

## ■ Thin Film Chip Resistor — TR Series



### ■ Application

- Medical equipments, Military equipments
- Converters
- Consumer products
- Communication devices
- Measurement instruments
- Printers

### ■ Features

- Tight tolerance from  $\pm 0.01\%$ ,  $\pm 0.1\%$ ,  $\pm 0.25\%$ ,  $\pm 0.5\%$ ,  $\pm 1\%$
- Low T.C.R.  $\pm 10\text{ppm}$ ,  $\pm 25\text{ppm}$ ,  $\pm 50\text{ppm}$

■ Type Dimension



TR0402 / TR0603 / TR0805 / TR1206 /  
TR1210 / TR2010 / TR2512

TR1218

■ Dimension

Unit: mm

| TYPE   | L           | W           | H           | l <sub>1</sub> | l <sub>2</sub> |
|--------|-------------|-------------|-------------|----------------|----------------|
| TR0402 | 1.00 ± 0.10 | 0.50 ± 0.05 | 0.30 ± 0.05 | 0.15 ± 0.10    | 0.20 ± 0.10    |
| TR0603 | 1.60 ± 0.20 | 0.80 ± 0.15 | 0.40 ± 0.10 | 0.30 ± 0.20    | 0.30 ± 0.10    |
| TR0805 | 2.00 ± 0.20 | 1.25 ± 0.15 | 0.50 ± 0.15 | 0.30 ± 0.15    | 0.40 ± 0.15    |
| TR1206 | 3.05 ± 0.10 | 1.60 ± 0.20 | 0.55 ± 0.15 | 0.40 ± 0.20    | 0.50 ± 0.20    |
| TR1210 | 3.05 ± 0.10 | 2.50 ± 0.20 | 0.55 ± 0.15 | 0.50 ± 0.20    | 0.50 ± 0.20    |
| TR2010 | 5.00 ± 0.20 | 2.50 ± 0.20 | 0.55 ± 0.10 | 0.60 ± 0.20    | 0.60 ± 0.20    |
| TR1218 | 3.10 ± 0.10 | 4.60 ± 0.10 | 0.55 ± 0.05 | 0.40 ± 0.20    | 0.50 ± 0.20    |
| TR2512 | 6.30 ± 0.20 | 3.20 ± 0.20 | 0.55 ± 0.10 | 0.60 ± 0.20    | 0.60 ± 0.20    |

