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RF power transistor, LdmoST family N-channel enhancement-mode lateral MOSFETs

Datasheet — production data

Features

- Excellent thermal stability
- Common source configuration
- $P_{OUT} = 15\text{ W}$ with 11 dB gain @ 2 GHz / 13.6 V
- Plastic package
- ESD protection
- In compliance with the 2002/95/EC European directive

Description

The PD20015-E is a common source N-channel, enhancement-mode lateral field-effect RF power transistor. It is designed for high gain, broadband commercial and industrial applications. It operates at 13.6 V in common source mode at frequencies of up to 1 GHz. PD20015-E boasts the excellent gain, linearity and reliability of ST's latest LDMOS technology mounted in the first true SMD plastic RF power package, PowerSO-10RF. PD20015-E's superior linearity performance makes it an ideal solution for mobile radio applications.

The PowerSO-10 plastic package, designed to offer high reliability, is the first ST JEDEC approved, high power SMD package. It has been specially optimized for RF needs and offers excellent RF performances and ease of assembly.

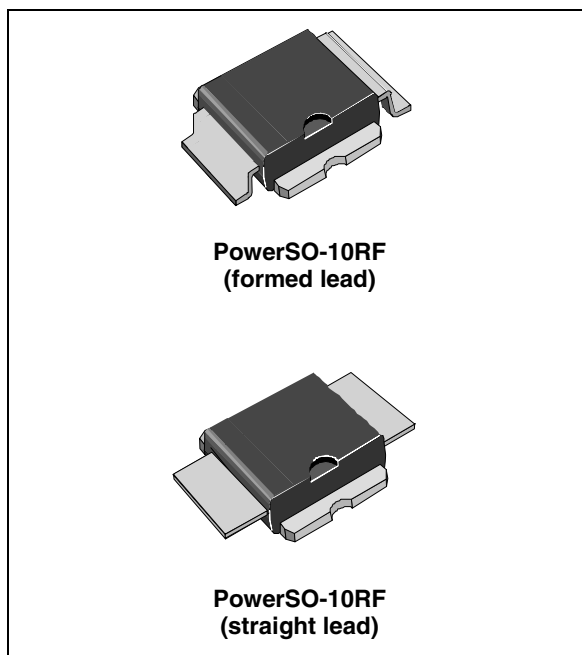


Figure 1. Pin connection

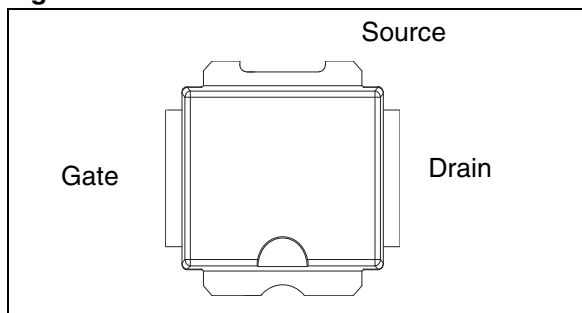


Table 1. Device summary

| Order codes | Package | Packing |
|--------------|------------------------------|---------------|
| PD20015-E | PowerSO-10RF (formed lead) | Tube |
| PD20015TR-E | PowerSO-10RF (formed lead) | Tape and reel |
| PD20015STR-E | PowerSO-10RF (straight lead) | |

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1 Electrical data

1.1 Maximum ratings

$T_{CASE} = 25\text{ °C}$

Table 2. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|---------------|---|-------------|------|
| $V_{(BR)DSS}$ | Drain-source voltage | 40 | V |
| V_{GS} | Gate-source voltage | -0.5 to +15 | V |
| I_D | Drain current | 7 | A |
| P_{DISS} | Power dissipation (@ $T_C = 70\text{ °C}$) | 79 | W |
| T_J | Max. operating junction temperature | 165 | °C |
| T_{STG} | Storage temperature | -65 to +150 | °C |

