

NCE N-Channel Super Trench Power MOSFET

Description

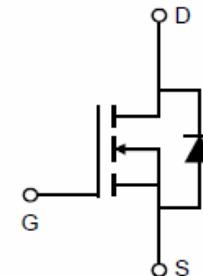
The NCEP4045GU uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and Q_g . This device is ideal for high-frequency switching and synchronous rectification.

General Features

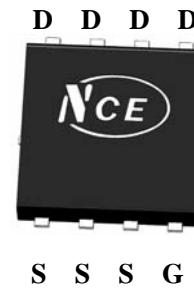
- $V_{DS} = 40V, I_D = 45A$
- $R_{DS(ON)} = 6.0m\Omega$ (typical) @ $V_{GS} = 10V$
- $R_{DS(ON)} = 8.5m\Omega$ (typical) @ $V_{GS} = 4.5V$
- Excellent gate charge $\times R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 150 °C operating temperature
- Pb-free lead plating
- 100% UIS tested

Application

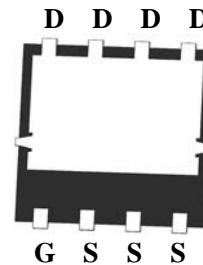
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification



Schematic Diagram



Top View



Bottom View

100% UIS TESTED!

100% ΔV_{ds} TESTED!

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCEP4045GU	NCEP4045GU	DFN5X6-8L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	45	A
Drain Current-Continuous($T_c=100^\circ C$)	$I_D (100^\circ C)$	31.8	A
Pulsed Drain Current	I_{DM}	125	A
Maximum Power Dissipation	P_D	28	W
Derating factor		0.22	W/°C
Single pulse avalanche energy ^(Note 5)	E_{AS}	115	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	°C

Thermal Characteristic

Thermal Resistance, Junction-to-Case ^(Note 2)	$R_{\theta JC}$	4.5	°C/W
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Electrical Characteristics ($T_C=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{\text{GS}}=0\text{V}, I_{\text{D}}=250\mu\text{A}$	40		-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{\text{DS}}=40\text{V}, V_{\text{GS}}=0\text{V}$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{\text{GS}}=\pm 20\text{V}, V_{\text{DS}}=0\text{V}$	-	-	± 100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{\text{GS(th)}}$	$V_{\text{DS}}=V_{\text{GS}}, I_{\text{D}}=250\mu\text{A}$	1.0	1.6	2.0	V
Drain-Source On-State Resistance	$R_{\text{DS(ON)}}$	$V_{\text{GS}}=10\text{V}, I_{\text{D}}=20\text{A}$	-	6	6.6	$\text{m}\Omega$
		$V_{\text{GS}}=4.5\text{V}, I_{\text{D}}=20\text{A}$	-	8.5	10	$\text{m}\Omega$
Forward Transconductance	g_{FS}	$V_{\text{DS}}=5\text{V}, I_{\text{D}}=20\text{A}$		30	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C_{iss}	$V_{\text{DS}}=20\text{V}, V_{\text{GS}}=0\text{V}, F=1.0\text{MHz}$	-	831	-	PF
Output Capacitance	C_{oss}		-	318	-	PF
Reverse Transfer Capacitance	C_{rss}		-	24	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{\text{d(on)}}$	$V_{\text{DD}}=20\text{V}, I_{\text{D}}=20\text{A}$ $V_{\text{GS}}=10\text{V}, R_{\text{G}}=1.6\Omega$	-	6	-	nS
Turn-on Rise Time	t_{r}		-	2.8	-	nS
Turn-Off Delay Time	$t_{\text{d(off)}}$		-	23	-	nS
Turn-Off Fall Time	t_{f}		-	3	-	nS
Total Gate Charge	Q_{g}	$V_{\text{DS}}=20\text{V}, I_{\text{D}}=20\text{A}, V_{\text{GS}}=10\text{V}$	-	17.6	-	nC
Gate-Source Charge	Q_{gs}		-	3.5	-	nC
Gate-Drain Charge	Q_{gd}		-	3.1	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{\text{GS}}=0\text{V}, I_{\text{s}}=20\text{A}$	-		1.2	V
Diode Forward Current (Note 2)	I_{s}		-	-	20	A
Reverse Recovery Time	t_{rr}	$T_J = 25^\circ\text{C}, I_F = I_s$ $dI/dt = 100\text{A}/\mu\text{s}$ (Note 3)	-	11	-	nS
Reverse Recovery Charge	Q_{rr}		-	19	-	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 $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. EAS condition : $T_J=25^\circ\text{C}, V_{\text{DD}}=20\text{V}, V_G=10\text{V}, L=0.5\text{mH}, R_g=25\Omega$

