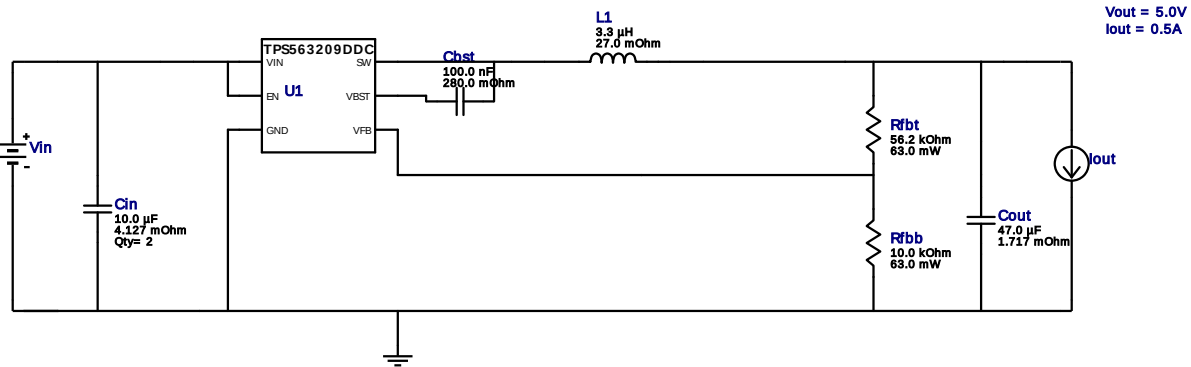


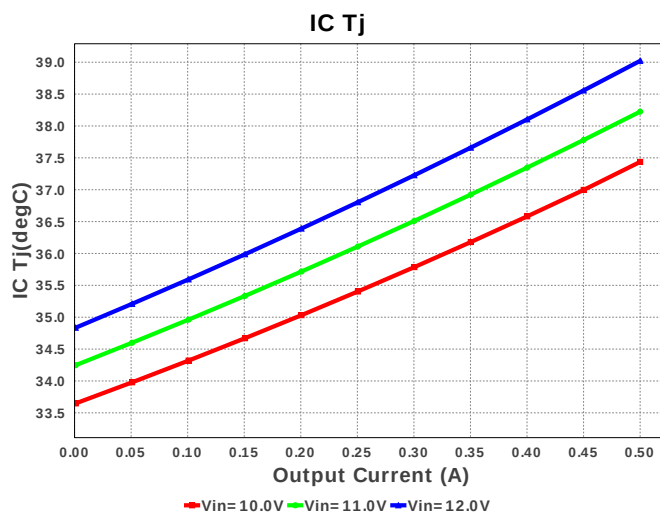
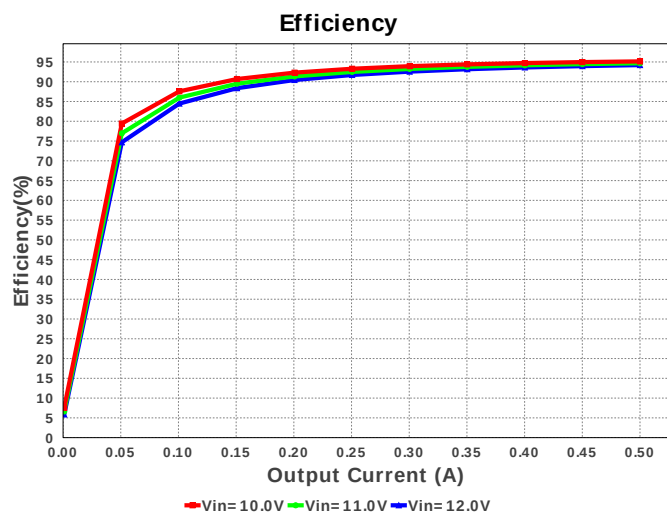
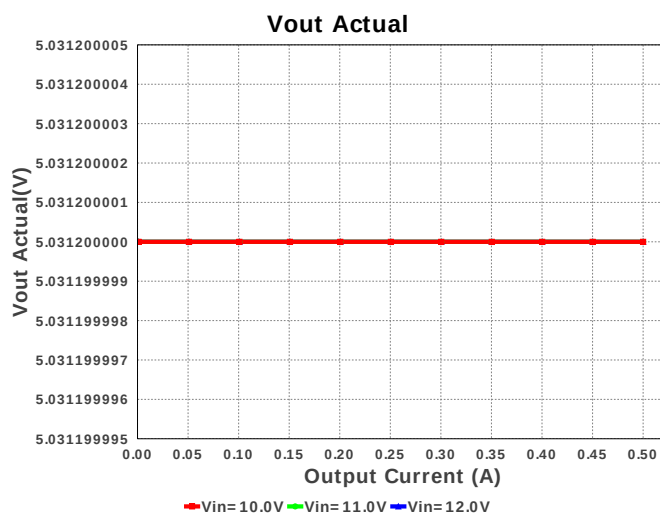
