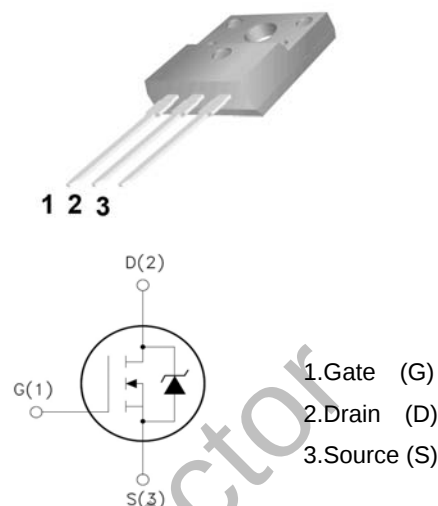


FQPF7N60SE

Features:

- ☐ Low Intrinsic Capacitances.
- ☐ Excellent Switching Characteristics.
- ☐ Extended Safe Operating Area.
- ☐ Unrivalled Gate Charge :Qg=29nC (Typ.).
- ☐ BVDSS=650V, I_D=7A
- ☐ R_{DS(on)} : 1.30Ω (Max) @V_G=10V
- ☐ 100% Avalanche Tested

TO-220F



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

Symbol	Parameter	Value	Unit
V _{DSS}	Drain-Source Voltage	650	V
I _D	Drain Current	T _j =25°C	A
		T _j =100°C	
V _{GS(TH)}	Gate Threshold Voltage	±30	V
E _{AS}	Single Pulse Avalanche Energy (note1)	150	mJ
I _{AR}	Avalanche Current (note2)	7.0	A
P _D	Power Dissipation (T _j =25°C)	50	W
T _j	Junction Temperature(Max)	150	°C
T _{stg}	Storage Temperature	-55~+150	°C
TL	Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds	300	°C

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
R _{θJC}	Thermal Resistance, Junction to Case	-	2.4	°C/W
R _{θJA}	Thermal Resistance, Junction to Ambient	-	62.5	°C/W

Electrical Characteristics (Ta=25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
Off Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	I _D =250μA, V _{GS} =0	650	-	-	V
ΔBVDSS/ΔT _J	Breakdown Voltage Temperature Coefficient	I _D =250μA ,Reference to 25℃	-	0.67	-	V/℃
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =650V, V _{GS} =0V	-	-	10	μA
		V _{DS} =520V, T _j =125℃			100	
I _{GSSF}	Gate-body leakage Current, Forward	V _{GS} =+30V, V _{DS} =0V	-	-	100	nA
I _{GSSR}	Gate-body leakage Current, Reverse	V _{GS} =-30V, V _{DS} =0V	-	-	-100	
On Characteristics						
V _{GS(TH)}	Date Threshold Voltage	I _D =250μA,V _{DS} =V _{GS}	2	-	4	V
R _{DS(ON)}	Static Drain-Source On-Resistance	I _D =3.5A,V _{GS} =10V	-	1.05	1.30	Ω
Dynamic Characteristics						
Ciss	Input Capacitance	V _{DS} =25V, V _{GS} =0, f=1.0MHz	-	1010	-	pF
Coss	Output Capacitance		-	135	-	
Crss	Reverse Transfer Capacitance		-	16	-	
Switching Characteristics						
Td(on)	Turn-On Delay Time	V _{DD} =325V, I _D =7A R _G =25Ω (Note 3,4)	-	30	70	nS
Tr	Turn-On Rise Time		-	80	170	
Td(off)	Turn-Off Delay Time		-	65	140	
Tf	Turn-Off Rise Time		-	60	130	
Qg	Total Gate Charge	V _{DS} =520V,V _{GS} =10V, I _D =7A (Note 3,4)	-	29	38	nC
Qgs	Gate-Source Charge		-	7	-	
Qgd	Gate-Drain Charge		-	14.5	-	
Drain-Source Diode Characteristics and Maximum Ratings						
IS	Max. Diode Forward Current	-	-	-	7	A
I _{SM}	Max. Pulsed Forward Current	-	-	-	28	
V _{SD}	Diode Forward Voltage	I _D =7A	-	-	1.4	V
Trr	Reverse Recovery Time	I _S =7A,V _{GS} =0V diF/dt=100A/μs	-	320	-	nS
Qrr	Reverse Recovery Charge	(Note3)	-	2.4	-	μC