## Standard Electrical Specifications

| TYPE   | Rated Power at 70°C | Max Working Voltage | Max Overload Voltage | T.C.R. (PPM/°C) | Resistance Range       |             |                       |             |
|--------|---------------------|---------------------|----------------------|-----------------|------------------------|-------------|-----------------------|-------------|
|        |                     |                     |                      |                 | T(±0.01%)<br>W(±0.05%) | B(±0.1%)    | C(±0.25%)<br>D(±0.5%) | F(±1%)      |
| TR0402 | 0.063W              | 25V                 | 50V                  | ±10             | -                      | 40.2Ω~42K2Ω | 40.2Ω~42K2Ω           | 40.2Ω~42K2Ω |
|        |                     |                     |                      | ±25             |                        | 10Ω~100KΩ   | 10Ω~100KΩ             | 10Ω~100KΩ   |
|        |                     |                     |                      | ±50             |                        | 10Ω~1MΩ     | 10Ω~1MΩ               | 10Ω~1MΩ     |
| TR0603 | 0.1W                | 75V                 | 150V                 | ±10             | 24.9Ω~100KΩ            | 10Ω~100KΩ   | 10Ω~100KΩ             | 10Ω~100KΩ   |
|        |                     |                     |                      | ±25             |                        | 4.7Ω~332KΩ  | 4.7Ω~332KΩ            | 4.7Ω~332KΩ  |
|        |                     |                     |                      | ±50             |                        | 4.7Ω~4M7Ω   | 4.7Ω~4M7Ω             | 1Ω~4M7Ω     |
| TR0805 | 0.125W              | 150V                | 300V                 | ±10             | 24.9Ω~100KΩ            | 10Ω~220KΩ   | 10Ω~220KΩ             | 10Ω~220KΩ   |
|        |                     |                     |                      | ±25             |                        | 4.7Ω~3M32Ω  | 4.7Ω~3M32Ω            | 4.7Ω~3M32Ω  |
|        |                     |                     |                      | ±50             |                        | 4.7Ω~3M32Ω  | 4.7Ω~3M32Ω            | 1Ω~3M32Ω    |
| TR1206 | 0.25W               | 200V                | 400V                 | ±10             | 24.9Ω~100KΩ            | 10Ω~220KΩ   | 10Ω~220KΩ             | 10Ω~220KΩ   |
|        |                     |                     |                      | ±25             |                        | 4.7Ω~2M74Ω  | 4.7Ω~2M74Ω            | 4.7Ω~2M74Ω  |
|        |                     |                     |                      | ±50             |                        | 4.7Ω~2M74Ω  | 4.7Ω~2M74Ω            | 1Ω~2M74Ω    |
| TR1210 | 0.25W               | 200V                | 400V                 | ±10             | 24.9Ω~100KΩ            | 10Ω~499KΩ   | 10Ω~499KΩ             | 10Ω~499KΩ   |
|        |                     |                     |                      | ±25             |                        | 4.7Ω~1MΩ    | 4.7Ω~1MΩ              | 4.7Ω~1MΩ    |
|        |                     |                     |                      | ±50             |                        | 4.7Ω~1MΩ    | 4.7Ω~1MΩ              | 1Ω~1MΩ      |
| TR2010 | 0.5W                | 200V                | 400V                 | ±10             | 24.9Ω~100KΩ            | 10Ω~499KΩ   | 10Ω~499KΩ             | 10Ω~499KΩ   |
|        |                     |                     |                      | ±25             |                        | 4.7Ω~1MΩ    | 4.7Ω~1MΩ              | 4.7Ω~1MΩ    |
|        |                     |                     |                      | ±50             |                        | 4.7Ω~1MΩ    | 4.7Ω~1MΩ              | 1Ω~1MΩ      |
| TR1218 | 0.5W                | 200V                | 400V                 | ±10             | 24.9Ω~100KΩ            | 10Ω~499KΩ   | 10Ω~499KΩ             | 10Ω~499KΩ   |
|        |                     |                     |                      | ±25             |                        | 4.7Ω~1MΩ    | 4.7Ω~1MΩ              | 4.7Ω~1MΩ    |
|        |                     |                     |                      | ±50             |                        | 4.7Ω~1MΩ    | 4.7Ω~1MΩ              | 1Ω~1MΩ      |
| TR2512 | 0.75W               | 200V                | 400V                 | ±10             | 24.9Ω~100KΩ            | 10Ω~499KΩ   | 10Ω~499KΩ             | 10Ω~499KΩ   |
|        |                     |                     |                      | ±25             |                        | 4.7Ω~1MΩ    | 4.7Ω~1MΩ              | 4.7Ω~1MΩ    |
|        |                     |                     |                      | ±50             |                        | 4.7Ω~1MΩ    | 4.7Ω~1MΩ              | 1Ω~1MΩ      |

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range : -55°C ~ +155°C.