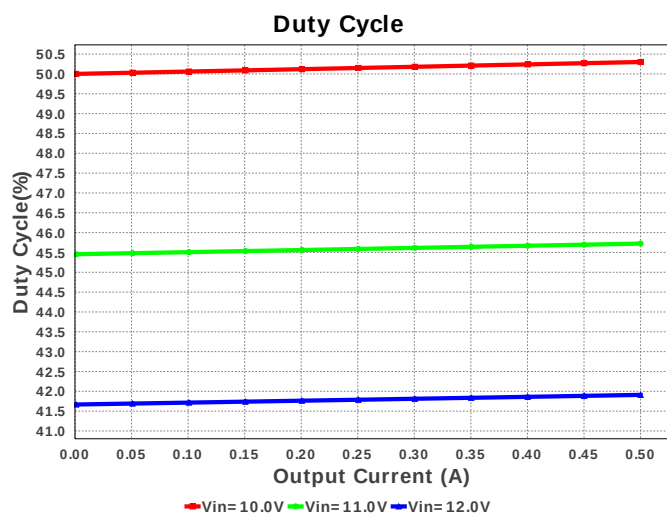
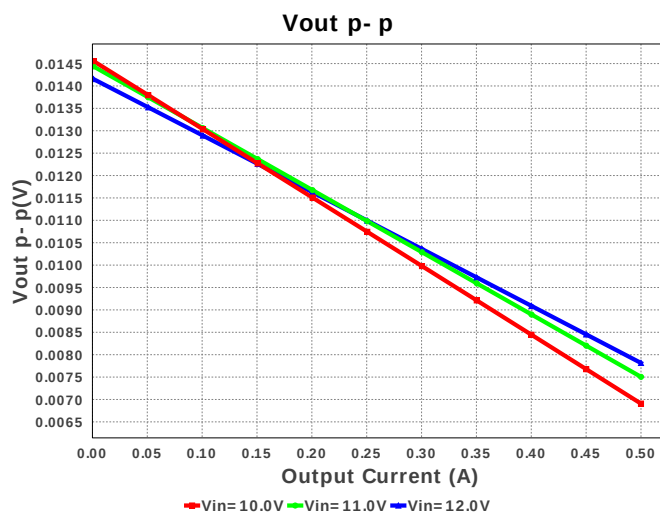
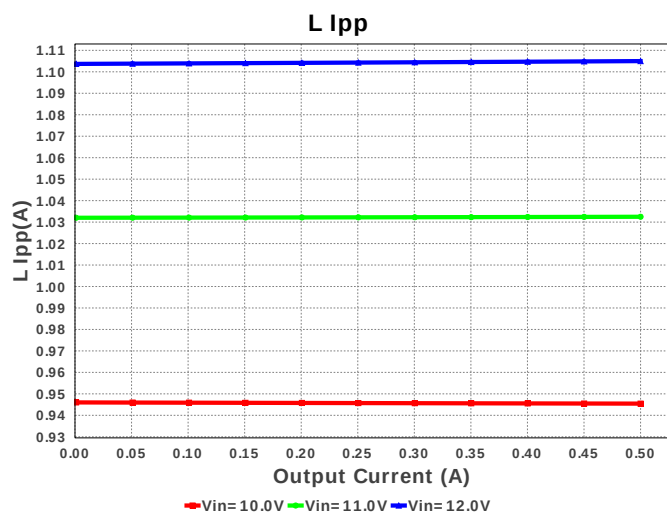
## WEBENCH® Design Report

