# PAN0024N

**N-Ch 100V Fast Switching MOSFET**

**$V_{DS}$=100V, $I_D$=2.0A, $RDS_{(ON)}$=160mΩ**

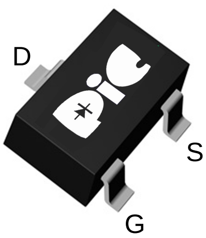
## General Description

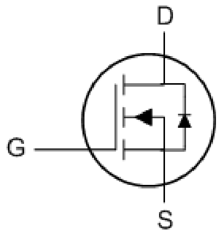
This PAN0024N N-Channel enhancement mode power field effect transistor is the high density trench technology and this advanced technology can provide excellent Rds(On) performance and efficiency for power switching and load switching application., this device also comply with the RoHS and Green Product requirement with full function reliability approved.

## Feature

- ●Super Low Gate Charge
- ●Green Device Available
- ●Excellent CdV/dt effect decline
- ●Advanced high cell density Trench technology
- ●SOT-23 Package design

## SOT-23




## Application

- ●Load Switch
- ●Portable instrument
- ●MB / NB / 3C device

## Absolute Maximum Ratings

| Parameter | Symbol | Rating | Units |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 100 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Continuous Drain Current, $V_{GS}$ @ 10V[1] | $I_D$@$T_A$=25˚C | 2 | A |
| Continuous Drain Current, $V_{GS}$ @ 10V[1] | $I_D$@$T_A$=70˚C | 1.6 | A |
| Pulsed Drain Current[2] | $I_{DM}$ | 4 | A |
| Total Power Dissipation[3] | $P_D$@$T_A$=25˚C | 1.5 | W |
| Storage Temperature Range | $T_{STG}$ | -55 to 150 | ˚C |
| Operating Junction Temperature Range | $T_J$ | -55 to 150 | ˚C |
| Thermal Resistance Junction-ambient(steady state)[1] | $R_{θJA}$ | 125 | ˚C/W |
| Thermal Resistance Junction-ambient(t<10s)[1] | | 85 | ˚C/W |

## Electrical Characteristics ($T_J$=25°C Unless otherwise noted)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V , $I_D$=250uA | 100 | --- | --- | V |
| Static Drain-Source On-Resistance [2] | $R_{DS(ON)}$ | $V_{GS}$=10V , $I_D$=2A | --- | --- | 160 | mΩ |
| | | $V_{GS}$=4.5V , $I_D$=1A | --- | --- | 175 | mΩ |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{GS}$=$V_{DS}$ , $I_D$ =250uA | 1.0 | 1.5 | 2.5 | V |
| Drain-Source Leakage Current | $I_{DSS}$ | $V_{DS}$=80V , $V_{GS}$=0V , $T_J$=25°C | --- | --- | 10 | uA |
| | | $V_{DS}$=80V , $V_{GS}$=0V , $T_J$=55°C | --- | --- | 100 | |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| Forward Transconductance | gfs | $V_{DS}$=5V , $I_D$=2A | --- | 10.2 | --- | S |
| Gate Resistance | $R_g$ | $V_{DS}$=0V , $V_{GS}$=0V , f=1MHz | --- | 2.3 | 4.6 | Ω |
| Total Gate Charge (10V) | $Q_g$ | $V_{DS}$=60V , $V_{GS}$=10V , $I_D$=2A | --- | 25 | --- | nC |
| Gate Source Charge | $Q_{gs}$ | | --- | 4.2 | --- | |
| Gate-Drain Charge | $Q_{gd}$ | | --- | 4.3 | --- | |
| Turn-On Delay Time | $T_{d(on)}$ | $V_{DD}$=50V , $V_{GS}$=10V , $R_G$=3.3Ω $I_D$=1A | --- | 17.3 | --- | ns |
| Rise Time | $T_r$ | | --- | 2.8 | --- | |
| Turn-Off Delay Time | $T_{d(off)}$ | | --- | 50 | --- | |
| Fall Time | $T_f$ | | --- | 2.8 | --- | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=15V , $V_{GS}$=0V , f=1MHz | --- | 1077 | --- | pF |
| Output Capacitance | $C_{oss}$ | | --- | 46 | --- | |
| Reverse Transfer Capacitance | $C_{rss}$ | | --- | 32 | --- | |