1.2 Thermal data

Table 3. Thermal data

| Symbol | Parameter | Value | Unit |
|------------|------------------------------------|-------|------|
| R_{thJC} | Junction - case thermal resistance | 1.2 | °C/W |

2 Electrical characteristics

T_{CASE} = +25 °C

2.1 Static

Table 4. Static

| Symbol | Test conditions | | Min. | Typ. | Max. | Unit |
|---------------------|------------------------|--------------------------|-----------|------|------|------|
| I _{DSS} | V _{GS} = 0 V | V _{DS} = 25 V | - | | 1 | μA |
| I _{GSS} | V _{GS} = 5 V | V _{DS} = 0 V | - | | 1 | μA |
| V _{GS(Q)} | V _{DS} = 10 V | I _D = 350 mA | 3.2 | | 4.8 | V |
| V _{DS(ON)} | V _{GS} = 10 V | I _D = 1 A | - | 0.27 | 0.31 | V |
| C _{ISS} | V _{GS} = 0 V | V _{DS} = 12.5 V | f = 1 MHz | - | 55 | pF |
| C _{OSS} | V _{GS} = 0 V | V _{DS} = 12.5 V | f = 1 MHz | - | 40 | pF |
| C _{RSS} | V _{GS} = 0 V | V _{DS} = 12.5 V | f = 1 MHz | - | 1.5 | pF |

2.2 Dynamic

Table 5. Dynamic

| Symbol | Test conditions | | Min. | Typ. | Max. | Unit |
|----------------|---|-----------|------|------|------|------|
| P3dB | V _{DD} = 13.6 V, I _{DQ} = 350 mA | f = 2 GHz | | 23 | - | W |
| G _P | V _{DD} = 13.6 V, I _{DQ} = 350 mA, P _{OUT} = 15 W, f = 2 GHz | | 10 | 11 | - | dB |
| h _D | V _{DD} = 13.6 V, I _{DQ} = 350 mA, P _{OUT} = P3dB, f = 2 GHz | | 45 | 53 | - | % |
| Load mismatch | V _{DD} = 15.5 V, I _{DQ} = 350 mA, P _{OUT} = 20 W, f = 2 GHz all phase angles | | 20:1 | | - | VSWR |

2.3 ESD protection characteristics

Table 6. ESD protection characteristics

| Test conditions | Class |
|------------------|-------|
| Human body model | 2 |
| Machine model | M3 |

2.4 Moisture sensitivity level

Table 7. Moisture sensitivity level

| Test methodology | Rating |
|------------------|--------|
| J-STD-020B | MSL 3 |