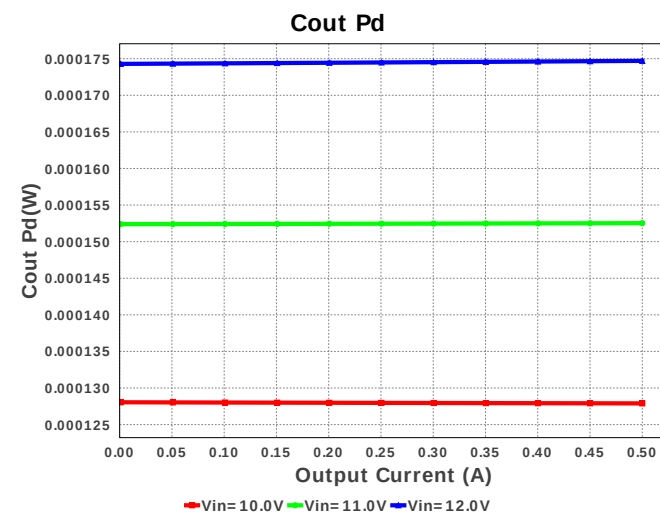
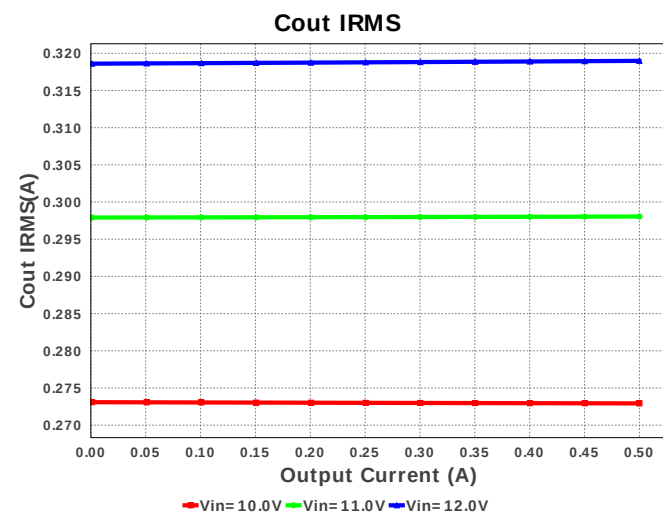
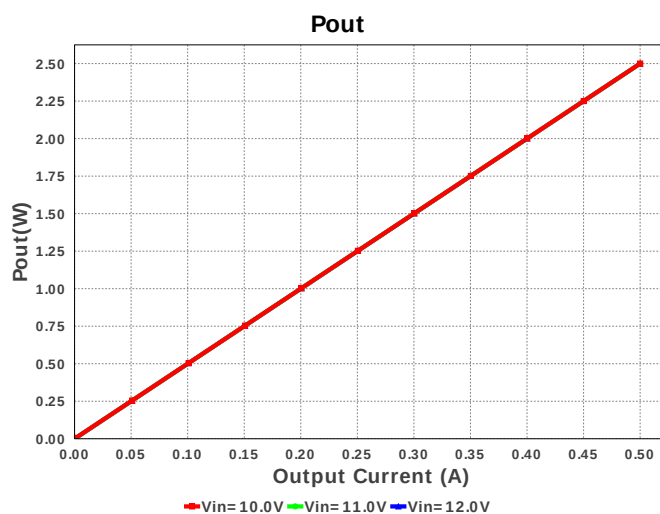
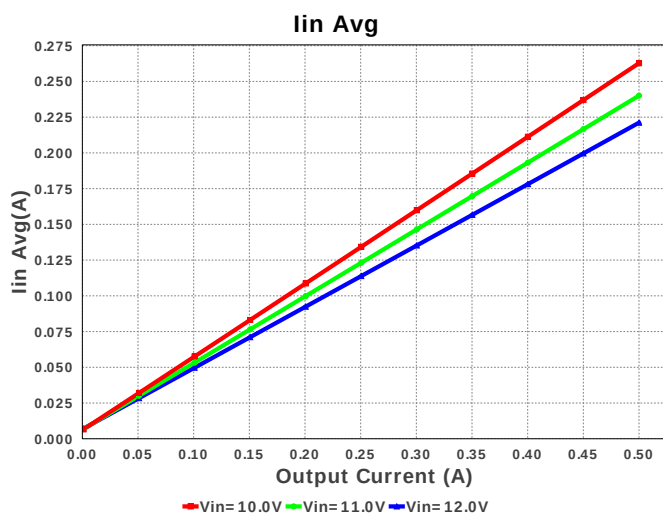