## Diode Characteristics

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Continuous Source Current [1,4] | $I_S$ | $V_G$=$V_D$=0V , Force Current | --- | --- | 2 | A |
| Diode Forward Voltage [2] | $V_{SD}$ | $V_{GS}$=0V , $I_S$=1A , $T_J$=25°C | --- | --- | 1.2 | V |

Note :
1.Pulse width limited by maximum junction temperature.
2.The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%
3.Ensure that the channel temperature does not exceed 150°C.
4.The data is theoretically the same as ID and IDM , in real applications , should be limited by total power dissipation.

## Typical Characteristics

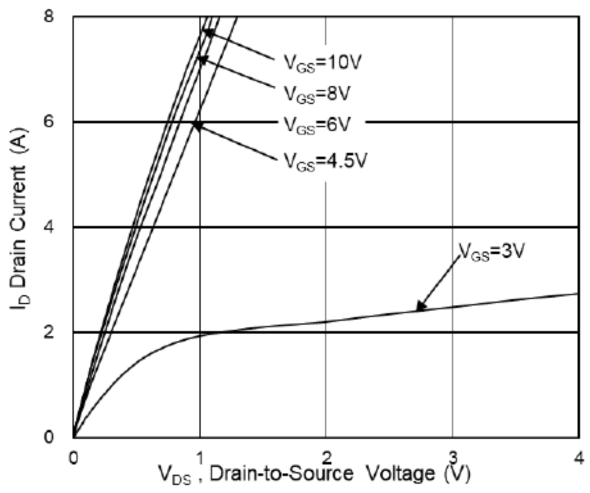



Fig.1 Typical Output Characteristics

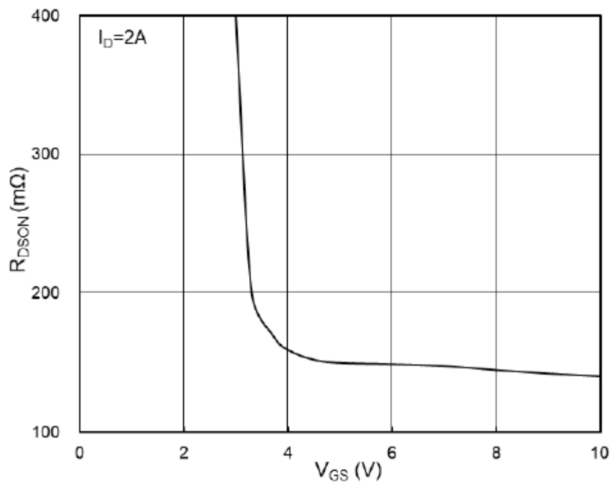



Fig.2 On-Resistance vs G-S Voltage

