TK9P65W,RQ

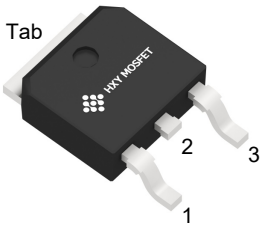
SiC Power MOSFET N-Channel Enhancement Mode

Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Avalanche Ruggednes

Applications

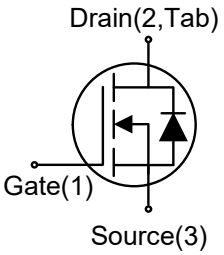
- Solar Inverters
- Switch Mode Power Supplies
- UPS
- Batterry Chargers



TO-252-2L

Package Marking and Ordering Information

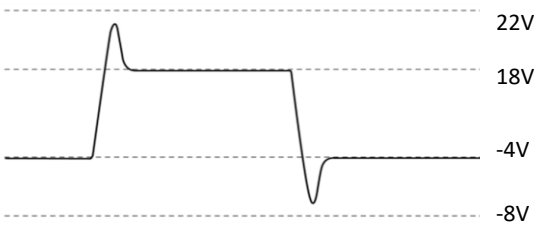
Ordering Part Number	Package	Brand
TK9P65W,RQ	TO-252-2L	HXY MOSFET



Absolute Maximum Ratings

Symbol	Parameter	Value	Unit	Test Conditions
V_{DSmax}	Drain - Source Voltage	650	V	
V_{GSmax}	Gate - Source Voltage (Absolute maximum values)	-8/+22	V	
V_{GS}	Gate - Source Voltage	-4/+18	V	
I_D	Continuous Drain Current	6.8	A	T_C = 25˚C
		4.8		T_C = 100˚C
$I_{D(pulse)}$	Pulsed Drain Current	29	A	Pulse width t_P limited by T_{jmax}
P_{TOT}	Power Dissipation	41	W	T_C = 25˚C
T_J , T_{stg}	Operating Junction and Storage Temperature	-55 to +175	˚C	

•Example of acceptable V_{GS} waveform



Electrical Characteristics (T_C = 25˚C unless other wise specified)

Symbol	Parameter	Value			Unit	Test Condition
		min.	typ.	max.		
Static Characteristics						
V_{DSS}	Drain-source breakdown voltage	750	-	-	V	V_{GS}=0V, I_D=100uA
$V_{GS(th)}$	Gate threshold voltage	2	2.8	4	V	V_{DS}=V_{GS},I_D=0.43mA
I_{DSS}	Zero gate voltage drain current	- -	1 5	10 -	μA	V_{DS}=650V,V_{GS}=0V T_C=25°C T_C=175°C
I_{GSS}	Gate-source leakage current	-		100	nA	V_{GS}=18V,V_{DS}=0V
$R_{DS(on)}$	Drain-source on-state resistance	-	460 540	610	mΩ	V_{GS}=18V, I_D=2A, T_J=25°C T_J=175°C
$R_{DS(on)}$	Drain-source on-state resistance	-	580	-	mΩ	V_{GS}=15V, I_D=2A, T_J=25°C
g_{fs}	Transconductance	-	1.3	-	S	V_{DS}=20V,I_D=2A
Dynamic Characteristics						
C_{iss}	Input Capacitance	-	176	-	pF	V_{DS} = 400V V_{GS} = 0V T_J = 25°C V_{AC} = 25mV f = 1MHz
C_{oss}	Output Capacitance	-	17	-		
C_{rss}	Reverse Transfer Capacitance	-	2	-		
Q_G	Gate Total Charge	-	8.5	-	nC	V_{DS} = 400V V_{GS} = -4/18V I_D = 1.6A
Q_{gs}	Gate-Source charge	-	2.6	-		
Q_{gd}	Gate-Drain charge	-	2.6	-		
E_{ON}	Turn-On Switching Energy	-	32.5	-	μJ	V_{DD} = 400V V_{GS} = -4/+18V I_D = 1.6A R_G = 5Ω
E_{OFF}	Turn-Off Switching Energy	-	0.53	-		
$t_{d(on)}$	Turn-on delay time	-	40	-	ns	
t_r	Rise time	-	33.5	-		
$t_{d(off)}$	Turn-off delay time	-	49	-		
t_f	Fall time	-	54	-		
R_G	Gate resistance	-	3.7	-	Ω	V_{AC} = 25mV, f=1MHz
Body Diode Characteristics						
V_{SD}	Body Diode Forward Voltage		3		V	V_{GS}= 0V,I_{SD}=1A, T_J=25°C
			2.7			V_{GS}= 0V,I_{SD}=1A, T_J=175°C
t_{rr}	Body Diode Reverse Recovery Time	-	52	-	ns	V_R = 400V, V_{GS} = 0V I_D = 1.6A di/dt = 800A/μS T_J = 175°C
Q_{rr}	Body Diode Reverse Recovery Charge	-	21.8	-	nC	

