

NCE P-Channel Enhancement Mode Power MOSFET

Description

The NCE30P20Q uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge. This device is suitable for use as a load switch or in PWM applications.

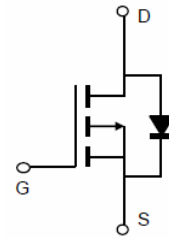
General Features

- $V_{DS} = -30V, I_D = -20A$
 $R_{DS(ON)} < 25m\Omega @ V_{GS} = -4.5V$
 $R_{DS(ON)} < 15m\Omega @ V_{GS} = -10V$
- High Power and current handing capability
- Lead free product is acquired
- Surface mount package

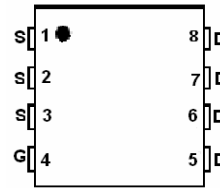
Application

- PWM applications
- Load switch
- Power management

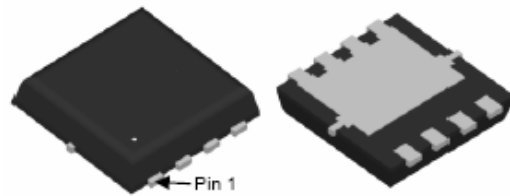
100% UIS TESTED!
100% ΔV_{ds} TESTED!



Schematic diagram



pin assignment



Top View

Bottom View

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCE30P20Q	NCE30P20Q	DFN3.3X3.3-8L	Ø330mm	12mm	5000 units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-30	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	-20	A
Drain Current-Continuous ($T_C = 100^\circ C$)	$I_D(100^\circ C)$	-14.1	A
Drain Current-Pulsed (Note 1)	I_{DM}	-80	A
Maximum Power Dissipation	P_D	35	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case (Note 2)	$R_{\theta JC}$	3.57	$^\circ C/W$
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Electrical Characteristics ($T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-30	-33	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-30V, V_{GS}=0V$	-	-	-1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1	-1.5	-1.9	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-15A$	-	11.5	15	m Ω
		$V_{GS}=-4.5V, I_D=-15A$	-	18	25	m Ω
Gate resistance	R_G		-	5.2	-	Ω
Forward Transconductance	g_{FS}	$V_{DS}=-5V, I_D=-15A$	15	-	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C_{ISS}	$V_{DS}=-25V, V_{GS}=0V,$ $F=1.0MHz$	-	2130	-	PF
Output Capacitance	C_{OSS}		-	302	-	PF
Reverse Transfer Capacitance	C_{RSS}		-	227	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-15V, I_D=-15A,$ $V_{GS}=-10V, R_{GEN}=1\Omega$	-	12	-	nS
Turn-on Rise Time	t_r		-	10	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	25	-	nS
Turn-Off Fall Time	t_f		-	13	-	nS
Total Gate Charge	Q_g	$V_{DS}=-15V, I_D=-20A, V_{GS}=-10V$	-	45.6	-	nC
Gate-Source Charge	Q_{gs}		-	4.6	-	nC
Gate-Drain Charge	Q_{gd}		-	11.1	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S=-20A$	-	-	-1.2	V

