = Die | | | | | |

Substituting BGA



Suffix Codes:

"DIE" is sometimes abbreviated to "D".

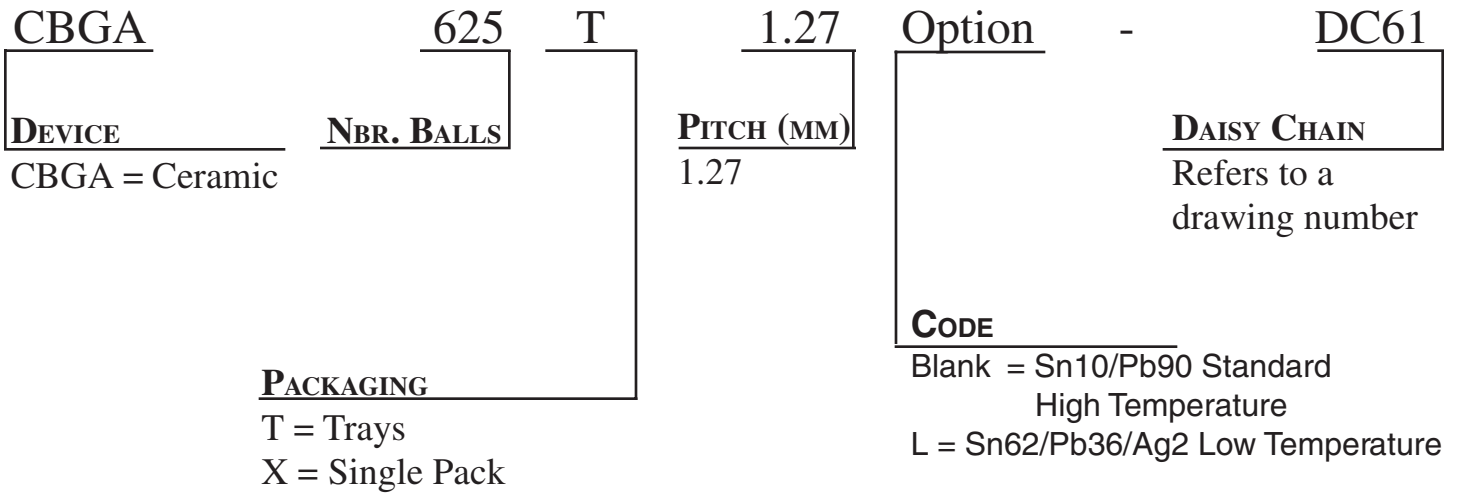
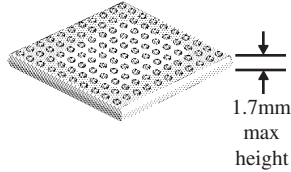
"DC" = Daisy Chain (SEE DRAWING) "ISO" = Isolated connections "BUS" = All Leads Connected.