3 Impedance

Figure 2. Current conventions

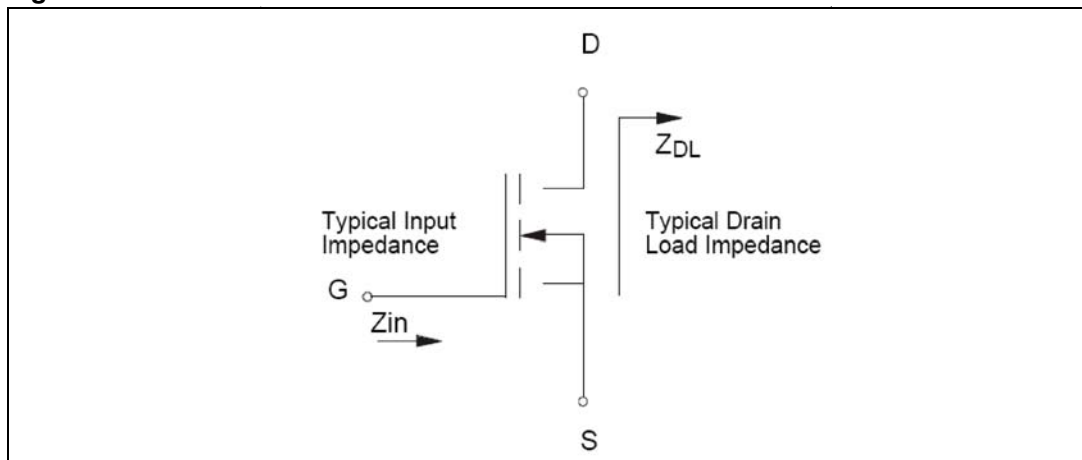


Table 8. Impedance data

| Freq. (MHz) | $Z_{IN} (\Omega)$ | $Z_{DL}(\Omega)$ |
|-------------|-------------------|------------------|
| 2000 | $0.45 + j0.99$ | $0.99-j0.9$ |

