

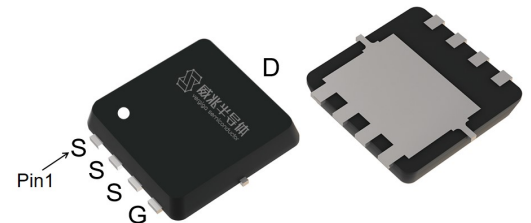
Features

- Enhancement mode
- Low on-resistance $R_{DS(on)}$ @ $V_{GS}=4.5V$
- Fast Switching and High efficiency
- Pb-free lead plating; RoHS compliant

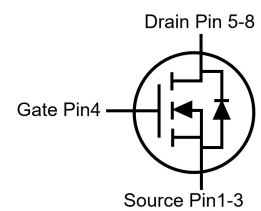


| | | |
|-------------------------------|----|------------|
| V_{DS} | 60 | V |
| $R_{DS(on),TYP@ V_{GS}=10V}$ | 9 | m Ω |
| $R_{DS(on),TYP@ V_{GS}=4.5V}$ | 11 | m Ω |
| I_D | 50 | A |

PDFN3333



| Part ID | Package Type | Marking | Packing |
|-------------|--------------|---------|--------------|
| VSE011N06MS | PDFN3333 | 011N06M | 5000pcs/Reel |



Maximum ratings, at $T_A=25^\circ C$, unless otherwise specified

| Symbol | Parameter | Rating | Unit |
|----------------|---|-------------------|------------|
| $V_{(BR)DSS}$ | Drain-Source breakdown voltage | 60 | V |
| V_{GS} | Gate-Source voltage | ± 20 | V |
| I_S | Diode continuous forward current | $T_C=25^\circ C$ | 50 A |
| I_D | Continuous drain current @ $V_{GS}=10V$ | $T_C=25^\circ C$ | 50 A |
| | | $T_C=100^\circ C$ | 32 A |
| I_{DM} | Pulse drain current tested ① | $T_C=25^\circ C$ | 200 A |
| I_{DSM} | Continuous drain current @ $V_{GS}=10V$ | $T_A=25^\circ C$ | 15 A |
| | | $T_A=70^\circ C$ | 12 A |
| EAS | Avalanche energy, single pulsed ② | | 58 mJ |
| P_D | Maximum power dissipation | $T_C=25^\circ C$ | 42 W |
| | | $T_C=100^\circ C$ | 17 W |
| P_{DSM} | Maximum power dissipation ③ | $T_A=25^\circ C$ | 3.6 W |
| | | $T_A=70^\circ C$ | 2.3 W |
| T_{STG}, T_J | Storage and junction temperature range | -55 to 150 | $^\circ C$ |

Thermal Characteristics

| Symbol | Parameter | Typical | Unit |
|-----------------|---|---------|--------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | 3 | $^\circ C/W$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 35 | $^\circ C/W$ |