■ Parts Number Explanation

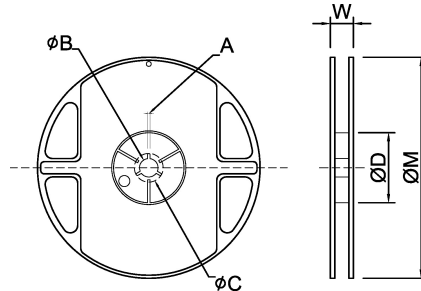
■ Example:



## Appendix For SMD Chip Resistor

### Packaging Information

◆ For TR Series



#### Dimension

Unit: mm

| TYPE                 | SIZE |          | A       | $\phi B$ | $\phi C$ | $\phi D$ | W        | $\phi M$ |
|----------------------|------|----------|---------|----------|----------|----------|----------|----------|
| 0402                 | 7"   | 10K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0   | 60±1.0   | 11.5±2.0 | 178±2.0  |
|                      | 13"  | 40K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0   | 100±1.0  | 11.5±2.0 | 330±2.0  |
|                      | 13"  | 50K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0   | 100±1.0  | 11.5±2.0 | 330±2.0  |
| 0603<br>0805<br>1206 | 7"   | 5K/Reel  | 2.0±0.5 | 13.5±1.0 | 21±1.0   | 60±1.0   | 11.5±2.0 | 178±2.0  |
|                      | 10"  | 10K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0   | 100±1.0  | 11.5±2.0 | 254±2.0  |
|                      | 13"  | 20K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0   | 100±1.0  | 11.5±2.0 | 330±2.0  |
| 1210                 | 7"   | 5K/Reel  | 2.0±0.5 | 13.5±1.0 | 21±1.0   | 60±1.0   | 11.5±2.0 | 178±2.0  |
| 2010/2512<br>1218    | 7"   | 4K/Reel  | 2.0±0.5 | 13.5±1.0 | 21±1.0   | 60±1.0   | 16.0±2.0 | 178±2.0  |

#### Tapping Specification



#### Dimension

Unit: mm

| Packaging  | Type | A         | B         | W        | E         | F        | G        | H        | T         | $\phi D$            | P       |
|------------|------|-----------|-----------|----------|-----------|----------|----------|----------|-----------|---------------------|---------|
| Paper Type | 0402 | 0.70±0.10 | 1.20±0.10 | 8.0±0.20 | 1.75±0.10 | 3.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.45±0.10 | 1.50<br>+0.10<br>-0 | 2.0±0.1 |
|            | 0603 | 1.05±0.20 | 1.80±0.20 | 8.0±0.20 | 1.75±0.10 | 3.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.60±0.10 |                     | 4.0±0.1 |
|            | 0805 | 1.55±0.20 | 2.30±0.20 | 8.0±0.20 | 1.75±0.10 | 3.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.75±0.10 |                     |         |
|            | 1206 | 1.90±0.20 | 3.50±0.20 | 8.0±0.20 | 1.75±0.10 | 3.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.75±0.10 |                     |         |
|            | 1210 | 2.85±0.20 | 3.50±0.20 | 8.0±0.20 | 1.75±0.10 | 3.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.75±0.10 |                     |         |