Notes : 1, L=17.1mH, I_{AS}=7A, V_{DD}=50V, R_G=25Ω, Starting T_J=25°C

2, Repetitive Rating : Pulse width limited by maximum junction temperature

3, Pulse Test : Pulse Width ≤ 300μs, Duty Cycle ≤ 2%

4, Essentially Independent of Operating Temperature

Typical Characteristics

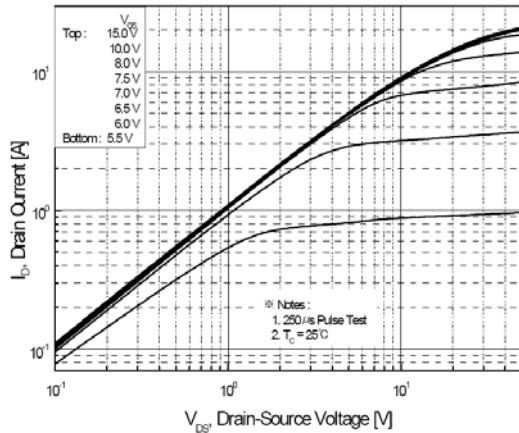


Figure 1. On-Region Characteristics

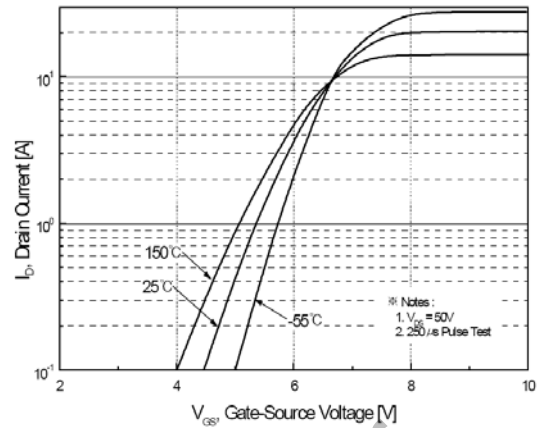


Figure 2. Transfer Characteristics

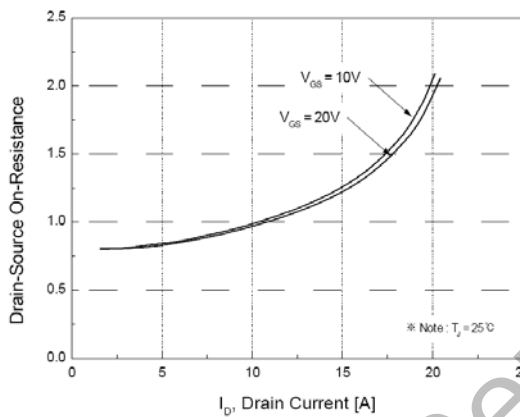