Typical Electrical and Thermal Characteristics

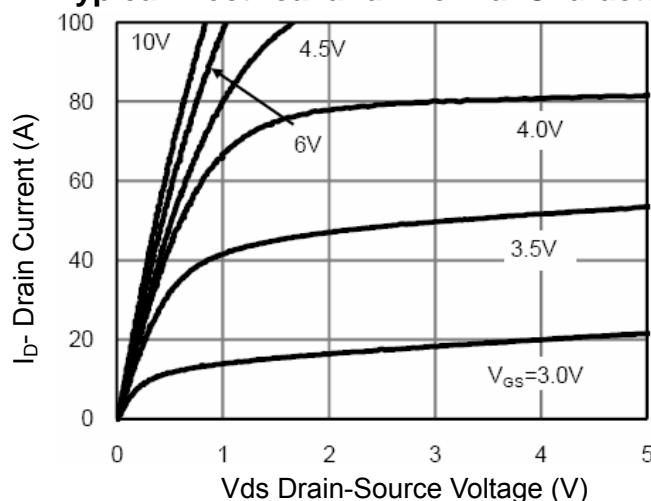


Figure 1 Output Characteristics

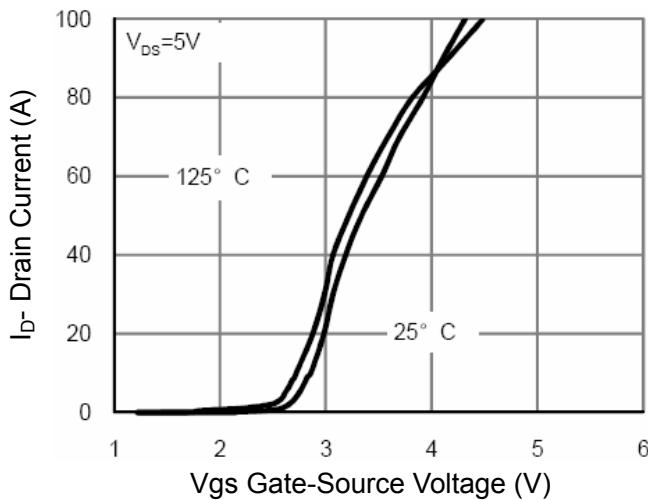


