

### TO-92S



#### Pin Definition:

1. V<sub>CC</sub>
2. GND
3. Output

### SOT-23



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## Description

TSH253 Hall-effect sensor is a temperature stable, stress-resistant switch. Superior high-temperature performance is made possible through a dynamic offset cancellation that utilizes chopper-stabilization. This method reduces the offset voltage normally caused by device over molding, temperature dependencies, and thermal stress. TSH253 includes the following on a single silicon chip: voltage regulator, Hall voltage generator, small-signal amplifier, chopper stabilization, Schmitt trigger, open-drain output. Advanced CMOS wafer fabrication processing is used to take advantage of low-voltage requirements, component matching, very low input-offset errors, and small component geometries.

## Features

- CMOS Hall IC Technology
- Solid-State Reliability much better than reed switch
- Omni polar output switches with absolute value of North or South pole from magnet
- Operation down to 1.8 V and Max at 6V.
- High Sensitivity for reed switch replacement
- ESD HBM ±4KV Min

## Ordering Information

| Part No.     | Package | Packing          |
|--------------|---------|------------------|
| TSH253CT B0G | TO-92S  | 1Kpcs / Bulk Bag |
| TSH253CX RFG | SOT-23  | 3Kpcs / 7" Reel  |

**Note:** "G" denote for Halogen Free Product

## Application

- Solid state switch, Revolution counter
- Lid close sensor for power supply devices
- Magnet proximity sensor for reed switch replacement in high duty cycle applications.
- Safety Key on sporting equipment
- Speed sensor, Position Sensor, Rotation Sensor

## Absolute Maximum Rating (Ta = 25°C unless otherwise noted)

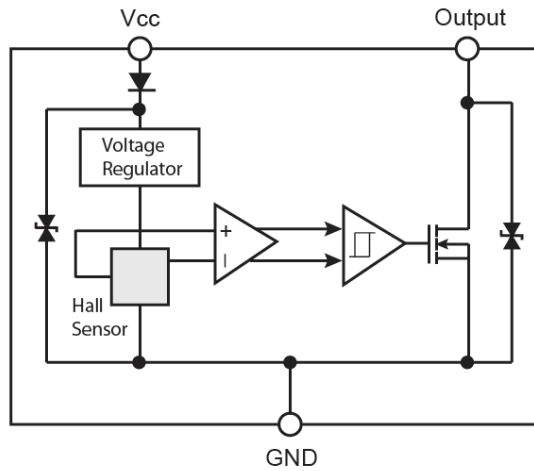
| Characteristics                          | Limit               | Value       | Unit  |
|------------------------------------------|---------------------|-------------|-------|
| Supply voltage                           | V <sub>CC</sub>     | 6           | V     |
| Output Voltage                           | V <sub>OUT</sub>    | 6           | V     |
| Reverse voltage                          | V <sub>CC/OUT</sub> | -0.3        | V     |
| Magnetic flux density                    |                     | Unlimited   | Gauss |
| Output current                           | I <sub>OUT</sub>    | 1           | mA    |
| Operating Temperature Range              | T <sub>OPR</sub>    | -40 to +85  | °C    |
| Storage temperature range                | T <sub>STG</sub>    | -55 to +150 | °C    |
| Maximum Junction Temp                    | T <sub>J</sub>      | 150         | °C    |
| Thermal Resistance - Junction to Ambient | TO-92S              | 206         | °C/W  |
|                                          | SOT-23              | 543         |       |
| Thermal Resistance - Junction to Case    | TO-92S              | 148         | °C/W  |
|                                          | SOT-23              | 410         |       |
| Package Power Dissipation                | TO-92S              | 606         | mW    |
|                                          | SOT-23              | 230         |       |

**Note:** Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute maximum-rated conditions for extended periods may affect device reliability.

# TSH253

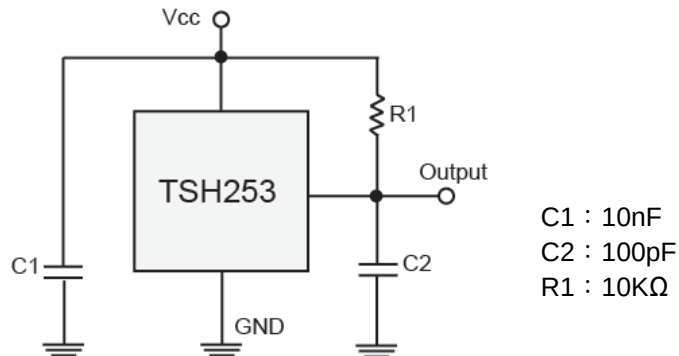
## High Sensitivity Omni-Polar Hall Effect Switch

### Block Diagram



**Note:** Static sensitive device; please observe ESD precautions. Reverse VDD protection is not included. For reverse voltage protection, a 100Ω resistor in series with VDD is recommended.