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

Typical Electrical and Thermal Characteristics



Figure 1: Switching Test Circuit



Figure 2: Switching Waveforms

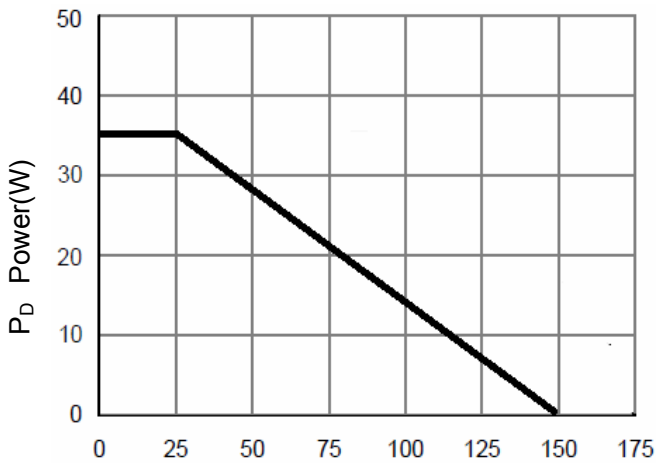


Figure 3 Power Dissipation

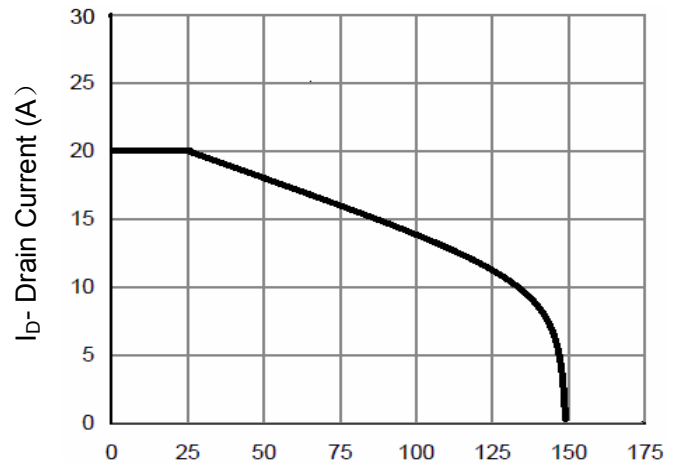


Figure 4 Drain Current

