

## NCE P-Channel Enhancement Mode Power MOSFET

### Description

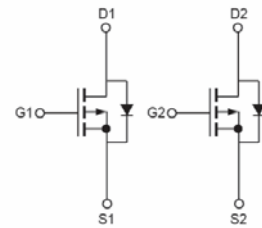
The NCE20PD05 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.

### General Features

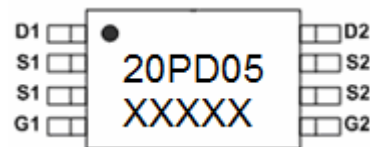
- $V_{DS} = -20V, I_D = -5A$
- $R_{DS(ON)} < 30m\Omega @ V_{GS}=2.5V$
- $R_{DS(ON)} < 22m\Omega @ V_{GS}=4.5V$
- High Power and current handling capability
- Lead free product is acquired
- Surface Mount Package

### Application

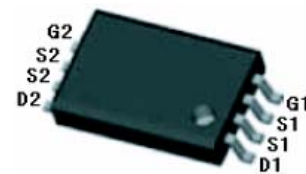
- Battery protection
- Load switch
- Power management



Schematic diagram



Marking and pin Assignment



TSSOP-8 top view

### Package Marking And Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
20PD05	NCE20PD05	TSSOP-8	Ø330mm	12mm	3000 units

### Absolute Maximum Ratings (TA=25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-20	V
Gate-Source Voltage	$V_{GS}$	±12	V
Drain Current-Continuous	$I_D$	-5	A
Drain Current-Pulsed (Note 1)	$I_{DM}$	-20	A
Maximum Power Dissipation	$P_D$	1.6	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	°C

### Thermal Characteristic

Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	78	°C/W
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### Electrical Characteristics (TA=25°C unless otherwise noted)

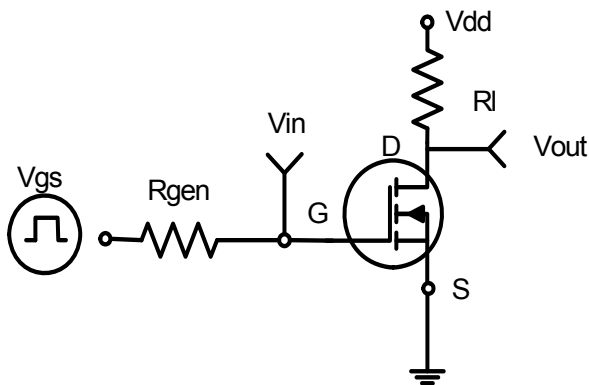
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-20	21	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=-20V, V_{GS}=0V$	-	-	1	μA

Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±12V,V <sub>DS</sub> =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =-250μA	-0.5	-0.7	-1.2	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-5A	-	24.8	30	mΩ
		V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-5A	-	32.5	40	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =-5V,I <sub>D</sub> =-5A	-	15	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C <sub>Iss</sub>	V <sub>DS</sub> =-10V,V <sub>GS</sub> =0V, F=1.0MHz	-	1025	-	PF
Output Capacitance	C <sub>Oss</sub>		-	167	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	119	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =-10V,I <sub>D</sub> =-5A V <sub>GS</sub> =-4.5V,R <sub>GEN</sub> =6Ω	-	10	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	15	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	70	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	40	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =-10V,I <sub>D</sub> =-5A, V <sub>GS</sub> =-4.5V	-	13	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	2	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	3.4	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V <sub>SD</sub>	V <sub>GS</sub> =0V,I <sub>S</sub> =-5A	-	-0.75	-1.2	V
Diode Forward Current (Note 2)	I <sub>S</sub>		-	-	-5	A

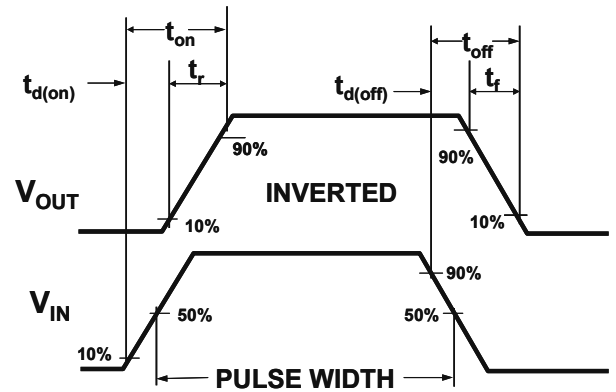
## Notes:

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

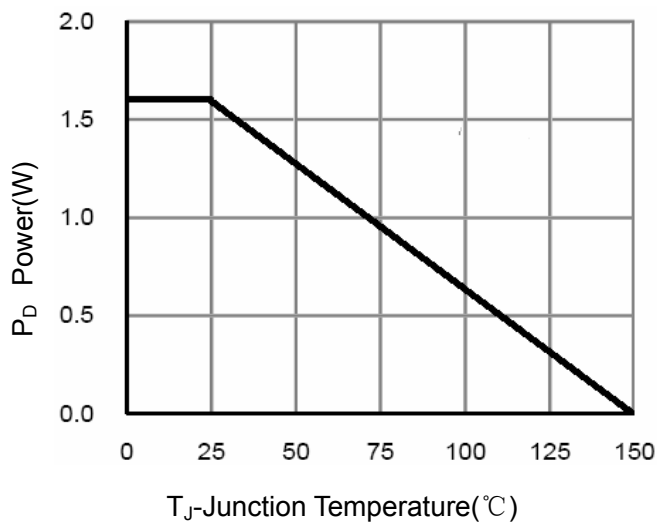
## Typical Electrical and Thermal Characteristics



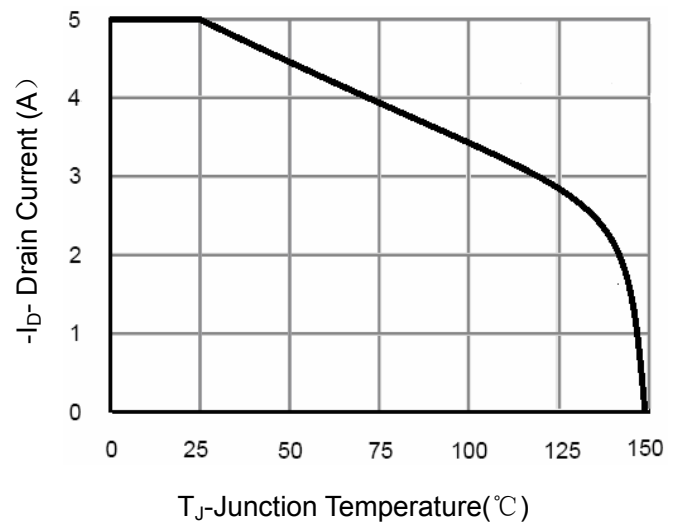
**Figure 1: Switching Test Circuit**



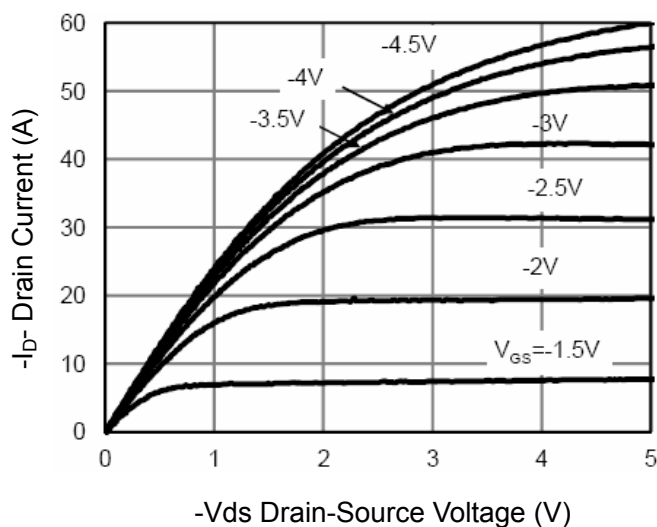
**Figure 2: Switching Waveforms**



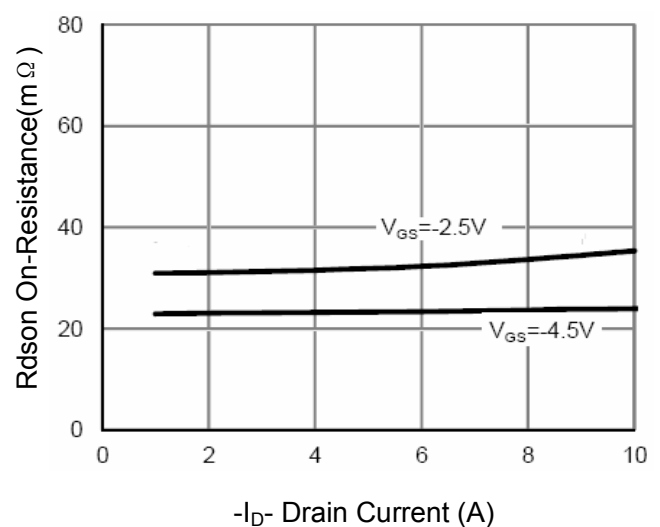