Figure 2 Transfer Characteristics

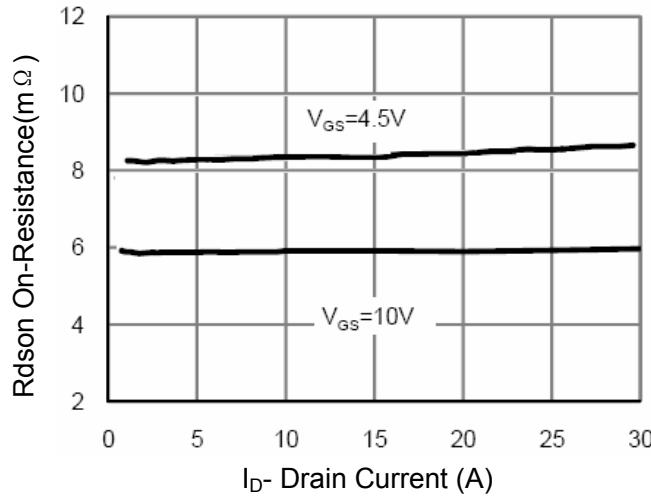


Figure 3 Rdson- Drain Current

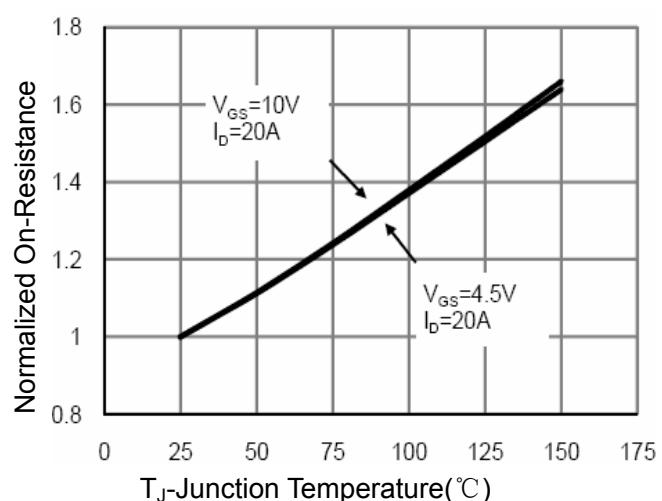


Figure 4 Rdson-Junction Temperature