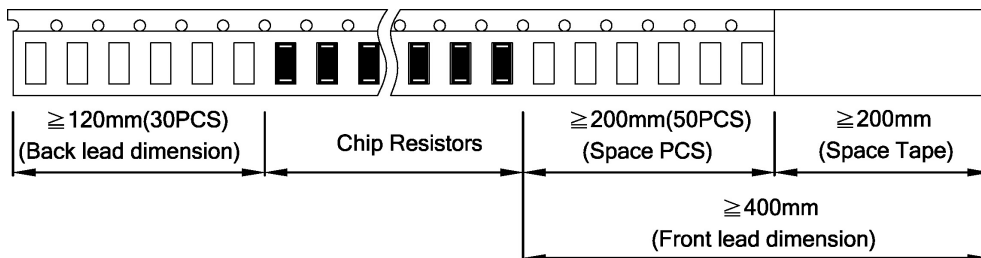
#### Dimension

Unit: mm

| Packaging     | Type | A         | B         | W       | E         | F        | G        | H        | T         | $\phi D$ | $\psi D1$ | T1        | P       |
|---------------|------|-----------|-----------|---------|-----------|----------|----------|----------|-----------|----------|-----------|-----------|---------|
| Embossed Type | 2010 | 2.80±0.20 | 5.60±0.20 | 12±0.10 | 1.75±0.10 | 5.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.23±0.10 | +0.10    | 1.50±0.10 | 0.85±0.15 | 4.0±0.1 |
|               | 2512 | 3.40±0.20 | 6.70±0.20 | 12±0.10 | 1.75±0.10 | 5.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.23±0.10 | 1.50     | 1.50±0.10 | 0.85±0.15 |         |
|               | 1218 | 3.30±0.20 | 4.60±0.20 | 12±0.10 | 1.75±0.10 | 5.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.23±0.10 | -0       | 1.50±0.10 | 0.85±0.15 |         |

■ Packing Material Data / Storage Data

■ Front & Back Lead Dimension



■ Top Adhesive Peel Off Strength : 10~70g



■ Package

| Inner Box Size |            |
|----------------|------------|
| Reel           | Size H(mm) |
| 1              | 13         |
| 2              | 24         |
| 3              | 36         |
| 5              | 60         |
| 10             | 113        |



| External Box Size |             |            |             |
|-------------------|-------------|------------|-------------|
| Contain (Kpcs)    | Length (mm) | Width (mm) | Height (mm) |
| 25K               | 180         | 180        | 60          |
| 50K               | 180         | 180        | 110         |
| 150K              | 430         | 200        | 200         |
| 300K              | 400         | 400        | 200         |



■ Storage Data :

Storage time at the environment temp:  $25\pm 5^\circ\text{C}$  & humidity:  $60\pm 20\%$  is valid for one year from the date of delivery.

## ● Reliability Test and Requirement

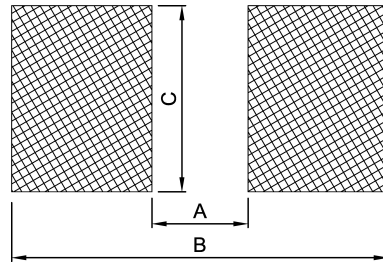
### ◆ For TR Series

| Test Item                                     | Test Method              | Procedure   | Requirements     |
|---|--------------------------|---|------------------|
| Temperature Coefficient of Resistance (T.C.R) | JIS C 5201-1 clause 4.8  | TCR +155 °C , 25°C is the reference temperature   | Refer to Ratings |
| Short Time Overload                           | JIS C 5201-1 clause 4.13 | General : 2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds.<br>High Power : 2.5 times RCWV or Max. Overload voltage whichever is less for 2 seconds. | ±(0.5%+0.05Ω)    |
| IR Reflow                                     | Sony SS-00254            |   | ±(0.5%+0.05Ω)    |
| Leaching                                      | Sony SS-00254-9          | 260±5°C for 30 seconds.   | >95% Coverage    |
| Soldering Heat                                | JIS C 5201-1 clause 4.18 | 260±5°C for 10 seconds.   | ±(0.5%+0.05Ω)    |
| Temperature Cycling                           | JIS C 5201-1 clause 4.19 | -55°C to +155°C, 5 cycles   | ±(0.5%+0.05Ω)    |
| Electric Iron                                 | Sony SS-00254-5          | Preheating temperature : 350±10°C<br>Electric iron preheating time : 3+1/-0 sec   | ±(0.5%+0.05Ω)    |
| Resistance to Solvent                         | JIS C 5201-1 clause 4.29 | The tested resistor be immersed into isopropyl alcohol of 20~25°C for 60 secs.<br>Then the resistor is left in the room for 48 hrs.   | ±(0.5%+0.05Ω)    |
| Load Life in Humidity                         | JIS C 5201-1 clause 4.24 | 40±2°C, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" .  | ±(0.5%+0.05Ω)    |
| Load Life (Endurance)                         | JIS C 5201-1 clause 4.25 | 70±2°C, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" .  | ±(0.5%+0.05Ω)    |
| Terminal Bending Strength                     | JIS C 5201-1 clause 4.33 | Bending once for 5 seconds<br>D : TR Series 0402、0603、0805=5mm<br>TR Series 1206、1210 =3mm<br>TR Series 1218、2010、2512、2030=2mm   | ±(0.5%+0.05Ω)    |
| Insulation Resistance                         | JIS C 5201-1 clause 4.6  | 100V for 1 minute.  | ≥10GΩ            |

