

# GSM1012E

## 20V N-Channel Enhancement Mode MOSFET

### Product Description

GSM1012E, N-Channel enhancement mode MOSFET, uses Advanced Trench Technology to provide excellent  $R_{DS(ON)}$ , low gate charge. These devices are particularly suited for low voltage power management, such as smart phone and notebook computer, and low in-line power loss are needed in commercial industrial surface mount applications.

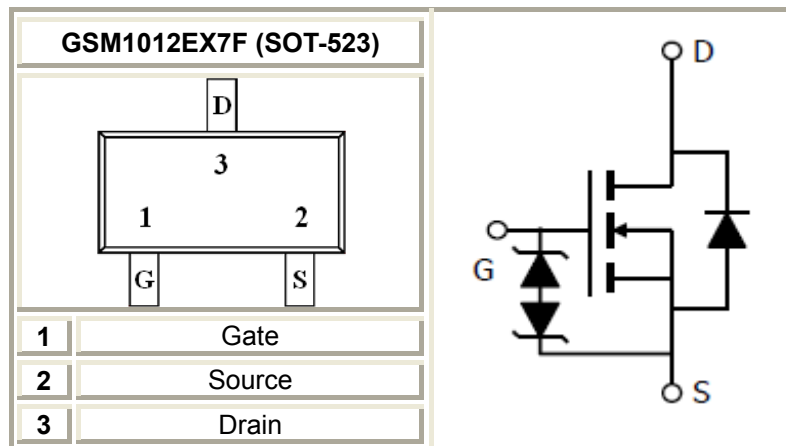
### Features

- 20V/0.6A,  $R_{DS(ON)}=360m\Omega@V_{GS}=4.5V$
- 20V/0.5A,  $R_{DS(ON)}=420m\Omega@V_{GS}=2.5V$
- 20V/0.4A,  $R_{DS(ON)}=560m\Omega@V_{GS}=1.8V$
- Low Offset (Error) Voltage
- Low-Voltage Operation
- High-Speed Circuits
- Low Battery Voltage Operation
- **ESD Protected**
- SOT-523 package design

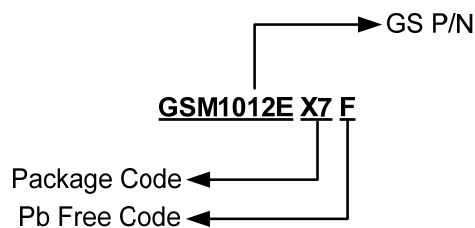
### Applications

- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories
- Battery Operated Systems
- Power Supply Converter Circuits
- Load/Power Switching Smart Phones, Pagers

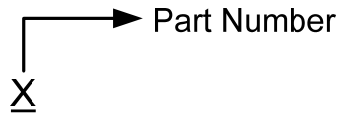
### Packages & Pin Assignments



### Ordering Information



## Marking Information



| Part Number | Package | Part Marking |
|-------------|---------|--------------|
| GSM1012EX7F | SOT-523 | <u>X</u>     |

## Absolute Maximum Ratings

(T<sub>A</sub>=25°C unless otherwise noted)