Electrical Characteristics

| Symbol | Parameter | Condition | Min. | Typ. | Max. | Unit |
|--|--|--|------|------|------|------|
| Static Electrical Characteristics @ T_j = 25°C (unless otherwise stated) | | | | | | |
| V _{(BR)DSS} | Drain-Source Breakdown Voltage | V _{GS} =0V, I _D =250μA | 60 | -- | -- | V |
| I _{DSS} | Zero Gate Voltage Drain Current(T _j =25°C) | V _{DS} =60V, V _{GS} =0V | -- | -- | 1 | μA |
| | Zero Gate Voltage Drain Current(T _j =125°C) | V _{DS} =60V, V _{GS} =0V | -- | -- | 100 | μA |
| I _{GSS} | Gate-Body Leakage Current | V _{GS} =±20V, V _{DS} =0V | -- | -- | ±100 | nA |
| V _{GS(TH)} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _D =250μA | 1.3 | -- | 2.5 | V |
| R _{DS(ON)} | Drain-Source On-State Resistance ④ | V _{GS} =10V, I _D =15A | -- | 9 | 12 | mΩ |
| | | T _j =100°C | -- | 12 | -- | mΩ |
| R _{DS(ON)} | Drain-Source On-State Resistance ④ | V _{GS} =4.5V, I _D =10A | -- | 11 | 14 | mΩ |
| Dynamic Electrical Characteristics @ T_j= 25°C (unless otherwise stated) | | | | | | |
| C _{iss} | Input Capacitance | V _{DS} =30V, V _{GS} =0V, f=1MHz | 3310 | 3890 | 4470 | pF |
| C _{oss} | Output Capacitance | | 145 | 170 | 195 | pF |
| C _{rss} | Reverse Transfer Capacitance | | 120 | 140 | 160 | pF |
| R _g | Gate Resistance | f=1MHz | -- | 0.7 | -- | Ω |
| Q _g (10V) | Total Gate Charge | V _{DS} =30V, I _D =15A, V _{GS} =10V | -- | 64 | -- | nC |
| Q _g (4.5V) | Total Gate Charge | | -- | 31 | -- | nC |
| Q _{gs} | Gate-Source Charge | | -- | 12 | -- | nC |
| Q _{gd} | Gate-Drain Charge | | -- | 10 | -- | nC |
| Switching Characteristics | | | | | | |
| t _{d(on)} | Turn-on Delay Time | V _{DD} =30V, I _D =15A, R _G =3Ω, V _{GS} =10V | -- | 11 | -- | ns |
| t _r | Turn-on Rise Time | | -- | 25 | -- | ns |
| t _{d(off)} | Turn-Off Delay Time | | -- | 41 | -- | ns |
| t _f | Turn-Off Fall Time | | -- | 14 | -- | ns |
| Source- Drain Diode Characteristics@ T_j = 25°C (unless otherwise stated) | | | | | | |
| V _{SD} | Forward on voltage | I _{SD} =15A, V _{GS} =0V | -- | 0.8 | 1.2 | V |
| t _{rr} | Reverse Recovery Time | T _j =25°C, I _{sd} =15A, V _{GS} =0V | -- | 20 | -- | ns |
| Q _{rr} | Reverse Recovery Charge | di/dt=100A/μs | -- | 17 | -- | nC |

NOTE: ① Repetitive rating; pulse width limited by max junction temperature.

② Limited by T_{Jmax}, starting T_J = 25°C, L = 0.5mH, R_G = 25Ω, I_{AS} = 12A, V_{GS} = 10V. Part not recommended for use above this value

③ The power dissipation P_{DSM} is based on R_{θJA} and the maximum allowed junction temperature of 150°C.

④ Pulse width ≤ 380μs; duty cycle ≤ 2%.

