650V Super Junction Power MOSFET

- ★ Super Low Gate Charge
- ★ 100% EAS Guaranteed
- ★ Green Device Available
- ★ Excellent CdV/dt effect decline
- ★ Advanced trench gate super junction technology

Product Summary

Green

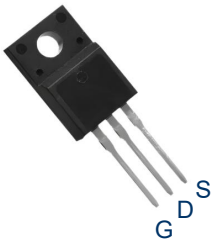
BVDSS	RDSON	ID
650V	160 mΩ	21A

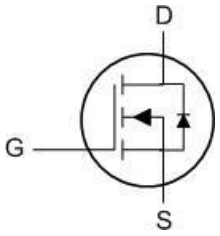
Description

The XR65R180FT use super junction technology and design to provide excellent RDS(ON) with low gate charge. This super junction MOSFET fits the industry's AC-DC SMPS requirements for PFC, AC/DC power conversion, and industrial power applications.

The XR65R180FT meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

TO220F Pin Configuration





Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	40	V
V_{GS}	Gate-Source Voltage	±30	V
I_D@T_C=25℃	Continuous Drain Current, V_{GS} @ 10V[1,6]	21	A
I_D@T_C=100℃	Continuous Drain Current, V_{GS} @ 10V[1,6]	13	A
I_{DM}	Pulsed Drain Current[2]	62	A
EAS	Single Pulse Avalanche Energy[3]	220	mJ
I_{AS}	Avalanche Current	---	A
P_D@T_C=25℃	Total Power Dissipation[4]	245	W
T_{STG}	Storage Temperature Range	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	℃

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient [1]	---	68	℃/W
$R_{\theta JC}$	Thermal Resistance Junction-Case[1]	---	0.51	℃/W

Electrical Characteristics (T_J=25 ℃, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=250uA	650	---	---	V
$\triangle BV_{DSS}/\triangle T_J$	BV_{DSS} Temperature Coefficient	Reference to 25℃ , I_D=1mA	---	---	---	V/℃
$R_{DS(ON)}$	Static Drain-Source On-Resistance[2]	V_{GS}=10V , I_D=16A	---	160	200	mΩ
		V_{GS}=4.5V , I_D=16A	---	---	---	
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =250uA	3.2	---	4.6	V
$\triangle V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	---	---	mV/℃
I_{DSS}	Drain-Source Leakage Current	V_{DS}=40V , V_{GS}=0V , T_J=25℃	---	---	5	uA
		V_{DS}=40V, V_{GS}=0V , T_J=100℃	---	1000	---	
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±30V , V_{DS}=0V	---	---	±100	nA
gfs	Forward Transconductance	V_{DS}=20V , I_D=10A	---	14.5	---	S
R_g	Gate Resistance	V_{DS}=0V , V_{GS}=0V , f=1MHz	---	1.5	---	Ω
Q_g	Total Gate Charge	V_{DS}=520V , V_{GS}=10V , I_D=10A	---	41	---	nC
Q_{gs}	Gate-Source Charge		---	12	---	
Q_{gd}	Gate-Drain Charge		---	20	---	
$T_{d(on)}$	Turn-On Delay Time	VGS=10V, VDS=325V, RG=10Ω, ID=20A	---	43	---	ns
T_r	Rise Time		---	58	---	
$T_{d(off)}$	Turn-Off Delay Time		---	105	---	
T_f	Fall Time		---	36	---	
C_{iss}	Input Capacitance	V_{DS}=100V , V_{GS}=0V , f=1MHz	---	1459	---	pF
C_{oss}	Output Capacitance		---	62	---	
C_{rss}	Reverse Transfer Capacitance		---	2	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current[1,4]	V_G=V_D=0V , Force Current	---	---	21	A
V_{SD}	Diode Forward Voltage[2]	V_{GS}=0V , I_S=16A , T_J=25℃	---	---	1.1	V
t_{rr}	Reverse Recovery Time	IF=10A , di/dt=100A/μs , T_J=25℃	---	108	---	nS
Q_{rr}	Reverse Recovery Charge		---	0.54	---	nC

