# FMOSTHU25N06-Q1-H

## List

# FMOSTHU25N06-Q1-H

## 25A 60V N-Channel Trench Enhancement Mode Power MOSFET

### Features

- $V_{DS}$ = 60V, $I_D$ = 25A.
- $R_{DS(ON)}$ ≤ 36mΩ, @$V_{GS}$=10V, $I_D$=12A.
- $R_{DS(ON)}$ ≤ 45mΩ, @$V_{GS}$=4.5V, $I_D$=7A.
- Fast switching.
- Qualified to AEC-Q101 standard for high reliability.
- Lead-free parts meet RoHS requirements.
- Halogen-free (IEC61249-2-21) .

### Applications

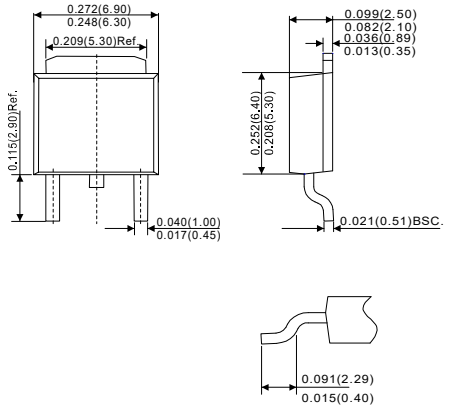
- LED lamp.
- Load switch.
- Uninterruptible power supply.

### Mechanical data

- Epoxy:UL94-V0 rated flame retardant.
- Case : Molded plastic, TO-252 (DPAK).
- Terminals : Solder plated, solder able per MIL-STD-750, Method 2026.
- Mounting Position : Any.

### Package outline

TO-252 (DPAK)




Dimensions in inches and (millimeters)

### Maximum ratings (At $T_J$=25°C unless otherwise noted)

| Parameter | Symbol | Ratings | Unit |
|---|---|---|---|
| Drain-source voltage | $V_{DS}$ | 60 | V |
| Gate-source voltage | $V_{GS}$ | ±20 | V |
| Continuous drain current ($T_C$=25°C) | $I_D$ | 25 | A |
| Pulsed drain current (Note 1) | $I_{DM}$ | 62 | A |
| Power dissipation ($T_C$=25°C) | $P_D$ | 37.5 | W |
| Thermal resistance, junction to ambient | $R_{\theta JA}$ | 62 | °C/W |
| Thermal resistance, junction to case | $R_{\theta JC}$ | 4 | °C/W |
| Junction temperature | $T_J$ | +175 | °C |
| Storage temperature range | $T_{STG}$ | -55 to +175 | |

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## Electrical characteristics (At $T_J$=25°C unless otherwise noted)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Off characteristics** | | | | | | |
| Drain-source breakdown voltage | $BV_{DSS}$ | $I_D$=250μA, $V_{GS}$=0V | 60 | | | V |
| Drain-source leakage current | $I_{DSS}$ | $V_{DS}$=48V, $V_{GS}$=0V | | | 1 | μA |
| Gate-source leakage current | $I_{GSS}$ | $V_{GS}$=±20V, $V_{DS}$=0V | | | ±100 | nA |
| **On characteristics** | | | | | | |
| Gate threshold voltage | $V_{GS(TH)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 1.2 | | 2.5 | V |
| Static drain-source on-state resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=12A | | | 36 | mΩ |
| | | $V_{GS}$=4.5V, $I_D$=7A | | | 45 | |
| **Dynamic parameters** | | | | | | |
| Input capacitance | $C_{iss}$ | $V_{GS}$=0V, $V_{DS}$=15V, f=1.0MHz | | 1027 | | pF |
| Out capacitance | $C_{oss}$ | | | 65 | | |
| Reverse transfer capacitance | $C_{rss}$ | | | 46 | | |
| Gate resistance | $R_g$ | $V_{GS}$=0V, $V_{DS}$=0V, f=1.0MHz | | 2.5 | | Ω |
| **Switching parameters** | | | | | | |
| Total gate charge | $Q_g$ | $V_{GS}$=10V, $V_{DS}$=48V, $I_D$=15A | | 19 | | nC |
| Gate to source charge | $Q_{gs}$ | | | 2.5 | | |
| Gate to drain charge | $Q_{gd}$ | | | 5 | | |
| Turn-on delay time | $t_{d(on)}$ | $V_{GS}$=10V, $V_{DD}$=30V, $I_D$=15A, $R_G$=3.3Ω | | 2.8 | | ns |
| Rise time | $t_r$ | | | 16.6 | | |
| Turn-off delay time | $t_{d(off)}$ | | | 21.2 | | |
| Fall time | $t_f$ | | | 5.6 | | |
| **Source-drain diode ratings and characteristics** | | | | | | |
| Drain-source diode forward voltage (Note2) | $V_{SD}$ | $I_S$=1A, $V_{GS}$=0V | | | 1.2 | V |
| Maximum body-diode continuous current | $I_S$ | $V_G$=$V_D$=0V, force current | | | 20 | A |
| Body diode reverse recovery time | $t_{rr}$ | $I_F$=15A, $dI_F/dt$ =100A/μs | | 12.2 | | nS |
| Body diode reverse recovery charge | $Q_{rr}$ | | | 7.3 | | nC |