### Typical Application Circuit



### Electrical Specifications (DC Operating Parameters : $T_A = +25^{\circ}\text{C}$ , $V_{CC} = 5\text{V}$ )

| Parameters               | Test Conditions                                | Min | Typ | Max  | Units |
|--------------------------|------------------------------------------------|-----|-----|------|-------|
| Supply Voltage           | Operating                                      | 1.8 | --  | 6    | V     |
| Supply Current           | Average                                        | --  | 2.6 | 6.0  | mA    |
| Output Low Voltage       | $I_{OUT} = 0.5\text{mA}$                       | --  | --  | 200  | mV    |
| Output Leakage Current   | $I_{OFF}$ $B < B_{RP}$ , $V_{OUT} = 3\text{V}$ | --  | --  | 10   | uA    |
| Output Rise Time         | $R_L = 10\text{k}\Omega$ , $C_L = 20\text{pF}$ | --  | --  | 0.45 | uS    |
| Output Fall Time         | $R_L = 10\text{k}\Omega$ ; $C_L = 20\text{pF}$ | --  | --  | 0.45 | uS    |
| Electro-Static Discharge | HBM                                            | 4   | --  | --   | KV    |

**Magnetic Specifications (TSH253CT)**

| Parameter       | Symbol           | Test Conditions                                        | Min. | Typ. | Max. | Units |
|-----------------|------------------|--------------------------------------------------------|------|------|------|-------|
| Operating Point | B <sub>OPS</sub> | S pole to branded side, B > B <sub>OP</sub> , Vout On  |      | 30   | 60   | Gauss |
|                 | B <sub>OPN</sub> | N pole to branded side, B > B <sub>OP</sub> , Vout On  | -60  | -30  |      | Gauss |
| Release Point   | B <sub>RPS</sub> | S pole to branded side, B < B <sub>RP</sub> , Vout Off | 5    | 25   |      | Gauss |
|                 | B <sub>RPN</sub> | N pole to branded side, B < B <sub>RP</sub> , Vout Off |      | -25  | -5   | Gauss |
| Hysteresis      | B <sub>HYS</sub> | BOPx - BRPx                                            |      | 5    |      | Gauss |

Note: 1G (Gauss) = 0.1mT (millitesta)