Thermal Characteristics

Symbol	Parameter	Typ.	Unit	Test Conditions
R_{thJC}	Thermal Resistance from Junction to Case	3.7	˚C/W	
R_{thJA}	Thermal Resistance From Junction to Ambient	40		

Typical Performance

Fig 1. Output Characteristics (T_J=-55℃)

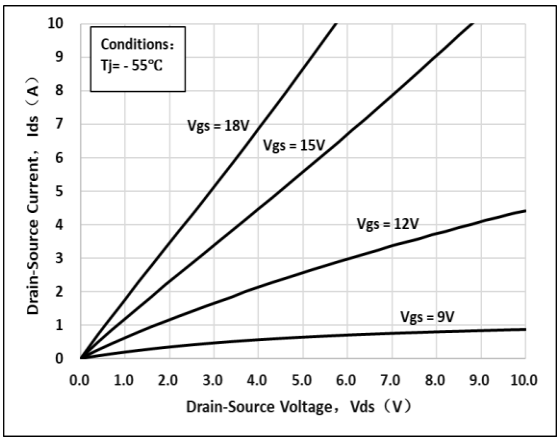


Fig 2. Output Characteristics (T_J=25℃)

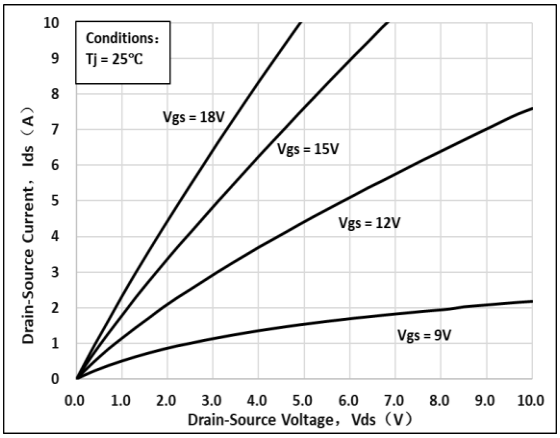


Fig 3. Output Characteristics (T_J=175℃)