Lead Free Plating: F = Sn96.5/Ag3.5 C = Sn95.6/Ag4.0/Cu0.5

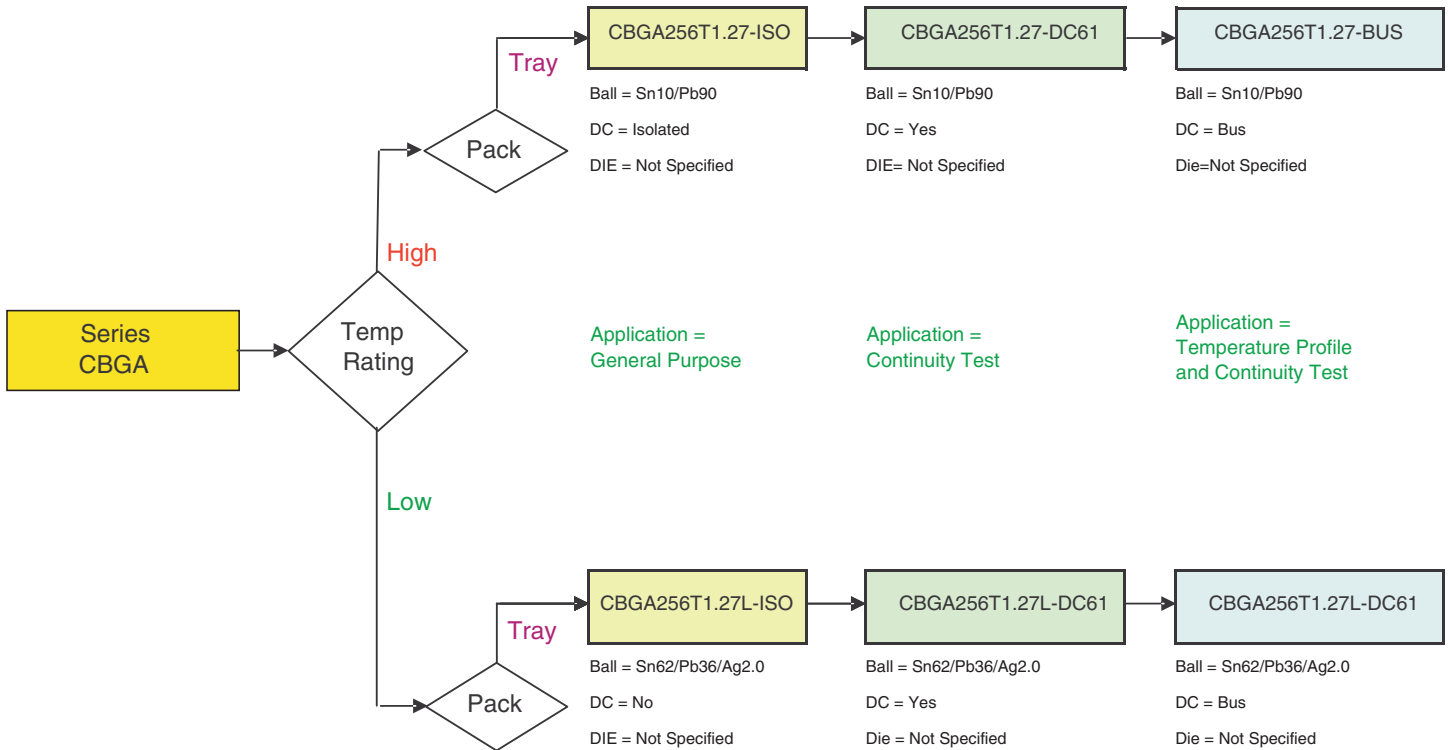
Pack: "T" = TRAYS, E13A = 13" Reels, E7A = 7" Reel (special), "X" = mini Pack Bags

For CBGA Only: Add letter "L" for low temperature ball.