Notes : 1. Repetitive rating: pulsed width limited by maximum junction temperature.
2. The data tested by pulsed, pulse width ≤ 300μs, duty cycle ≤ 2%.
3. The data is theoretically the same as $I_D$ and $I_{DM}$, in real applications, should be limited by total power dissipation.

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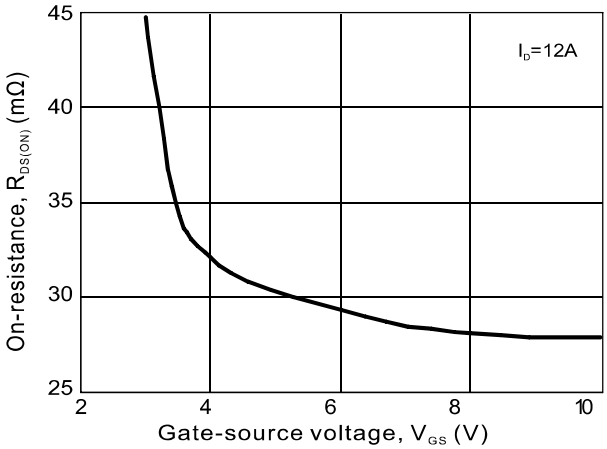
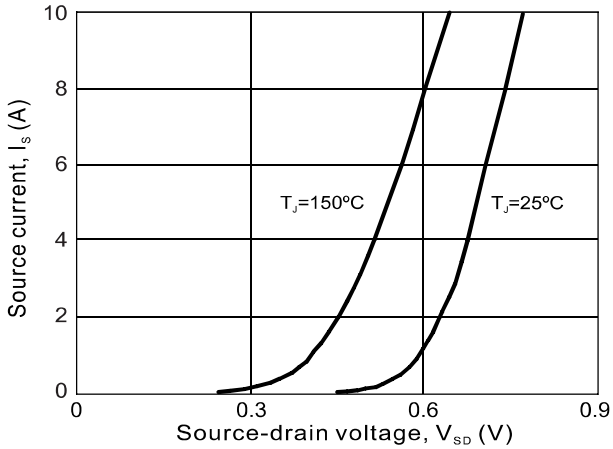
## Rating and characteristic curves