Note :
1.The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper.
2.The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
3.The EAS data shows Max. rating . The test condition is TJ = 25℃,VDD=200V,VGS=10V,L=50mH
4.The power dissipation is limited by 150℃ junction temperature
5.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

Typical Performance Characteristics

Fig 1. Output Characteristics (T_j=25℃)

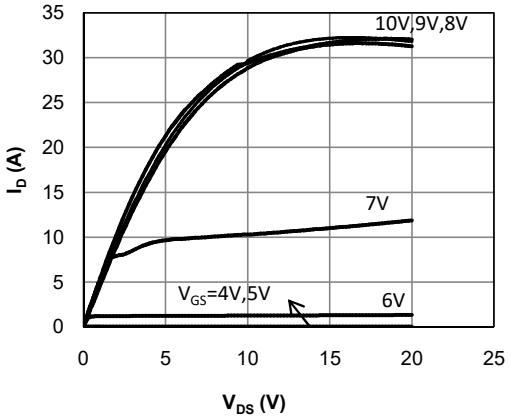


Fig 2. Output Characteristics (T_j=150℃)

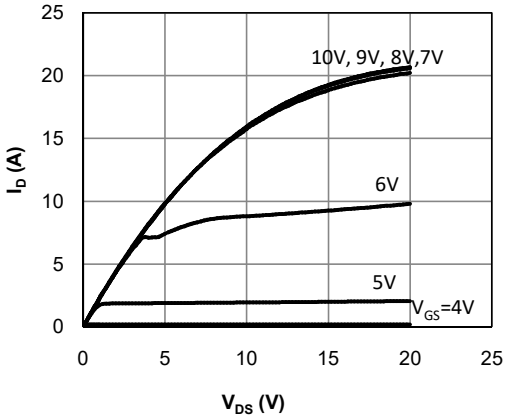


Fig 3: Transfer Characteristics

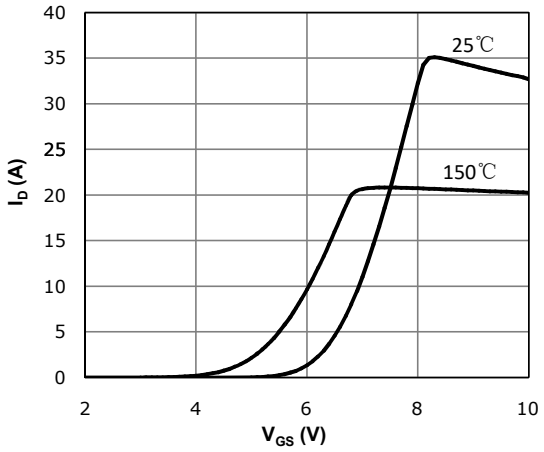


Fig 4: V_{TH} vs. T_j Temperature Characteristics

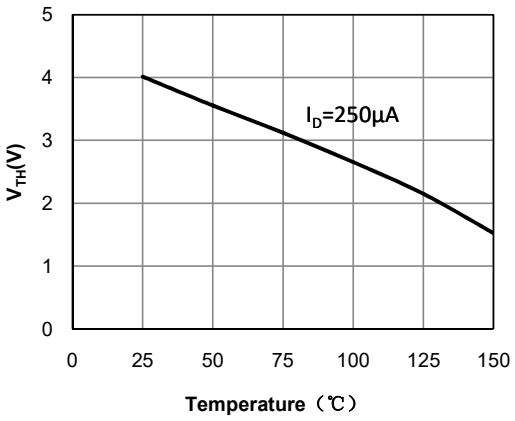


Fig 5: $R_{DS(on)}$ vs. I_{DS} Characteristics(T_j=25℃)