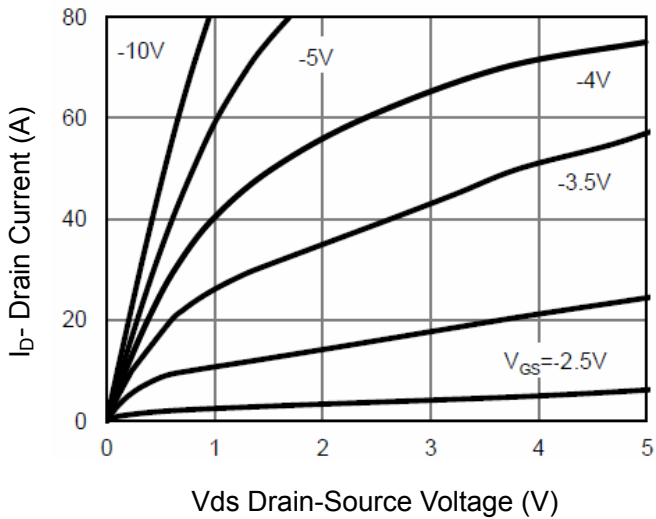


Figure 5 Output Characteristics

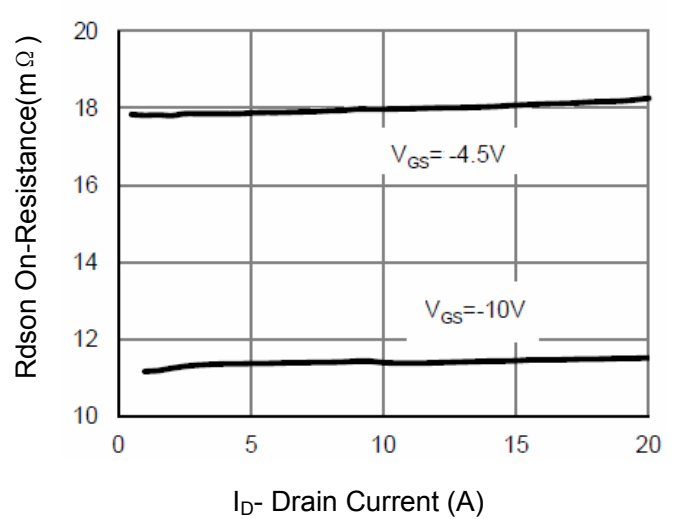


Figure 6 Drain-Source On-Resistance

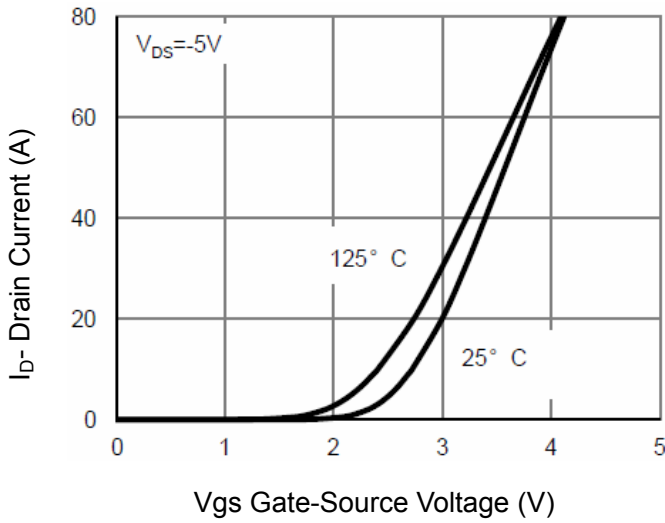


Figure 7 Transfer Characteristics

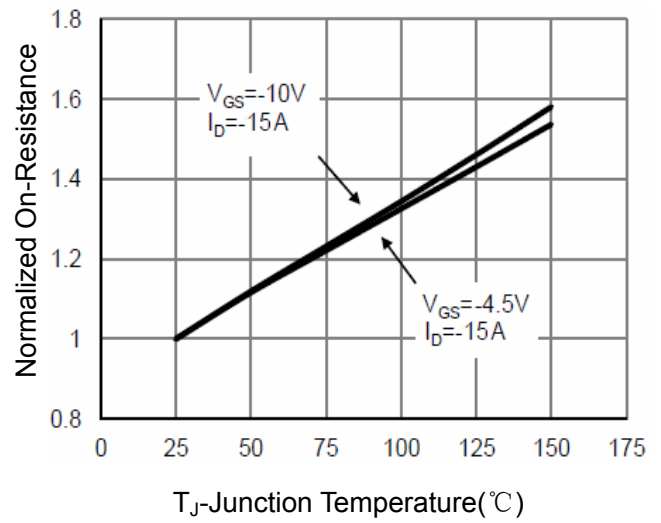


Figure 8 Drain-Source On-Resistance