**Figure 3 Power Dissipation**



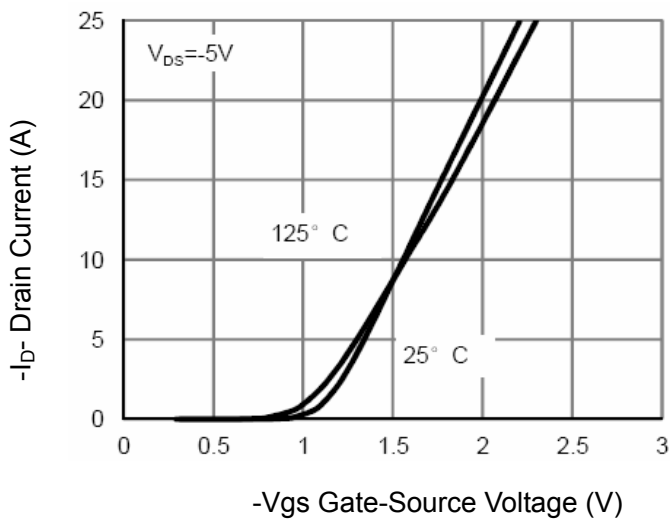
**Figure 4 Drain Current**



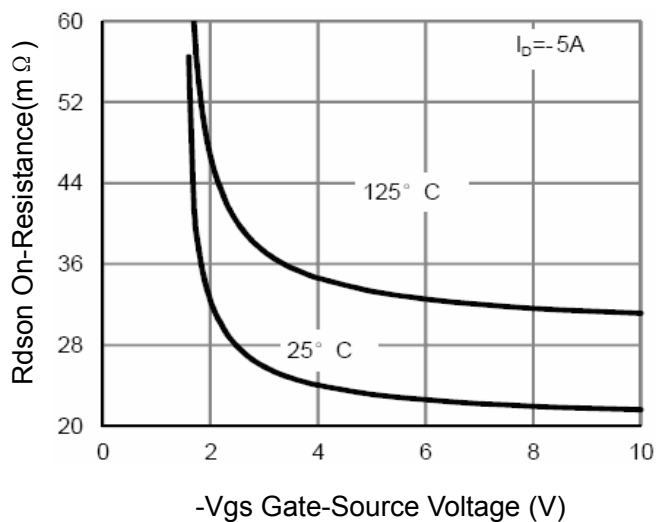
**Figure 5 Output Characteristics**



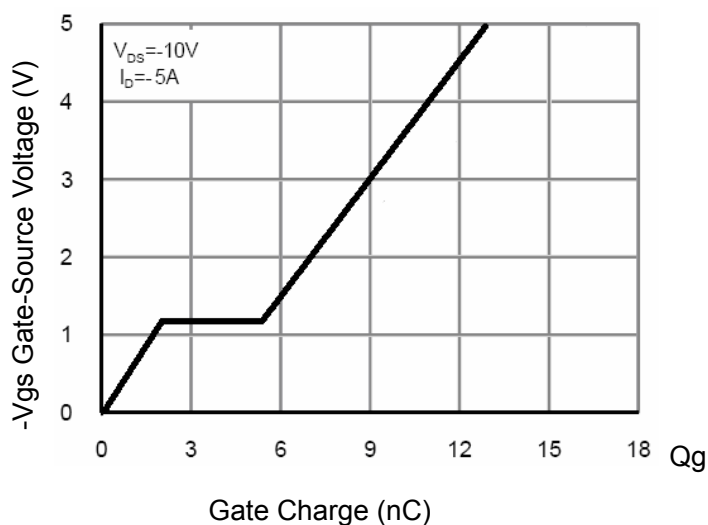
**Figure 6 Drain-Source On-Resistance**



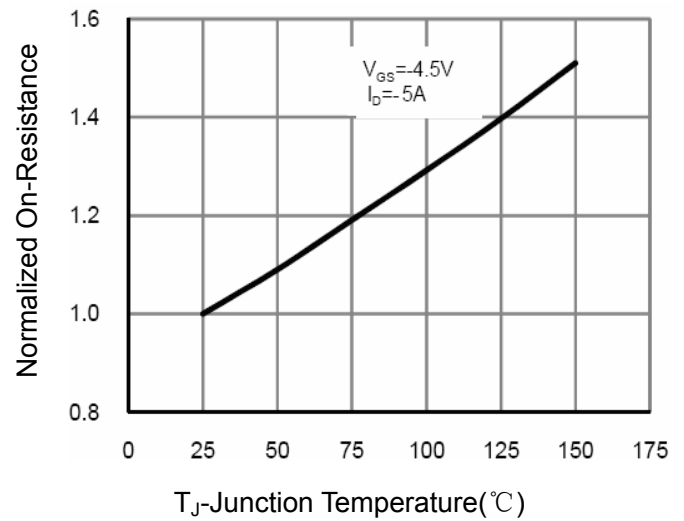
**Figure 7 Transfer Characteristics**



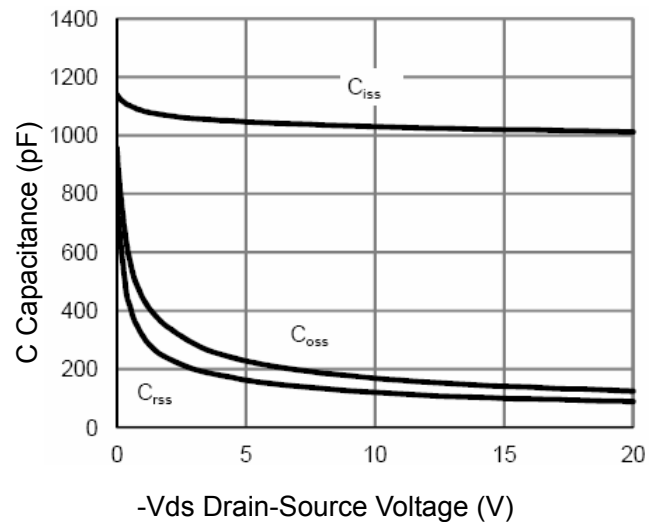