Typical Characteristics

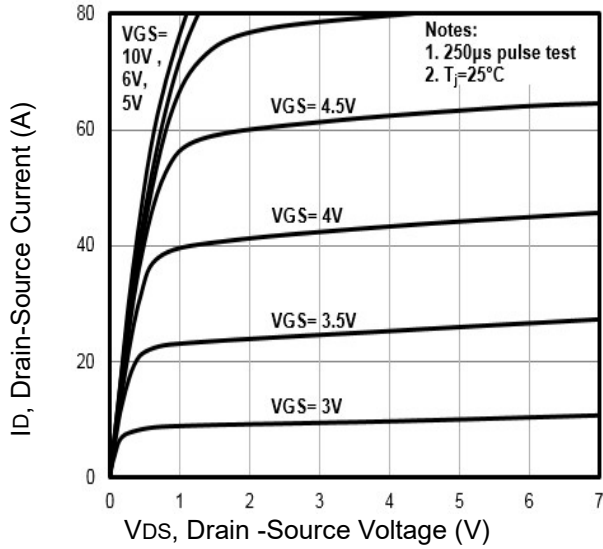


Fig1. Typical Output Characteristics

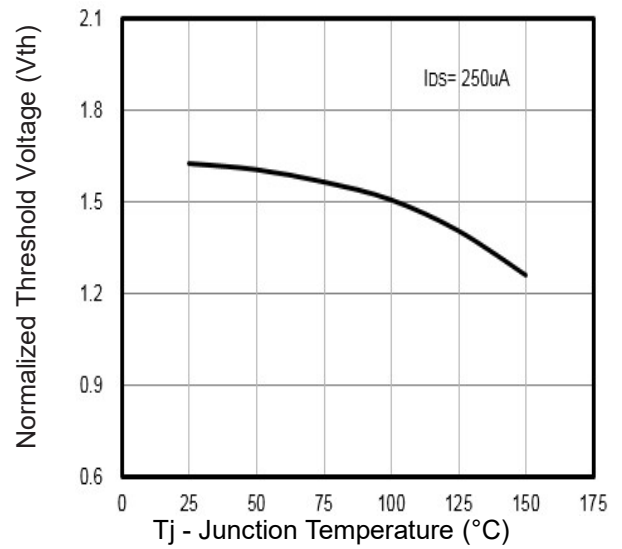


Fig2. Normalized Threshold Voltage Vs. Temperature

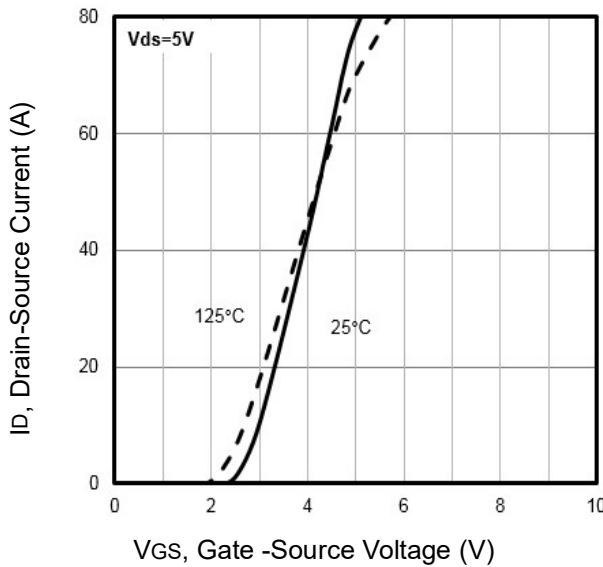


Fig3. Typical Transfer Characteristics

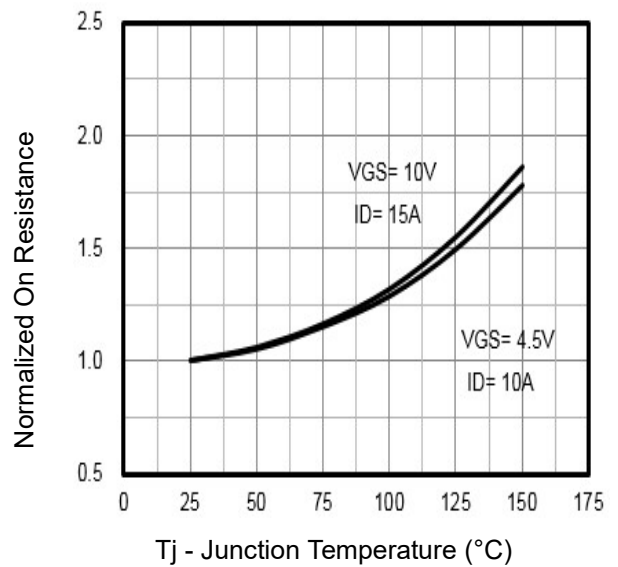