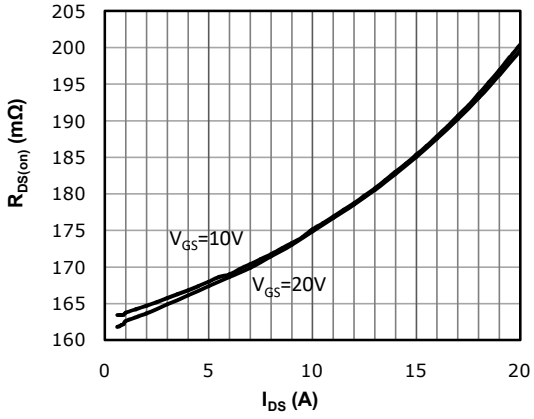


Fig 6: $R_{DS(on)}$ vs. Temperature

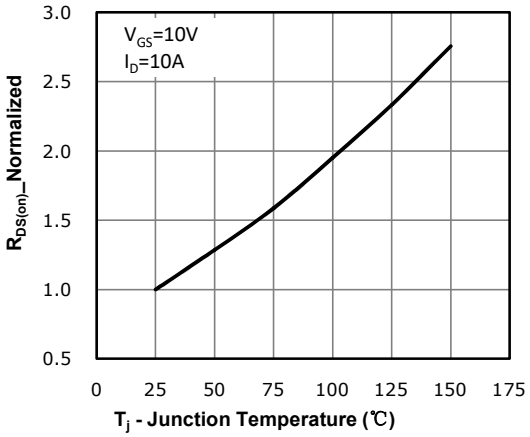


Fig 7: BV_{DSS} vs. Temperature

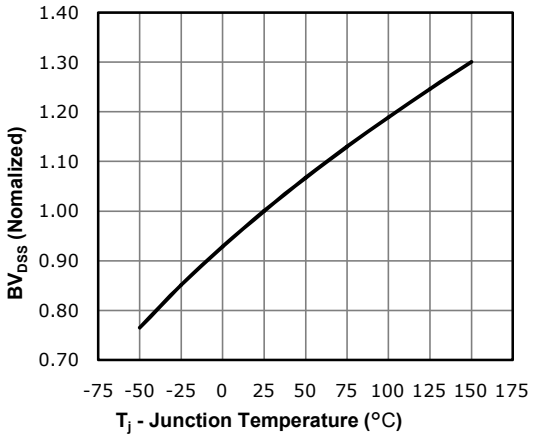


Fig 8: $R_{DS(on)}$ vs. Gate Voltage

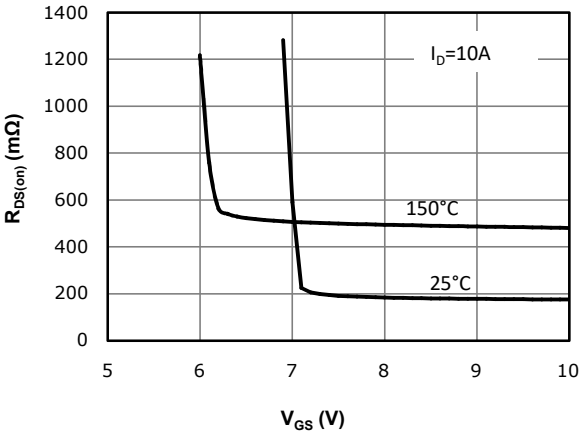


Fig 9: Body-diode Forward Characteristics