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

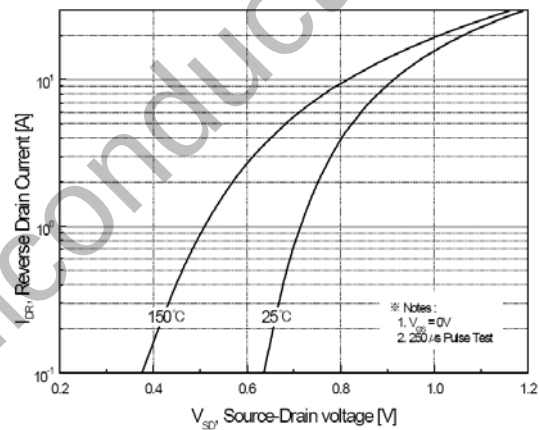


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

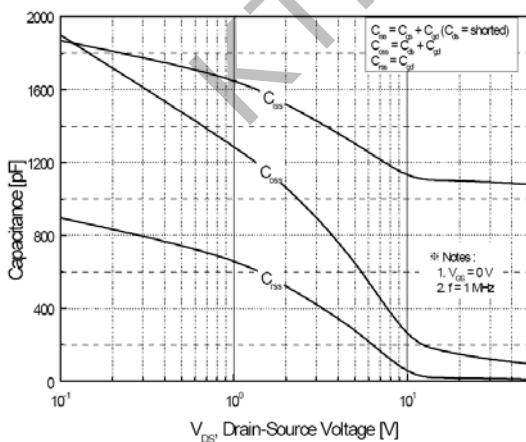


Figure 5. Capacitance Characteristics

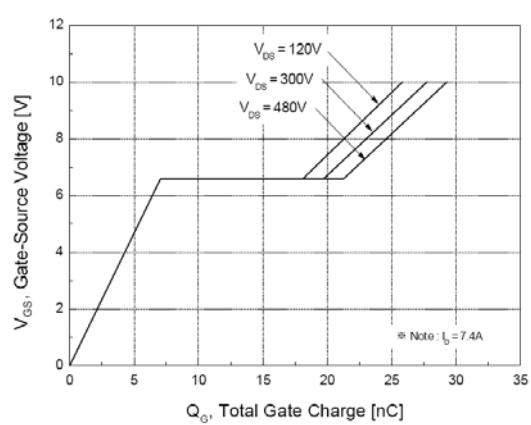


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

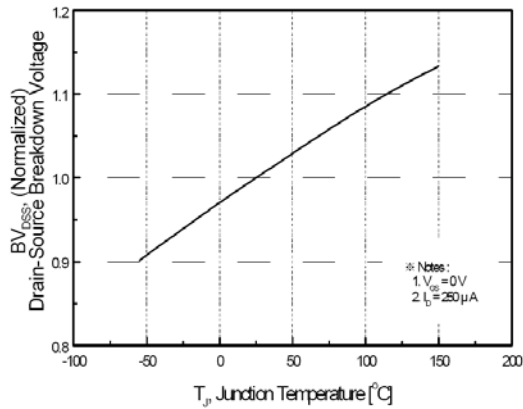


Figure 7. Breakdown Voltage Variation vs Temperature

