

N-Channel Enhancement-Mode MOSFET Transistors

TN2410L VN2406D VN2410L
VN2406L VN2410M
VN2406M

Product Summary

| Part Number | V _{(BR)DSS} Min (V) | r _{DS(on)} Max (Ω) | V _{GS(th)} (V) | I _D (A) |
|-------------|------------------------------|------------------------------|-------------------------|--------------------|
| TN2410L | 240 | 10 @ V _{GS} = 4.5 V | 0.5 to 1.8 | 0.18 |
| VN2406D | | 6 @ V _{GS} = 10 V | 0.8 to 2 | 1.12 |
| VN2406L | | 6 @ V _{GS} = 10 V | 0.8 to 2 | 0.18 |
| VN2406M | | 6 @ V _{GS} = 10 V | 0.8 to 2 | 0.19 |
| VN2410L | | 10 @ V _{GS} = 10 V | 0.8 to 2 | 0.18 |
| VN2410M | | 10 @ V _{GS} = 10 V | 0.8 to 2 | 0.19 |

Features

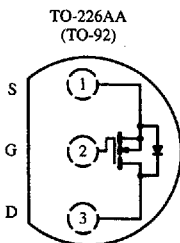
- Low On-Resistance: 3.5 Ω
- Secondary Breakdown Free: 260 V
- Low Power/Voltage Driven
- Low Input and Output Leakage
- Excellent Thermal Stability

Benefits

- Low Offset Voltage
- Full-Voltage Operation
- Easily Driven Without Buffer
- Low Error Voltage
- No High-Temperature "Run-Away"

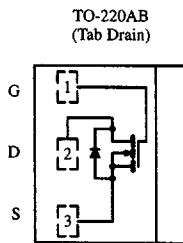
Applications

- High-Voltage Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Transistors, etc.
- Telephone Mute Switches, Ringer Circuits
- Power Supply, Converters
- Motor Control



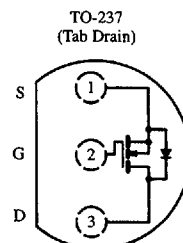
Top View

TN2410L
VN2406L
VN2410L



Top View

VN2406D



Top View

VN2406M
VN2410M

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TN2410L, VN2406/2410 Series

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Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ Unless Otherwise Noted)

| Parameter | Symbol | TN2410L | VN2406D ^b | VN2406L | VN2406M | VN2410L | VN2410M | Unit |
|---|---------------------------|------------|----------------------|----------|----------|----------|----------|---------------------------|
| Drain-Source Voltage | V_{DS} | 240 | 240 | 240 | 240 | 240 | 240 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | ± 20 | ± 20 | ± 20 | ± 20 | ± 20 | V |
| Continuous Drain Current ($T_J = 150^\circ\text{C}$) | $T_A = 25^\circ\text{C}$ | I_D | 0.18 | 1.12 | 0.18 | 0.19 | 0.18 | 0.19 |
| | $T_A = 100^\circ\text{C}$ | I_D | 0.11 | 0.7 | 0.11 | 0.12 | 0.11 | 0.12 |
| Pulsed Drain Current ^a | I_{DM} | 1 | 3 | 1.7 | 2 | 1.7 | 2 | A |
| Power Dissipation | $T_A = 25^\circ\text{C}$ | P_D | 0.8 | 20 | 0.8 | 1 | 0.8 | 1 |
| | $T_A = 100^\circ\text{C}$ | P_D | 0.32 | 8 | 0.32 | 0.4 | 0.32 | 0.4 |
| Maximum Junction-to-Ambient | R_{thJA} | 156 | 6.25 ^c | 156 | 125 | 156 | 125 | $^\circ\text{C}/\text{W}$ |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | -55 to 150 | | | | | | $^\circ\text{C}$ |

Notes

- Pulse width limited by maximum junction temperature.
- Reference case for all temperature testing.
- Maximum junction-to-case