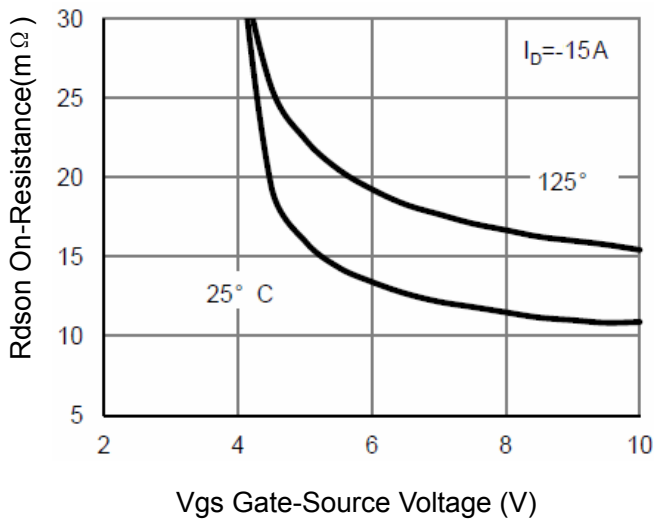


Figure 9 Rdson vs Vgs

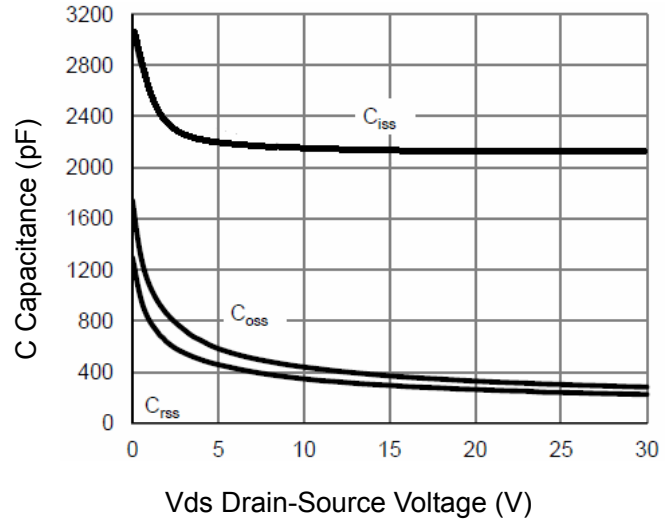


Figure 10 Capacitance vs Vds

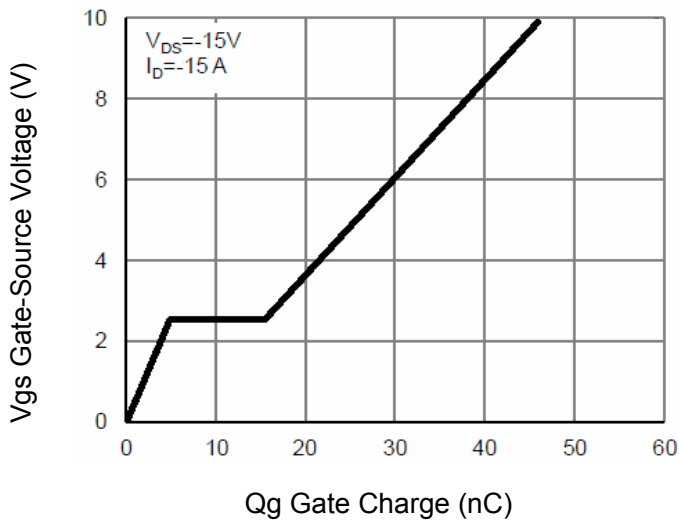


Figure 11 Gate Charge

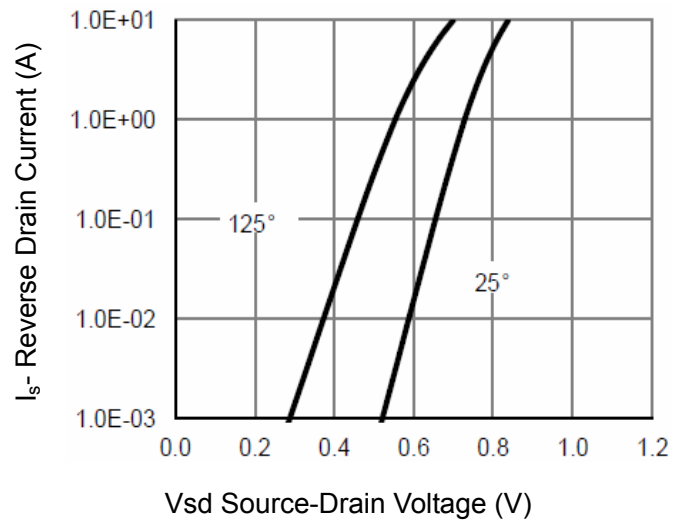
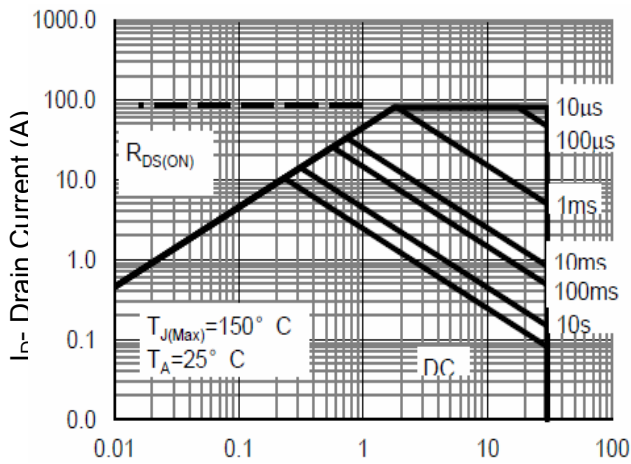
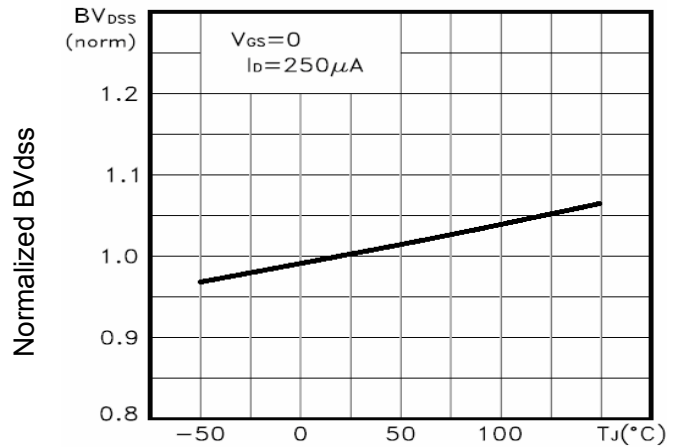