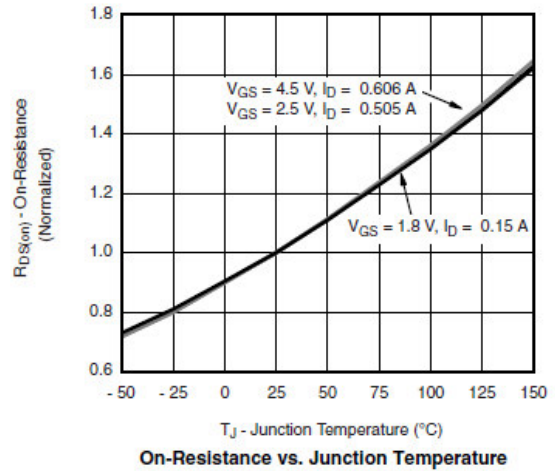
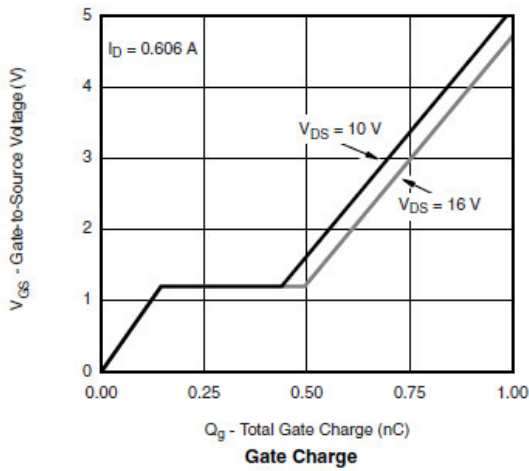
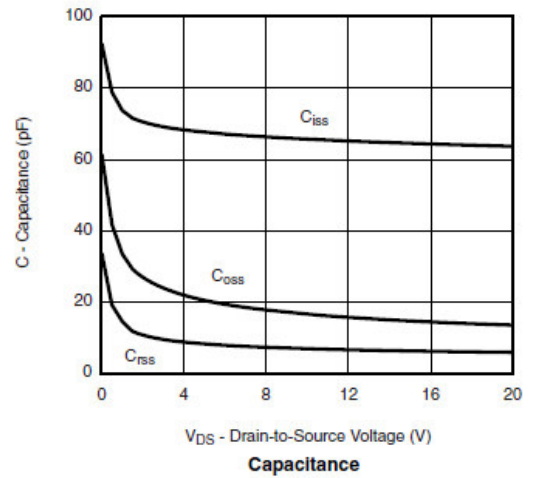
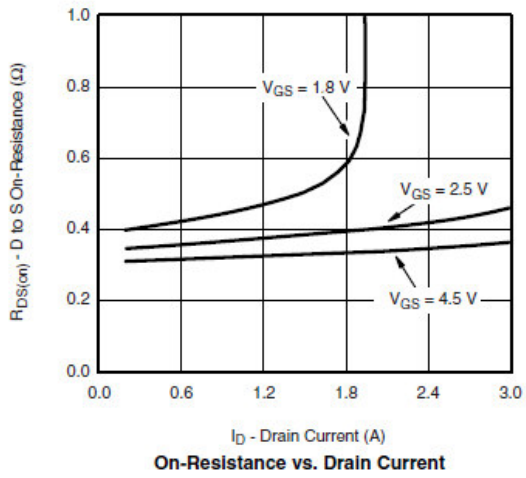
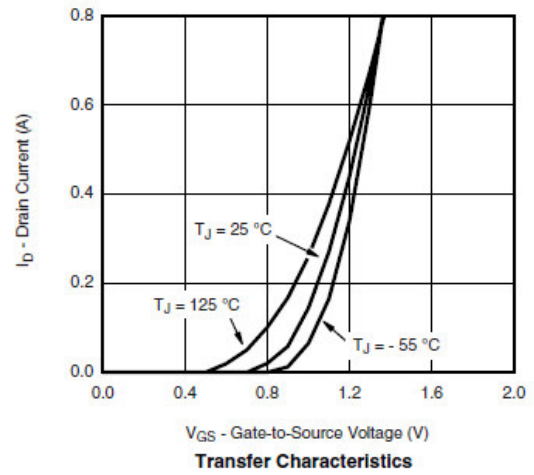
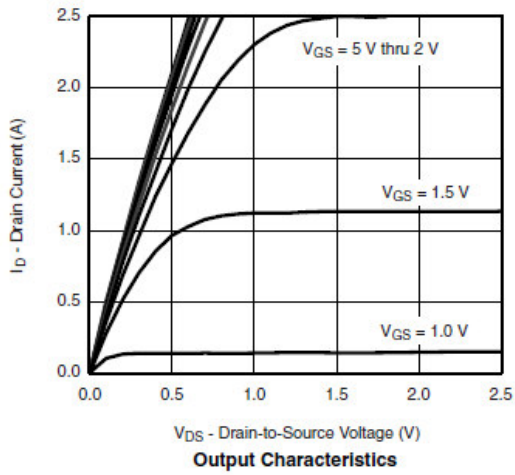
| Symbol           | Parameter                                       | Typical              | Unit |
|------------------|---|----------------------|------|
| V <sub>DSS</sub> | Drain-Source Voltage                            | 20                   | V    |
| V <sub>GSS</sub> | Gate –Source Voltage                            | ±12                  | V    |
| I <sub>D</sub>   | Continuous Drain Current(T <sub>J</sub> =150°C) | T <sub>A</sub> =25°C | 0.7  |
|                  |   | T <sub>A</sub> =70°C | 0.4  |
| I <sub>DM</sub>  | Pulsed Drain Current                            | 1.0                  | A    |
| I <sub>S</sub>   | Continuous Source Current(Diode Conduction)     | 0.3                  | A    |
| P <sub>D</sub>   | Power Dissipation                               | T <sub>A</sub> =25°C | 0.27 |
|                  |   | T <sub>A</sub> =70°C | 0.16 |
| T <sub>J</sub>   | Operating Junction Temperature                  | -55/150              | °C   |
| T <sub>STG</sub> | Storage Temperature Range                       | -55/150              | °C   |