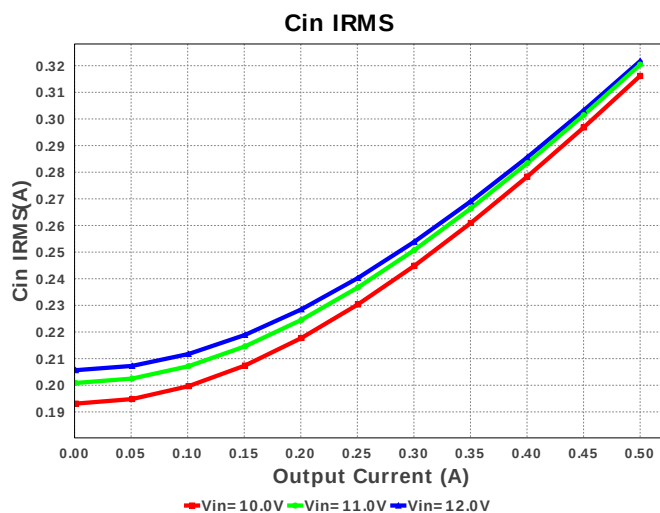
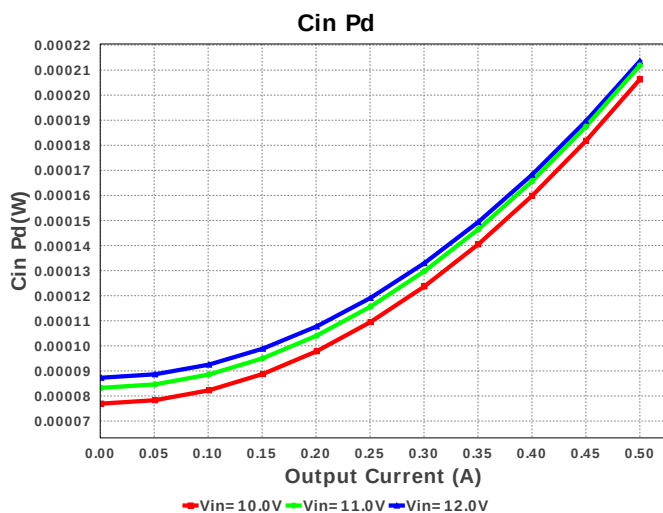
Design : 4742013/241 TPS563209DDCR  
TPS563209DDCR 10.0V-12.0V to 5.00V @ 0.5A