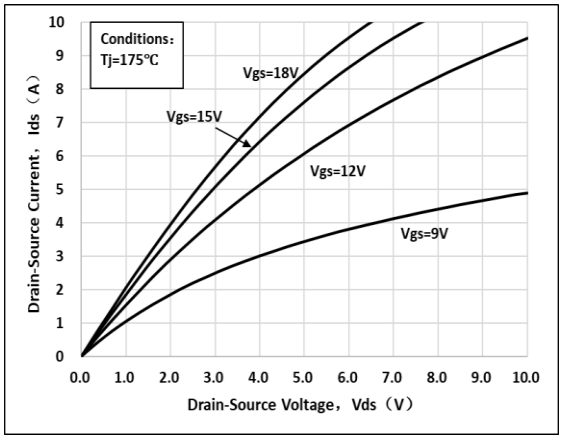


Fig 4: Rdson Vs Ids Characteristics

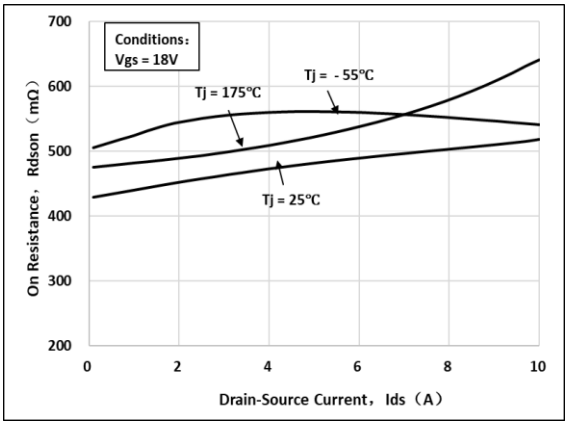


Fig 5: Rds(on) vs. Temperature

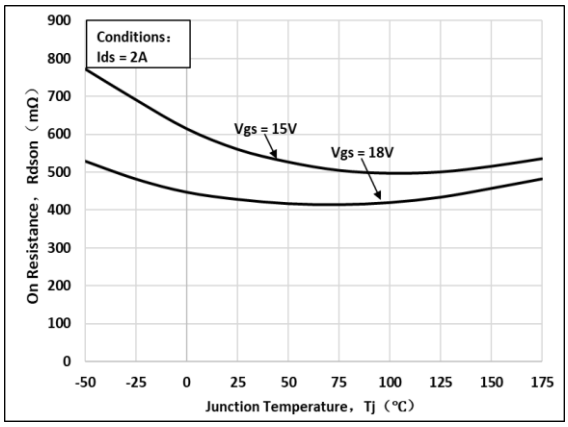


Fig 5: Transfer Characteristics

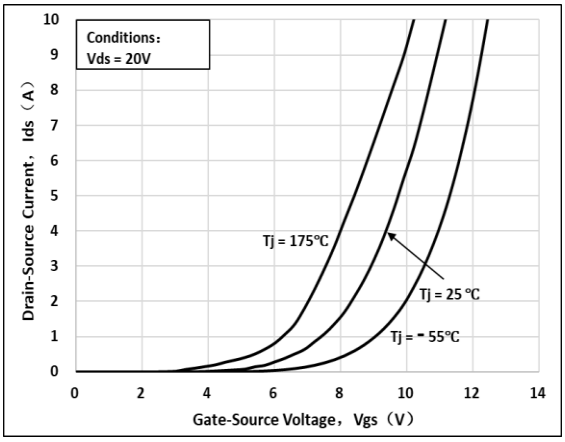


Fig 7: Body-diode Characteristics (TJ=-55℃)

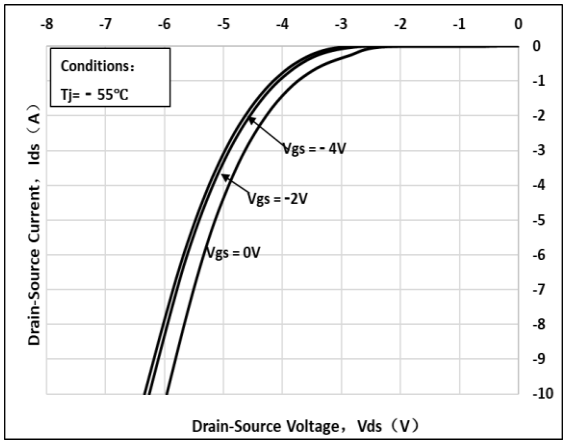


Fig 8: Body-diode Characteristics (TJ=25℃)

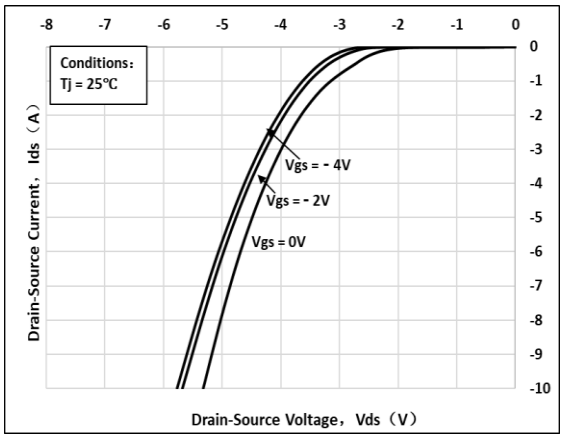


Fig 9: Body-diode Characteristics (T_J=175℃)