Fig4. Normalized On-Resistance Vs. Temperature

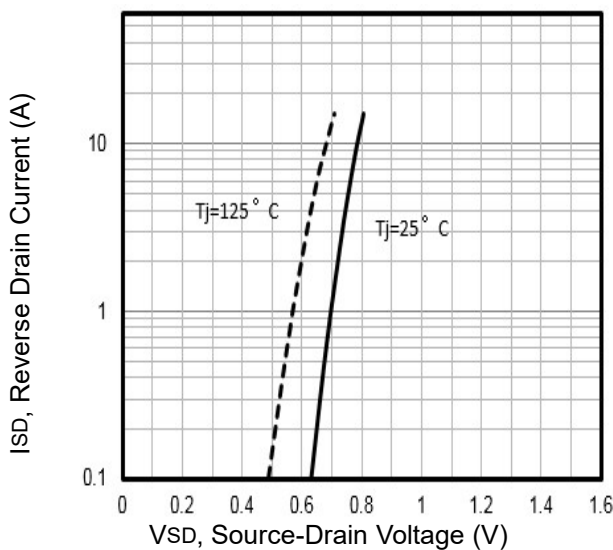


Fig5. Typical Source-Drain Diode Forward Voltage

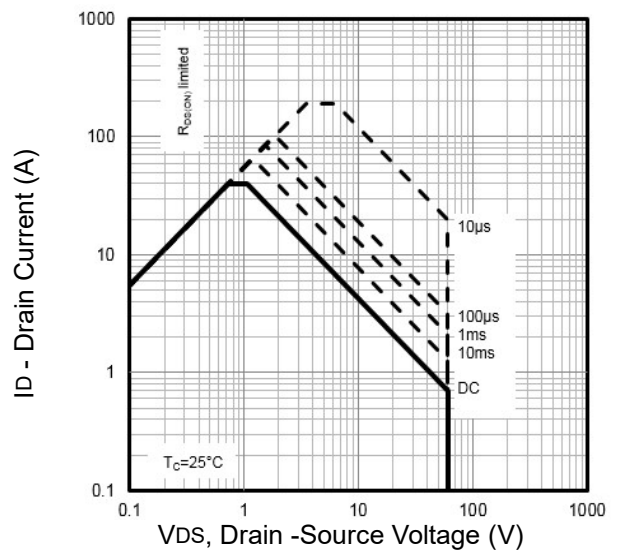


Fig6. Maximum Safe Operating Area

Typical Characteristics

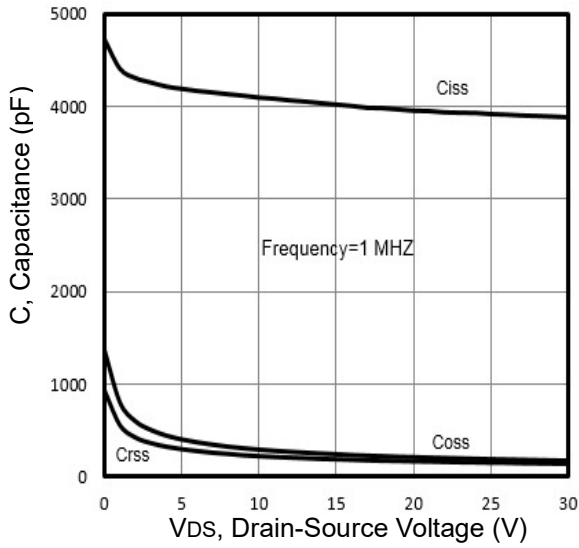


Fig7. Typical Capacitance Vs. Drain-Source Voltage