## Electrical Characteristics

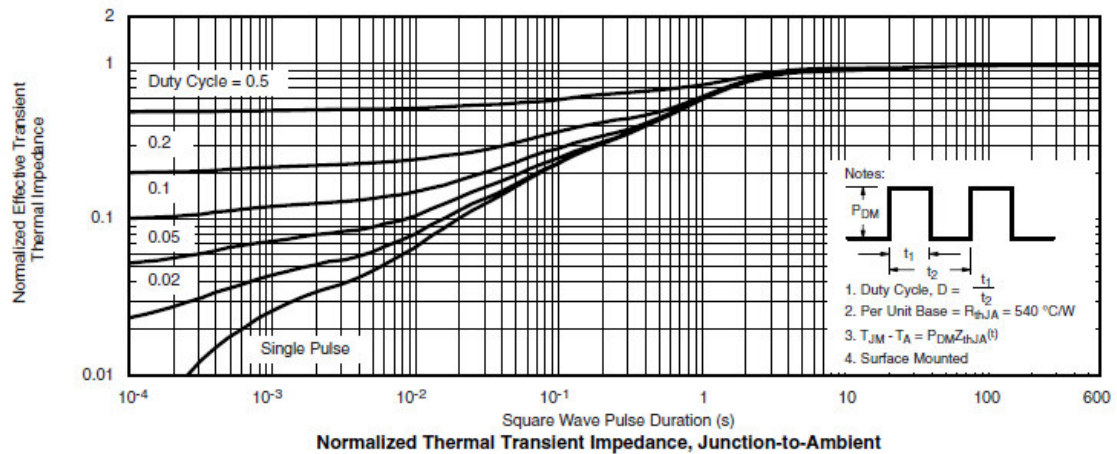
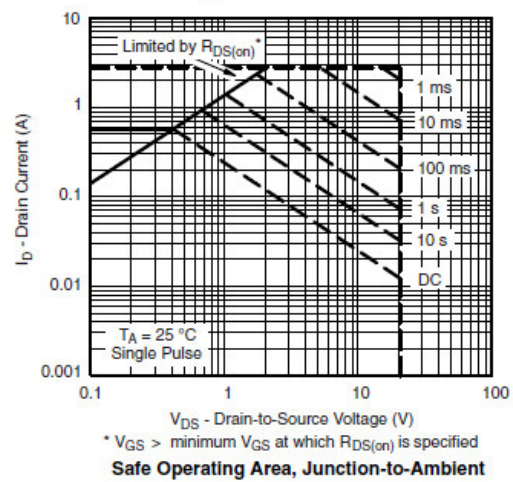
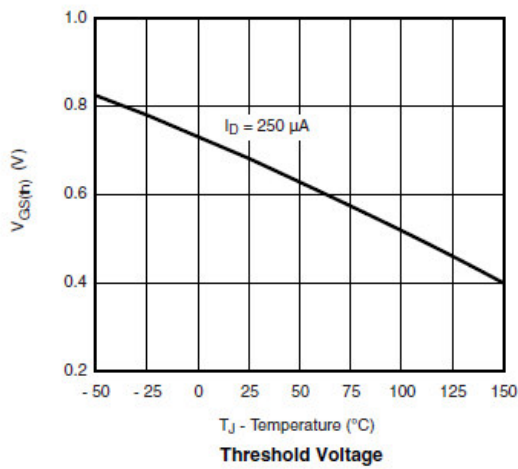
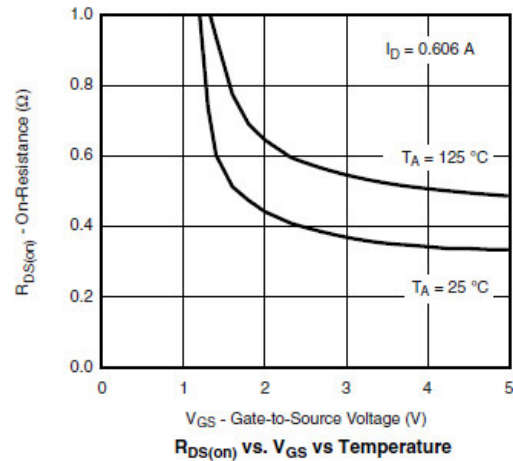
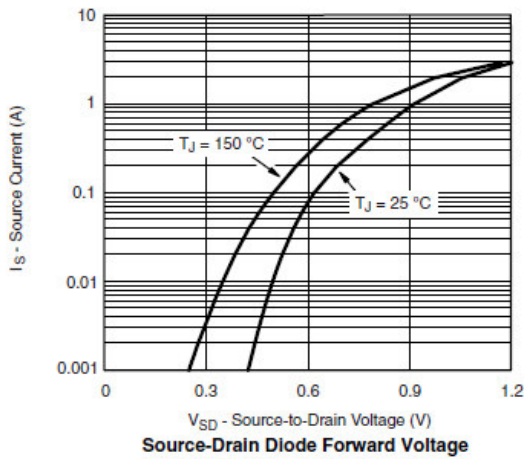
( $T_A=25^\circ\text{C}$  unless otherwise noted)

