

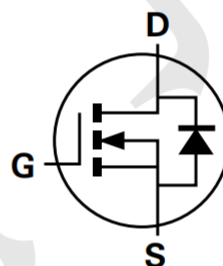
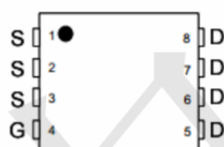
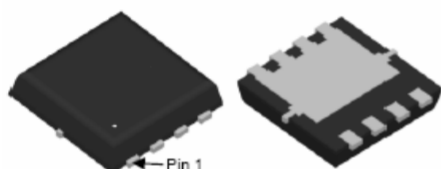
### Features

- $R_{DS(ON)}$ ,  $V_{GS}@10V, I_D@16A < 9m\Omega$
- $R_{DS(ON)}$ ,  $V_{GS}@4.5V, I_D@8A < 13m\Omega$
- High switching speed
- Improved dv/dt capability
- Low Gate Charge
- Low reverse transfer capacitance
- Lead free in compliance with EU RoHS 2.0

### Application

- Load/Power Switching
- Interfacing Switching
- Battery Management for Ultra Small Portable Electronics
- Logic Level Shift

## Package and Pin Configuration



**Marking:4408**

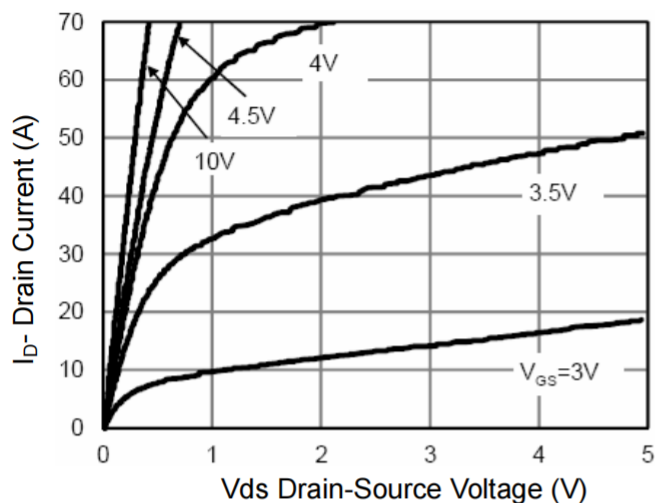
### Absolute Maximum Ratings ( $T_A=25^\circ\text{C}$ unless otherwise noted)

| PARAMETER                                        |                         | SYMBOL          | LIMIT    | UNITS              |
|--------------------------------------------------|-------------------------|-----------------|----------|--------------------|
| Drain-Source Voltage                             |                         | $V_{DS}$        | 30       | V                  |
| Gate-Source Voltage                              |                         | $V_{GS}$        | $\pm 20$ | V                  |
| Continuous Drain Current                         | $T_C=25^\circ\text{C}$  | $I_D$           | 42       | A                  |
|                                                  | $T_C=100^\circ\text{C}$ |                 | 26       |                    |
| Pulsed Drain Current <sup>(Note 1)</sup>         | $T_C=25^\circ\text{C}$  | $I_{DM}$        | 168      |                    |
| Power Dissipation                                | $T_C=25^\circ\text{C}$  | $P_D$           | 35       | W                  |
|                                                  | $T_C=100^\circ\text{C}$ |                 | 14       |                    |
| Continuous Drain Current                         | $T_A=25^\circ\text{C}$  | $I_D$           | 10       | A                  |
|                                                  | $T_A=70^\circ\text{C}$  |                 | 8        |                    |
| Power Dissipation                                | $T_A=25^\circ\text{C}$  | $P_D$           | 2.0      | W                  |
| Power Dissipation                                | $T_A=70^\circ\text{C}$  |                 | 1.3      |                    |
| Operating Junction and Storage Temperature Range |                         | $T_J, T_{STG}$  | -55~150  | $^\circ\text{C}$   |
| Typical Thermal Resistance <sup>(Note 4,5)</sup> | Junction to Case        | $R_{\theta JC}$ | 3.6      | $^\circ\text{C/W}$ |
|                                                  | Junction to Ambient     | $R_{\theta JA}$ | 62.5     |                    |