4 Typical performance

Figure 3. Capacitances vs drain voltage

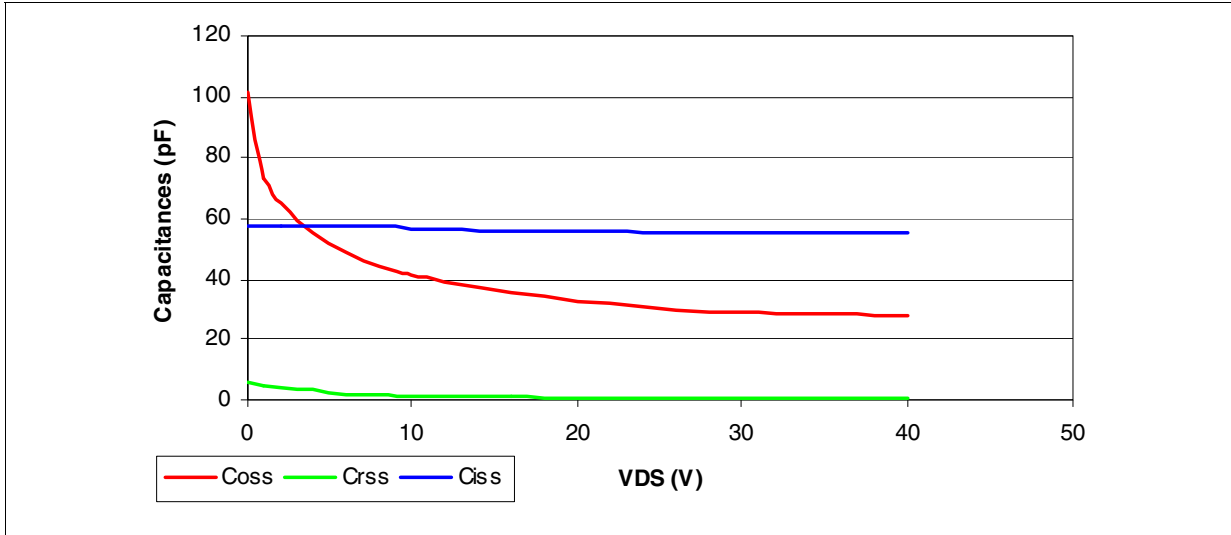


Figure 4. DC output characteristics

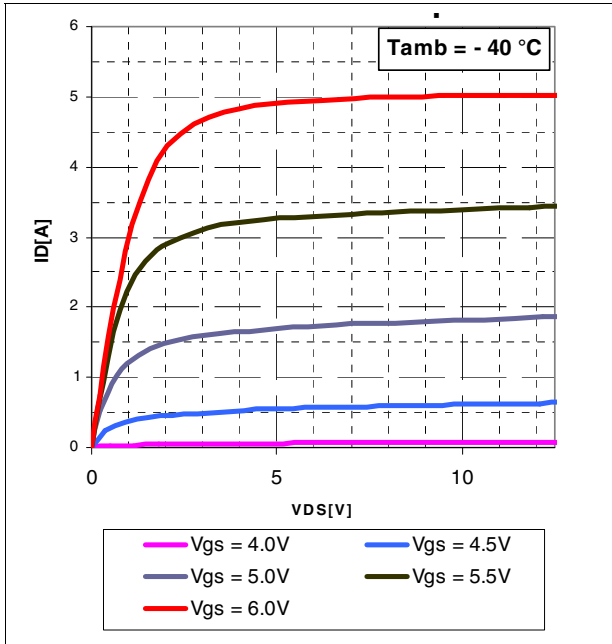


Figure 5. DC output characteristics

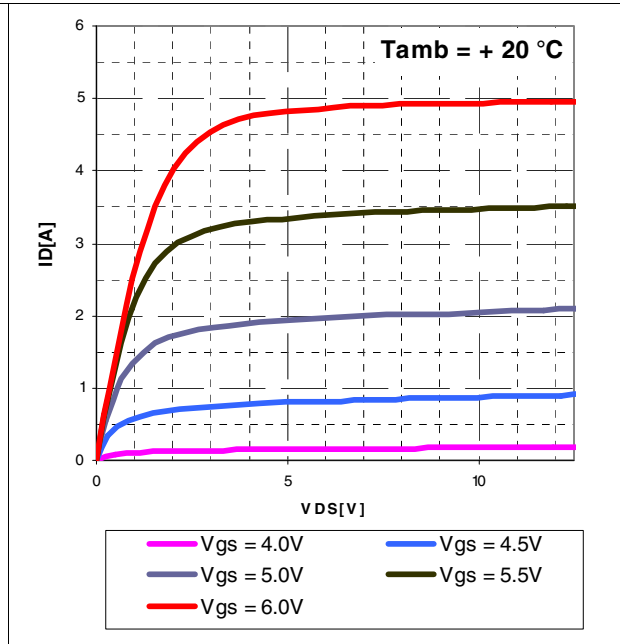


Figure 6. DC output characteristics

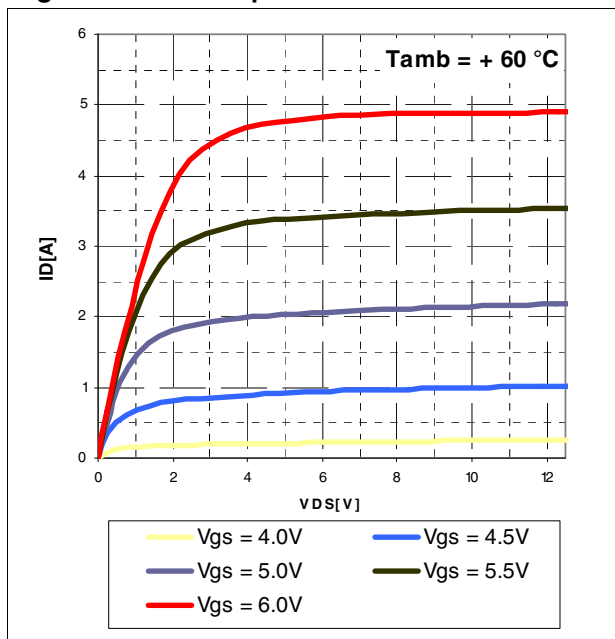