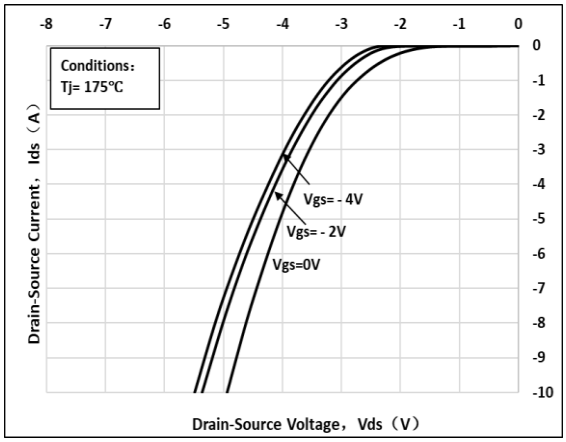


Fig 10: VTH Vs TJ Temperature Characteristics

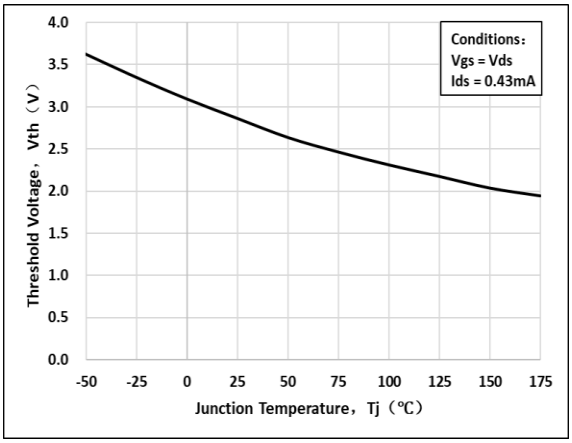


Fig 11: 3rd Quadrant Characteristics(TJ=-55℃)

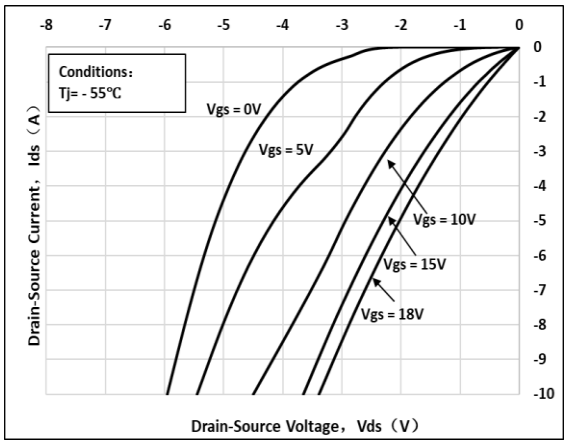


Fig 12: 3rd Quadrant Characteristics(TJ=25℃)

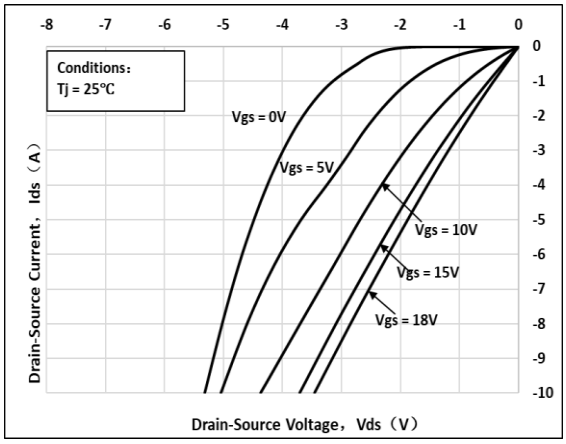


Fig 13: 3rd Quadrant Characteristics(TJ=175℃)

