

## NCE N-Channel Super Trench II Power MOSFET

### Description

The NCEP038N10GU uses **Super Trench II** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of  $R_{DS(ON)}$  and  $Q_g$ . This device is ideal for high-frequency switching and synchronous rectification.

### Application

- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

### General Features

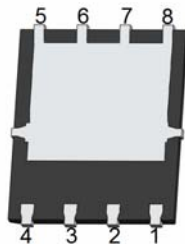
- $V_{DS} = 100V, I_D = 135A$   
 $R_{DS(ON)} = 3.45m\Omega$  (Typ.) @  $V_{GS} = 10V$
- Excellent gate charge x  $R_{DS(ON)}$  product(FOM)
- Very low on-resistance  $R_{DS(ON)}$
- 150 °C operating temperature
- Pb-free lead plating

**100% UIS TESTED!**  
**100% ΔVds TESTED!**

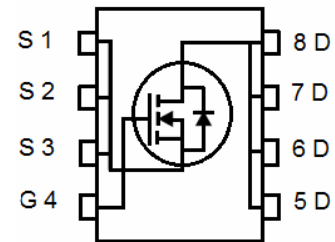
### DFN 5X6



Top View



Bottom View



Schematic Diagram

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
P038N10GU	NCEP038N10GU	DFN5X6-8L	-	-	-

### Absolute Maximum Ratings ( $T_C = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	100	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	135	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	108	A
Pulsed Drain Current <sup>(Note 1)</sup>	$I_{DM}$	540	A
Maximum Power Dissipation	$P_D$	170	W
Derating factor		1.36	W/°C
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	750	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	°C

### Thermal Characteristic

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JC}$	0.74	°C/W
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## Electrical Characteristics ( $T_C=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	100		-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=100V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics</b> (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2	3	4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=67.5A$	-	3.45	3.8	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=67.5A$		130	-	S
<b>Dynamic Characteristics</b> (Note 4)						
Input Capacitance	$C_{iss}$	$V_{DS}=50V, V_{GS}=0V,$ $F=1.0\text{MHz}$	-	6300	-	PF
Output Capacitance	$C_{oss}$		-	560	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	40	-	PF
<b>Switching Characteristics</b> (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=50V, I_D=67.5A,$ $V_{GS}=10V, R_G=3\Omega$	-	23	-	nS
Turn-on Rise Time	$t_r$		-	15	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	48	-	nS
Turn-Off Fall Time	$t_f$		-	16	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=50V, I_D=67.5A,$ $V_{GS}=10V$	-	110	-	nC
Gate-Source Charge	$Q_{gs}$		-	33		nC
Gate-Drain Charge	$Q_{gd}$		-	30		nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=67.5A$	-		1.2	V
Diode Forward Current	$I_S$		-	-	135	A
Reverse Recovery Time	$t_{rr}$	$T_J = 25^\circ\text{C}, I_F = 67.5A$ $di/dt = 100A/\mu s$ (Note 3)	-	70	-	nS
Reverse Recovery Charge	$Q_{rr}$		-	117	-	nC

### Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition :  $T_J=25^\circ\text{C}, V_{DD}=50V, V_G=10V, L=0.5\text{mH}, R_G=25\Omega$