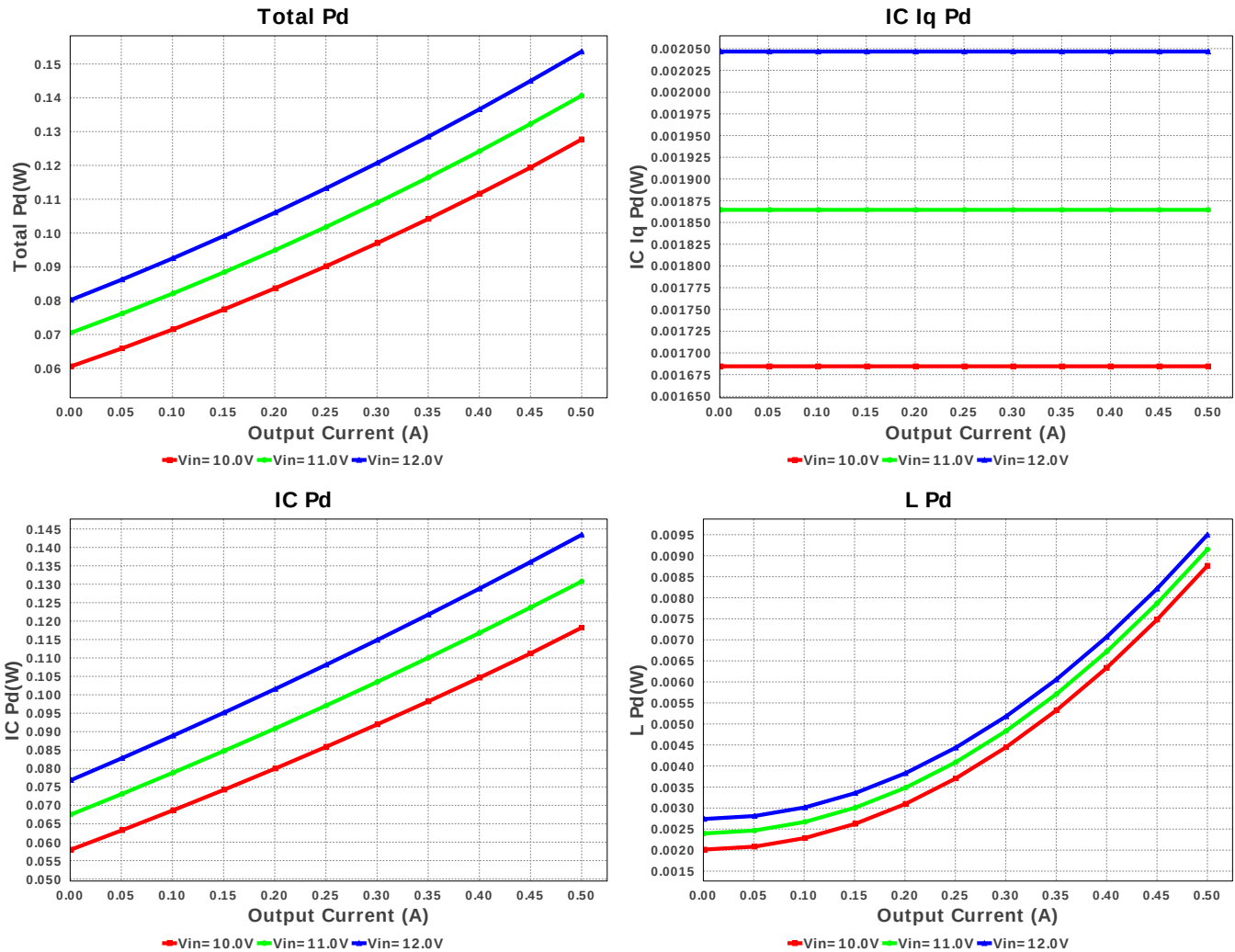


## Electrical BOM

| #  | Name | Manufacturer      | Part Number                           | Properties                                                        | Qty | Price  | Footprint                                                                                                |
|----|------|-------------------|---------------------------------------|-------------------------------------------------------------------|-----|--------|----------------------------------------------------------------------------------------------------------|
| 1. | Cbst | AVX               | 08053C104KAT2A<br>Series= X7R         | Cap= 100.0 nF<br>ESR= 280.0 mOhm<br>VDC= 25.0 V<br>IRMS= 0.0 A    | 1   | \$0.01 | <br>0805 7 mm²        |
| 2. | Cin  | MuRata            | GRM21BR61C106KE15L<br>Series= X5R     | Cap= 10.0 uF<br>ESR= 4.127 mOhm<br>VDC= 16.0 V<br>IRMS= 2.46634 A | 2   | \$0.03 | <br>0805 7 mm²      |
| 3. | Cout | TDK               | C3216JB1A476M<br>Series= JB           | Cap= 47.0 uF<br>ESR= 1.717 mOhm<br>VDC= 10.0 V<br>IRMS= 0.0 A     | 1   | \$0.34 | <br>1206 11 mm²     |
| 4. | L1   | Bourns            | SRR7032-3R3M                          | L= 3.3 uH<br>DCR= 27.0 mOhm                                       | 1   | \$0.26 | <br>SRR7032 81 mm²  |
| 5. | Rfbb | Vishay-Dale       | CRCW040210K0FKED<br>Series= CRCW...e3 | Res= 10.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%               | 1   | \$0.01 | <br>0402 3 mm²      |
| 6. | Rfht | Vishay-Dale       | CRCW040256K2FKED<br>Series= CRCW...e3 | Res= 56.2 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%               | 1   | \$0.01 | <br>0402 3 mm²      |
| 7. | U1   | Texas Instruments | TPS563209DDCR                         | Switcher                                                          | 1   | \$0.52 | <br>DDC0006A 10 mm² |