Specifications^a

| Parameter | Symbol | Test Conditions | Typ ^b | Limits | | | | | | Unit |
|---|---------------|---|------------------|---------|-----|-------------|-----------|-----------|-----------|---------------|
| | | | | TN2410L | | VN2406D/L/M | | VN2410L/M | | |
| | | | | Min | Max | Min | Max | Min | Max | |
| Static | | | | | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = 100\ \mu\text{A}$ | 260 | 240 | | 240 | | 240 | | V |
| Gate-Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 1\text{ mA}$ | 1.4 | 0.5 | 1.8 | 0.8 | 2 | 0.8 | 2 | V |
| Gate-Body Leakage | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 15\text{ V}$ | | | | | ± 100 | | ± 100 | nA |
| | | $T_J = 125^\circ\text{C}$ | | | | | ± 500 | | ± 500 | |
| | | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$ | | | | ± 10 | | | | |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 192\text{ V}, V_{GS} = 0\text{ V}$ | 0.01 | | 1 | | | | | μA |
| | | $T_J = 125^\circ\text{C}$ | 1 | | 100 | | | | | |
| | | $V_{DS} = 120\text{ V}, V_{GS} = 0\text{ V}$ | | | | | 10 | | 10 | |
| On-State Drain Current ^c | $I_{D(on)}$ | $V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}$ | 0.8 | 0.25 | | | | | | A |
| | | $V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}$ | 1.5 | | | 1 | | 1 | | |
| | | $V_{GS} = 2.5\text{ V}, I_D = 0.1\text{ A}$ | 7.5 | | | | 10 | | 10 | |
| Drain-Source On-Resistance ^c | $r_{DS(on)}$ | $V_{GS} = 3.5\text{ V}, I_D = 0.05\text{ A}$ | 4.5 | | 15 | | | | | Ω |
| | | $V_{GS} = 4.5\text{ V}, I_D = 0.2\text{ A}$ | 4 | | 10 | | | | | |
| | | $T_J = 125^\circ\text{C}$ | 7.5 | | 20 | | | | | |
| | | $V_{GS} = 10\text{ V}, I_D = 0.5\text{ A}$ | 3.5 | | | | 6 | | 10 | |
| | | $T_J = 125^\circ\text{C}$ | 6.5 | | | | 14.8 | | 24.7 | |
| Forward Transconductance ^c | g_{fs} | $V_{DS} = 10\text{ V}, I_D = 0.2\text{ A}$ | 500 | 100 | | | | | | mS |
| | | $V_{DS} = 10\text{ V}, I_D = 0.5\text{ A}$ | 530 | | | 300 | | 300 | | |

Specifications^a

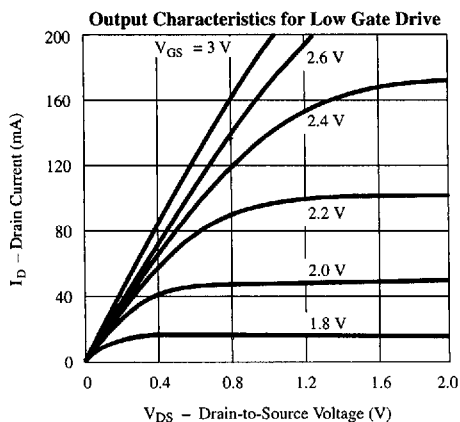
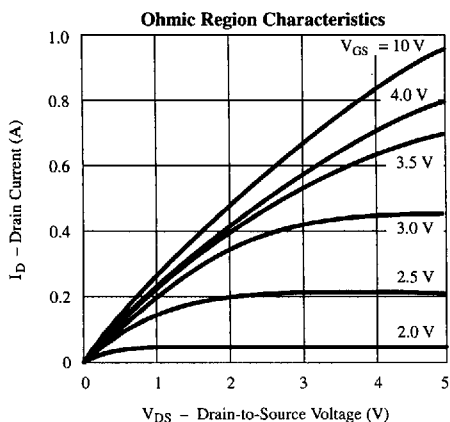
| Parameter | Symbol | Test Conditions | Typ ^b | Limits | | | | | | Unit |
|------------------------------|--------------|--|------------------|---------|-----|-------------|-----|-----------|-----|------|
| | | | | TN2410L | | VN2406D/L/M | | VN2410L/M | | |
| | | | | Min | Max | Min | Max | Min | Max | |
| Dynamic | | | | | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}$ $f = 1\text{ MHz}$ | 115 | | 135 | | 135 | | 135 | pF |
| Output Capacitance | C_{oss} | | 30 | | 50 | | 50 | | 50 | |
| Reverse Transfer Capacitance | C_{rss} | | 5 | | 20 | | 20 | | 20 | |
| Switching^d | | | | | | | | | | |
| Turn-On Time | t_{ON} | $V_{DD} = 60\text{ V}, R_L = 150\ \Omega$ $I_D \approx 0.4\text{ A}, V_{GEN} = 10\text{ V}$ $R_G = 25\ \Omega$ | 5 | | 35 | | | | | ns |
| | $t_{d(on)}$ | | 3 | | | | 8 | | 8 | |
| | t_r | | 2 | | | | 8 | | 8 | |
| Turn-Off Time | t_{OFF} | | 26 | | 60 | | | | | |
| | $t_{d(off)}$ | | 20 | | | | 23 | | 23 | |
| | t_f | | 6 | | | | 24 | | 34 | |

Notes

- a. $T_A = 25^\circ\text{C}$ unless otherwise noted.
- b. For DESIGN AID ONLY, not subject to production testing.
- c. Pulse test: $PW \leq 300\ \mu\text{s}$ duty cycle $\leq 2\%$.
- d. Switching time is essentially independent of operating temperature.