CBGA
Ceramic Ball Grid Array



Substituting CBGA



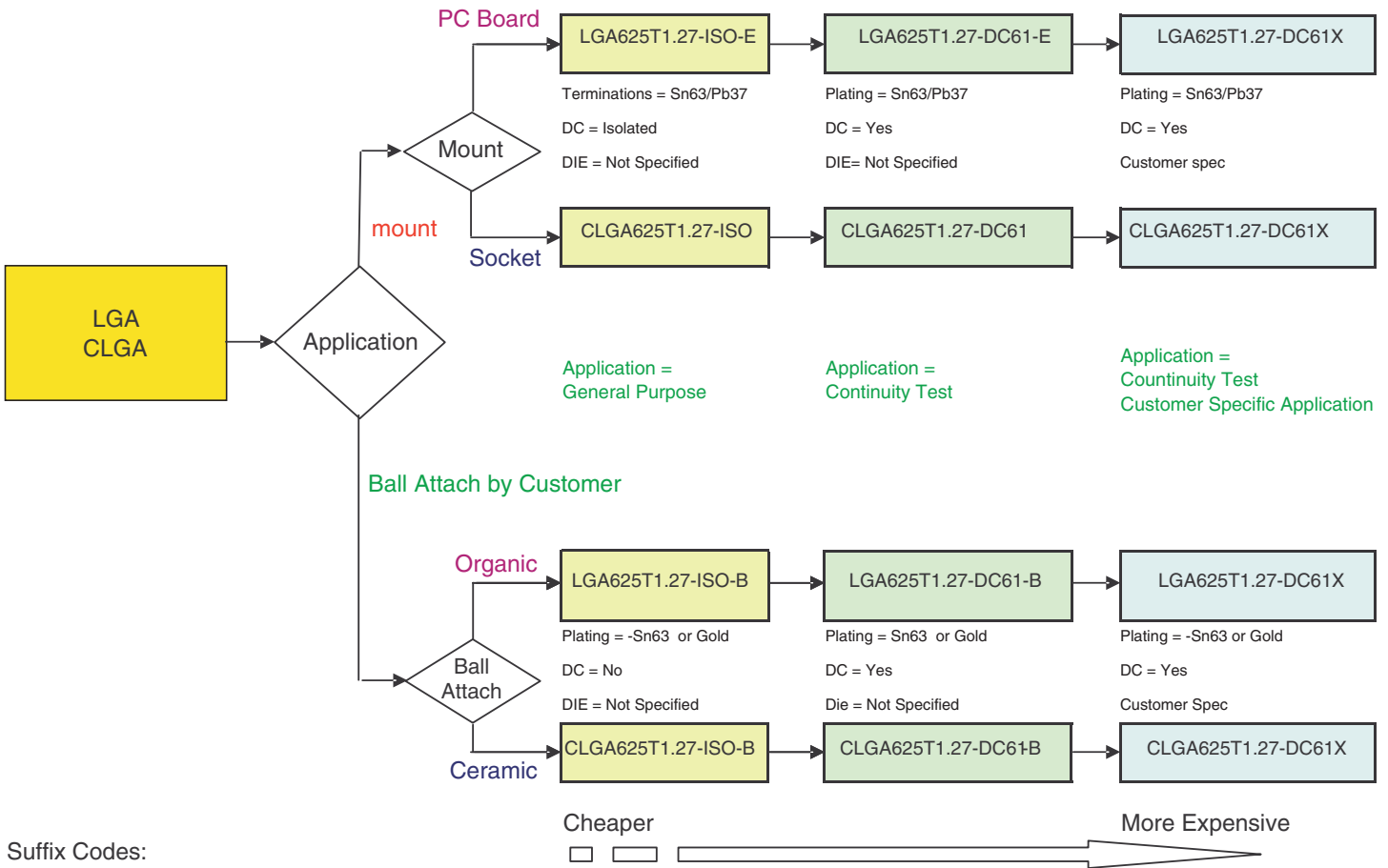
Suffix Codes:

"DC" = Daisy Chain (SEE DRAWING) "ISO" = Isolated connections "BUS" = All Leads Connected.
 Lead Free Plating: Blank = Sn10/Pb90 (standard High Temp) L = Sn62/Pb36/Ag2.0 (Low Temp)
 Pack: "T" = TRAYS "X" = mini Pack Bags

LGA
Land Grid Array

| | | | | | | |
|------------------|------------|------------------|--------------|--|--|--|
| CLGA | 625 | T | 1.27 | - DC61 | A | 3 |
| <u>Substrate</u> | <u>I/O</u> | <u>Packaging</u> | <u>Pitch</u> | <u>Circuit</u> | <u>Options</u> | <u>Substrate</u> |
| Ceramic | | T = Trays | mm | DC = Daisy Chain Pads BUS = All Pads Shorted ISO = All Pads Isolated | Blank = Standard for Socket E = Raised Pad 5mil B = Ball Attach by Customer X = Customer Spec | Blank = 1.0mm thick (Standard) 2 = 1.5mm thick 3 = 3mm thick |

Substituting LGA



Suffix Codes:

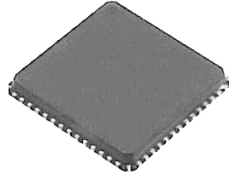
Organic = FR5 Substrate, Ceramic = Alumina

"DC" = Daisy Chain (SEE DRAWING) "ISO" = Isolated connections "BUS" = All Leads Connected.

Lead Free Plating: F = Sn96.5/Ag3.5 G = Gold Other plating available

Pack: "T" = TRAYS

SLP, MLF, QFN, MCC



SLP

DEVICE

SLP
MLF
QFN

16

NUMBER LEADS

PACKAGING

M = Tubes
T = Trays
E7A = 7" Tape & Reel
X = Small Pack

M

.5

PITCH (MILS)