## Operating Values

| #   | Name           | Value                 | Category | Description                                                                                |
|-----|----------------|-----------------------|----------|--------------------------------------------------------------------------------------------|
| 1.  | Cin IRMS       | 321.725 mA            | Current  | Input capacitor RMS ripple current                                                         |
| 2.  | Cout IRMS      | 318.983 mA            | Current  | Output capacitor RMS ripple current                                                        |
| 3.  | Iin Avg        | 221.14 mA             | Current  | Average input current                                                                      |
| 4.  | L Ipp          | 1.105 A               | Current  | Peak-to-peak inductor ripple current                                                       |
| 5.  | BOM Count      | 8                     | General  | Total Design BOM count                                                                     |
| 6.  | FootPrint      | 129.0 mm <sup>2</sup> | General  | Total Foot Print Area of BOM components                                                    |
| 7.  | Frequency      | 800.303 kHz           | General  | Switching frequency                                                                        |
| 8.  | Pout           | 2.5 W                 | General  | Total output power                                                                         |
| 9.  | Total BOM      | \$1.21                | General  | Total BOM Cost                                                                             |
| 10. | Vout Actual    | 5.031 V               | Op_Point | Vout Actual calculated based on selected voltage divider resistors                         |
| 11. | Vout OP        | 5.0 V                 | Op_Point | Operational Output Voltage                                                                 |
| 12. | Duty Cycle     | 41.91 %               | Op_point | Duty cycle                                                                                 |
| 13. | Efficiency     | 94.209 %              | Op_point | Steady state efficiency                                                                    |
| 14. | IC Tj          | 39.021 degC           | Op_point | IC junction temperature                                                                    |
| 15. | ICThetaJA      | 62.9 degC/W           | Op_point | IC junction-to-ambient thermal resistance                                                  |
| 16. | IOUT_OP        | 500.0 mA              | Op_point | Iout operating point                                                                       |
| 17. | VIN_OP         | 12.0 V                | Op_point | Vin operating point                                                                        |
| 18. | Vout p-p       | 14.274 mV             | Op_point | Peak-to-peak output ripple voltage                                                         |
| 19. | Cin Pd         | 213.586 μW            | Power    | Input capacitor power dissipation                                                          |
| 20. | Cout Pd        | 174.705 μW            | Power    | Output capacitor power dissipation                                                         |
| 21. | IC Iq Pd       | 2.047 mW              | Power    | IC Iq Pd                                                                                   |
| 22. | IC Pd          | 143.422 mW            | Power    | IC power dissipation                                                                       |
| 23. | L Pd           | 9.497 mW              | Power    | Inductor power dissipation                                                                 |
| 24. | Total Pd       | 153.675 mW            | Power    | Total Power Dissipation                                                                    |
| 25. | Vout Tolerance | 3.053 %               |          | Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable |

## Design Inputs

| #  | Name | Value   | Description            |
|----|------|---------|------------------------|
| 1. | Iout | 500.0 m | Maximum Output Current |

| #  | Name    | Value     | Description           |
|----|---------|-----------|-----------------------|
| 2. | VinMax  | 12.0      | Maximum input voltage |
| 3. | VinMin  | 10.0      | Minimum input voltage |
| 4. | Vout    | 5.0       | Output Voltage        |
| 5. | base_pn | TPS563209 | Base Product Number   |
| 6. | source  | DC        | Input Source Type     |
| 7. | Ta      | 30.0      | Ambient temperature   |

## Design Assistance

1. **TPS563209** Product Folder : <http://www.ti.com/product/TPS563209> : contains the data sheet and other resources.

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