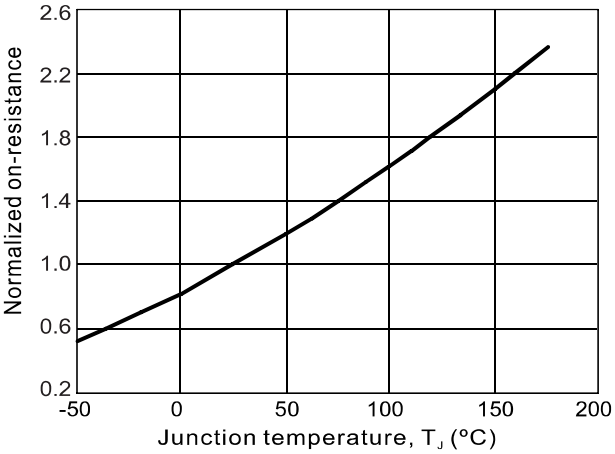
On-resistance vs. Gate-source voltage



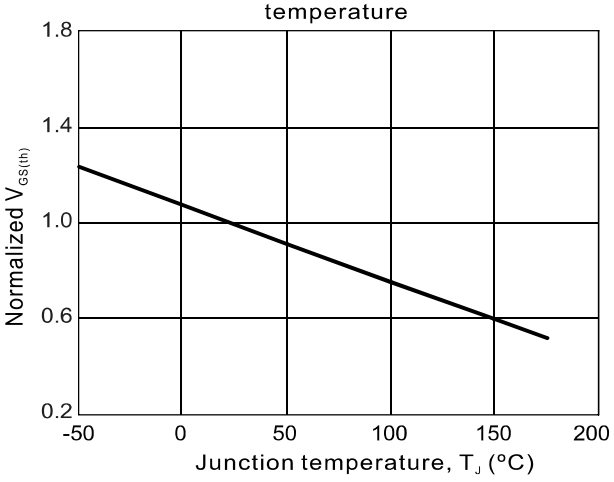

Source current vs. Source-drain voltage



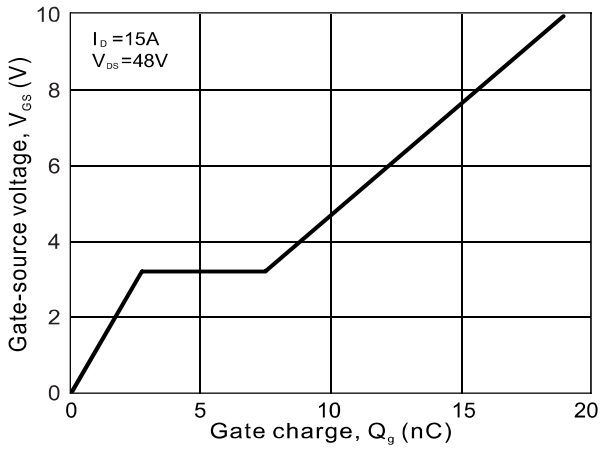

Normalized on-resistance vs. Junction temperature




Normalized gate threshold voltage vs. Junction temperature




Gate charge characteristics



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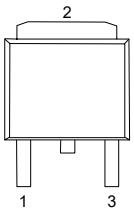
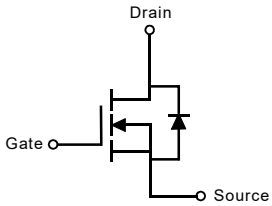
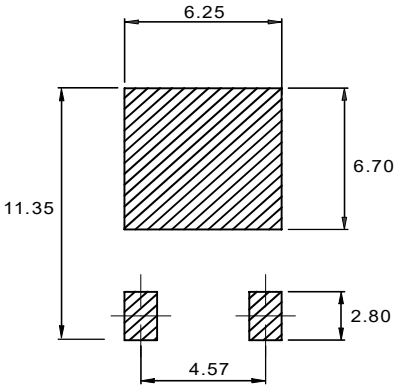
## Pinning information

| Pin | Simplified outline | Symbol |
|---|---|---|
| Pin 1 Gate<br>Pin 2 Drain<br>Pin 3 Source |  |  |

## Marking

| Type Number | Marking code |
|---|---|
| FMOSTHU25N06-Q1-H | NG036 |

## Suggested solder pad layout




Note:
1.Controlling dimension:in millimeters.
2.General tolerance:± 0.1mm.
3.The pad layout is for reference purposes only.