Figure 7. Gain and efficiency vs P_{OUT}

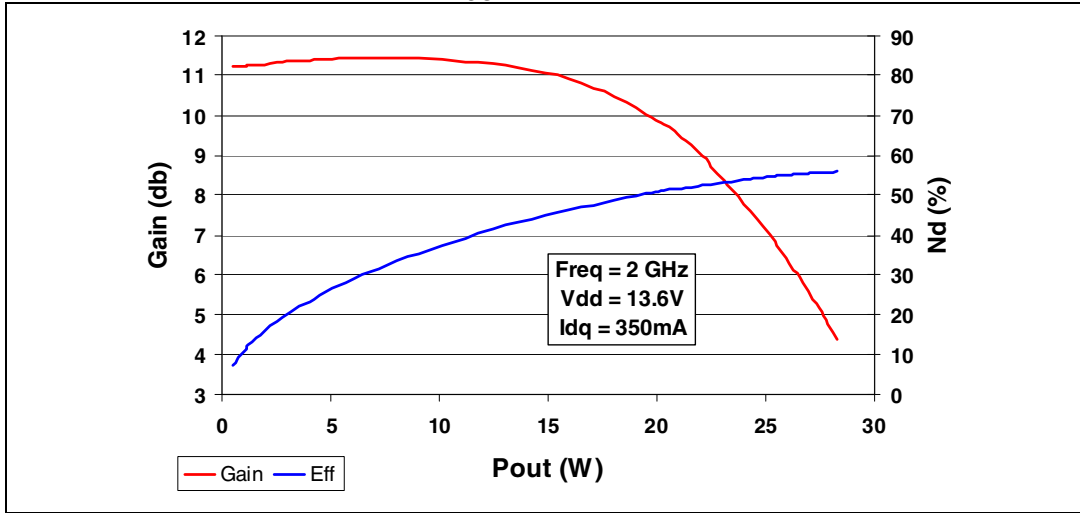
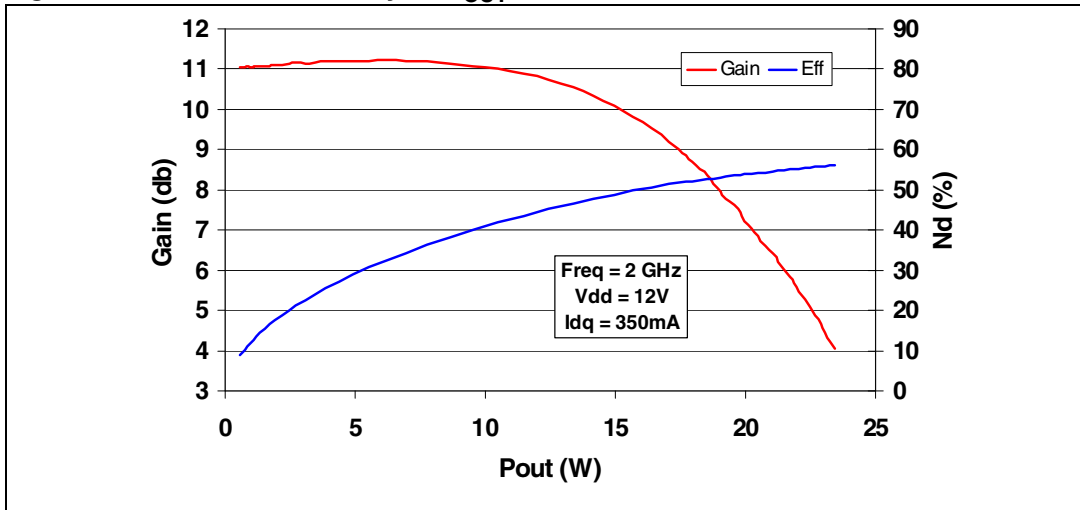


Figure 8. Gain and efficiency vs P_{OUT}



5 Package mechanical data

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Table 9. PowerSO-10RF formed lead (gull wing) mechanical data