| Symbol         | Parameter                       | Conditions  | Min. | Typ  | Max.    | Unit       |
|----------------|---------------------------------|---|------|------|---------|------------|
| <b>Static</b>  |                                 |   |      |      |         |            |
| $V_{(BR)DSS}$  | Drain-Source Breakdown Voltage  | $V_{GS}=0V, I_D=250\mu\text{A}$                                 | 20   |      |         | V          |
| $V_{GS(th)}$   | Gate Threshold Voltage          | $V_{DS}=V_{GS}, I_D=250\mu\text{A}$                             | 0.3  |      | 0.8     |            |
| $I_{GSS}$      | Gate Leakage Current            | $V_{DS}=0V, V_{GS}=\pm 12V$                                     |      |      | $\pm 1$ | nA         |
| $I_{DSS}$      | Zero Gate Voltage Drain Current | $V_{DS}=16V, V_{GS}=0V$   |      |      | 1       | uA         |
|                |                                 | $V_{DS}=16V, V_{GS}=0V, T_J=85^\circ\text{C}$                   |      |      | 5       |            |
| $I_{D(on)}$    | On-State Drain Current          | $V_{DS}\geq 5V, V_{GS}=4.5V$                                    | 0.7  |      |         | A          |
| $R_{DS(on)}$   | Drain-Source On-Resistance      | $V_{GS}=4.5V, I_D=0.6A$   |      | 300  | 360     | m $\Omega$ |
|                |                                 | $V_{GS}=2.5V, I_D=0.5A$   |      | 240  | 420     |            |
|                |                                 | $V_{GS}=1.8V, I_D=0.4A$   |      | 420  | 560     |            |
| $g_{fs}$       | Forward Transconductance        | $V_{DS}=10V, I_D=0.4A$  |      | 1    |         | S          |
| $V_{SD}$       | Diode Forward Voltage           | $I_S=0.15A, V_{GS}=0V$  |      | 0.65 | 1.2     | V          |
| <b>Dynamic</b> |                                 |   |      |      |         |            |
| $C_{iss}$      | Input Capacitance               | $V_{DS}=10V, V_{GS}=0V$<br>$f=1\text{MHz}$                      |      | 70   |         | pF         |
| $C_{oss}$      | Output Capacitance              |   |      | 20   |         |            |
| $C_{riss}$     | Reverse Transfer Capacitance    |   |      | 8    |         |            |
| $Q_g$          | Total Gate Charge               | $V_{DS}=10V, V_{GS}=4.5V, I_D=0.6A$                             |      | 1.06 | 1.38    | nC         |
| $Q_{gs}$       | Gate-Source Charge              |   |      | 0.18 |         |            |
| $Q_{gd}$       | Gate-Drain Charge               |   |      | 0.32 |         |            |
| $t_{d(on)}$    | Turn-On Time                    | $V_{DD}=10V, R_L=20\Omega, I_D=0.5A, V_{GEN}=4.5V, R_G=1\Omega$ |      | 18   | 26      | ns         |
| $t_r$          |                                 |   |      | 20   | 28      |            |
| $t_{d(off)}$   | Turn-Off Time                   |   |      | 70   | 110     |            |
| $t_f$          |                                 |   |      | 25   | 40      |            |