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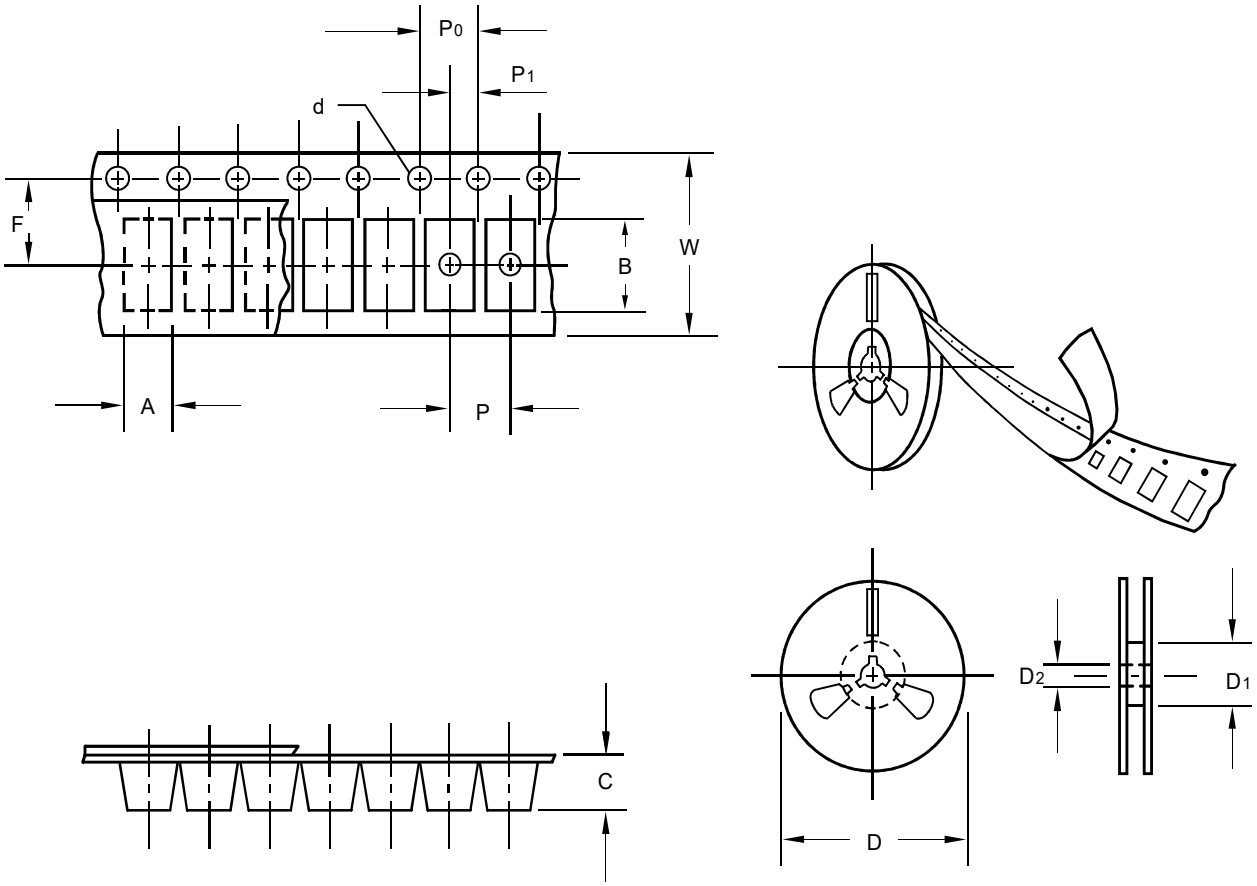
## Packing information




unit:mm

| Item | Symbol | Tolerance | TO-252 (DPAK) |
|---|---|---|---|
| Carrier width | A | 0.1 | 6.90 |
| Carrier length | B | 0.1 | 10.50 |
| Carrier depth | C | 0.1 | 2.78 |
| Sprocket hole | d | 0.1 | 1.50 |
| 13" Reel outside diameter | D | 2.0 | 330.00 |
| 13" Reel inner diameter | $D_1$ | min | 98.00 |
| 7" Reel outside diameter | D | 2.0 | - |
| 7" Reel inner diameter | $D_1$ | min | - |
| Feed hole diameter | $D_2$ | 0.5 | 13.00 |
| Punch hole position | F | 0.1 | 7.50 |
| Punch hole pitch | P | 0.1 | 8.00 |
| Sprocket hole pitch | $P_0$ | 0.1 | 4.00 |
| Embossment center | $P_1$ | 0.1 | 2.00 |
| Tape width | W | 0.3 | 16.00 |

Note:Devices are packed in accor dance with EIA standar RS-481-A and specifications listed above.