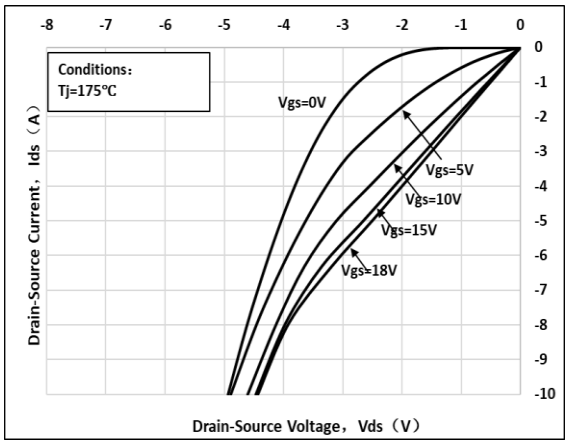


Fig 14: Gate Charge Characteristics

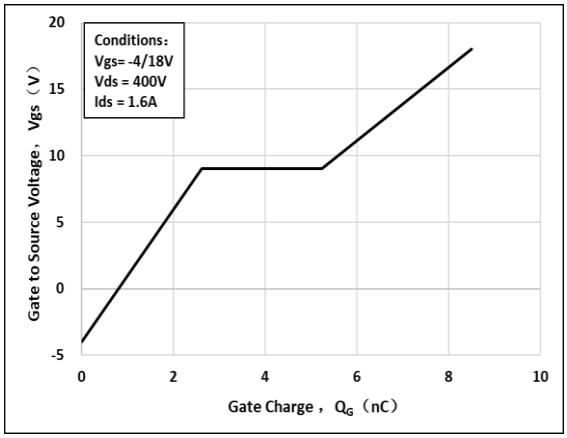


Fig 15:Continuous Drain Current vs.Case Temperature

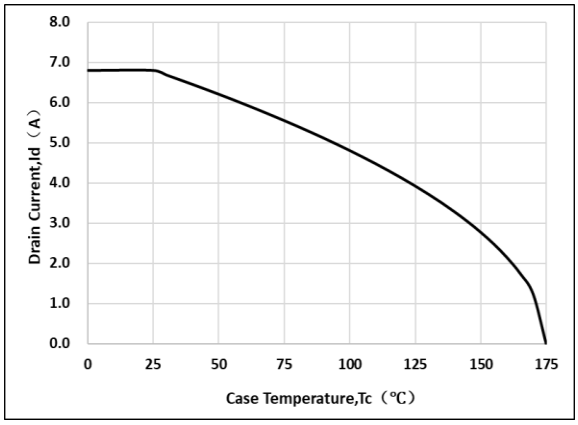


Fig 16: Safe Operating Area

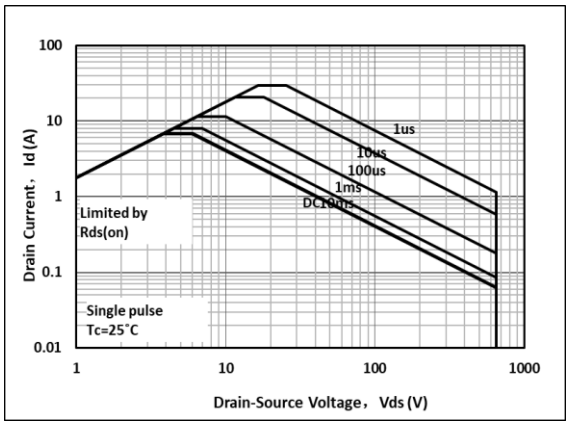


Fig 17: Capacitance Characteristics

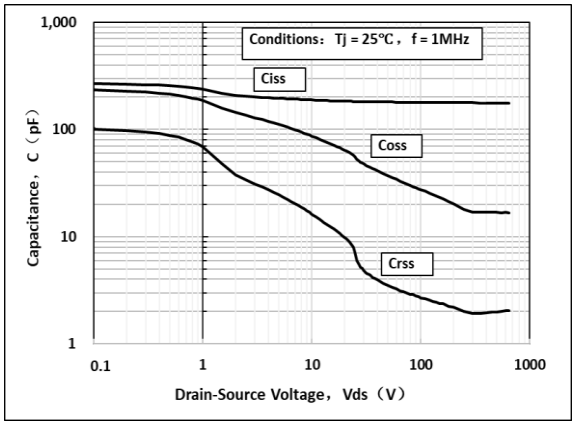
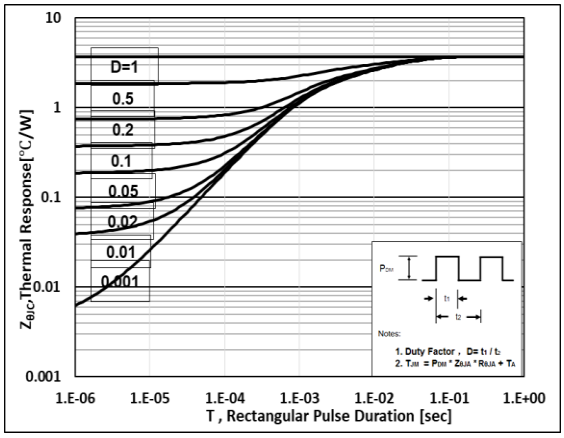