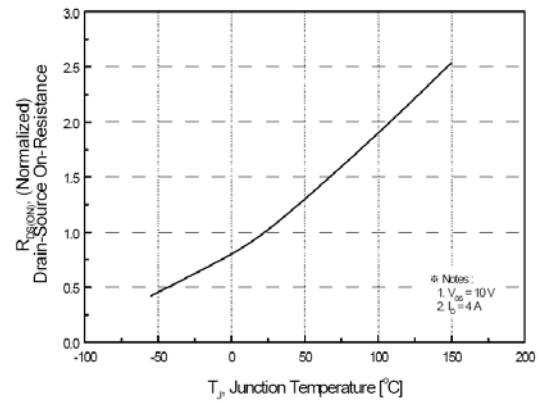


Figure 8. On-Resistance Variation vs Temperature

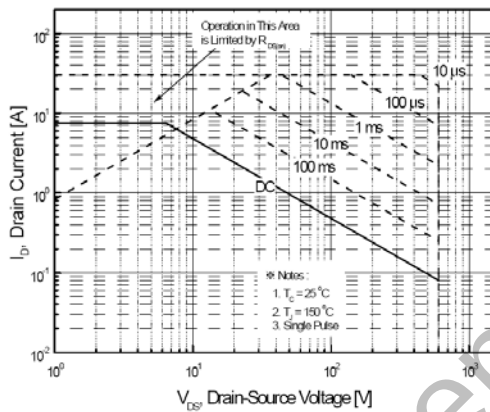


Figure 9-2. Maximum Safe Operating Area

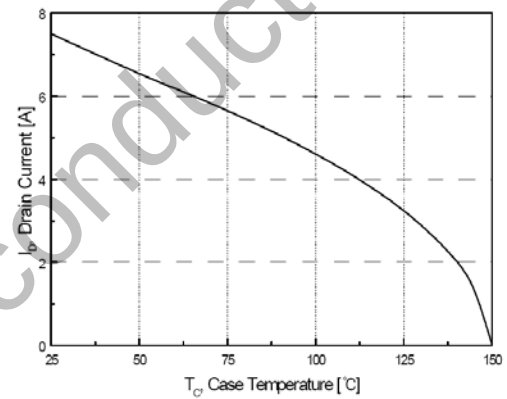


Figure 10. Maximum Drain Current vs Case Temperature

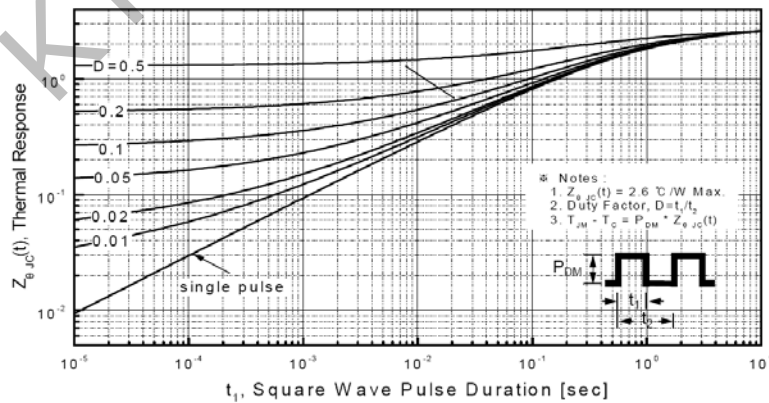
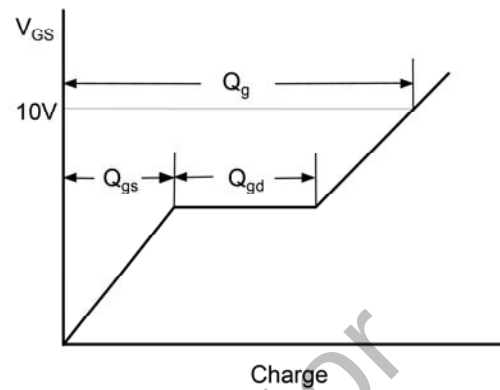
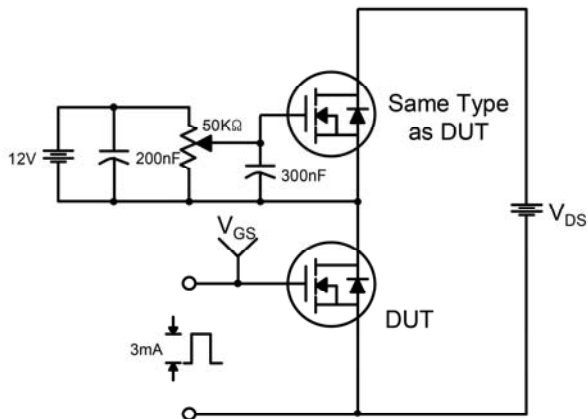
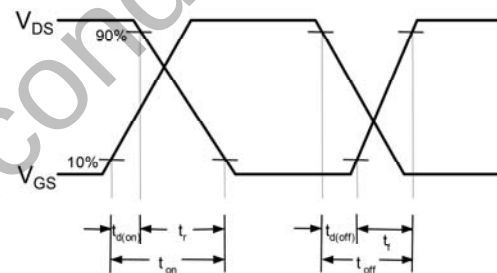
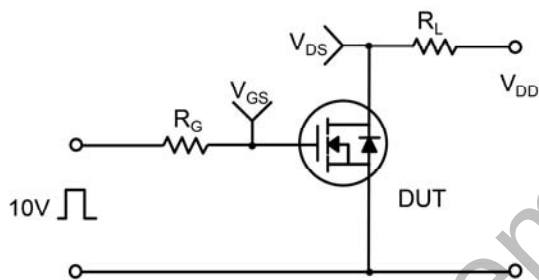