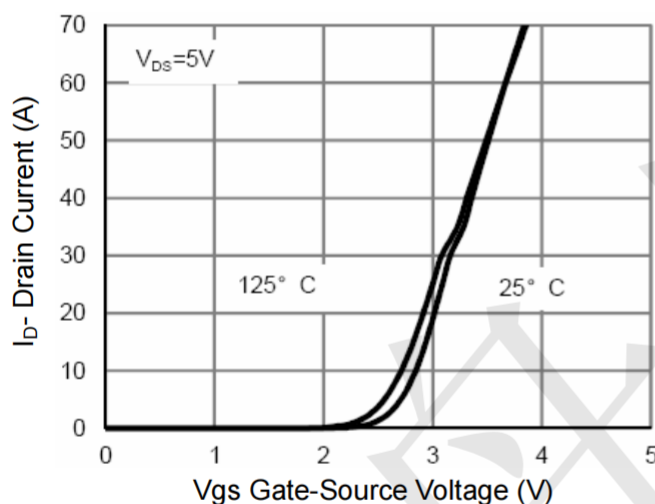
**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

| PARAMETER                                             | SYMBOL       | TEST CONDITION                                                    | MIN. | TYP. | MAX. | UNITS |
|-------------------------------------------------------|--------------|-------------------------------------------------------------------|------|------|------|-------|
| Static                                                |              |                                                                   |      |      |      |       |
| Drain-Source Breakdown Voltage                        | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$                                         | 30   | -    | -    | V     |
| Gate Threshold Voltage                                | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$                                     | 1.0  | 1.7  | 2.5  |       |
| Drain-Source On-State Resistance                      | $R_{DS(on)}$ | $V_{GS}=10V, I_D=16A$                                             | -    | 6.5  | 9    | mΩ    |
|                                                       |              | $V_{GS}=4.5V, I_D=8A$                                             | -    | 9.5  | 13   |       |
| Zero Gate Voltage Drain Current                       | $I_{DSS}$    | $V_{DS}=30V, V_{GS}=0V$                                           | -    | -    | 1.0  | μA    |
| Gate-Source Leakage Current                           | $I_{GSS}$    | $V_{GS}=\pm 20V, V_{DS}=0V$                                       | -    | -    | ±100 | nA    |
| Dynamic (Note 6)                                      |              |                                                                   |      |      |      |       |
| Total Gate Charge                                     | $Q_g$        | $V_{DS}=15V, I_D=20A,$<br>$V_{GS}=4.5V$ (Note 2,3)                | -    | 7.1  | -    | nC    |
| Gate-Source Charge                                    | $Q_{gs}$     |                                                                   | -    | 3.1  | -    |       |
| Gate-Drain Charge                                     | $Q_{gd}$     |                                                                   | -    | 2.0  | -    |       |
| Input Capacitance                                     | $C_{iss}$    | $V_{DS}=25V, V_{GS}=0V,$<br>$f=1.0MHz$                            | -    | 763  | -    | pF    |
| Output Capacitance                                    | $C_{oss}$    |                                                                   | -    | 132  | -    |       |
| Reverse Transfer Capacitance                          | $C_{rss}$    |                                                                   | -    | 81   | -    |       |
| Turn-On Delay Time                                    | $t_{d(on)}$  | $V_{DS}=15V, I_D=15A,$<br>$V_{GS}=10V, R_G=6\Omega$<br>(Note 2,3) | -    | 5.4  | -    | ns    |
| Turn-On Rise Time                                     | $t_r$        |                                                                   | -    | 86   | -    |       |
| Turn-Off Delay Time                                   | $t_{d(off)}$ |                                                                   | -    | 20   | -    |       |
| Turn-Off Fall Time                                    | $t_f$        |                                                                   | -    | 10   | -    |       |
| Drain-Source Diode                                    |              |                                                                   |      |      |      |       |
| Maximum Continuous Drain-Source Diode Forward Current | $I_S$        | ---                                                               | -    | -    | 42   | A     |
| Diode Forward Voltage                                 | $V_{SD}$     | $I_S=1A, V_{GS}=0V$                                               | -    | 0.7  | 1.0  | V     |