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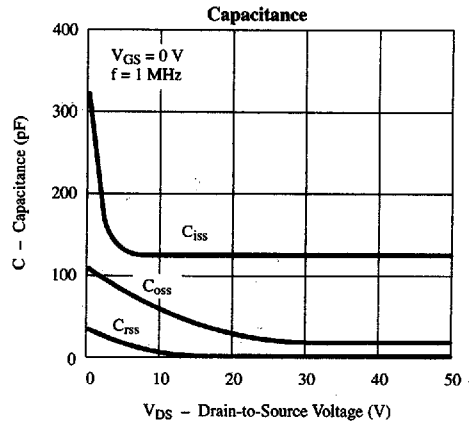
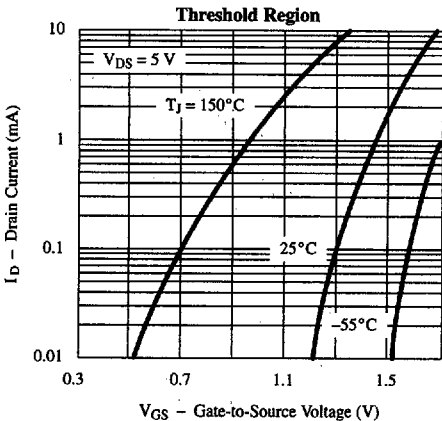
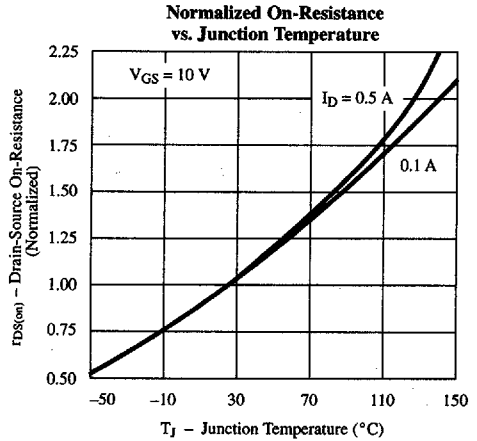
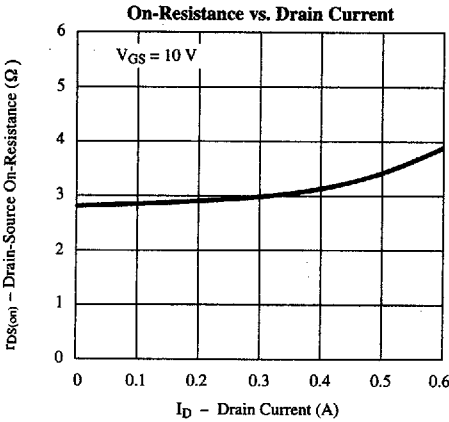
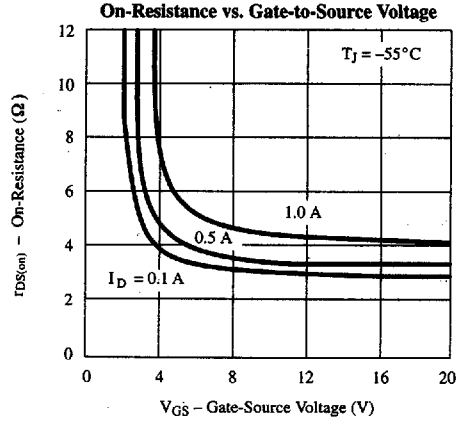
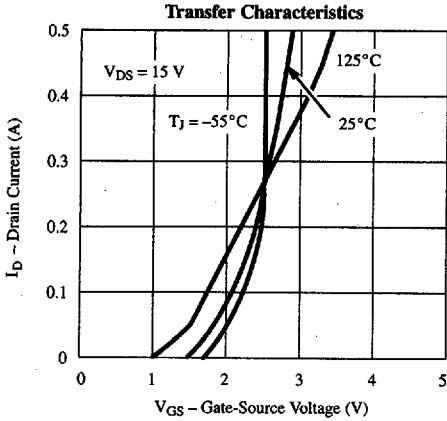
Typical Characteristics (25°C Unless Otherwise Noted)