Fig 18: Transient Thermal Impedance



Test Circuit & Waveform

Figure A. Definition of switching times

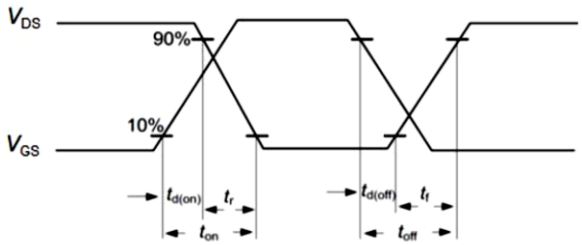


Figure B. Dynamic test circuit

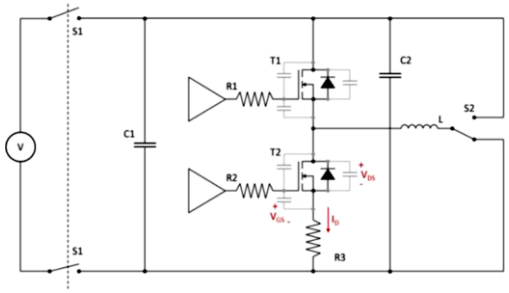


Figure C. Definition of body diodeswitching characteristics

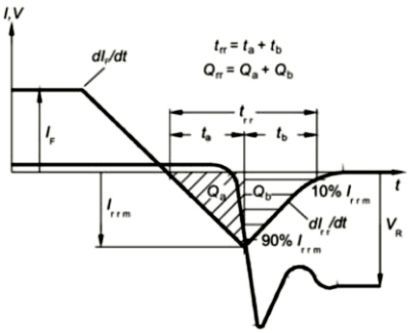
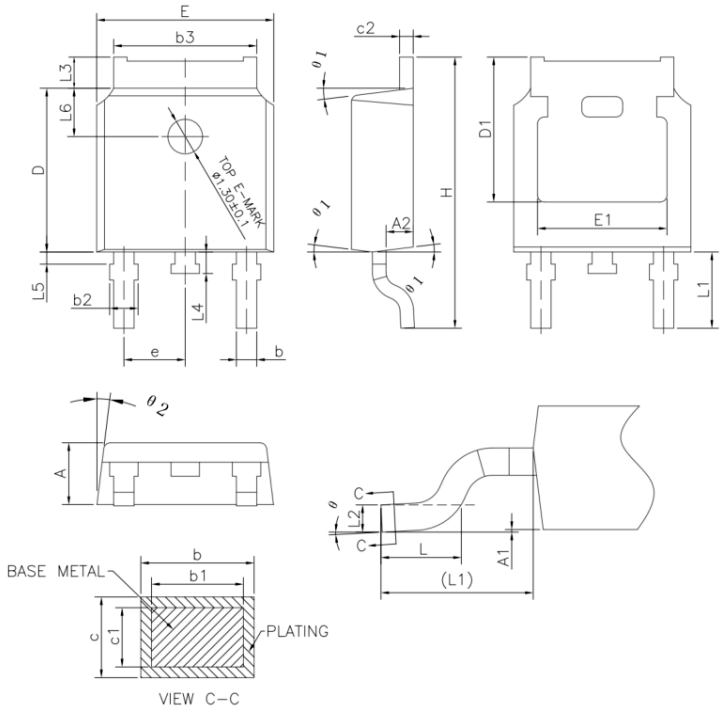


Figure C. **Definition of diode switching characteristics**

Package Dimensions

Package TO-252-2L



SYMBOL	Unit: mm		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0	-	0.10
A2	0.90	1.01	1.10
b	0.72	-	0.85
b1	0.71	0.76	0.81
b2	0.72	-	0.90
b3	5.13	5.33	5.46
c	0.47	-	0.60
c1	0.46	0.51	0.56
c2	0.47	-	0.60
D	6.00	6.10	6.20
D1	5.25	-	-
E	6.50	6.60	6.70
E1	4.70	-	-
e	2.186	2.286	2.386
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L1	2.90 REF		
L2	0.508 BSC		
L3	0.90	-	1.25
L4	0.60	0.80	1.00
L5	0.15	-	0.75
L6	1.80 REF		
θ	0°	-	8°
θ1	5°	7°	9°
θ2	5°	7°	9°

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