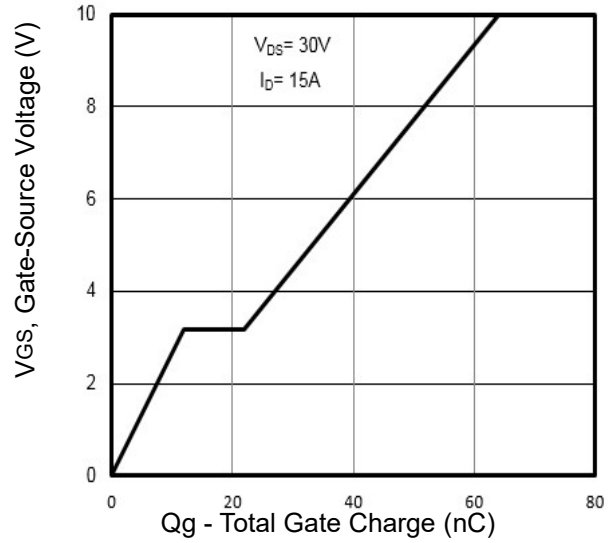


Fig8. Typical Gate Charge Vs. Gate-Source

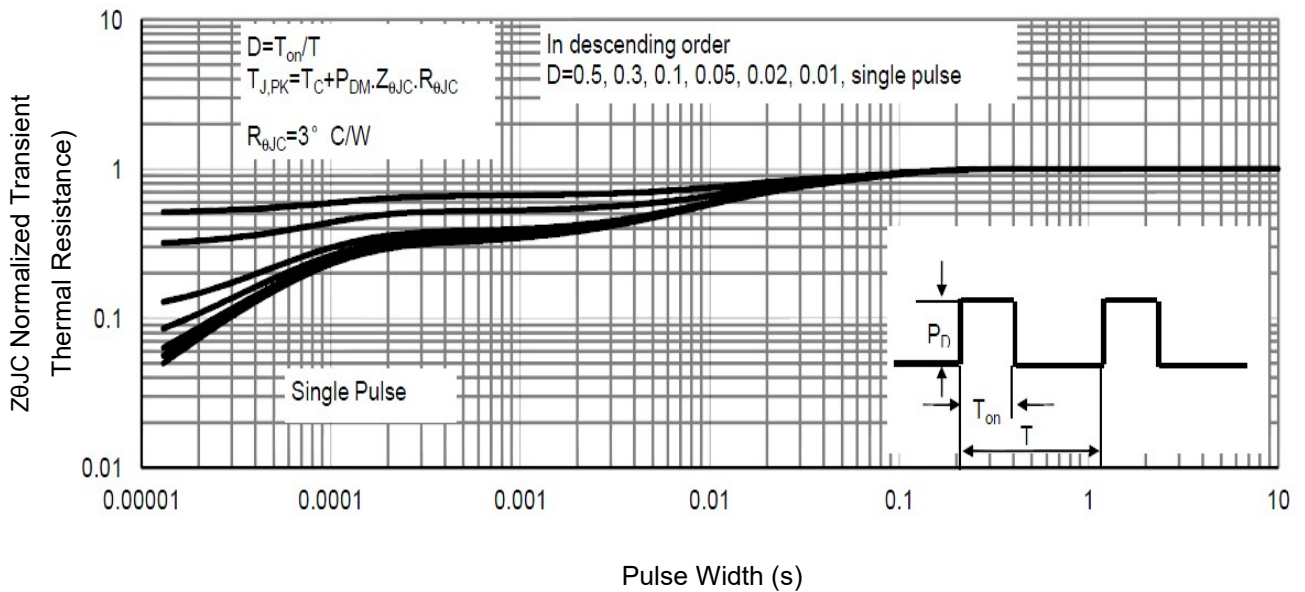


Fig9. Normalized Maximum Transient Thermal Impedance

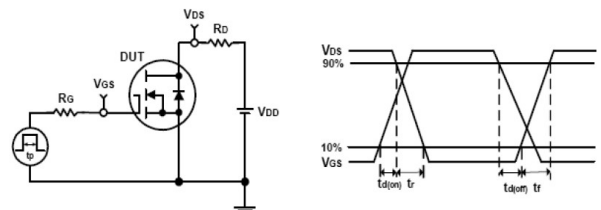
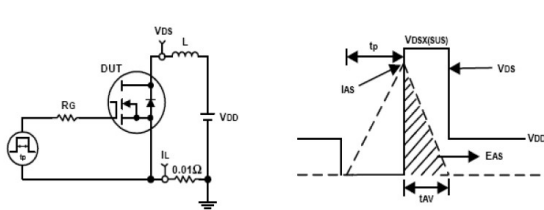
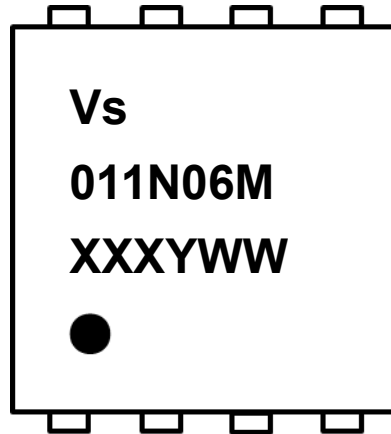