.5 = 0.5mm
.65 = 0.65mm
.8 = 0.8mm

Lead
Plating - Option

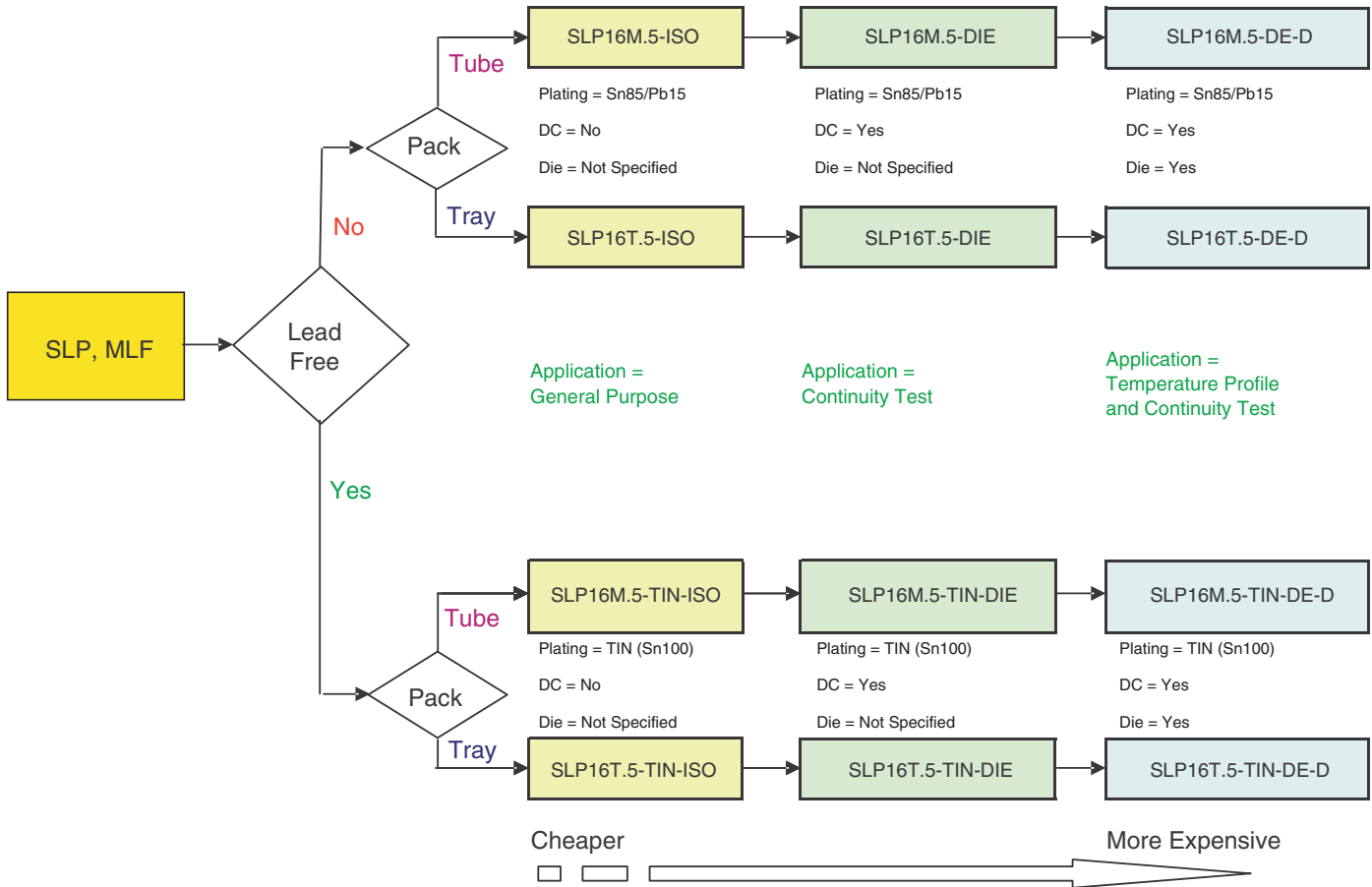
LEAD PLATING

Blank = Sn85/Pb15
TIN = Sn100
F = Ni-Pd

OPTION

Blank = unspecified
DE = Daisy Chain Even
ISO = Isolated

Substituting SLP, MLF, QFN



Suffix Codes:

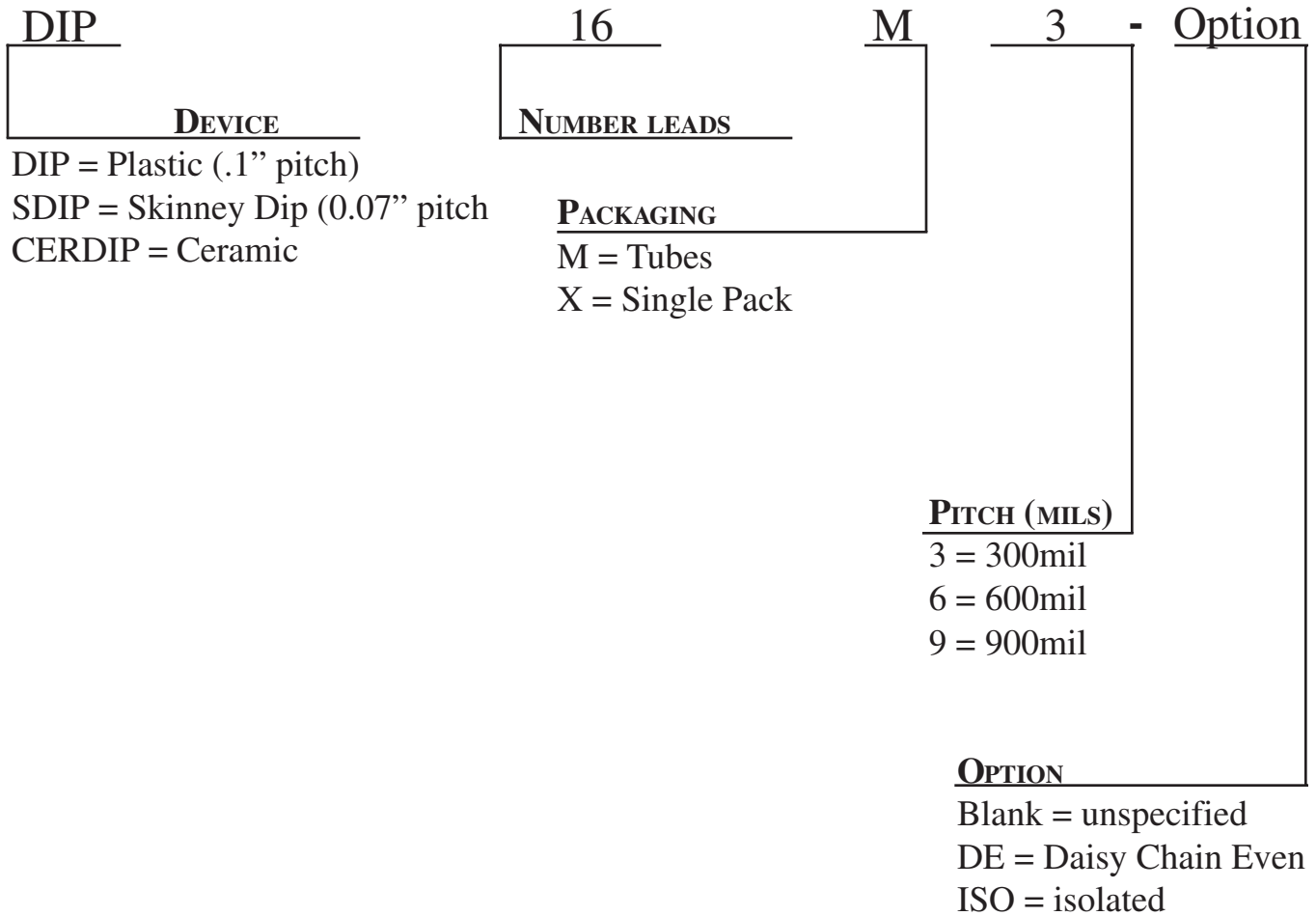
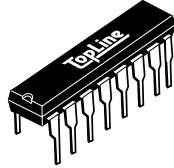
"DE" = Daisy Chain "Even" (1-2, 3-4, 5-6, 7-8, etc) "ISO" = Isolated connections "BUS" = All Leads Connected.