● Temperature Coefficient of Resistance test to - 55 °C is available on request

## ● General Information

### ■ Recommend Land Pattern Design ( For Reflow Soldering )



### ■ Dimension

Unit: mm

| Type<br>Item | 0402 | 0603 | 0805 | 1206 | 1210 | 2010 | 1218 | 2512 |
|--------------|------|------|------|------|------|------|------|------|
| A            | 0.60 | 0.80 | 1.30 | 2.20 | 2.00 | 3.80 | 2.04 | 4.90 |
| B            | 1.60 | 2.40 | 2.90 | 4.20 | 4.40 | 6.60 | 4.24 | 8.10 |
| C            | 0.70 | 1.00 | 1.45 | 1.80 | 2.70 | 2.70 | 4.80 | 3.40 |

### ■ Performance Characteristics

#### ■ Power Derating Curve



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70°C. For operation at ambient temperature in excess of 70°C, the load should be derated in accordance with figure of derating Curve.

### ■ Voltage Rating or Current Rating

Resistance Range:  $\geq 1 \Omega$

Rated Voltage: The resistor shall have a DC continuous working voltage or a RMS AC continuous working voltage at commercial-line frequency and wave form corresponding to the power rating, as determined formula as following:

$$E(RCWV) = \sqrt{P \times R}$$

E=Rated voltage(V)

P=Power rating(W)

R=Nominal resistance( $\Omega$ )



## ■ Operation and Storage Temperature

|                       | MIN   | MAX  |
|-----------------------|-------|------|
| Operation temperature | -55°C | 70°C |
| Storage temperature   | 20°C  | 30°C |
| Storage humidity      | 40%   | 80%  |

## ■ Equipments Applicable:

Our company's products are produced under low temperature processing applicable to IR reflow surface mounting devices. It is comparatively not applicable to wave soldering which will possibly cause the risk ablating the element protection layer and the front conductor and cause the drift of the resistance value and ablation of the markings.

## ■ Product Testing Method:

Our products are tested with our company's tapping & testing equipments by using four-foot probe to touch at the back of both electrodes. Supposed different testing points or methods are requested, please advise beforehand and customized-made production is available.

## ■ 0603 E-96 Multiplier Code

| Code       | A               | B               | C               | D               | E               | F               | G               | H               | X                | Y                | Z                |
|------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| Multiplier | 10 <sup>0</sup> | 10 <sup>1</sup> | 10 <sup>2</sup> | 10 <sup>3</sup> | 10 <sup>4</sup> | 10 <sup>5</sup> | 10 <sup>6</sup> | 10 <sup>7</sup> | 10 <sup>-1</sup> | 10 <sup>-2</sup> | 10 <sup>-3</sup> |