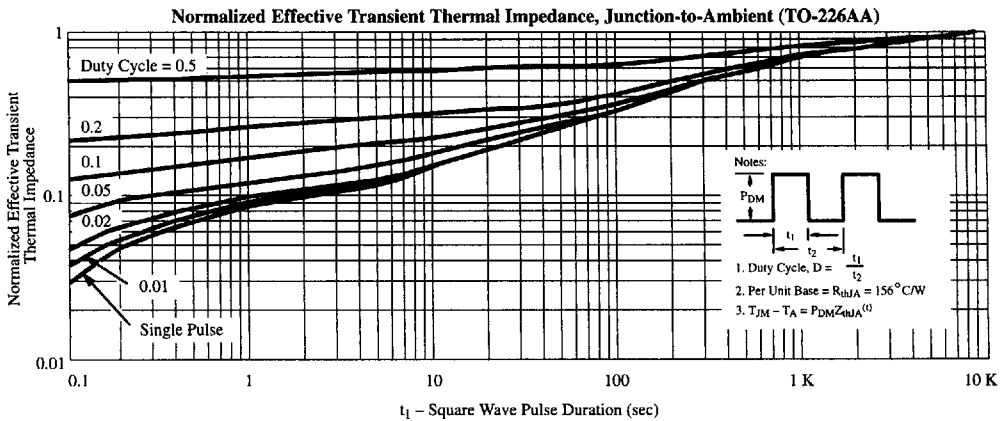
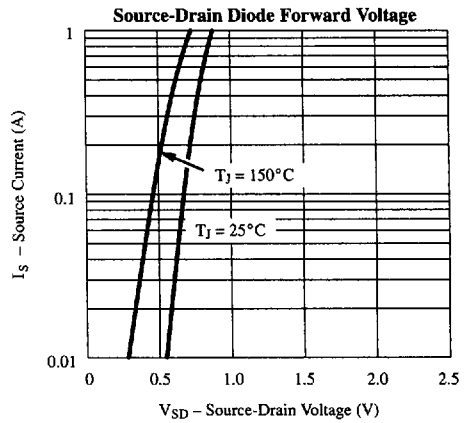
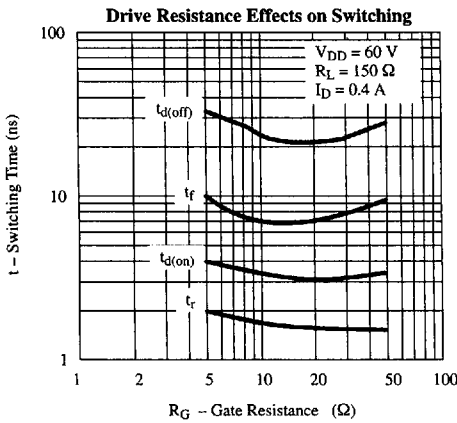
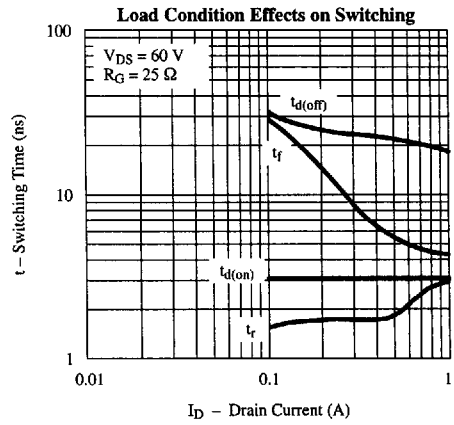
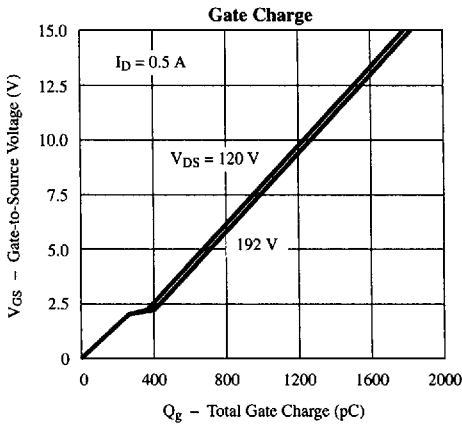
TN2410L, VN2406/2410 Series

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Typical Characteristics (25°C Unless Otherwise Noted) (Cont'd)



Typical Characteristics (25°C Unless Otherwise Noted) (Cont'd)



Low Power MOSFETs