**Magnetic Specifications (TSH253CX)**

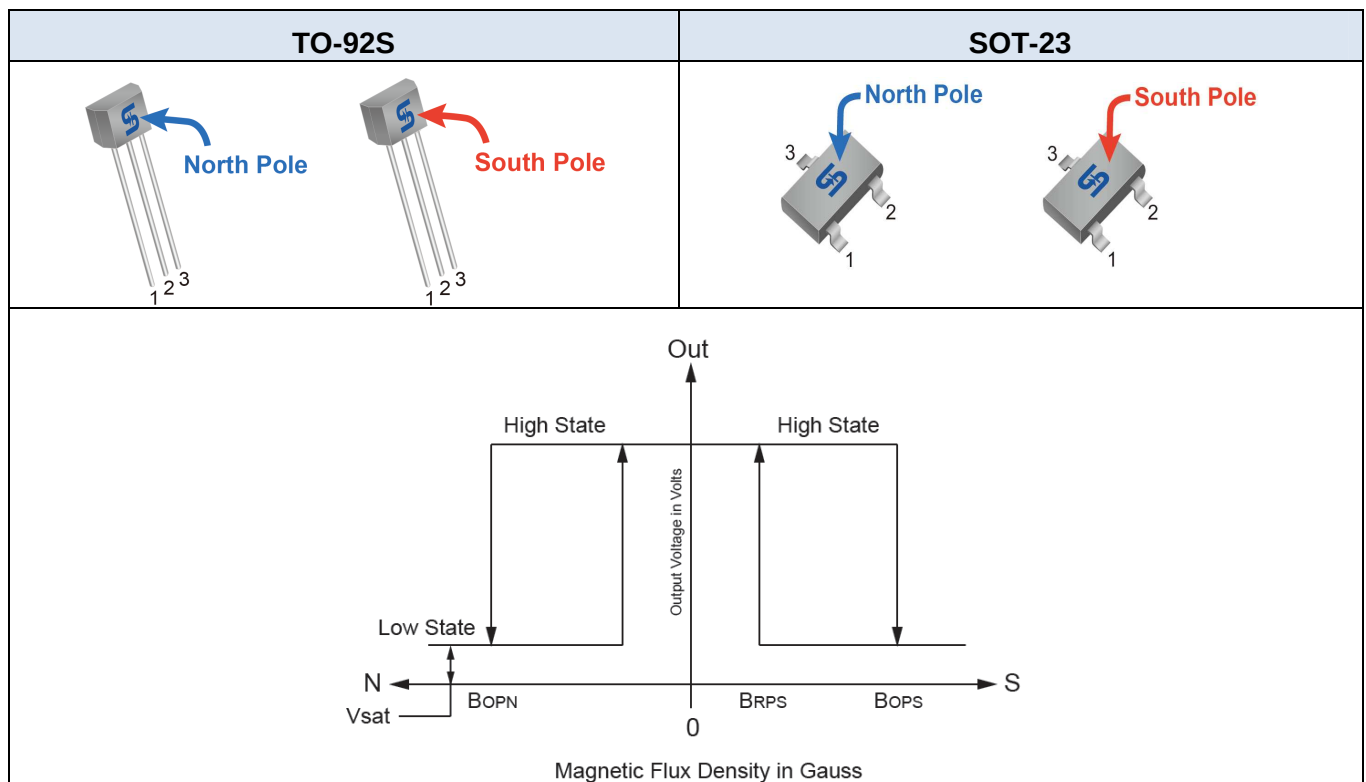
| Parameter       | Symbol           | Test Conditions                                        | Min. | Typ. | Max. | Units |
|-----------------|------------------|--------------------------------------------------------|------|------|------|-------|
| Operating Point | B <sub>OPS</sub> | N pole to branded side, B > B <sub>OP</sub> , Vout On  | --   | 30   | 60   | Gauss |
|                 | B <sub>OPN</sub> | S pole to branded side, B > B <sub>OP</sub> , Vout On  | -60  | -30  | --   | Gauss |
| Release Point   | B <sub>RPS</sub> | N pole to branded side, B < B <sub>RP</sub> , Vout Off | 5    | 25   | --   | Gauss |
|                 | B <sub>RPN</sub> | S pole to branded side, B < B <sub>RP</sub> , Vout Off | --   | -25  | -5   | Gauss |
| Hysteresis      | B <sub>HYS</sub> | BOPx - BRPx                                            | --   | 5    | --   | Gauss |

Note: 1G (Gauss) = 0.1mT (millitesta)

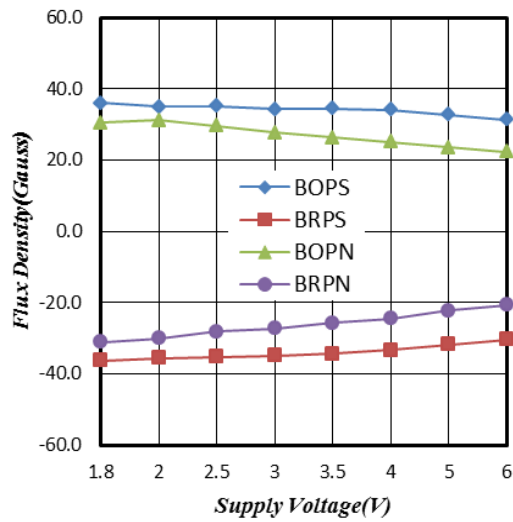
**Output Behavior versus Magnetic Pole**

DC Operating Parameters: T<sub>A</sub> = -40 to 125°C, V<sub>CC</sub> = 1.8V ~ 6V