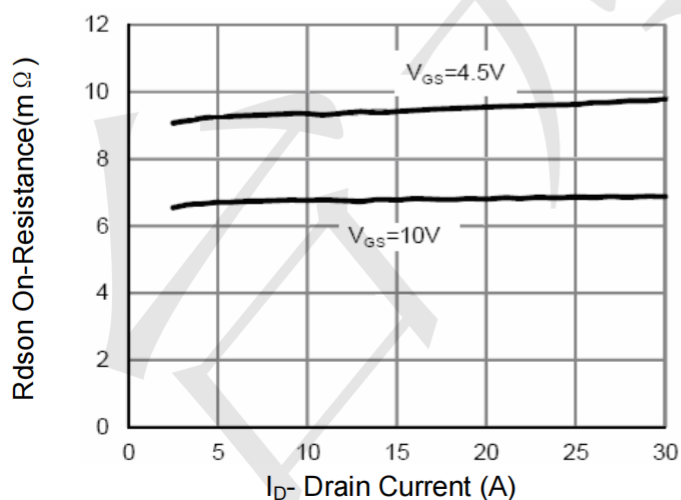
## Typical Characteristics



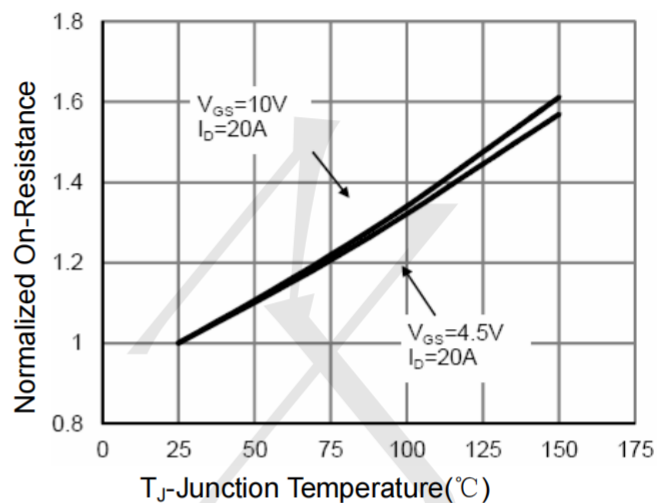
**Figure 1 Output Characteristics**



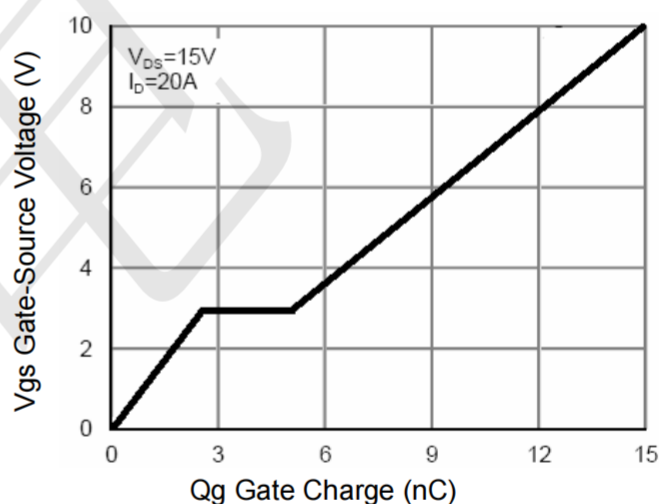
**Figure 2 Transfer Characteristics**



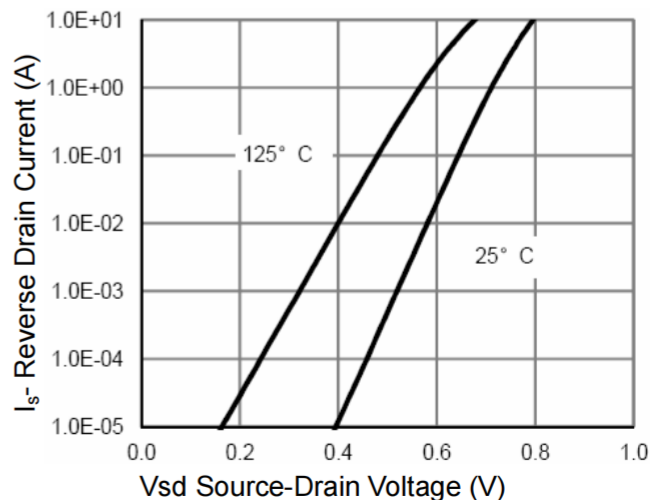