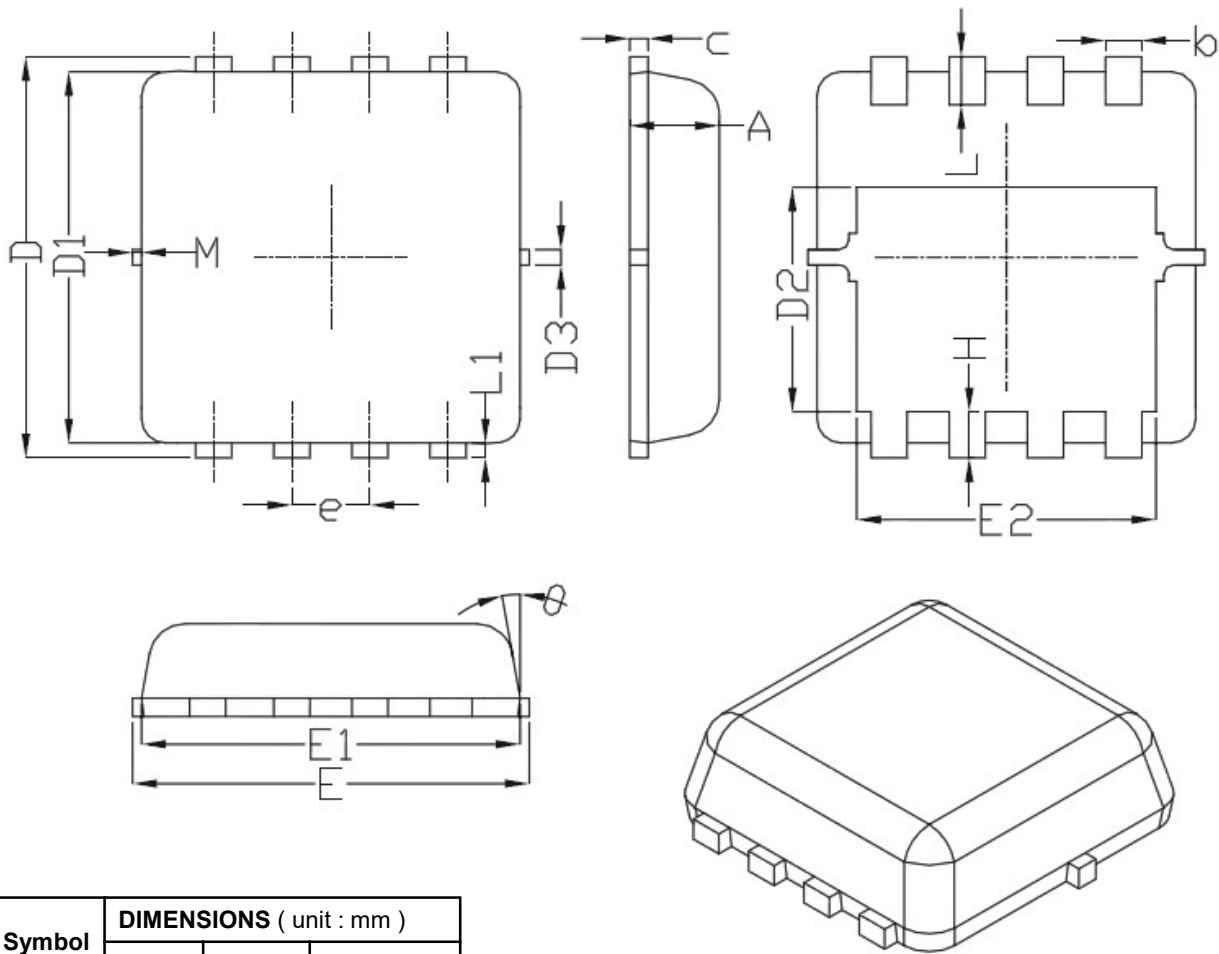
Fig10. Unclamped Inductive Test Circuit and waveforms Fig11. Switching Time Test Circuit and waveforms

Marking Information



- 1st line: Vergiga Code (Vs)
- 2nd line: Part Number (011N06M)
- 3rd line: Date code (XXXYWW)
 - XXX: Wafer Lot Number Code , code changed with Lot Number
 - Y: Year Code , refer to table below
 - WW: Week Code (01 to 53)

| Code | C | D | E | F | G | H | J | K | L | M | N | P | Q | R | S | T |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Year | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |

PDFN3333 Package Outline Data


| Symbol | DIMENSIONS (unit : mm) | | |
|-----------------|--------------------------|------|------|
| | Min | Typ | Max |
| A | 0.7 | 0.75 | 0.8 |
| b | 0.25 | 0.3 | 0.35 |
| C | 0.1 | 0.15 | 0.25 |
| D | 3.25 | 3.35 | 3.45 |
| D1 | 3 | 3.1 | 3.2 |
| D2 | 1.78 | 1.88 | 1.98 |
| D3 | -- | 0.13 | -- |
| E | 3.2 | 3.3 | 3.4 |
| E1 | 3 | 3.15 | 3.2 |
| E2 | 2.39 | 2.49 | 2.59 |
| e | 0.65 BSC | | |
| H | 0.3 | 0.39 | 0.5 |
| L | 0.3 | 0.4 | 0.5 |
| L1 | -- | 0.13 | -- |
| θ | -- | 10° | 12° |
| M | * | * | 0.15 |
| * Not specified | | | |

Notes:

1. Follow JEDEC MO-240 variation CA.
2. Dimensions "D1" and "E1" do NOT include mold flash protrusions or gate burrs.
3. Dimensions "D1" and "E1" include interterminal flash or protrusion. Interterminal flash or protrusion shall not exceed 0.25mm per side.

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