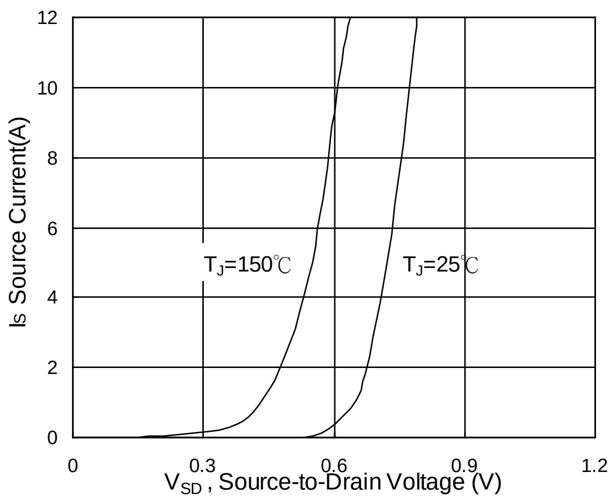



Fig.3 Source Drain Forward Characteristics

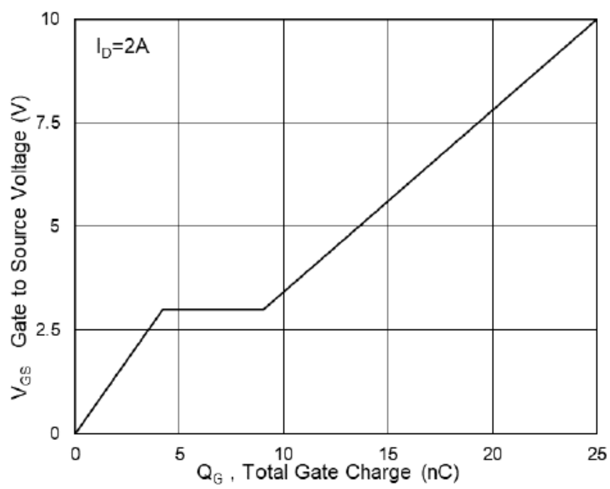



Fig.4 Gate-Charge Characteristics

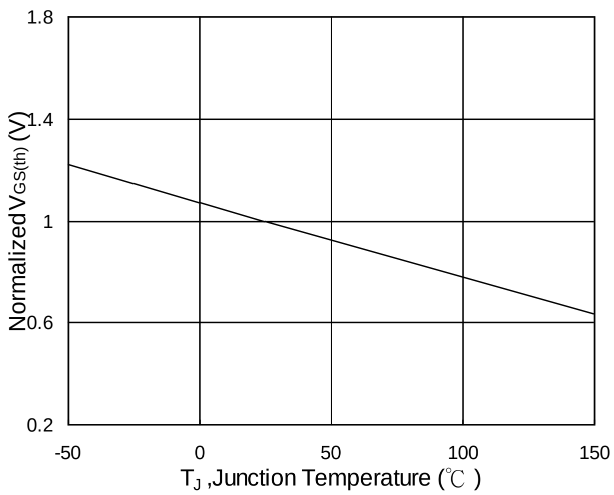



Fig.5 Normalized $V_{GS(th)}$ vs $T_J$

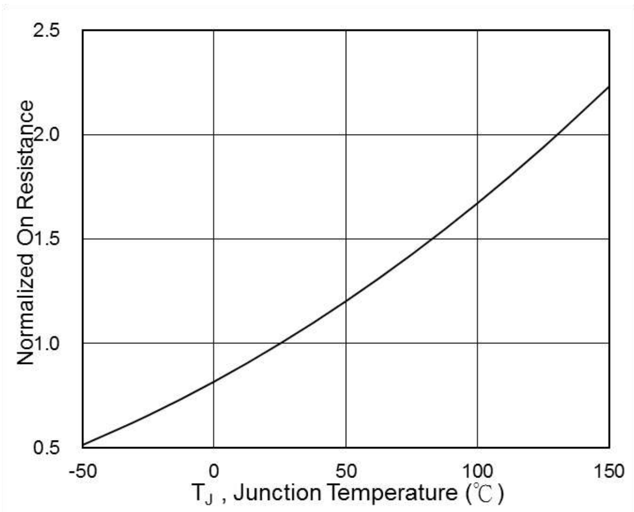



Fig.6 Normalized $R_{DSON}$ vs $T_J$

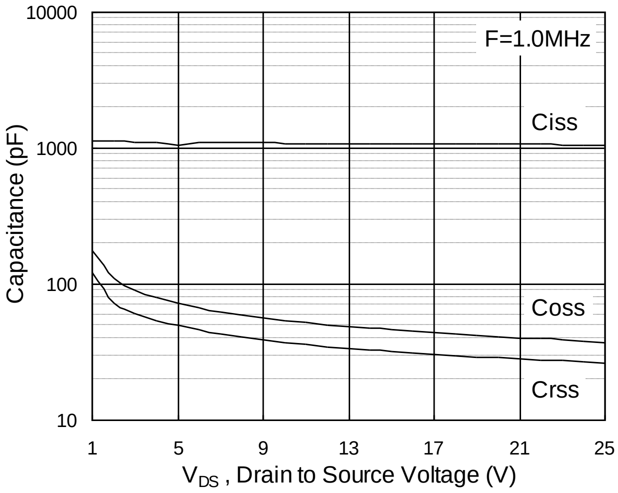