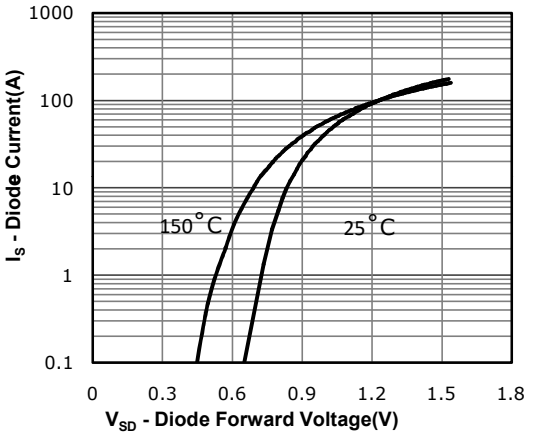


Fig 10: Gate Charge Characteristics

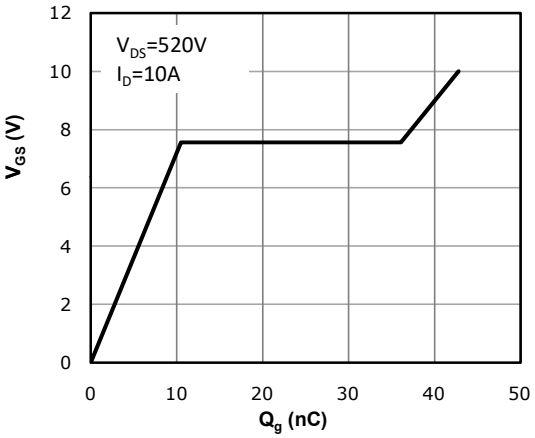


Fig 11: Capacitance Characteristics

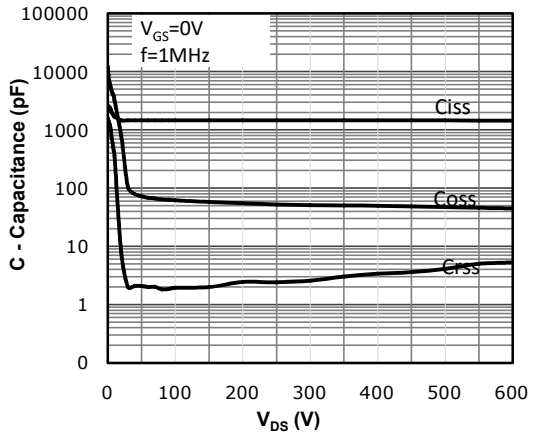


Fig 12: Safe Operating Area

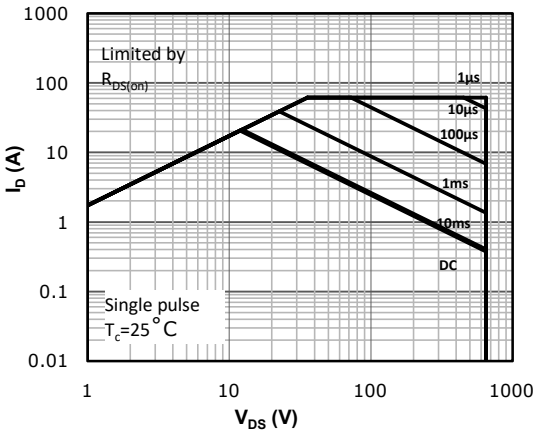
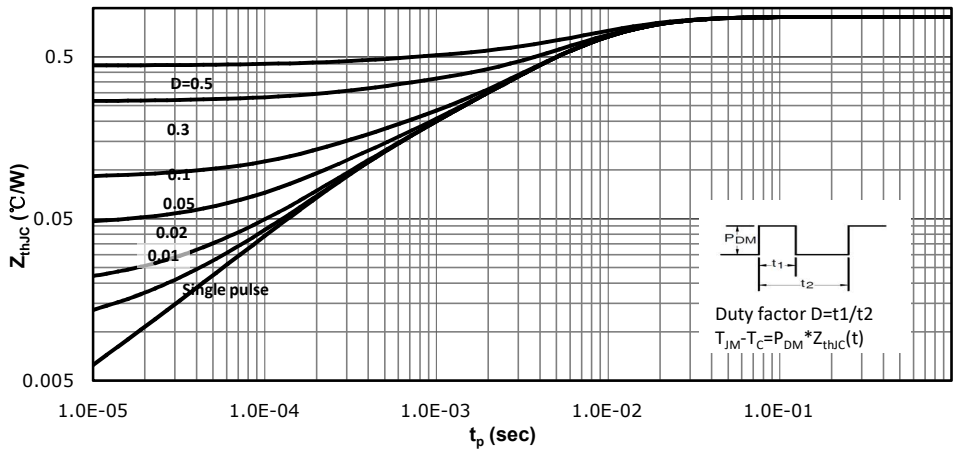
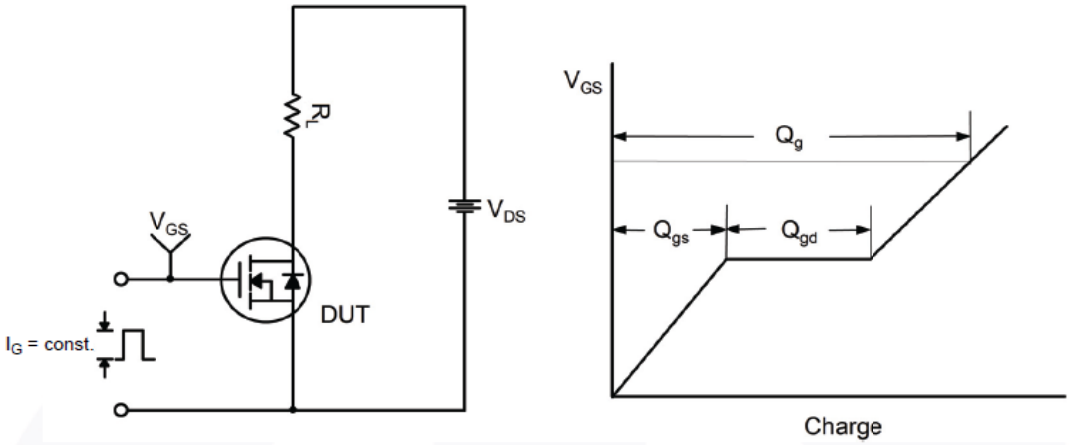