### CODING FORMULA

XX      X  
 ↑      ↙  
 Resistance Code      Multiplier Code

Example: 10.2KΩ =  $\frac{102}{10^4} \times 10^2 \Omega = 02C$

33.2Ω =  $\frac{332}{10^5} \times 10^{-1} \Omega = 51X$

## ■ 0603 Standard E-96 Values and 0603 Resistance Codes

|         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| R-Value | 100 | 102 | 105 | 107 | 110 | 113 | 115 | 118 | 121 | 124 | 127 | 130 | 133 | 137 | 140 | 143 | 147 | 150 | 154 | 158 | 162 | 165 | 169 | 174 |
| Code    | 01  | 02  | 03  | 04  | 05  | 06  | 07  | 08  | 09  | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  | 21  | 22  | 23  | 24  |
| R-Value | 178 | 182 | 187 | 191 | 196 | 200 | 205 | 210 | 215 | 221 | 226 | 232 | 237 | 243 | 249 | 255 | 261 | 267 | 274 | 280 | 287 | 294 | 301 | 309 |
| Code    | 25  | 26  | 27  | 28  | 29  | 30  | 31  | 32  | 33  | 34  | 35  | 36  | 37  | 38  | 39  | 40  | 41  | 42  | 43  | 44  | 45  | 46  | 47  | 48  |
| R-Value | 316 | 324 | 332 | 340 | 348 | 357 | 365 | 374 | 383 | 392 | 402 | 412 | 422 | 432 | 442 | 453 | 464 | 475 | 487 | 499 | 511 | 523 | 536 | 549 |
| Code    | 49  | 50  | 51  | 52  | 53  | 54  | 55  | 56  | 57  | 58  | 59  | 60  | 61  | 62  | 63  | 64  | 65  | 66  | 67  | 68  | 69  | 70  | 71  | 72  |
| R-Value | 562 | 576 | 590 | 604 | 619 | 634 | 649 | 665 | 681 | 698 | 715 | 732 | 750 | 768 | 787 | 806 | 825 | 845 | 866 | 887 | 909 | 931 | 953 | 976 |
| Code    | 73  | 74  | 75  | 76  | 77  | 78  | 79  | 80  | 81  | 82  | 83  | 84  | 85  | 86  | 87  | 88  | 89  | 90  | 91  | 92  | 93  | 94  | 95  | 96  |

■ Standard Resistance Values in a Decade

Marking code:

1%: marking code, please refer to E96 and E24 data form as below

Ex: 120K, The marking code is 1203 in E24

121K, The marking code is 1213 in E96

Note: 0402 series resistor has no marking code.

Type: 0603 1% marking code, please refer to E-96 multiplier code.