Figure 11-2. Transient Thermal Response Curve

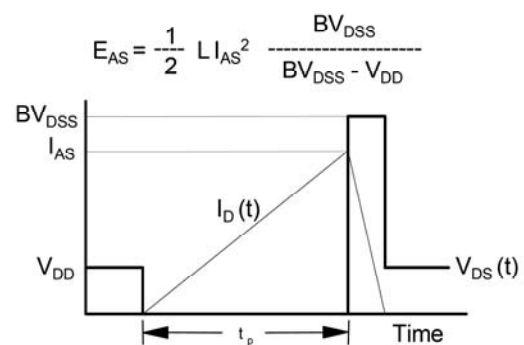
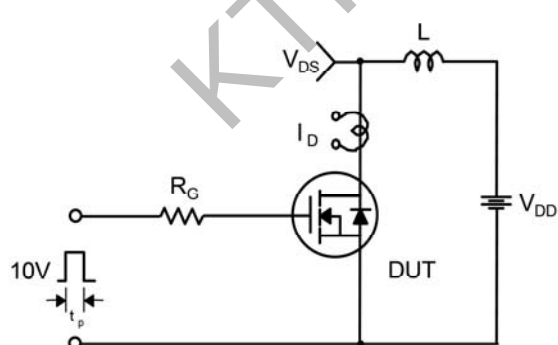
Gate Charge Test Circuit & Waveform



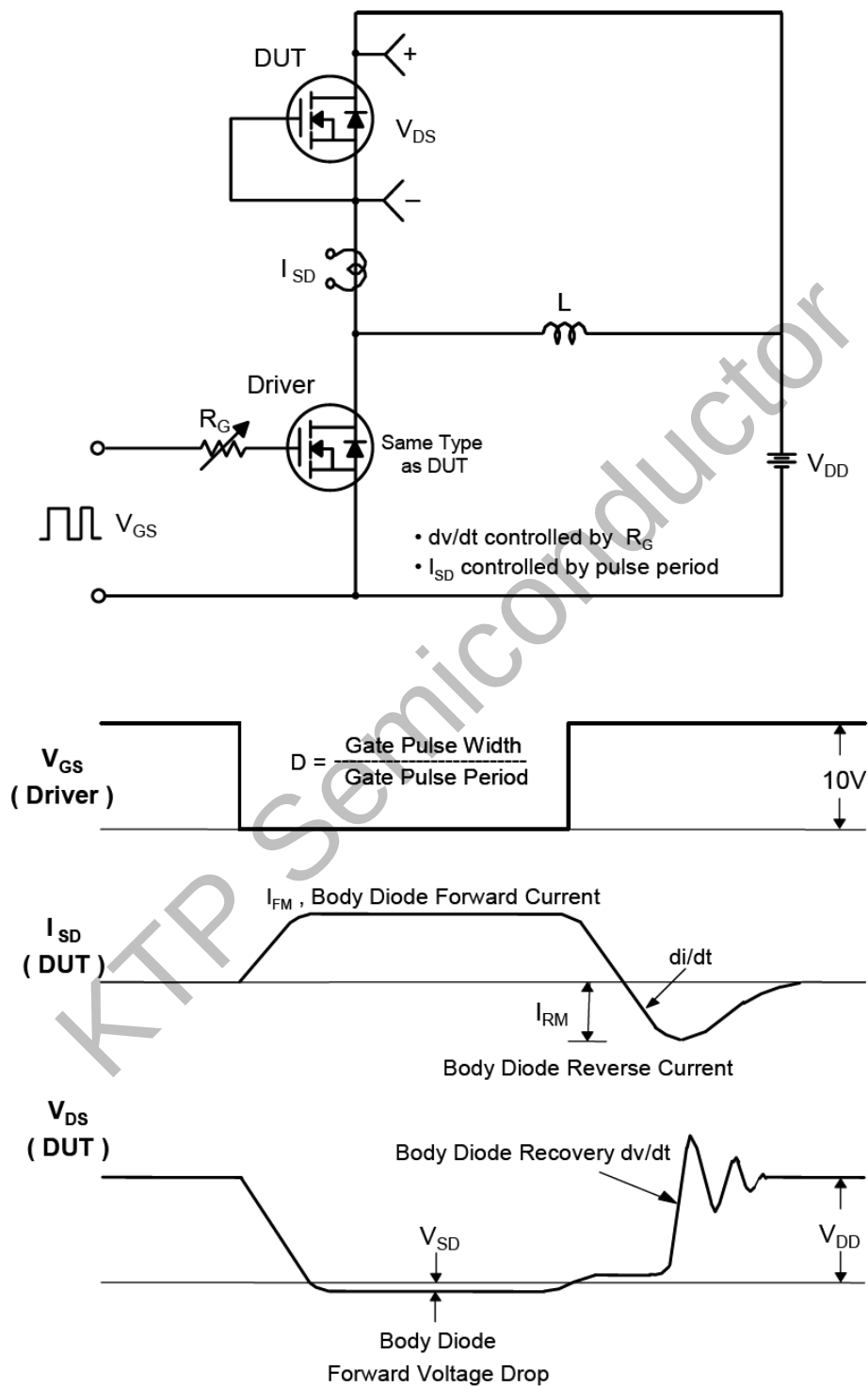
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