Typical Electrical and Thermal Characteristics

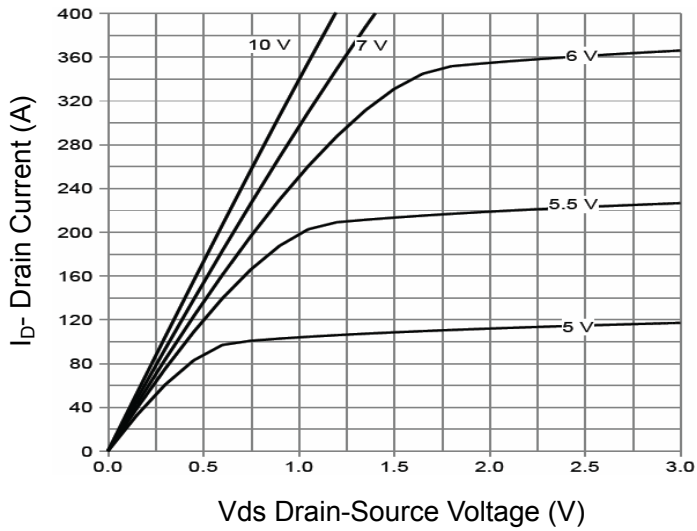


Figure 1 Output Characteristics

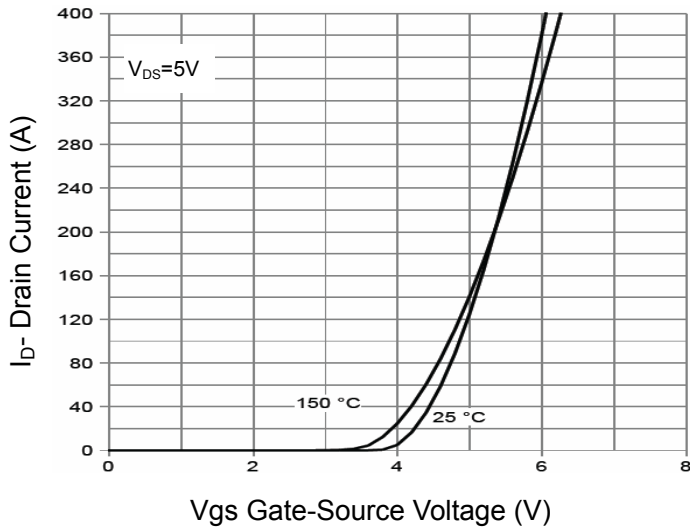


Figure 2 Transfer Characteristics

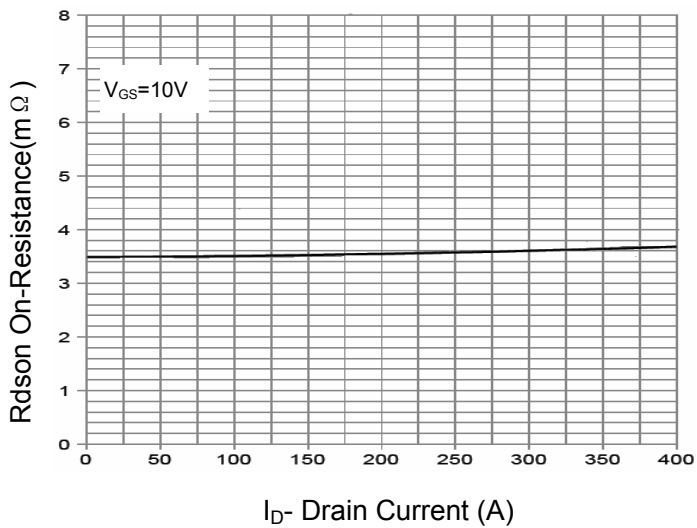


Figure 3 Rdson- Drain Current