## Typical Performance Characteristics

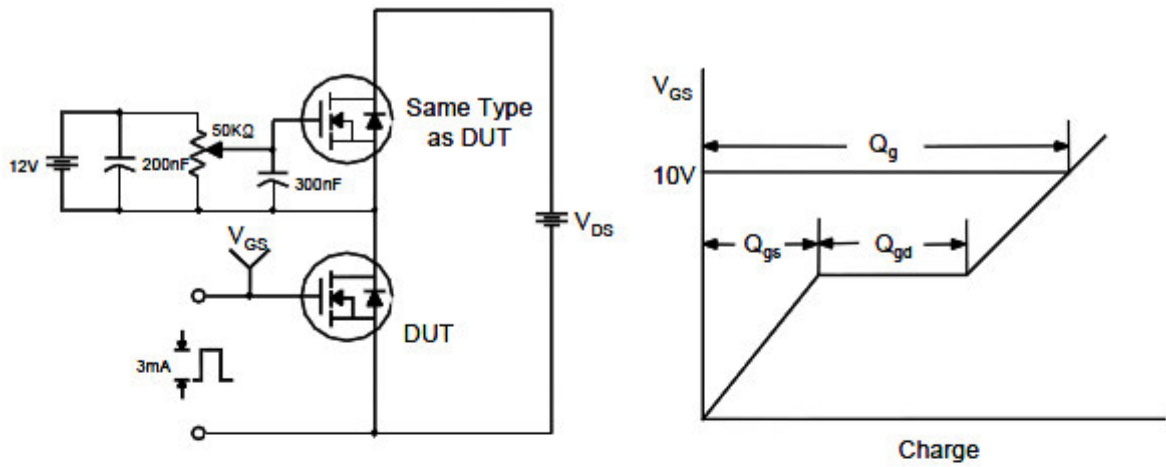


## Typical Performance Characteristics (continue)

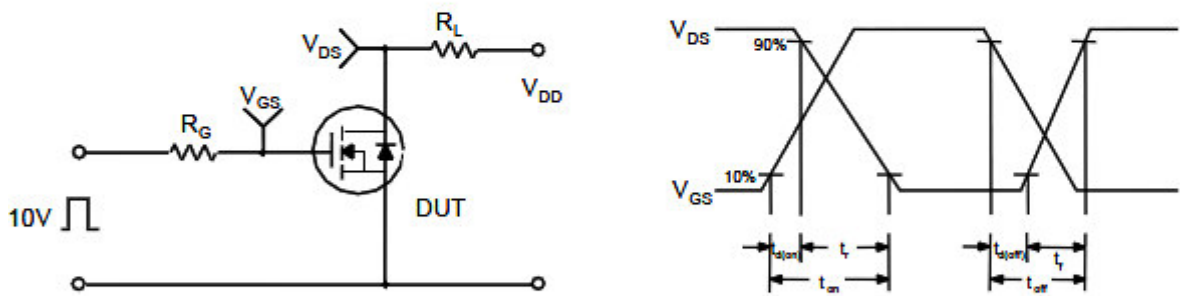


## Typical Characteristics

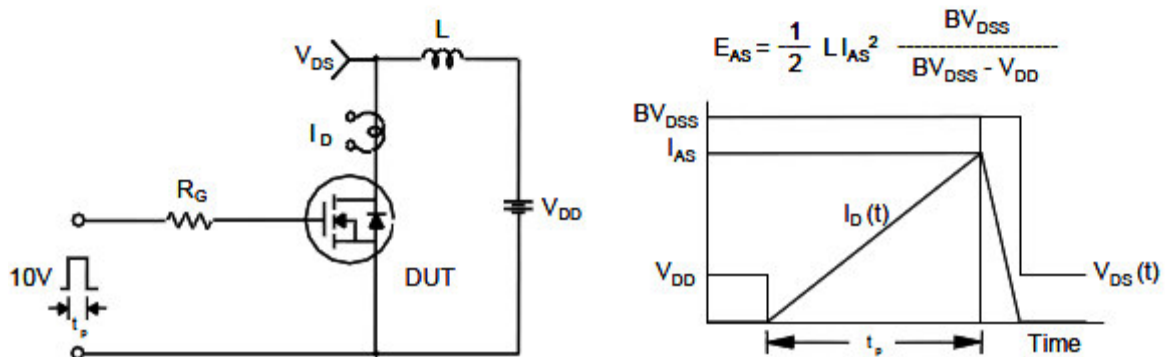
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms

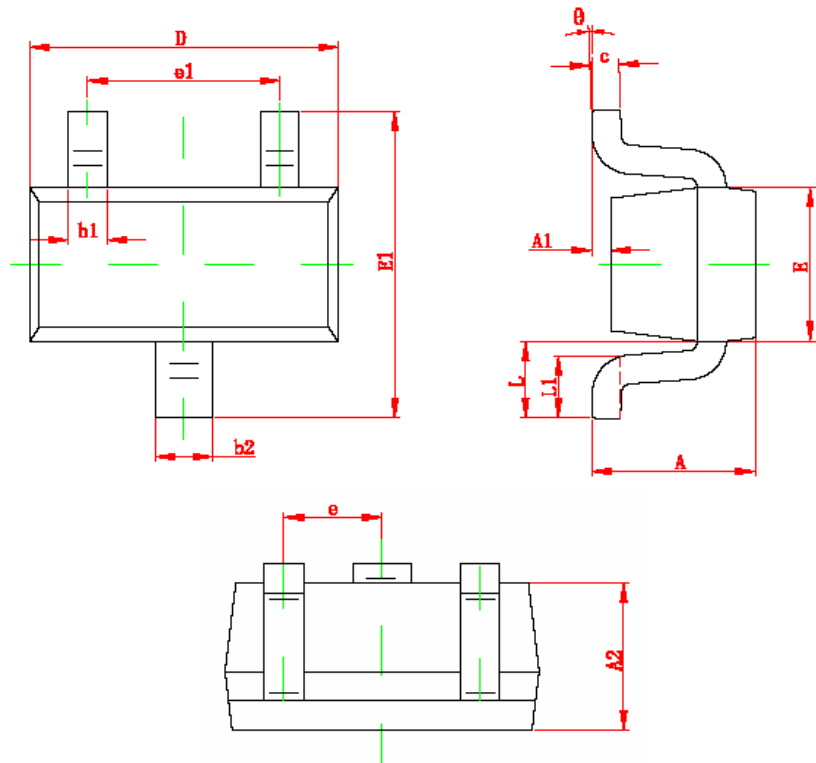


Unclamped Inductive Switching Test Circuit & Waveforms



## Package Dimension

### SOT-523











| Dimensions |             |       |            |       |
|------------|-------------|-------|------------|-------|
| Symbol     | Millimeters |       | Inches     |       |
|            | Min         | Max   | Min        | Max   |
| A          | 0.700       | 0.900 | 0.028      | 0.035 |
| A1         | 0.000       | 0.100 | 0.000      | 0.004 |
| A2         | 0.700       | 0.800 | 0.028      | 0.031 |
| b1         | 0.150       | 0.250 | 0.006      | 0.010 |
| b2         | 0.250       | 0.325 | 0.010      | 0.013 |
| c          | 0.100       | 0.200 | 0.004      | 0.008 |
| D          | 1.500       | 1.700 | 0.059      | 0.067 |
| E          | 0.750       | 0.850 | 0.030      | 0.033 |
| E1         | 1.450       | 1.750 | 0.057      | 0.069 |
| e          | 0.500(TYP)  |       | 0.020(TYP) |       |
| e1         | 0.900       | 1.100 | 0.035      | 0.043 |
| L          | 0.550(REF)  |       | 0.022(REF) |       |
| L1         | 0.280       | 0.440 | 0.011      | 0.017 |
| θ          | 0°          | 4°    | 0°         | 4°    |



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