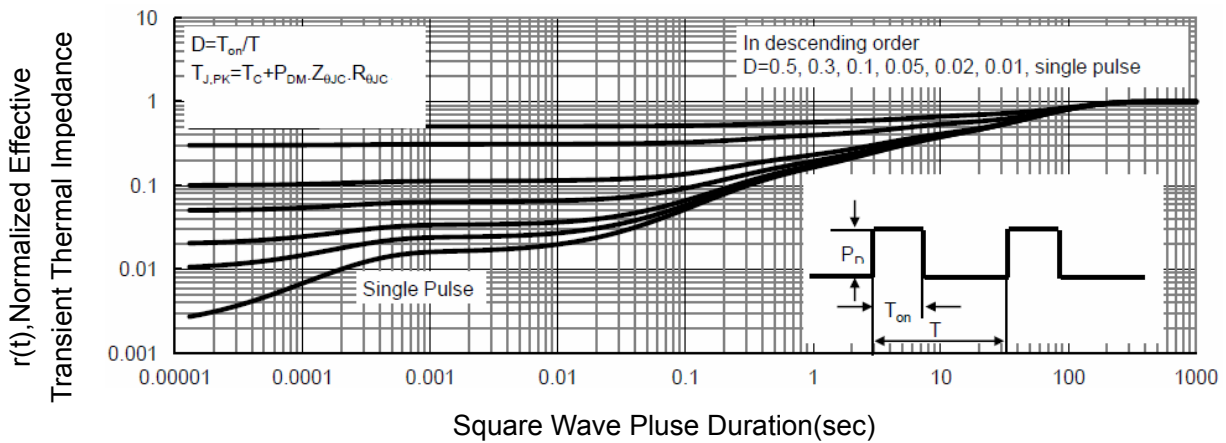
Figure 12 Source- Drain Diode Forward



Vds Drain-Source Voltage (V)
Figure 13 Safe Operation Area

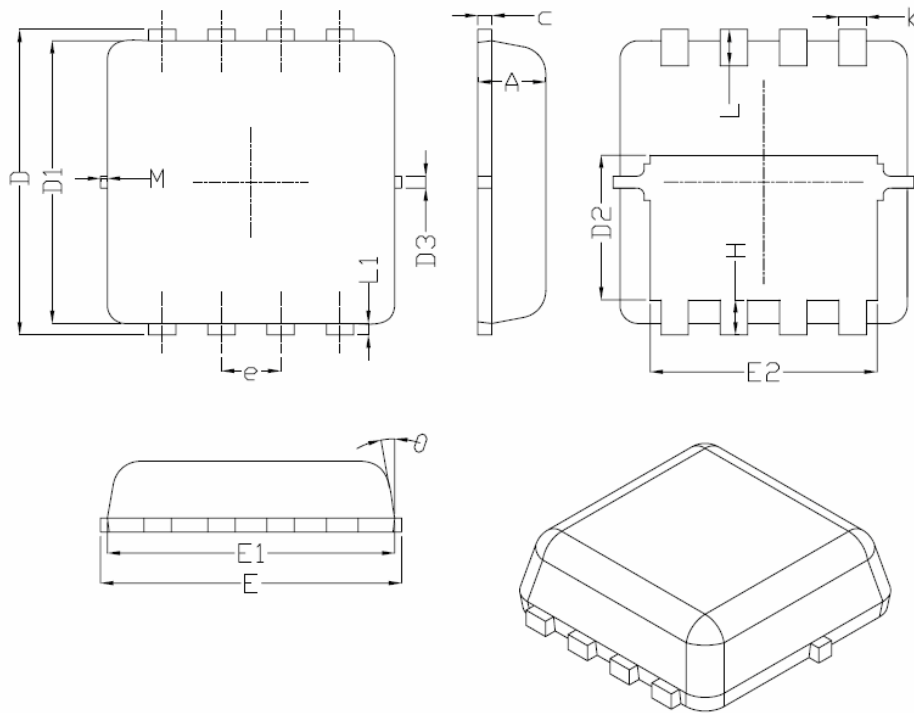


Tj Junction Temperature(°C)
Figure 14 BV_{DSS} vs Junction Temperature



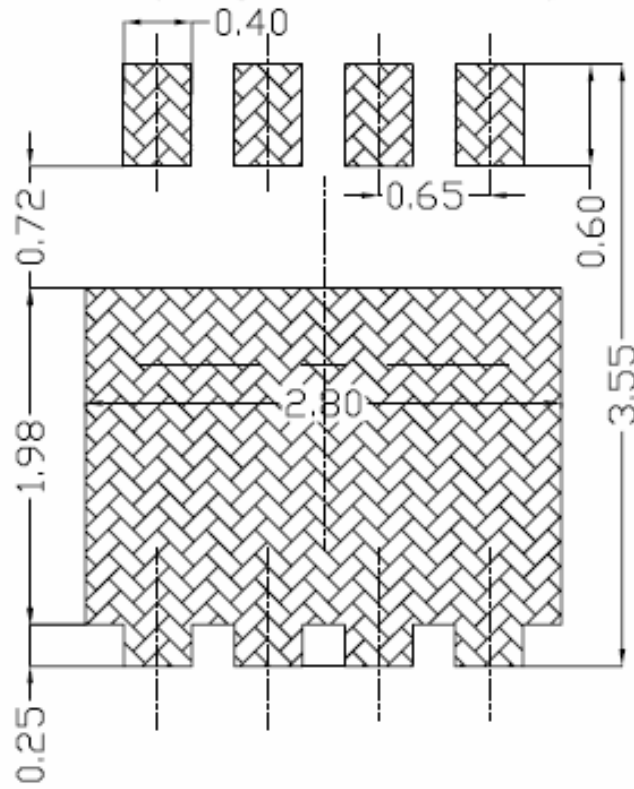
Square Wave Pulse Duration(sec)
Figure 15 Normalized Maximum Transient Thermal Impedance

DFN3.3X3.3-8L Package Information



Symbol	Dimensions In Millimeters		
	Min.	Nom.	Max.
A	0.70	0.75	0.80
b	0.25	0.30	0.35
c	0.10	0.15	0.25
D	3.25	3.35	3.45
D1	3.00	3.10	3.20
D2	1.48	1.58	1.68
D3	-	0.13	-
E	3.20	3.30	3.40
E1	3.00	3.15	3.20
E2	2.39	2.49	2.59
e	0.65BSC		
H	0.30	0.39	0.50
L	0.30	0.40	0.50
L1	-	0.13	-
M	*	*	0.15
θ		10°	12°

Land Pattern (Only for Reference)



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