| Dim. | mm. | | | Inch | | |
|------|-------|--------|-------|-------|--------|--------|
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A1 | 0 | 0.05 | 0.1 | 0. | 0.0019 | 0.0038 |
| A2 | 3.4 | 3.5 | 3.6 | 0.134 | 0.137 | 0.142 |
| A3 | 1.2 | 1.3 | 1.4 | 0.046 | 0.05 | 0.054 |
| A4 | 0.15 | 0.2 | 0.25 | 0.005 | 0.007 | 0.009 |
| a | | 0.2 | | | 0.007 | |
| b | 5.4 | 5.53 | 5.65 | 0.212 | 0.217 | 0.221 |
| c | 0.23 | 0.27 | 0.32 | 0.008 | 0.01 | 0.012 |
| D | 9.4 | 9.5 | 9.6 | 0.370 | 0.374 | 0.377 |
| D1 | 7.4 | 7.5 | 7.6 | 0.290 | 0.295 | 0.298 |
| E | 13.85 | 14.1 | 14.35 | 0.544 | 0.555 | 0.565 |
| E1 | 9.3 | 9.4 | 9.5 | 0.365 | 0.37 | 0.375 |
| E2 | 7.3 | 7.4 | 7.5 | 0.286 | 0.292 | 0.294 |
| E3 | 5.9 | 6.1 | 6.3 | 0.231 | 0.24 | 0.247 |
| F | | 0.5 | | | 0.019 | |
| G | | 1.2 | | | 0.047 | |
| L | 0.8 | 1 | 1.1 | 0.030 | 0.039 | 0.042 |
| R1 | | | 0.25 | | | 0.01 |
| R2 | | 0.8 | | | 0.031 | |
| T | 2 deg | 5 deg | 8 deg | 2 deg | 5 deg | 8 deg |
| T1 | | 6 deg | | | 6 deg | |
| T2 | | 10 deg | | | 10 deg | |

Note: Resin protrusions not included (Max. value: 0.15 mm per side)

Figure 9. Package dimensions

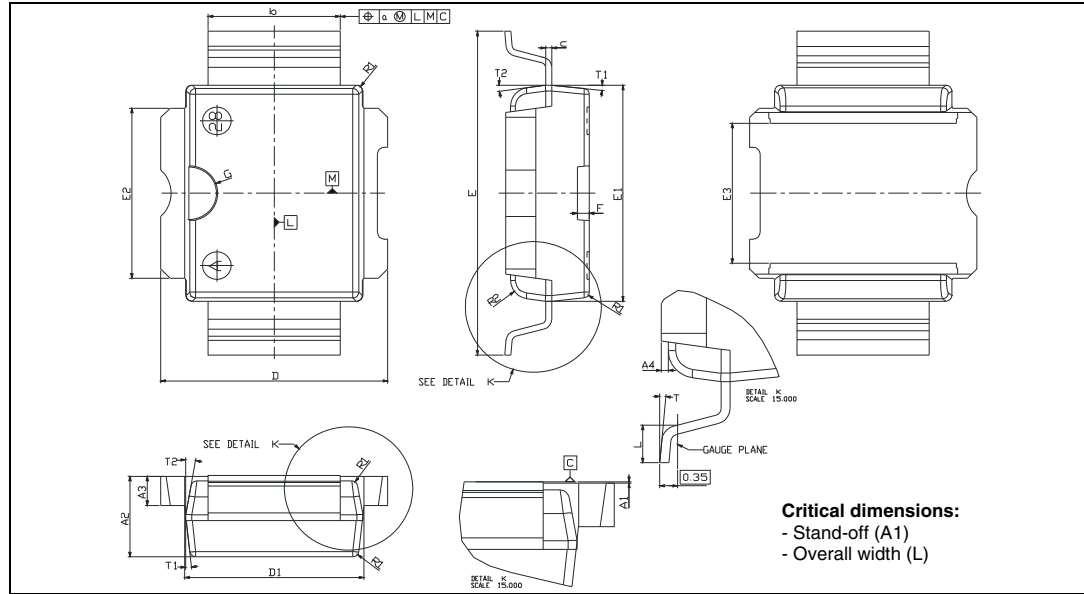
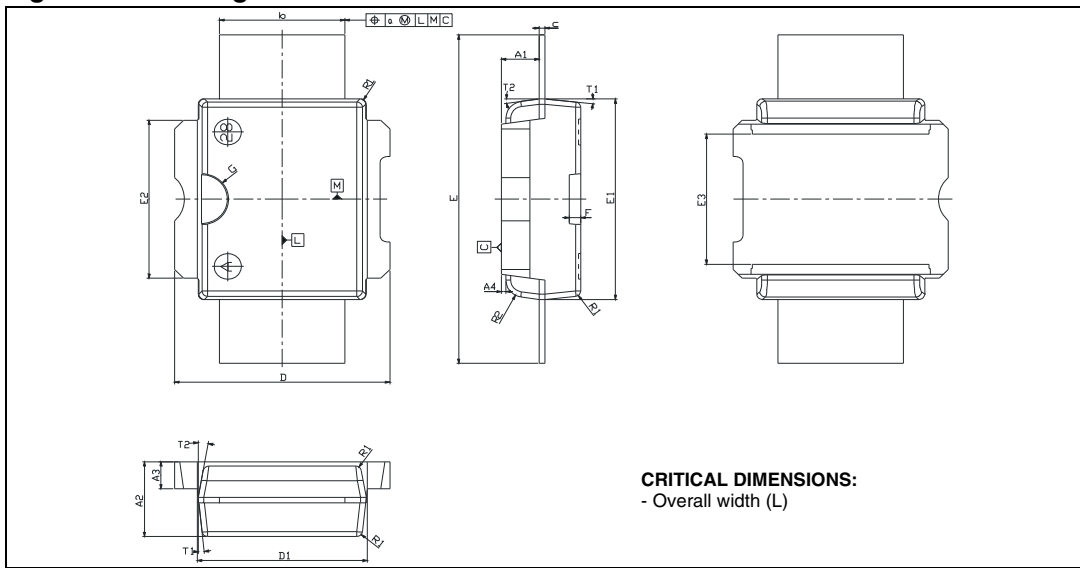