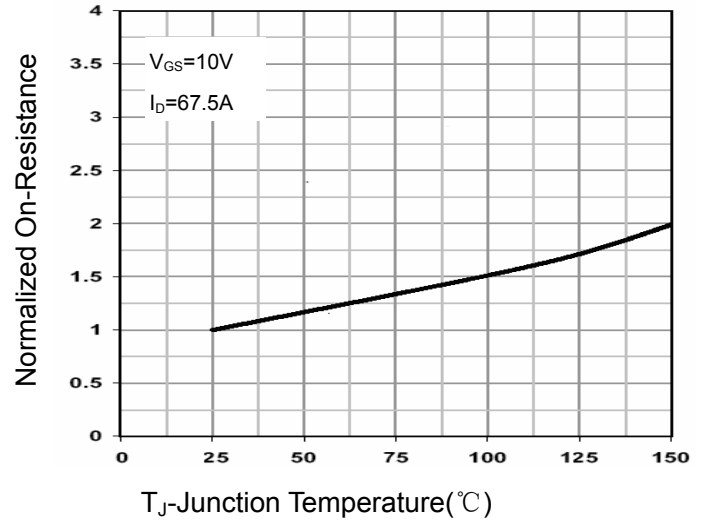


Figure 4 Rdson-Junction Temperature

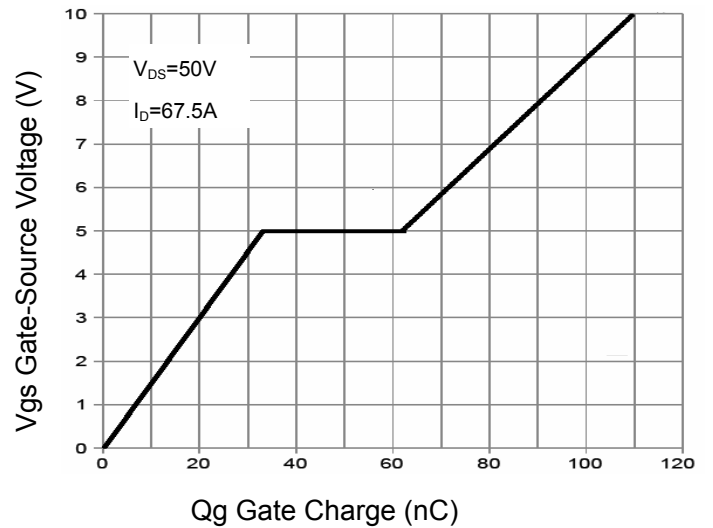


Figure 5 Gate Charge

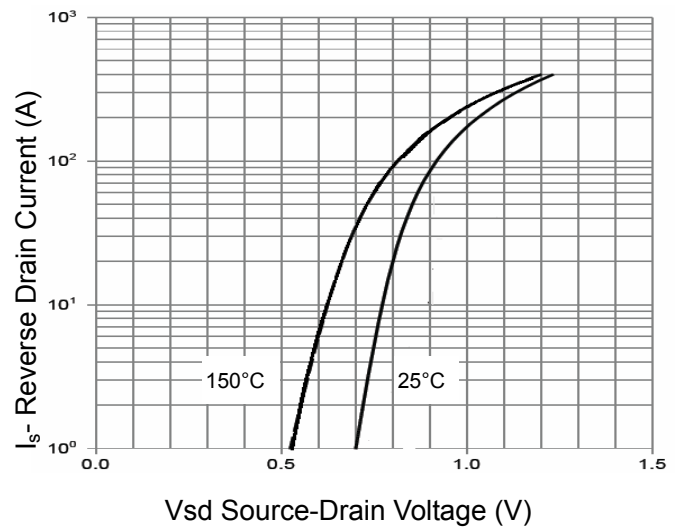
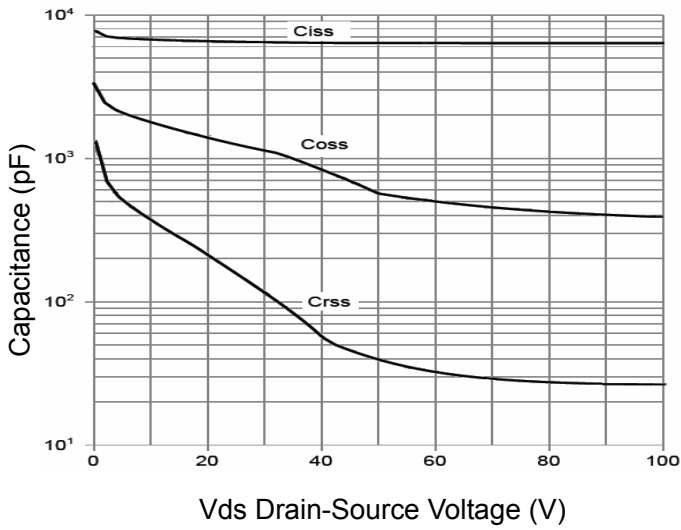
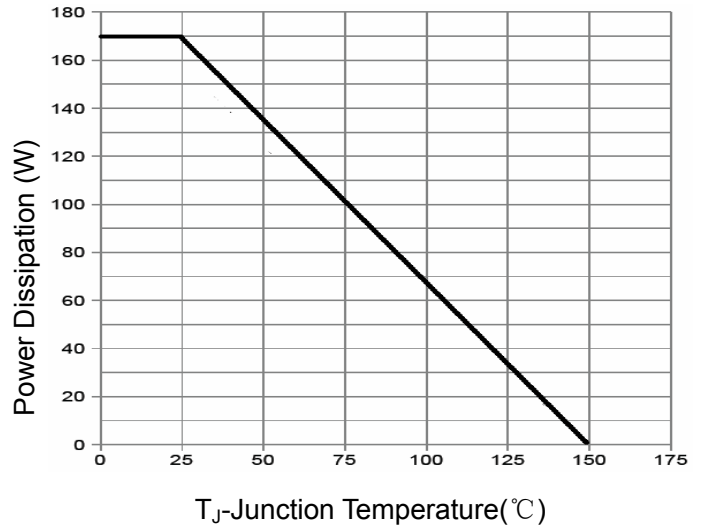