**Fig.7 Capacitance**

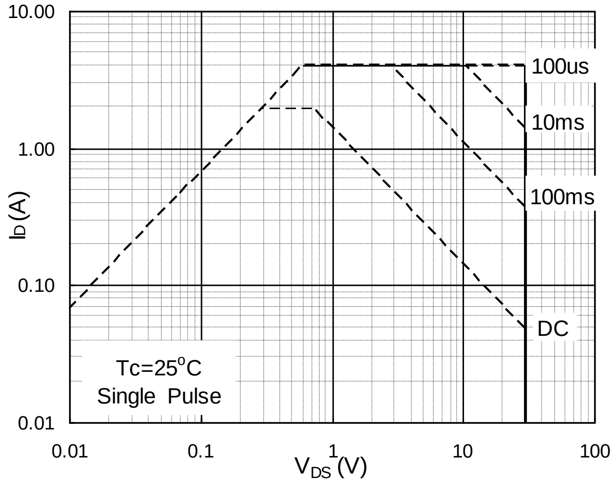



**Fig.8 Safe Operating Area**

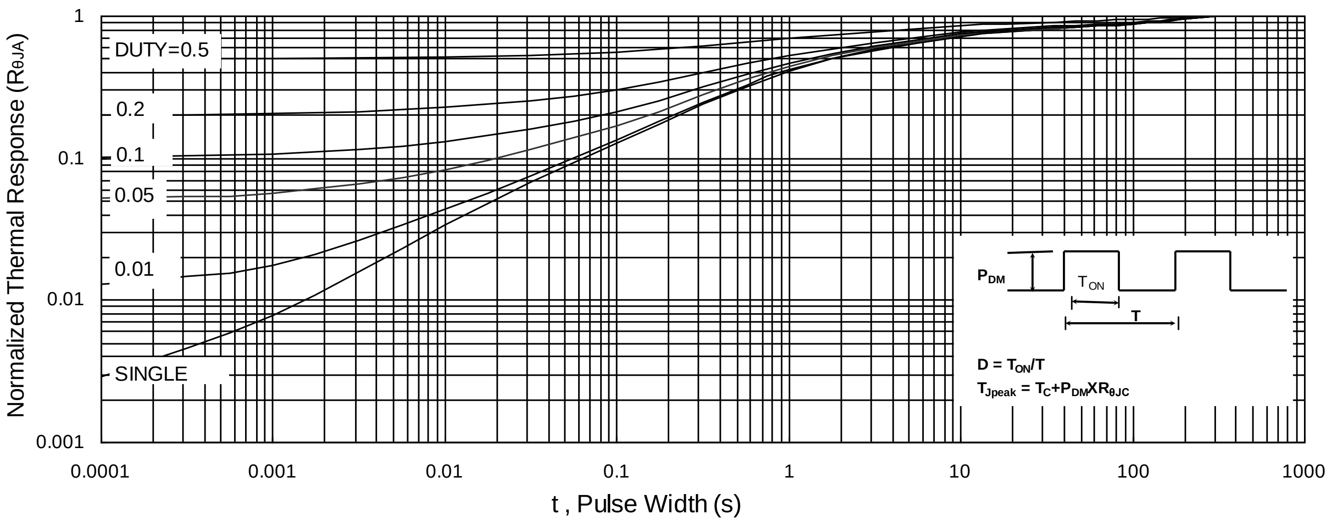



**Fig.9 Normalized Maximum Transient Thermal Impedance**

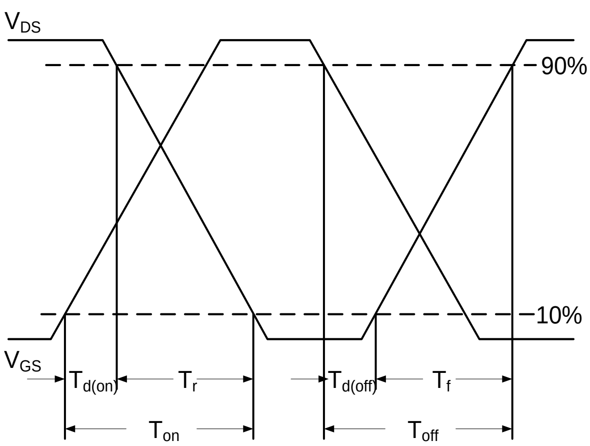



**Fig.10 Switching Time Waveform**

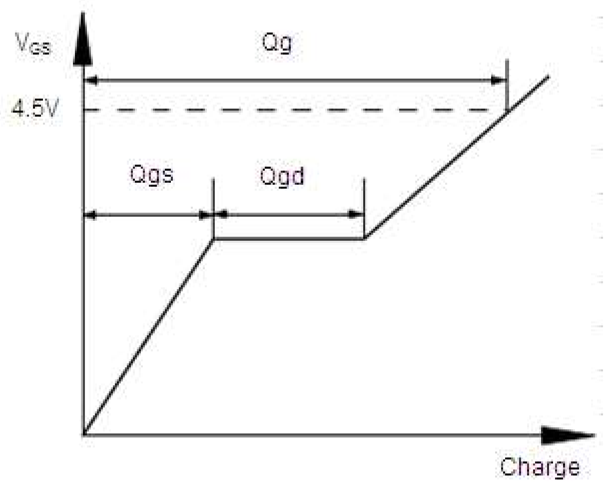
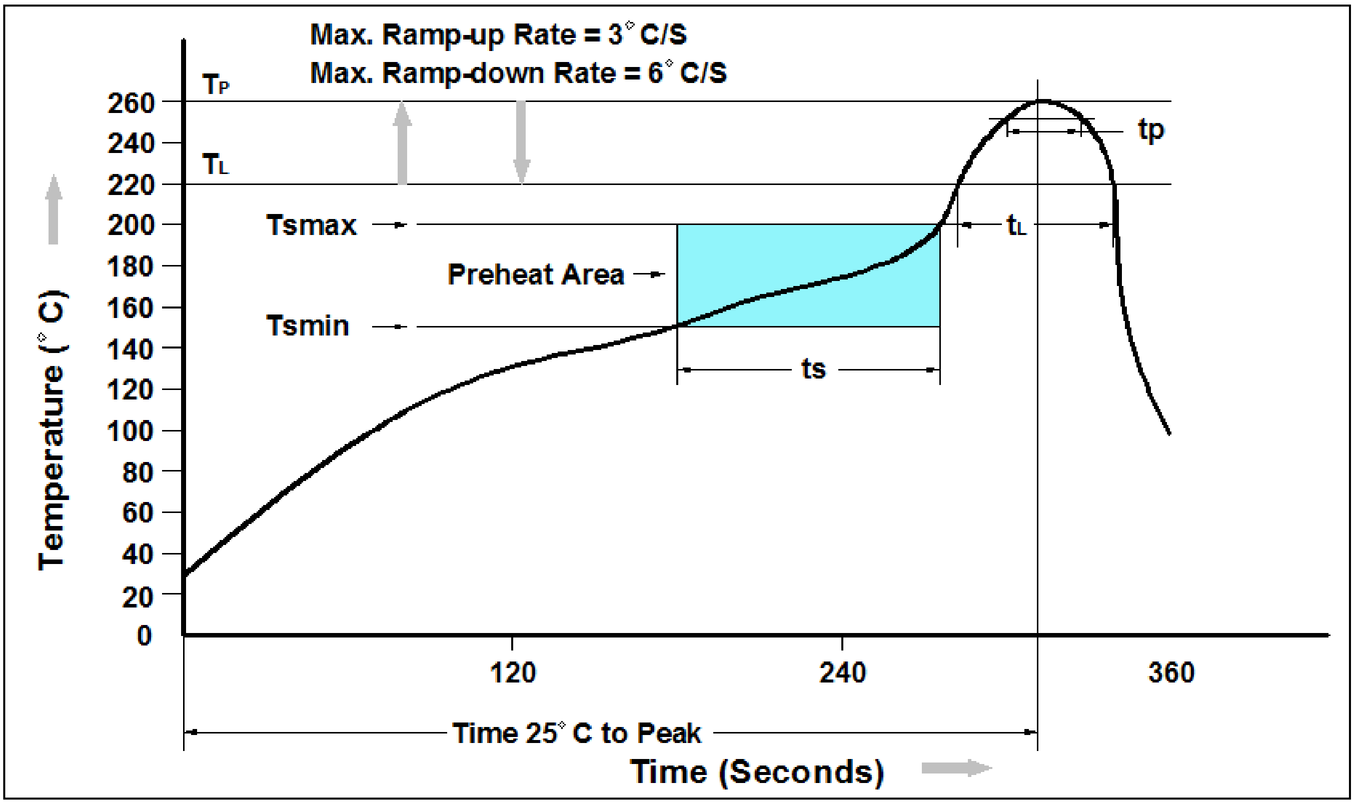