Table 10. PowerSO-10RF straight lead mechanical data

| Dim. | mm. | | | Inch | | |
|------|-------|--------|-------|-------|--------|-------|
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A1 | 1.62 | 1.67 | 1.72 | 0.064 | 0.065 | 0.068 |
| A2 | 3.4 | 3.5 | 3.6 | 0.134 | 0.137 | 0.142 |
| A3 | 1.2 | 1.3 | 1.4 | 0.046 | 0.05 | 0.054 |
| A4 | 0.15 | 0.2 | 0.25 | 0.005 | 0.007 | 0.009 |
| a | | 0.2 | | | 0.007 | |
| b | 5.4 | 5.53 | 5.65 | 0.212 | 0.217 | 0.221 |
| c | 0.23 | 0.27 | 0.32 | 0.008 | 0.01 | 0.012 |
| D | 9.4 | 9.5 | 9.6 | 0.370 | 0.374 | 0.377 |
| D1 | 7.4 | 7.5 | 7.6 | 0.290 | 0.295 | 0.298 |
| E | 15.15 | 15.4 | 15.65 | 0.595 | 0.606 | 0.615 |
| E1 | 9.3 | 9.4 | 9.5 | 0.365 | 0.37 | 0.375 |
| E2 | 7.3 | 7.4 | 7.5 | 0.286 | 0.292 | 0.294 |
| E3 | 5.9 | 6.1 | 6.3 | 0.231 | 0.24 | 0.247 |
| F | | 0.5 | | | 0.019 | |
| G | | 1.2 | | | 0.047 | |
| R1 | | | 0.25 | | | 0.01 |
| R2 | | 0.8 | | | 0.031 | |
| T1 | | 6 deg | | | 6 deg | |
| T2 | | 10 deg | | | 10 deg | |

Note: Resin protrusions not included (Max. value: 0.15 mm per side)

Figure 10. Package dimensions



6 Revision history

Table 11. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 14-Dec-2007 | 1 | Initial release. |
| 14-Apr-2009 | 2 | Updated Table 4 on page 4 . |
| 28-Jun-2011 | 3 | Updated Table 4 on page 4 . |
| 29-May-2012 | 4 | Removed commercial type in Table 1 on page 1 . |

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