**Figure 9 Rdson vs Vgs**



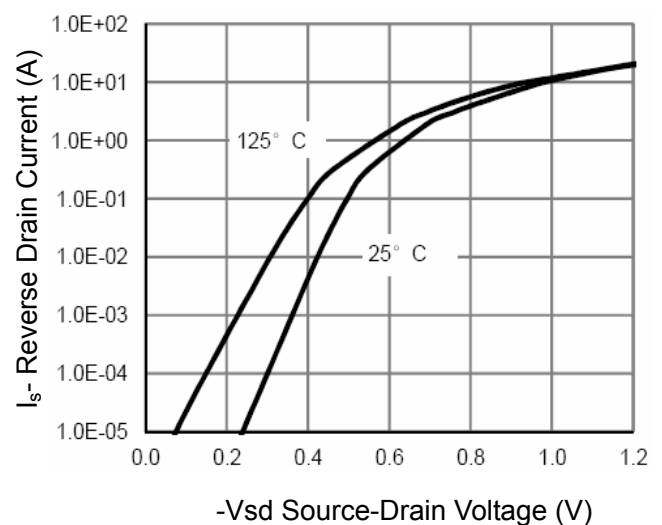
**Figure 11 Gate Charge**



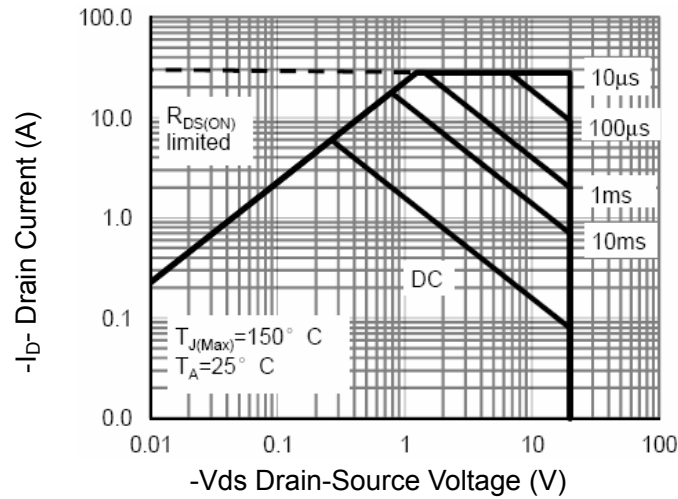
**Figure 8 Drain-Source On-Resistance**



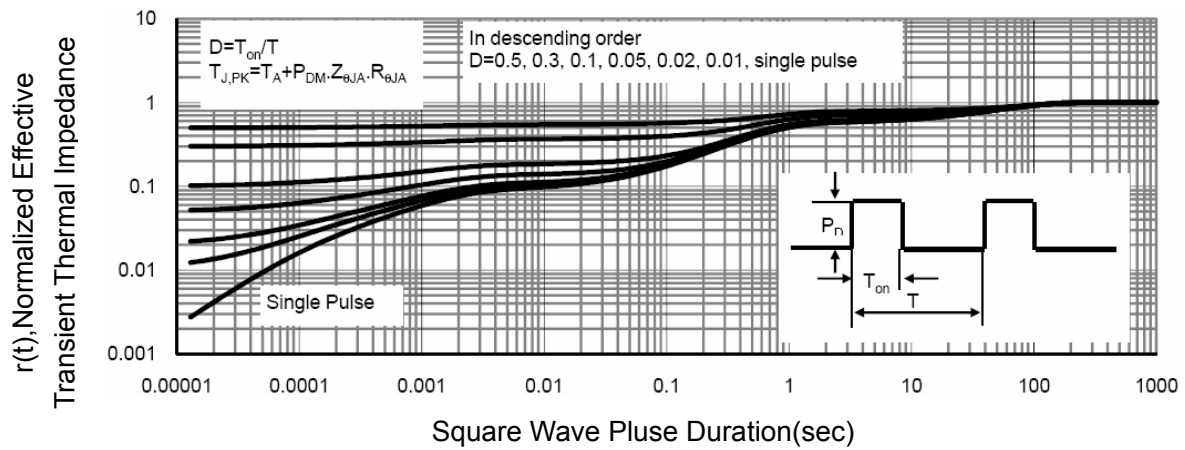
**Figure 10 Capacitance vs Vds**



**Figure 12 Source- Drain Diode Forward**

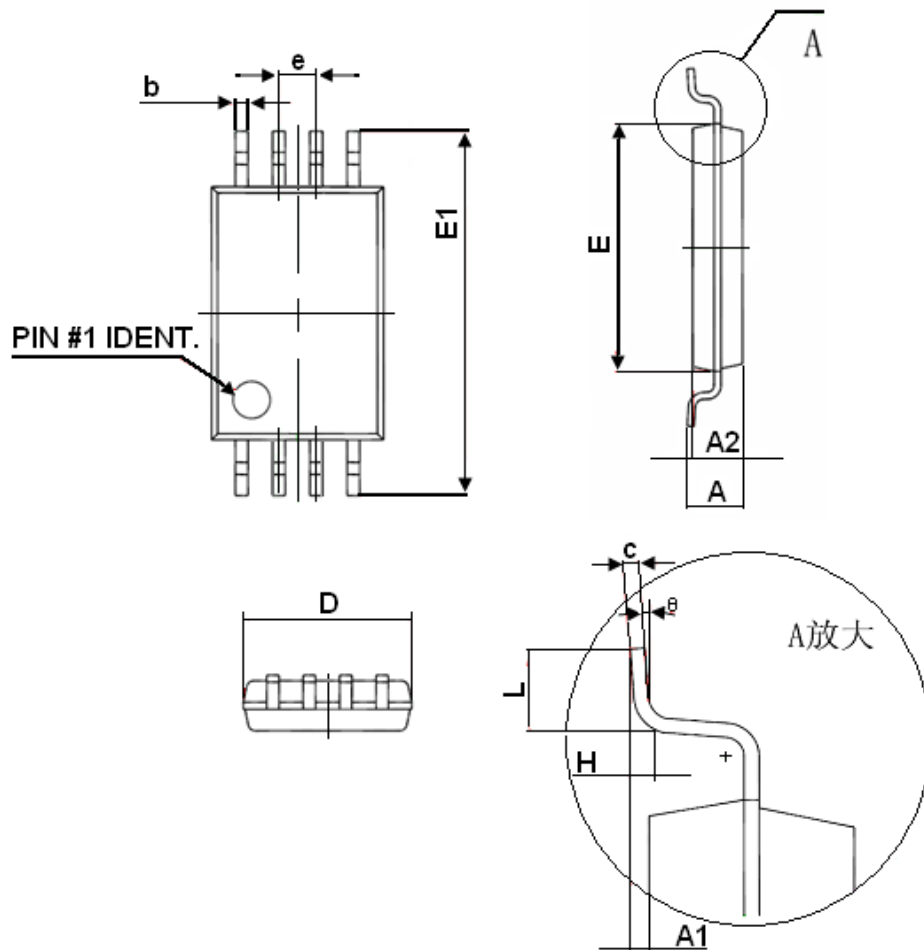


**Figure 13 Safe Operation Area**



**Figure 14 Normalized Maximum Transient Thermal Impedance**

## Tssop-8 Package Information



Symbol	Dimensions In Millimeters	
	Min	Max
D	2.900	3.100
E	4.300	4.500
b	0.190	0.300
c	0.090	0.200
E1	6.250	6.550
A		1.100
A2	0.800	1.000
A1	0.020	0.150
e	0.65(BSC)	
L	0.500	0.700
H	0.25(TYP)	
$\theta$	1°	7°

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