**Figure 3 Rdson- Drain Current**



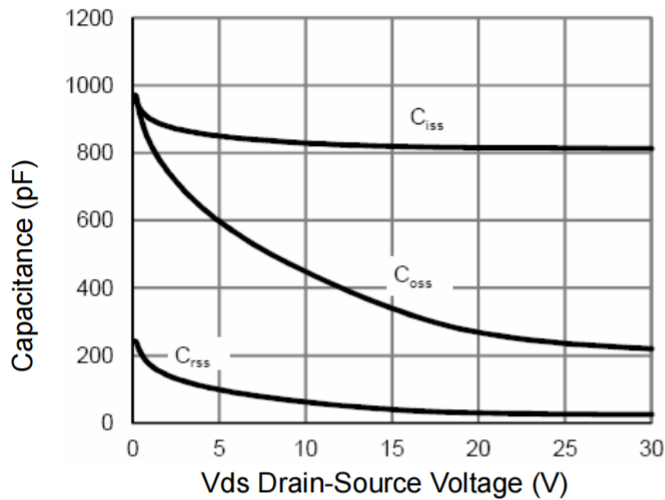
**Figure 4 Rdson-Junction Temperature**



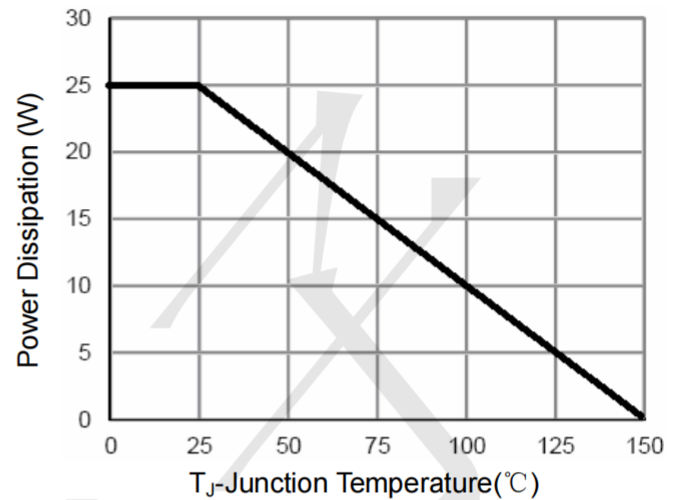
**Figure 5 Gate Charge**



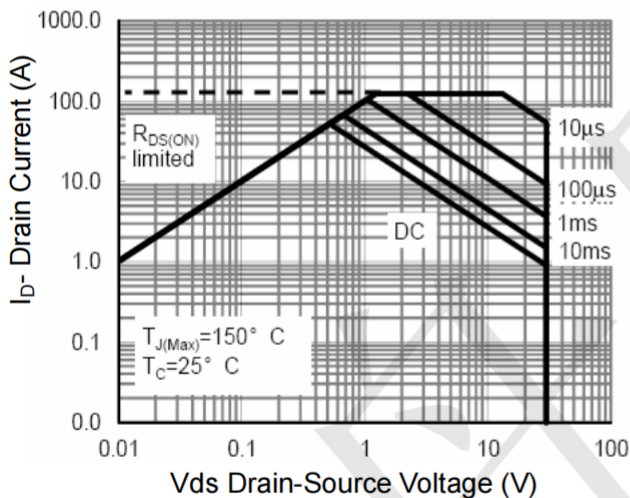
**Figure 6 Source- Drain Diode Forward**