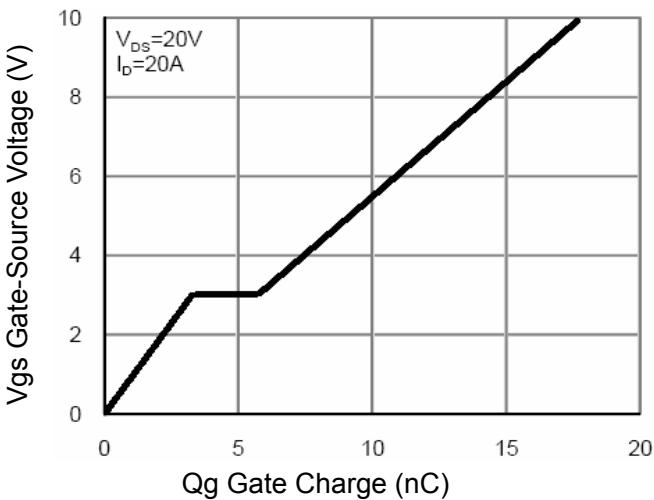


Figure 5 Gate Charge

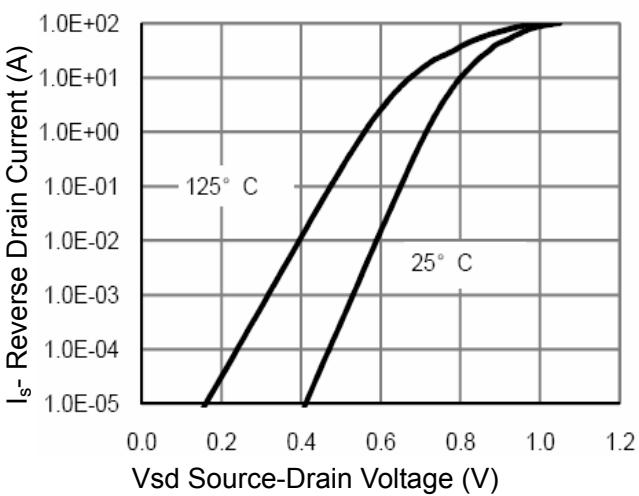
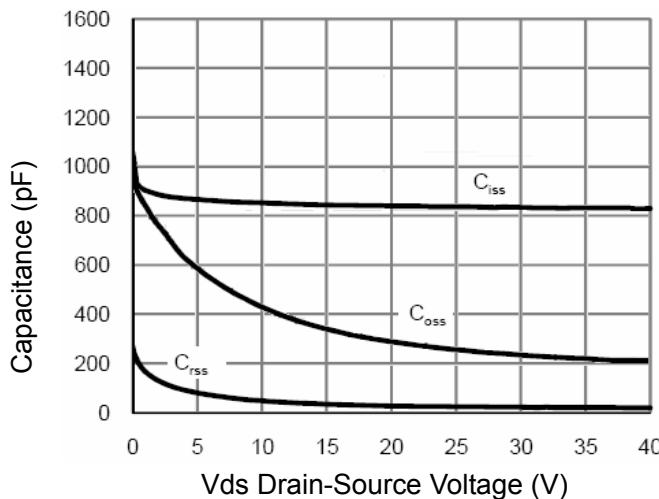
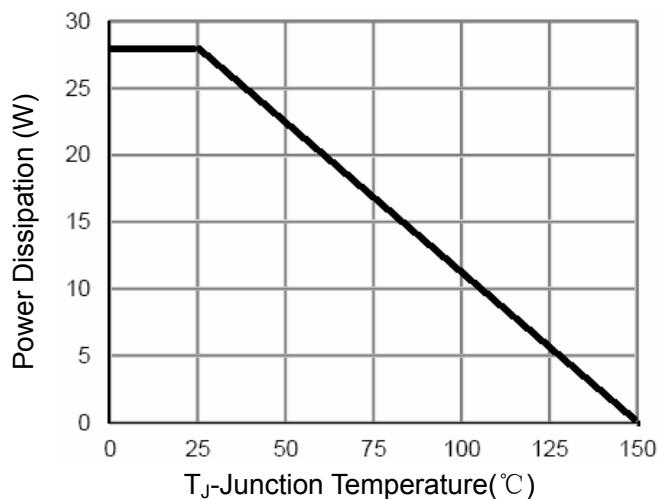