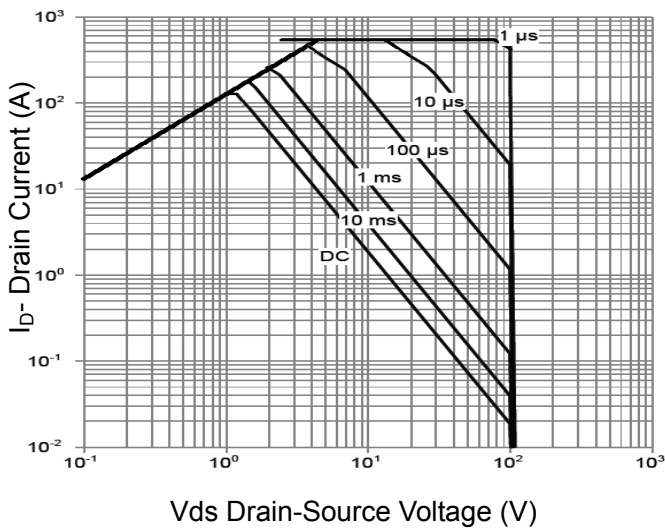
Figure 6 Source- Drain Diode Forward



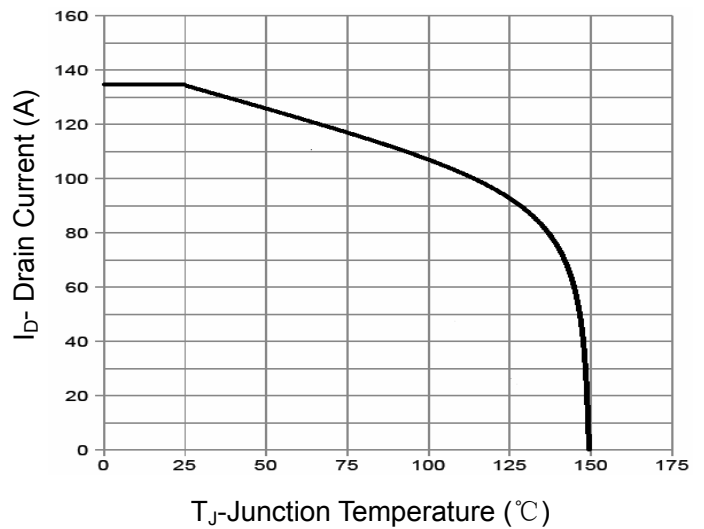
Vds Drain-Source Voltage (V)  
**Figure 7 Capacitance vs Vds**



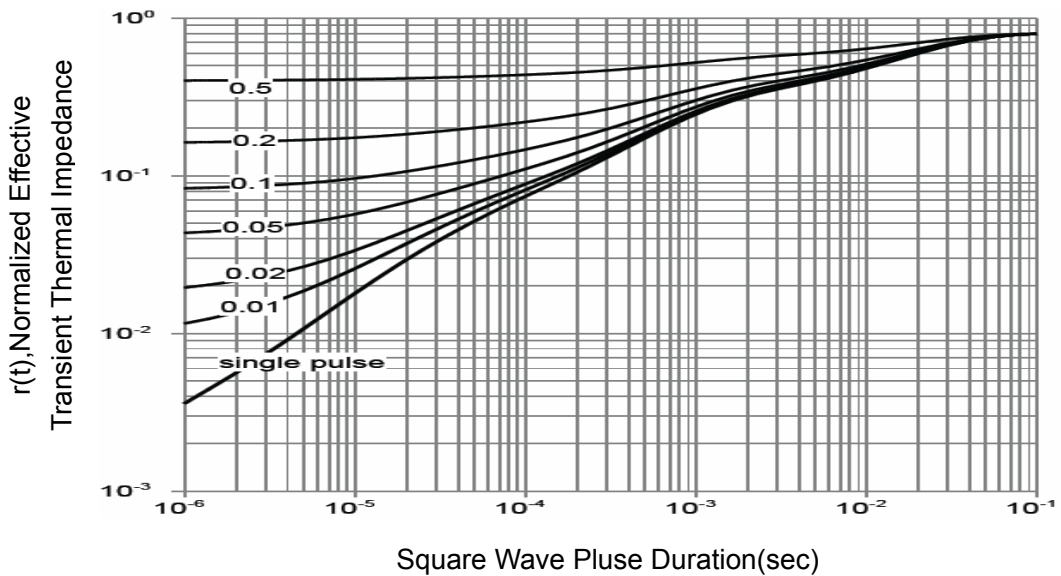
T<sub>J</sub>-Junction Temperature(°C)  
**Figure 9 Power De-rating**