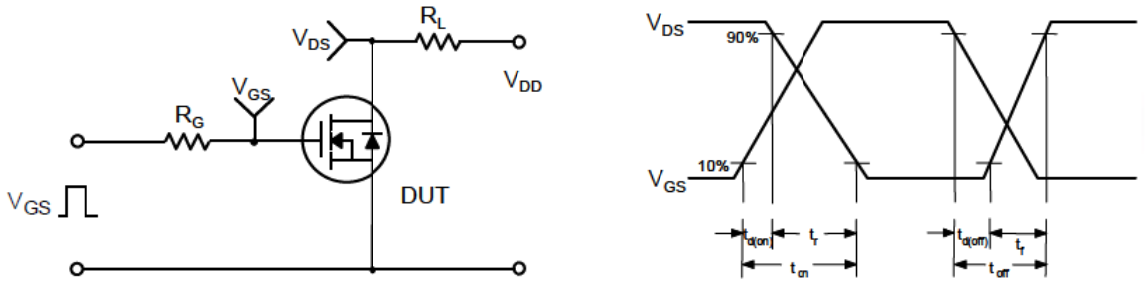
Fig 13: Max. Transient Thermal Impedance



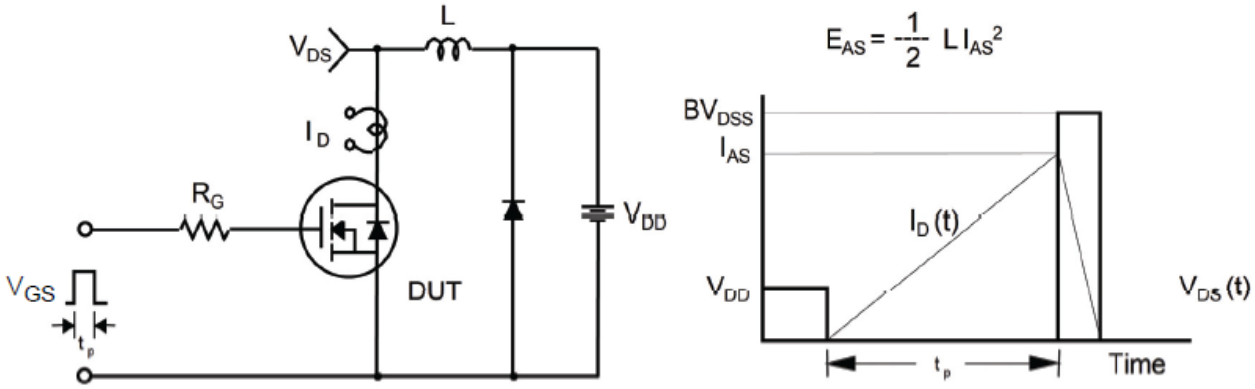
Gate Charge Test Circuit & Waveform



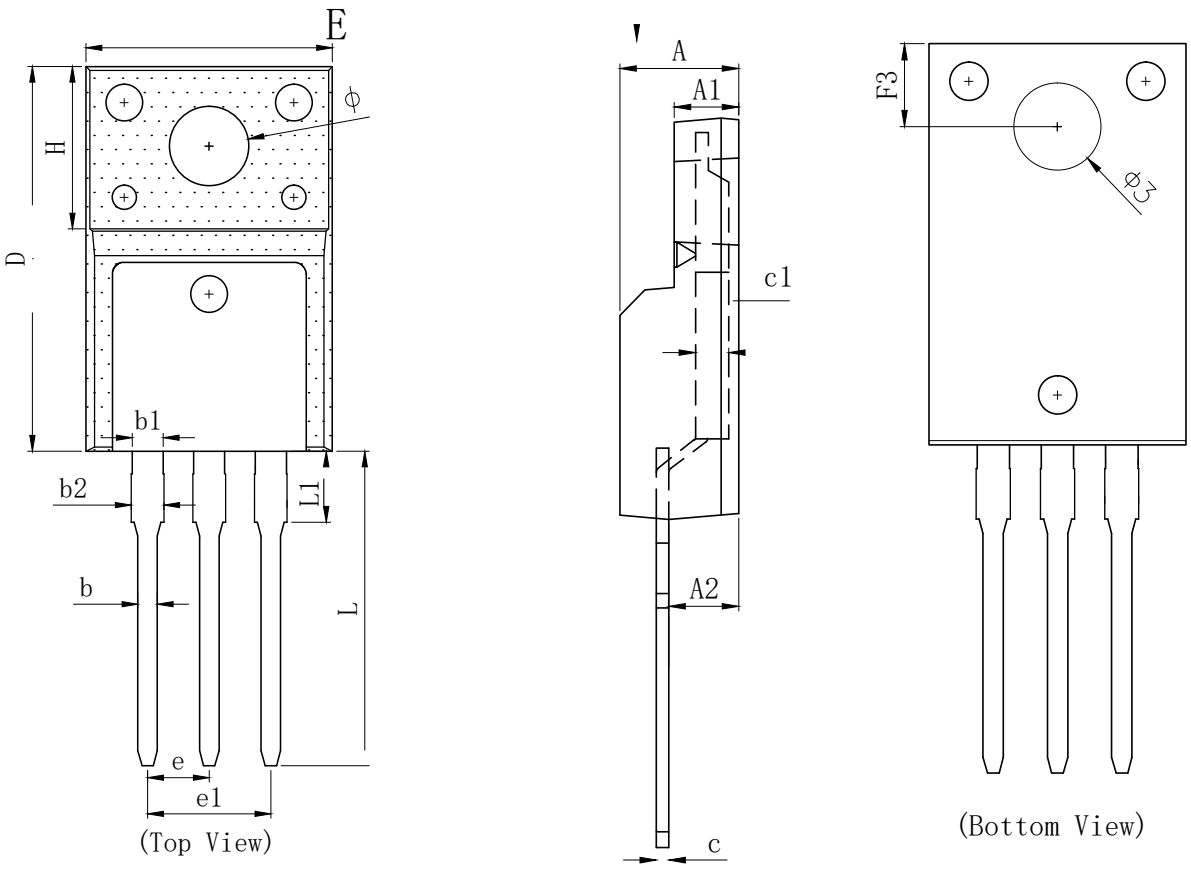
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions for TO-220F



SYMBOL	MILLIMETER		
	MIN	Typ.	MAX
A	4.500	4.700	4.900
A1	2.340	2.540	2.740
A2	2.560	2.760	2.960
b	0.700	0.800	0.950
b1	1.180	1.280	1.430
b2	1.250	1.350	1.550
c	0.400	0.500	0.650
c1	1.200	1.300	1.350
D	15.570	15.870	16.170
H	6.700 REF		
E	9.960	10.160	10.360
e	2.540 BSC		
e1	5.080 BSC		
L	12.680	12.980	13.280
L1	2.780	2.930	3.080
F3	3.150	3.300	3.450
ϕ	3.030	3.180	3.450
ϕ3	3.150	3.450	3.650