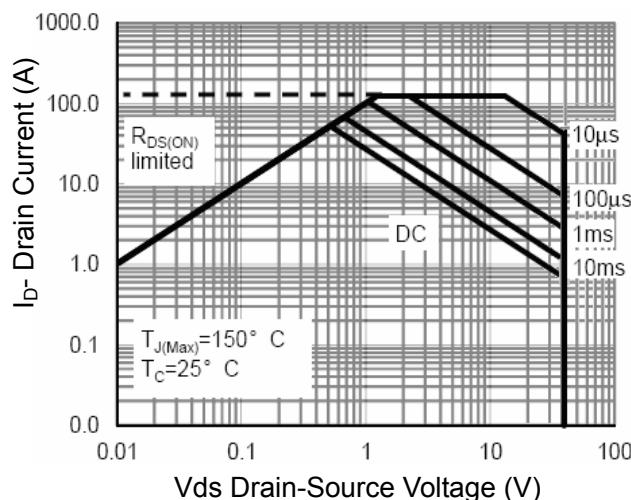
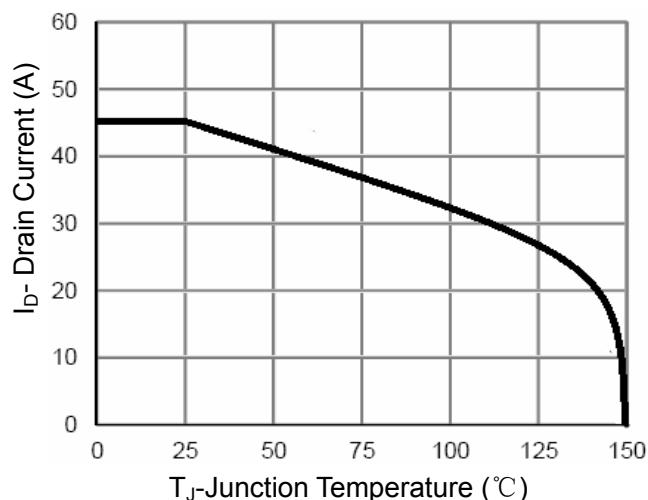
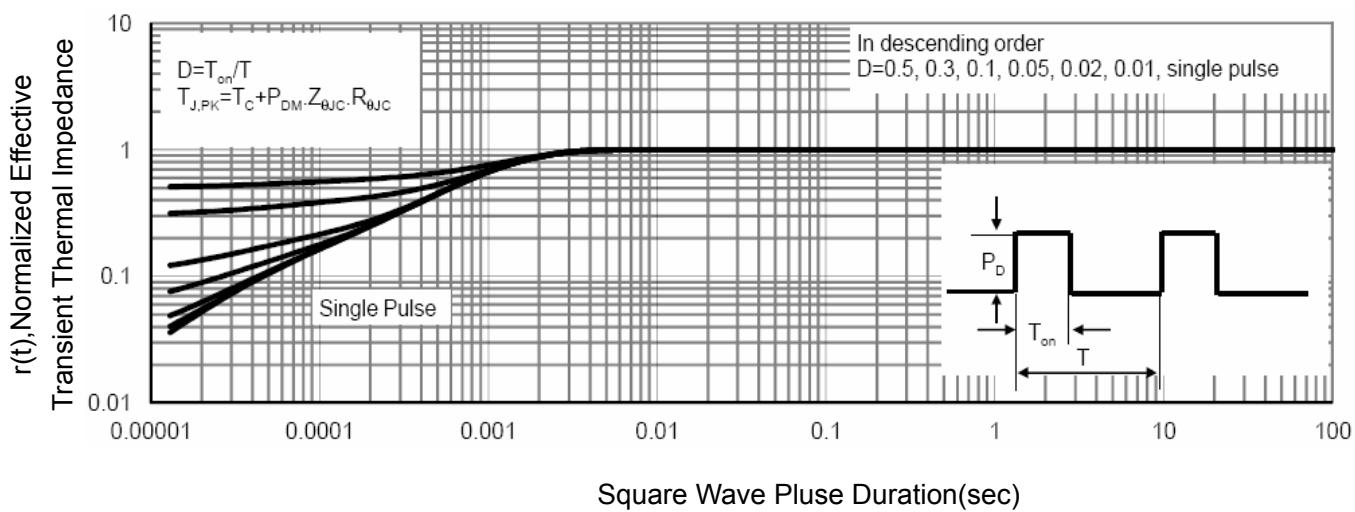
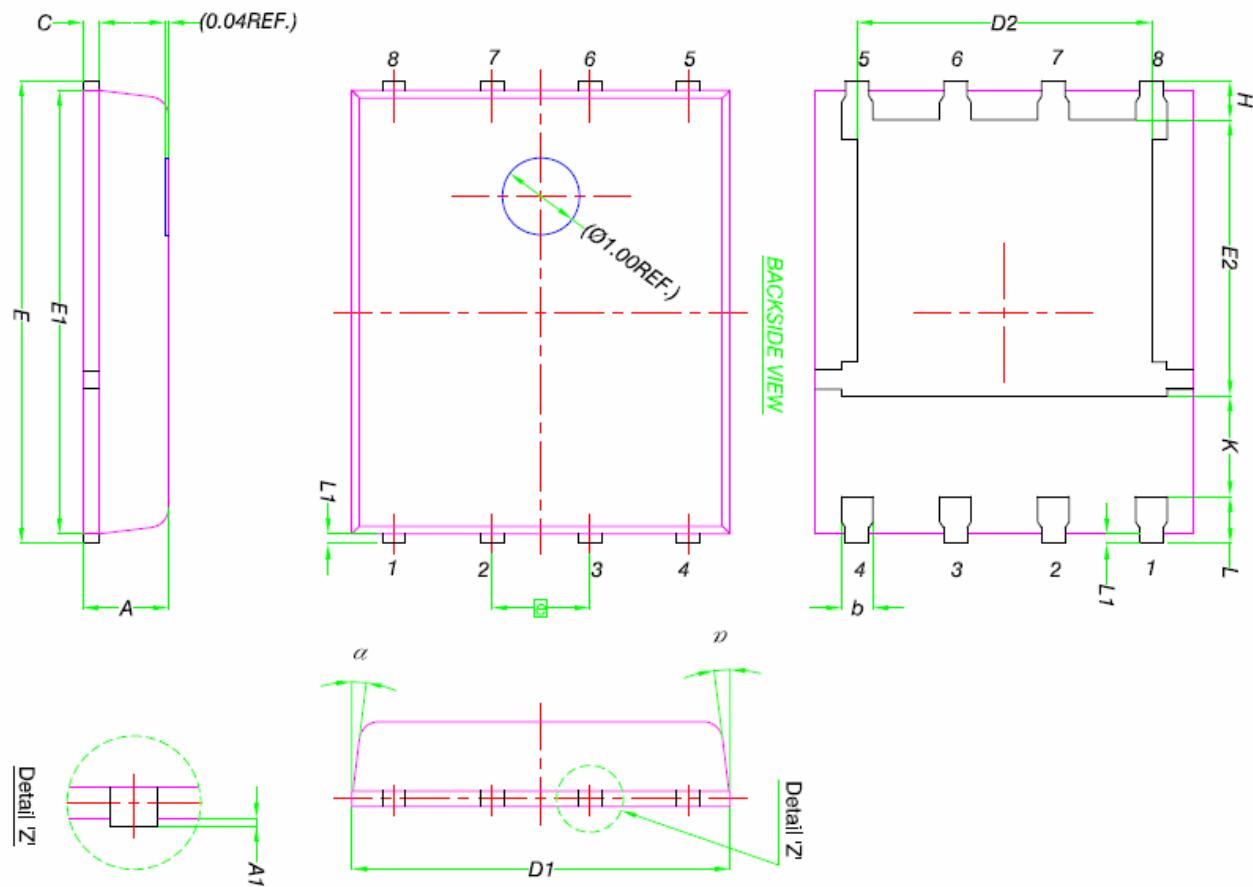