Vds Drain-Source Voltage (V)  
**Figure 8 Safe Operation Area**

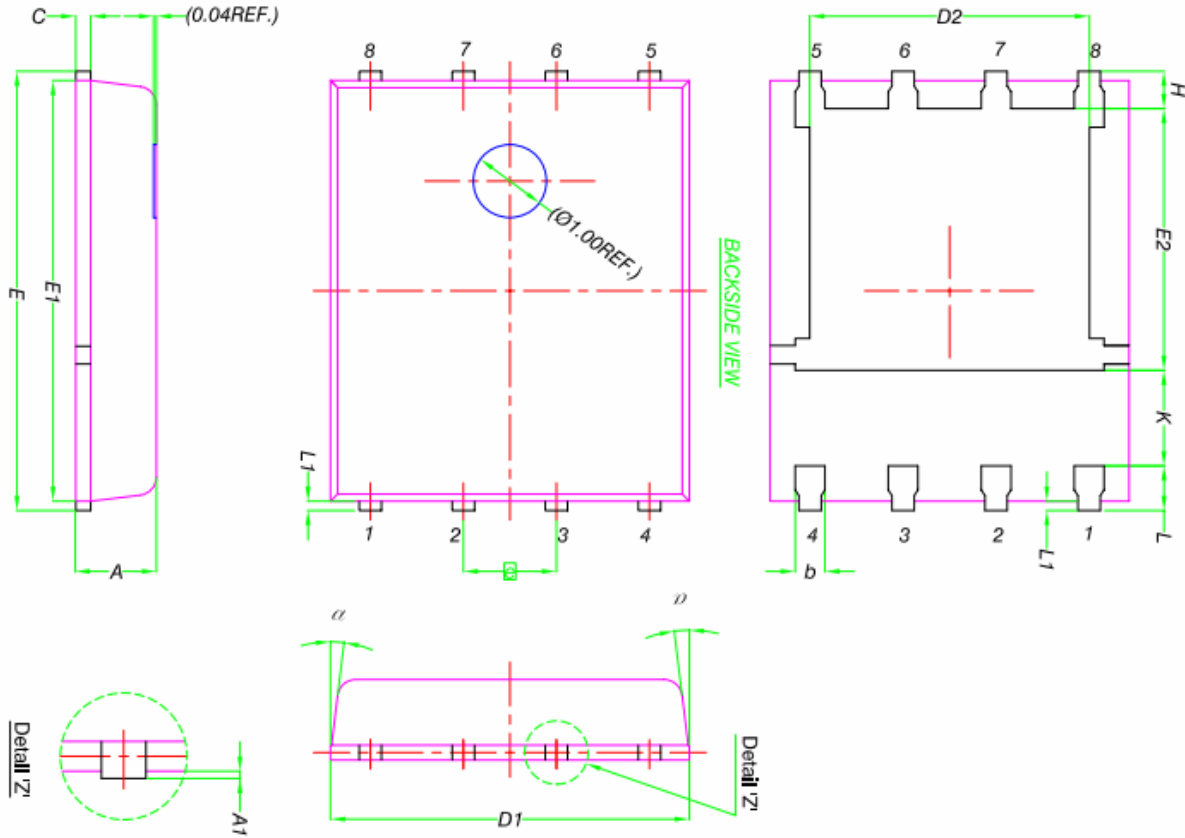


T<sub>J</sub>-Junction Temperature (°C)  
**Figure 10 Current De-rating**

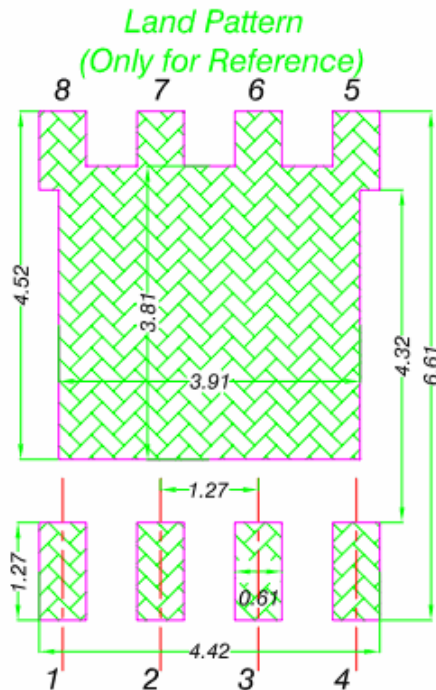


**Figure 11 Normalized Maximum Transient Thermal Impedance**

DFN5X6-8L Package Information



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0	-	0.05
b	0.33	0.41	0.51
C	0.20	0.25	0.30
D1	4.80	4.90	5.00
D2	3.61	3.81	3.96
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.38	3.58	3.78
e	1.27 BSC		
H	0.41	0.51	0.61
K	1.10	-	-
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
α	0°	-	12°



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