| E192 | E96 | E48 | E192 | E96 | E48 | E192 | E96 | E48 | E192 | E96 | E48 | E192 | E96 | E48 |    |
|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|----|
| 100  | 100 | 100 | 169  | 169 | 169 | 287  | 287 | 287 | 487  | 487 | 487 | 825  | 825 | 825 |    |
| 101  |     |     | 172  |     |     | 291  |     |     | 493  |     |     | 835  |     |     |    |
| 102  | 102 |     | 174  | 174 |     | 294  | 294 |     | 499  | 499 |     | 845  | 845 |     |    |
| 104  |     |     | 176  |     |     | 298  |     |     | 505  |     |     | 856  |     |     |    |
| 105  | 105 | 105 | 178  | 178 | 178 | 301  | 301 | 301 | 511  | 511 | 511 | 866  | 866 | 866 |    |
| 106  |     |     | 180  |     |     | 305  |     |     | 517  |     |     | 876  |     |     |    |
| 107  | 107 |     | 182  | 182 |     | 309  | 309 |     | 523  | 523 |     | 887  | 887 |     |    |
| 109  |     |     | 184  |     |     | 312  |     |     | 530  |     |     | 898  |     |     |    |
| 110  | 110 | 110 | 187  | 187 | 187 | 316  | 316 | 316 | 536  | 536 | 536 | 909  | 909 | 909 |    |
| 111  |     |     | 189  |     |     | 320  |     |     | 542  |     |     | 920  |     |     |    |
| 113  | 113 |     | 191  | 191 |     | 324  | 324 |     | 549  | 549 |     | 931  | 931 |     |    |
| 114  |     |     | 193  |     |     | 328  |     |     | 556  |     |     | 942  |     |     |    |
| 115  | 115 | 115 | 196  | 196 | 196 | 332  | 332 | 332 | 562  | 562 | 562 | 953  | 953 | 953 |    |
| 117  |     |     | 198  |     |     | 336  |     |     | 569  |     |     | 965  |     |     |    |
| 118  | 118 |     | 200  | 200 |     | 340  | 340 |     | 576  | 576 |     | 976  | 976 |     |    |
| 120  |     |     | 203  |     |     | 344  |     |     | 583  |     |     | 988  |     |     |    |
| 121  | 121 | 121 | 205  | 205 | 205 | 348  | 348 | 348 | 590  | 590 | 590 |      |     |     |    |
| 123  |     |     | 208  |     |     | 352  |     |     | 597  |     |     |      |     |     |    |
| 124  | 124 |     | 210  | 210 |     | 357  | 357 |     | 604  | 604 |     | E24  | E12 | E6  | E3 |
| 126  |     |     | 213  |     |     | 361  |     |     | 612  |     |     | 10   | 10  | 10  | 10 |
| 127  | 127 | 127 | 215  | 215 | 215 | 365  | 365 | 365 | 619  | 619 | 619 | 11   |     |     |    |
| 129  |     |     | 218  |     |     | 370  |     |     | 626  |     |     | 12   | 12  |     |    |
| 130  | 130 |     | 221  | 221 |     | 374  | 374 |     | 634  | 634 |     | 13   |     |     |    |
| 132  |     |     | 223  |     |     | 379  |     |     | 642  |     |     | 15   | 15  | 15  |    |
| 133  | 133 | 133 | 226  | 226 | 226 | 383  | 383 | 383 | 649  | 649 | 649 | 16   |     |     |    |
| 135  |     |     | 229  |     |     | 388  |     |     | 657  |     |     | 18   | 18  |     |    |
| 137  | 137 |     | 232  | 232 |     | 392  | 392 |     | 665  | 665 |     | 20   |     |     |    |
| 138  |     |     | 234  |     |     | 397  |     |     | 673  |     |     | 22   | 22  | 22  | 22 |
| 140  | 140 | 140 | 237  | 237 | 237 | 402  | 402 | 402 | 681  | 681 | 681 | 24   |     |     |    |
| 142  |     |     | 240  |     |     | 407  |     |     | 690  |     |     | 27   | 27  |     |    |
| 143  | 143 |     | 243  | 243 |     | 412  | 412 |     | 698  | 698 |     | 30   |     |     |    |
| 145  |     |     | 246  |     |     | 417  |     |     | 706  |     |     | 33   | 33  | 33  |    |
| 147  | 147 | 147 | 249  | 249 | 249 | 422  | 422 | 422 | 715  | 715 | 715 | 36   |     |     |    |
| 149  |     |     | 252  |     |     | 427  |     |     | 723  |     |     | 39   | 39  |     |    |
| 150  | 150 |     | 255  | 255 |     | 432  | 432 |     | 732  | 732 |     | 43   |     |     |    |
| 152  |     |     | 258  |     |     | 437  |     |     | 741  |     |     | 47   | 47  | 47  | 47 |
| 154  | 154 | 154 | 261  | 261 | 261 | 442  | 442 | 442 | 750  | 750 | 750 | 51   |     |     |    |
| 156  |     |     | 264  |     |     | 448  |     |     | 759  |     |     | 56   | 56  |     |    |
| 158  | 158 |     | 267  | 267 |     | 453  | 453 |     | 768  | 768 |     | 62   |     |     |    |
| 160  |     |     | 271  |     |     | 459  |     |     | 777  |     |     | 68   | 68  | 68  |    |
| 162  | 162 | 162 | 274  | 274 | 274 | 464  | 464 | 464 | 787  | 787 | 787 | 75   |     |     |    |
| 164  |     |     | 277  |     |     | 470  |     |     | 796  |     |     | 82   | 82  |     |    |
| 165  | 165 |     | 280  | 280 |     | 475  | 475 |     | 806  | 806 |     | 91   |     |     |    |
| 167  |     |     | 284  |     |     | 481  |     |     | 816  |     |     |      |     |     |    |

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