Lead Free Plating: "TIN" = "T"

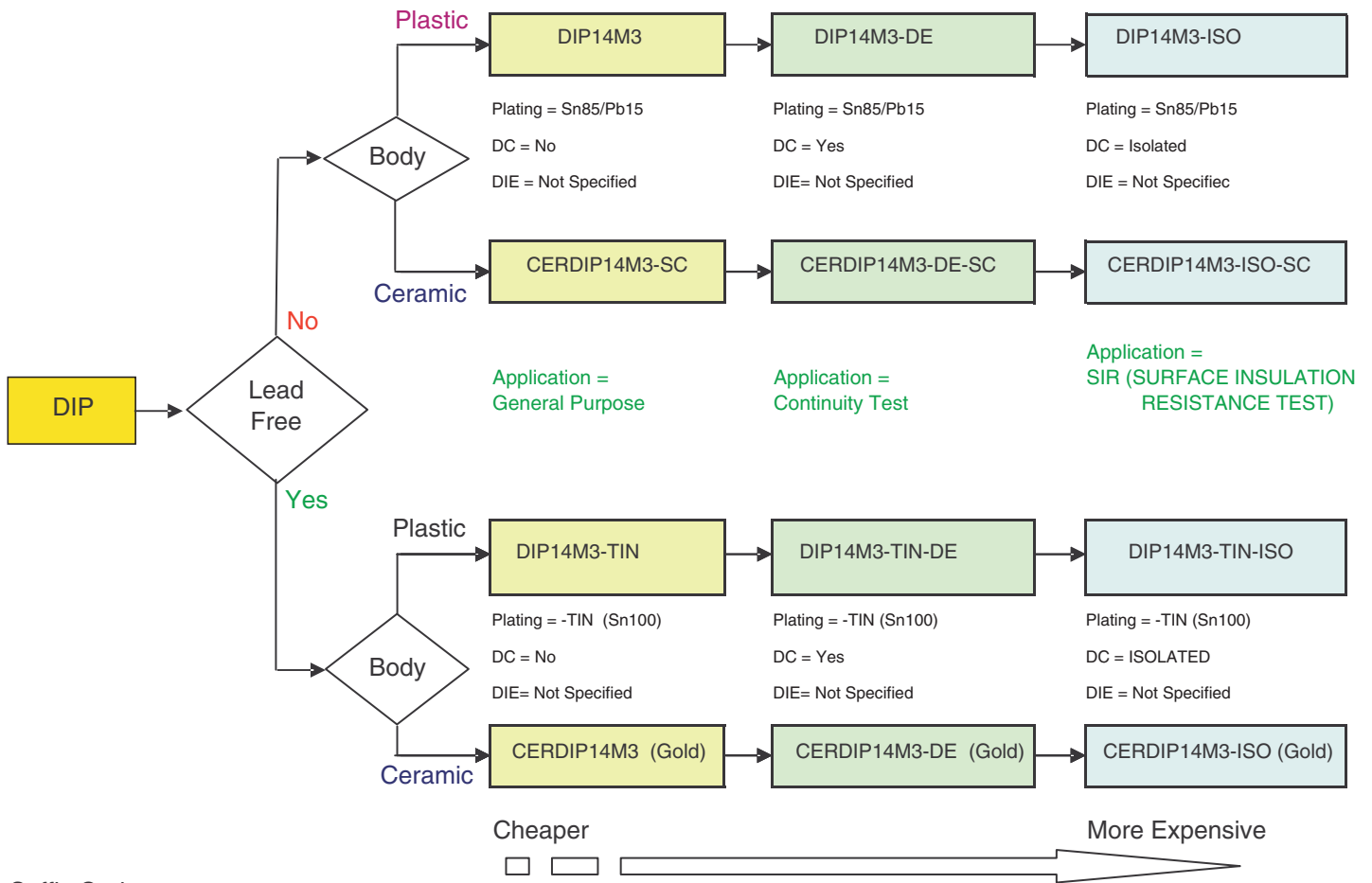
Pack: "T" = Tray, "M" = Tube, "E7A" = 7" Reel, "E" = Carrier Tape without Reel, "X" = mini Pack Bags, "D" = Silicon Dummy Die

Pitch in mils: .5 = 0.5mm, .65 = 0.65mm, .8 = 0.8mm

DIP & CERDIP



Substituting DIP & Cerdip



Suffix Codes:

"DE" = Daisy Chain "Even" (1-2, 3-4, 5-6, 7-8, etc) "ISO" = Isolated connections "BUS" = All Leads Connected.