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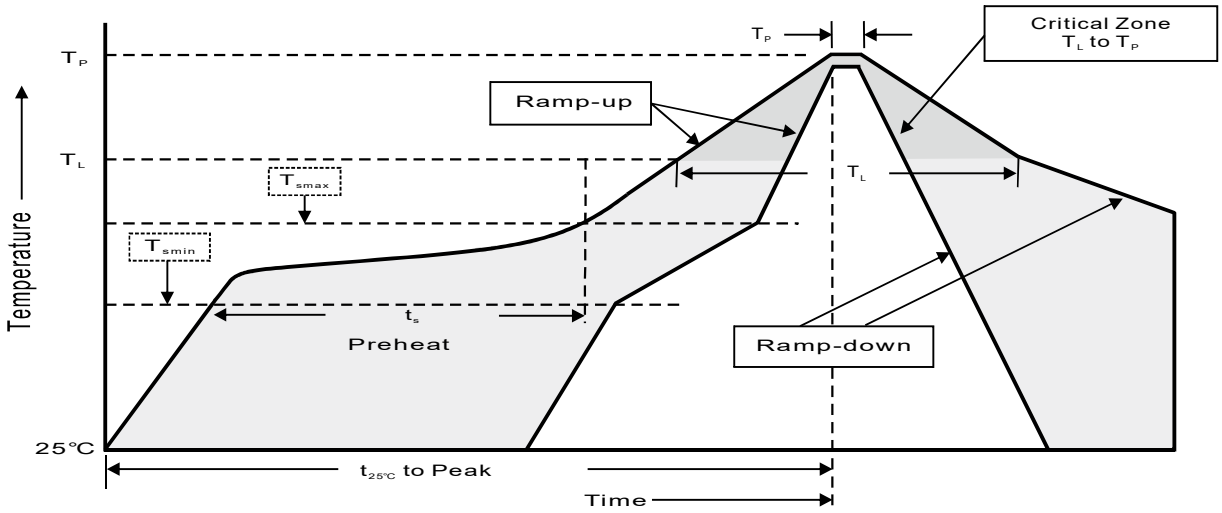
## Reel packing

| PACKAGE | REEL SIZE | REEL (pcs) | COMPONENT SPACING (m/m) | BOX (pcs) | INNER BOX (m/m) | REEL DIA, (m/m) | CARTON SIZE (m/m) | CARTON (pcs) |
|---|---|---|---|---|---|---|---|---|
| TO-252 (DPAK) | 13" | 2,500 | 4.0 | 5,000 | 335*335*38 | 178 | 350*350*225 | 25,000 |

## Suggested thermal profiles for soldering processes

1.Storage environment: Temperature = 5°C ~ 40°C Humidity = 55%, ±25%
2.Reflow soldering of surface-mount devices




3.Reflow soldering

| Profile feature | Soldering condition |
|---|---|
| Average ramp-up rate ($T_L$ to $T_P$) | < 3 ℃/sec |
| Preheat<br>- Temperature Min ($T_{smin}$)<br>- Temperature Max ($T_{smax}$)<br>- Time (Min to Max) ($t_s$) | <br>150℃<br>200℃<br>60 ~ 120 sec |
| $T_{smax}$ to $T_L$<br>- Ramp-up rate | <br>< 3 ℃/sec |
| Time maintained above :<br>- Temperature ($T_L$)<br>- Time ($T_L$) | <br>217℃<br>60 ~ 260 sec |
| Peak temperature ($T_P$) | 255 ℃ -0/+5℃ |
| Time with 5℃ of actual peak temperature ($T_P$) | 10 ~30 sec |
| Ramp-down rate | < 6 ℃/sec |
| Time 25℃ to peak temperature | < 6 minutes |

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## High reliability test capabilities

| Item Test | Conditions | Reference |
|---|---|---|
| 1. MSL Preconditioning | 24hr bake@125°C+168hrs@85°C /85%RH+3xIR@260°C+1flux immersion+alcohol+DI H2O rinse | JESD22-A113 |
| 2. High Temperature Reverse Bias | $V_{DS}$=$V_{DS}$*80% ($T_J$=$T_J$ max.)Test Duration:1000hrs | JESD22-A108 |
| 3. High Temperature Storage Life | Ta=150°C Test Duration:1000hrs | JESD22 A-103 |
| 4. Temperature Cycle | -55°C(15min) to 150°C(15min)Test Cycles:1000cycles | JESD22 A-104 |
| 5. Autoclave | P=2atm Ta=121°C RH=100% Test Duration:96hrs | JESD22 A-102 |
| 6. Solderability | 245±5°C for 5sec | J-STD-002 |
| 7. Moisture Resistance | Ta=85°C/85% Relative humidity Test Duration:1000hrs | MIL-STD-750E METHOD 1021.2 |
| 8. Resistance To Solder Heat | 260±5°C for 10sec | JESD22 B-106 |
| 9. High Temperature High Humidity Reverse Bias | Ta=85°C, 85%RH, $V_{DS}$=80% rated$V_{DS}$ Test Duration: 1000hrs | JESD22-A101 |