Figure 6 Source- Drain Diode Forward

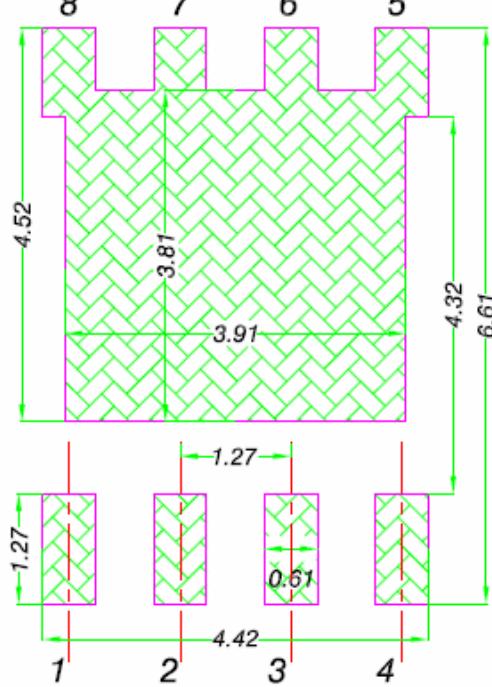

Figure 7 Capacitance vs Vds

Figure 9 Power De-rating

Figure 8 Safe Operation Area

Figure 10 Current De-rating

Figure 11 Normalized Maximum Transient Thermal Impedance

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°

Land Pattern
(Only for Reference)





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