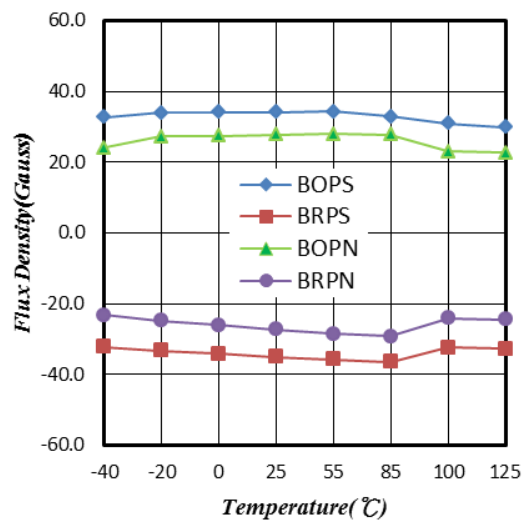
| Parameter                   | Test condition      | OUT                   |
|-----------------------------|---------------------|-----------------------|
| South pole                  | B < Bop[(-60)~(-5)] | Low                   |
| Null or weak magnetic field | B = 0 or B < BRP    | Open(Pull-up Voltage) |
| North pole                  | B > Bop(60~5)       | Low                   |



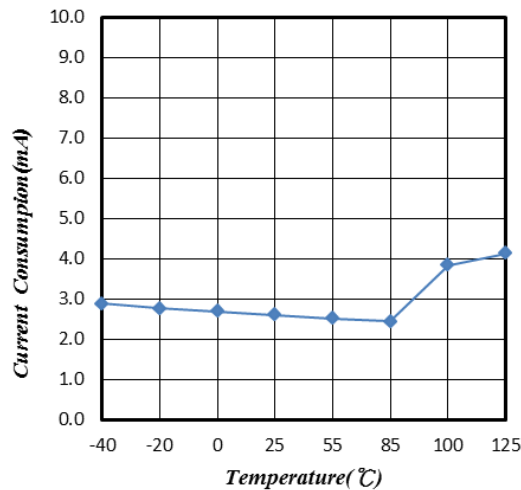
**Characteristic Performance**



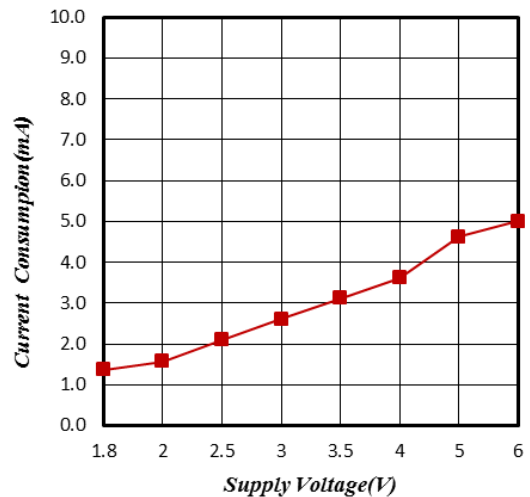
**Figure 1. Supply Voltage vs. Flux Density**



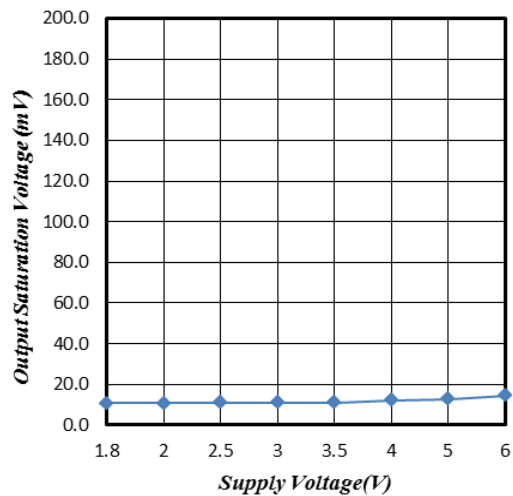
**Figure 2. Temperature vs. Flux Density**



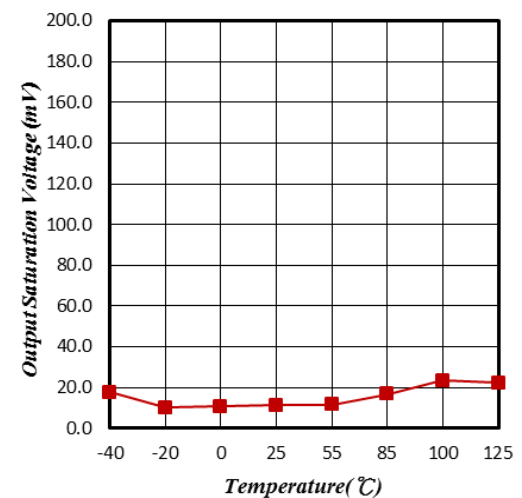
**Figure 3. Supply Current vs. Temperature**