**Fig.11 Gate Charge Waveform**

## Recommand IR Reflow Soldering Thermal Profile

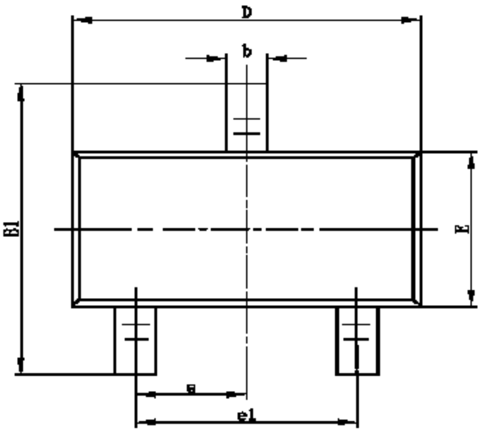


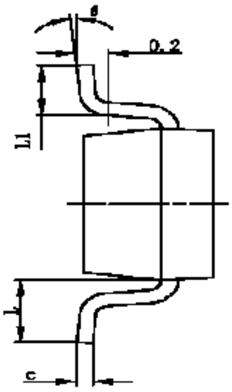

| Profile Feature | Pb-Free Assembly Profile |
|---|---|
| Temperature Min. (Tsmin) | 150°C |
| Temperature Max. (Tsmax) | 200°C |
| Time (ts) from (Tsmin to Tsmax) | 60-120 seconds |
| Average Ramp-up Rate (tL to tP) | 3°C/second max. |
| Liquidous Temperature (TL) | 217°C |
| Time (tL) Maintained Above (TL) | 60 – 150 seconds |
| Peak Temperature | 260°C +0°C / -5°C |
| Time (tP) within 5°C of actual Peak Temperature | 30 seconds |
| Ramp-down Rate (TP to TL) | 6°C/second max |
| Time 25°C to Peak Temperature | 8 minutes max. |

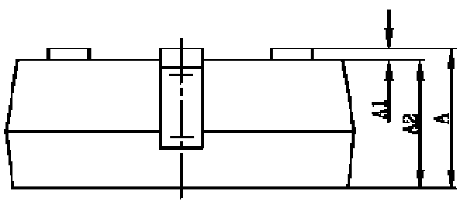
## Ordering Information

| Part Number | Description | Quantity |
|---|---|---|
| PAN0024N | SOT-23 Reel | 3000 pcs |

## ➢ Package Information ( SOT- 23 )




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 0.300 | 0.400 | 0.012 | 0.016 |
| c | 0.100 | 0.200 | 0.004 | 0.008 |
| D | 2.820 | 3.020 | 0.111 | 0.119 |
| E | 1.500 | 1.700 | 0.059 | 0.067 |
| E1 | 2.650 | 2.950 | 0.104 | 0.116 |
| e | 0.950TYP | | 0.037TYP | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.700REF | | 0.028REF | |
| L1 | 0.300 | 0.600 | 0.012 | 0.024 |
| θ | 0° | 8° | 0° | 8° |

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