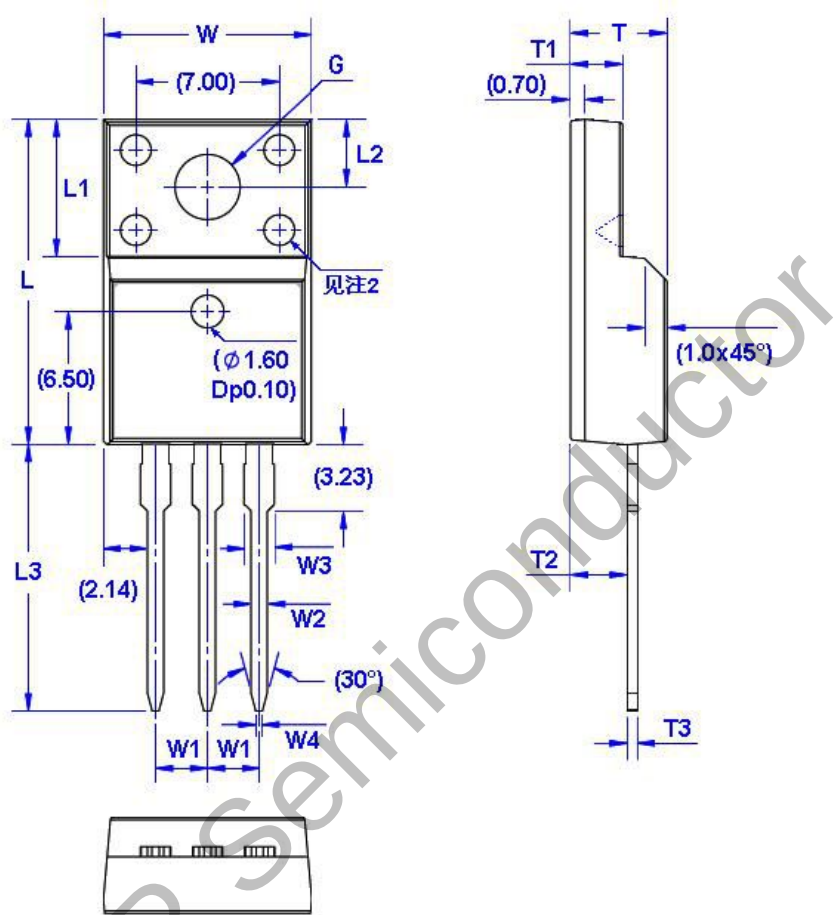
Peak Diode Recovery dv/dt Test Circuit & Waveform



Package Dimension

TO-220F

Unit: mm



Symbol	Size		Symbol	Size		Symbol	Size		Symbol	Size	
	Min	Max		Min	Max		Min	Max		Min	Max
W	9.96	10.36	W4	0.25	0.45	L3	12.78	13.18	T3	0.45	0.60
W1	2.54 (TYP)		L	15.67	16.07	T	4.50	4.90	G(Φ)	3.08	3.28
W2	0.70	0.90	L1	6.48	6.88	T1	2.34	2.74			
W3	1.24	1.47	L2	3.20	3.40	T2	2.56	2.96			