**Figure 4. Supply Current vs. Supply Voltage**

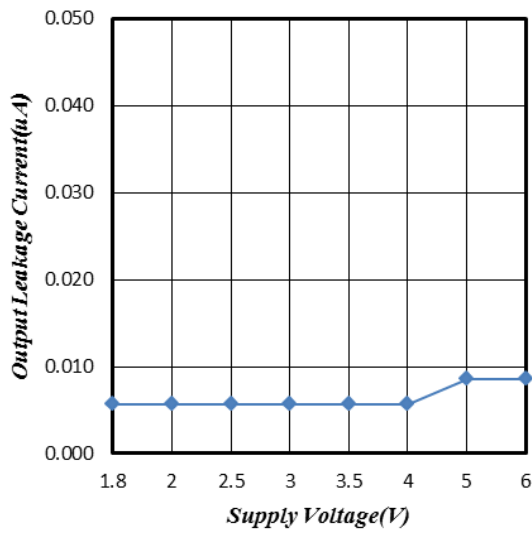


**Figure 5. Output Saturation Voltage vs. Supply Voltage**

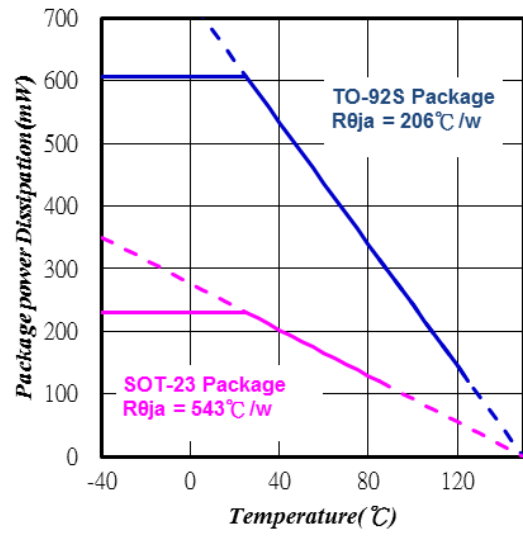


**Figure 6. Output Saturation Voltage vs. Temperature**

**Characteristic Performance**

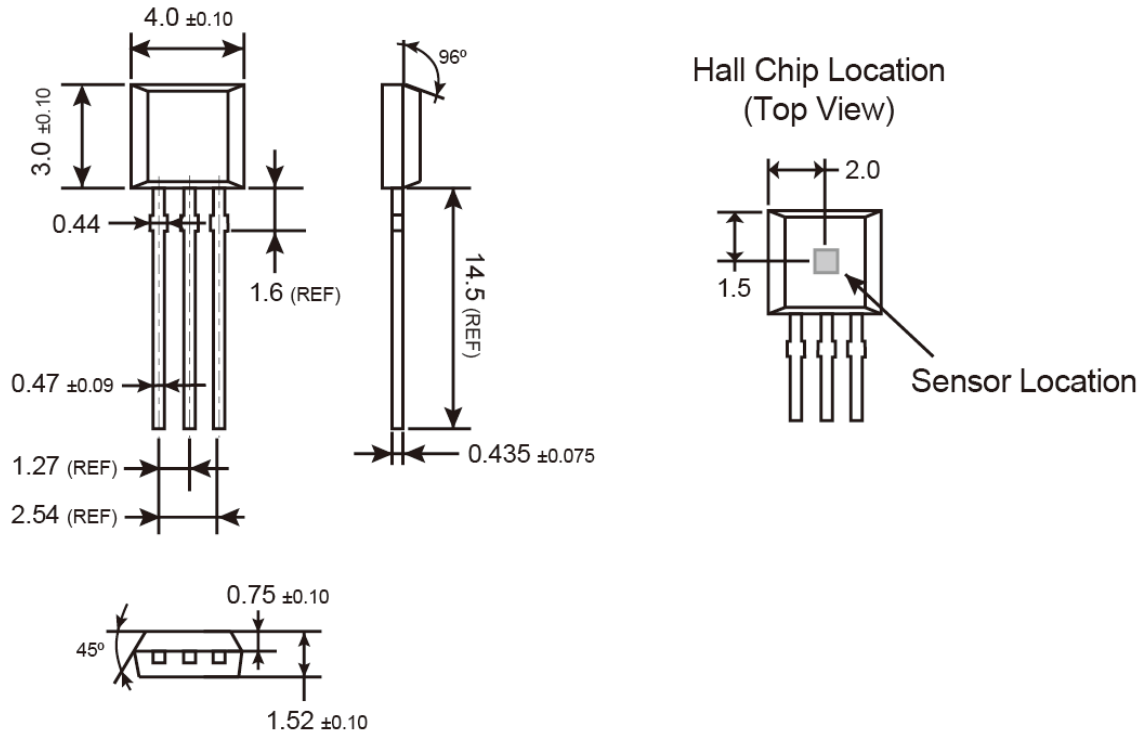


**Figure 7. Output Leakage Current vs. Supply Voltage**



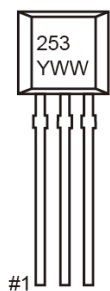
**Figure 8. Power Dissipation vs. Temperature**

## TO-92S Mechanical Drawing



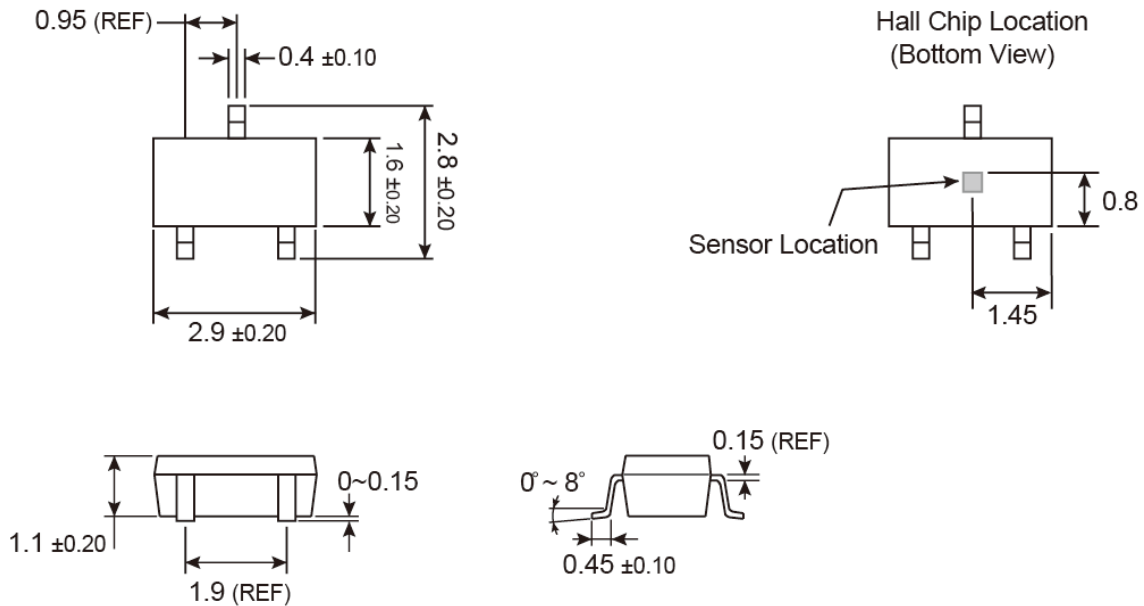
Unit: Millimeters

## Marking Diagram



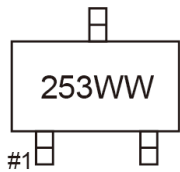
**253** = Device Code  
**Y** = Year Code (3=2013, 4=2014....)  
**WW** = Week Code (01~52)

## SOT-23 Mechanical Drawing



Unit: Millimeters

## Marking Diagram



**253** = Device Code

**WW** = Week Code Table

|      |    |    |    |    |    |    |    |    |    |    |    |    |    |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|
| week | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 |
| code | OA | OB | OC | OD | OE | OF | OG | OH | OI | OJ | OK | OL | OM |
| week | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| code | ON | OO | OP | OQ | OR | OS | OT | OU | OV | OW | OX | OY | OZ |
| week | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 |
| code | PA | PB | PC | PD | PE | PF | PG | PH | PI | PJ | PK | PL | PM |
| week | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |
| code | PN | PO | PP | PQ | PR | PS | PT | PU | PV | PW | PX | PY | PZ |

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