Lead Free Plating: "TIN" = "T"

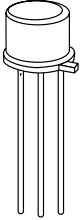
Pack: "F" = Leads on tie bars, M = Tube, "X" = mini Pack Bags

"D" = Silicon Dummy DIE

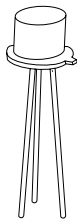
Pitch in mils: .5 = 0.5mm, .65 = 0.65mm, .8 = 0.8mm

TO - Throughhole Transistor

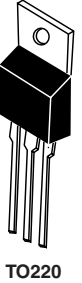
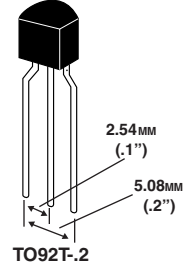
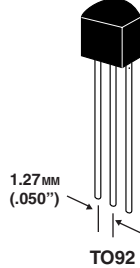
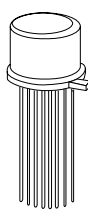
TO5 (1.25" LEAD LENGTH)
TO39 (.75" LEAD LENGTH)



TO18



TO75 6 LEAD
TO99 8 LEAD



TO

DEVICE

TO = Transistor Outline

220

JEDEC REGISTRATION NUMBER

M

PACKAGING

- M = Tubes
- T = Tape & Reel
- C = Carrier
- A = Ammo Tape
- Blank = Bulk

3

OPTION

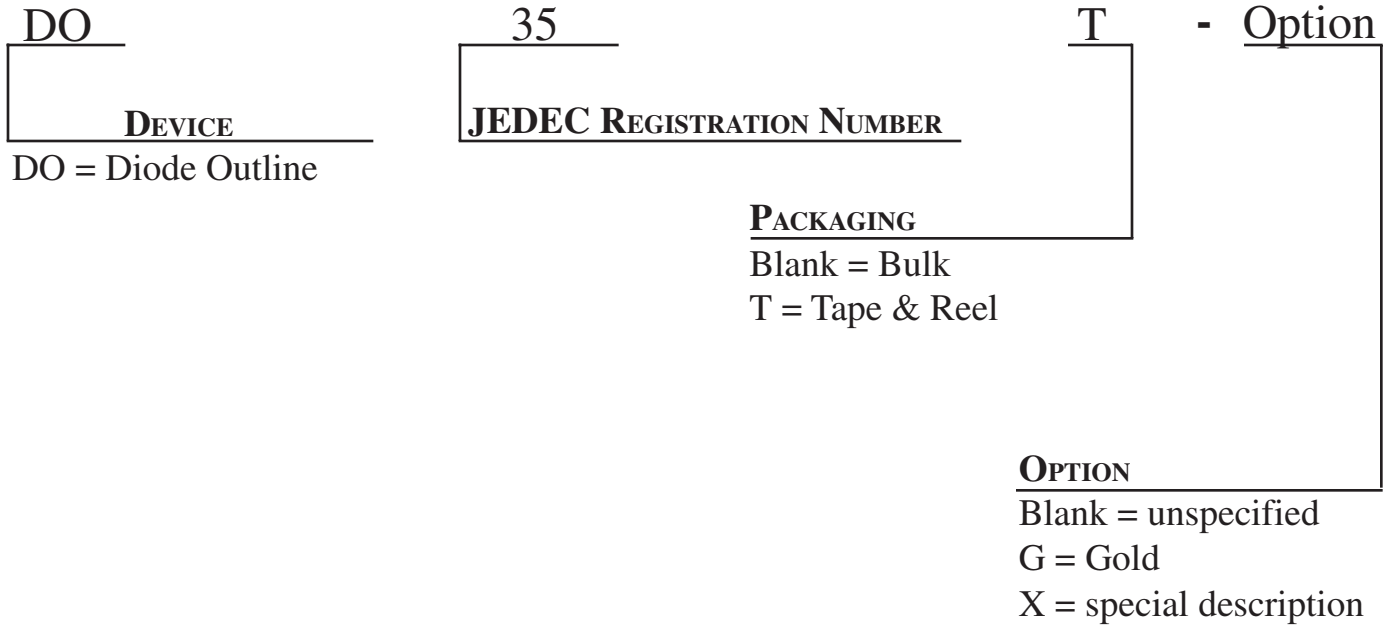
- 3 = 3 Leads
- Blank = Standard

Option

OPTION

- Blank = unspecified
- G = Gold
- X = special description

DO - Throughhole Diodes



Notes



Part Numbering System

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