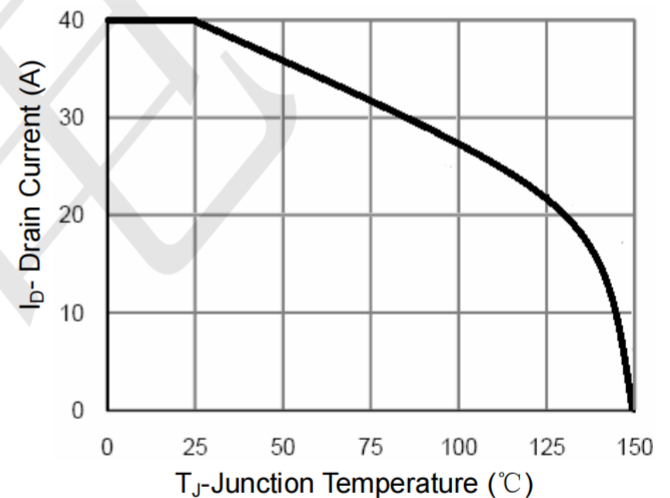
**Figure 7 Capacitance vs Vds**



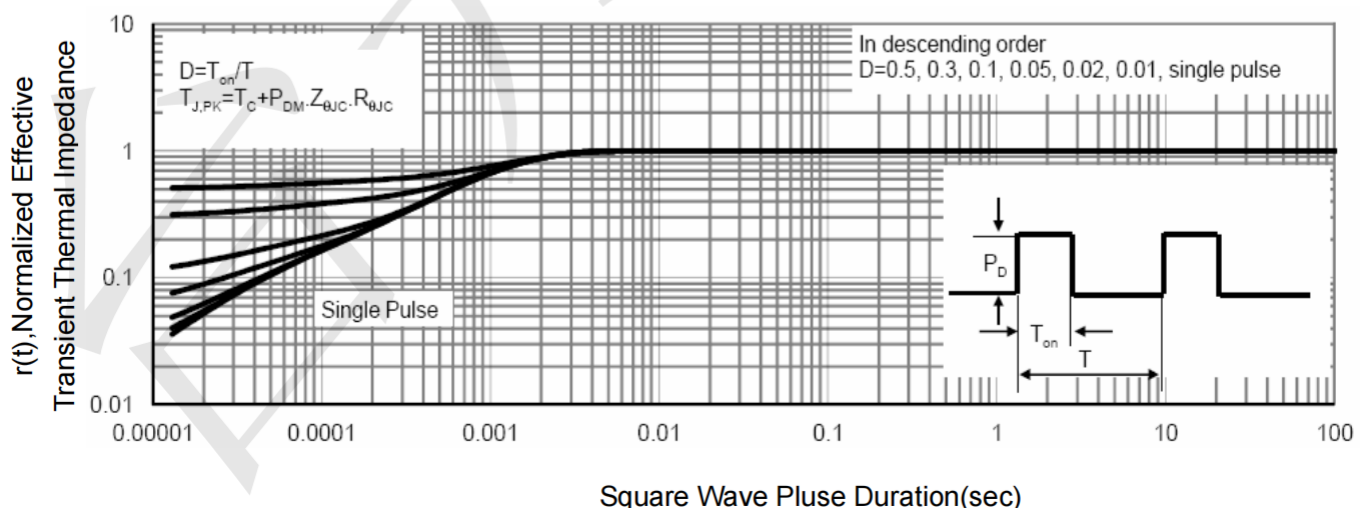
**Figure 9 Power De-rating**



**Figure 8 Safe Operation Area**

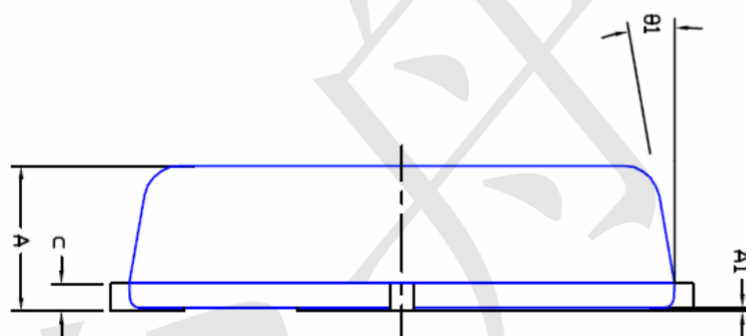
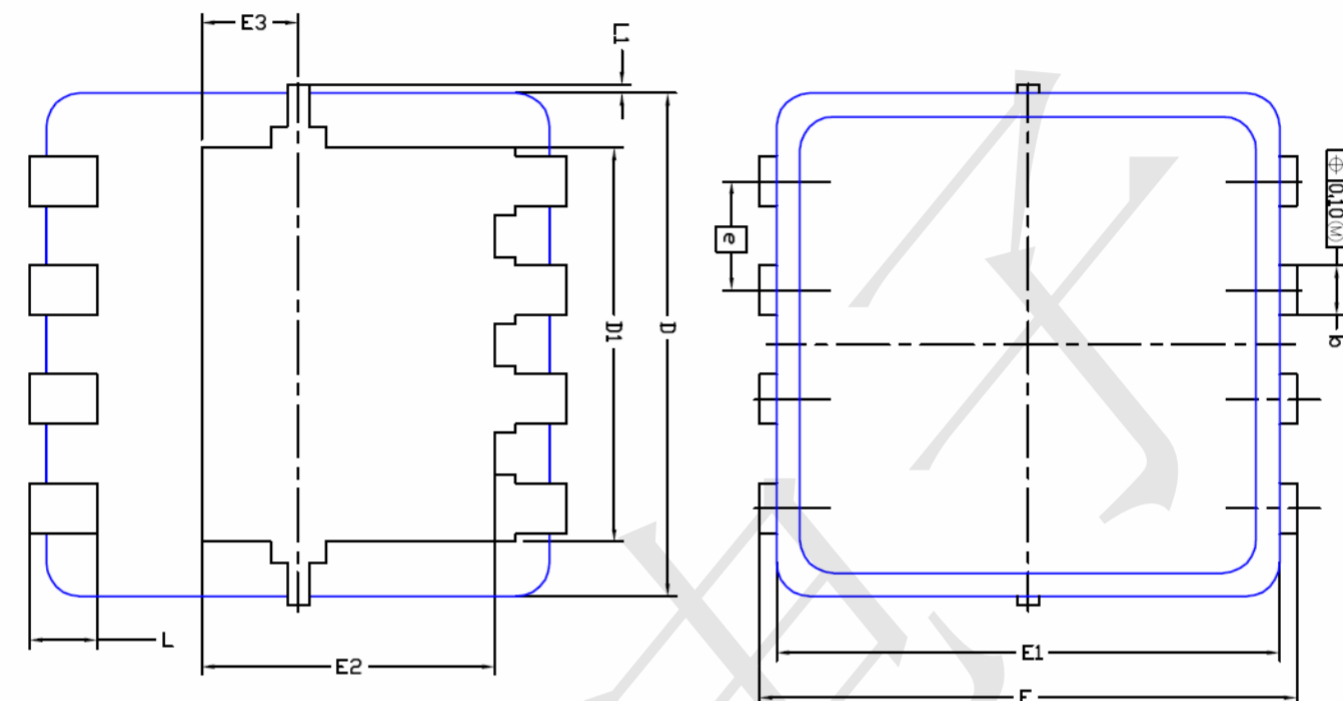


**Figure 10 Current De-rating**



**Figure 11 Normalized Maximum Transient Thermal Impedance**

**DFN3X3 Package Information**



| DIM. | MILLIMETERS |       |       | INCHES    |        |        |
|------|-------------|-------|-------|-----------|--------|--------|
|      | MIN         | NOM   | MAX   | MIN       | NOM    | MAX    |
| A    | 0.700       | 0.80  | 0.900 | 0.0276    | 0.0315 | 0.0354 |
| A1   | 0.00        | ---   | 0.05  | 0.000     | ---    | 0.002  |
| b    | 0.24        | 0.30  | 0.35  | 0.009     | 0.012  | 0.014  |
| c    | 0.10        | 0.152 | 0.25  | 0.004     | 0.006  | 0.010  |
| D    | 3.00 BSC    |       |       | 0.118 BSC |        |        |
| D1   | 2.35 BSC    |       |       | 0.093 BSC |        |        |
| E    | 3.20 BSC    |       |       | 0.126 BSC |        |        |
| E1   | 3.00 BSC    |       |       | 0.118 BSC |        |        |
| E2   | 1.75 BSC    |       |       | 0.069 BSC |        |        |
| E3   | 0.575 BSC   |       |       | 0.023 BSC |        |        |
| e    | 0.65 BSC    |       |       | 0.026 BSC |        |        |
| L    | 0.30        | 0.40  | 0.50  | 0.0118    | 0.0157 | 0.0197 |
| L1   | 0           | ---   | 0.100 | 0         | ---    | 0.004  |
| θ1   | 0°          | 10°   | 12°   | 0°        | 10°    | 12°    |