KJC12040P

Silicon Carbide Power Mosfet

1. Product Information

Features

- 1200V, 40mΩ, 79A
- High Blocking Voltage with Low On-Resistance
- Fast switching speed with low capacitances
- Easy to Parallel and Simple to Drive
- Resistant to Latch-Up
- Halogen-free, RoHS compliant

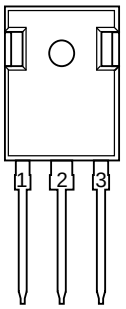
Applications

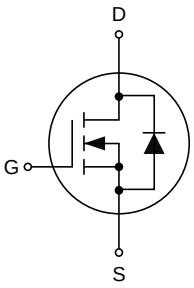
- Power Factor Correction or DC/DC Converters
- Solar Inverters
- EV Charging Station
- Motor Drives
- Switch Mode Power Supply

Pin Description

Pin	Description
1	Gate(G)
2	Drain(D)
3	Source(S)

Simplified Outline	Symbol





Top View
TO-247-3L

Package Marking and Ordering Information

Product Name	Package	Marking	Form	Quantity (PCS)
KJC12040P	TO-247-3L	KJC12040P	Tube	30

2. Absolute Maximum Ratings (T_C=25℃ unless otherwise noted)

Symbol	Parameter	Values	Unit
V_{DS}	Drain-Source Voltage	1200	V
V_{GS}	Gate-Source Voltage (Absolute maximum values)	-10/+22	V
V_{GS}	Gate-Source Voltage (Recommended operational values)	-5/+18	V
I_D	Continuous Drain Current, V_{GS}=18V, T_C=25℃	79	A
I_D	Continuous Drain Current, V_{GS}=18V, T_A=100℃	50	A
I_{DM}	Pulsed Drain Current, Pulse width t_p limited by T_{jmax}	180	A
P_D	Power Dissipation, T_C=25℃, T_J=150℃	357	W
T_J, T_{STG}	Operating Junction and Storage Temperature	-55~150	℃
$R_{\theta JC}$	Thermal Resistance-Junction to Case	0.47	℃/W

3. Electrical Characteristics (T_C=25℃, unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Type	Max	Unit
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D=100μA	1200	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=1200V, V_{GS}=0V	-	1	100	μA
I_{GSS}	Gate-Source Leakage Current	V_{GS}=18V, V_{DS}=0V	-	-	250	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=10mA	2.0	2.9	4.0	V
		V_{DS}=V_{GS}, I_D=10mA, T_J=150℃	-	2.1	-	V
$R_{DS(ON)}$	Drain-Source On-State Resistance	V_{GS}=18V, I_D=40A, T_J=25℃	-	43	53	mΩ
		V_{GS}=18V, I_D=40A, T_J=150℃	-	57	-	mΩ
G_{FS}	Transconductance	V_{GS}=20V, I_D=40A, T_J=25℃	-	21.2	-	S
		V_{GS}=20V, I_D=40A, T_J=150℃	-	20.4	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS}=1000V, V_{GS}=0V, F=100kHz, V_{AC}=25mV	-	3360	-	pF
C_{oss}	Output Capacitance		-	140	-	pF
C_{rss}	Reverse Transfer Capacitance		-	12	-	pF
E_{oss}	C_{oss} Stored Energy		-	138	-	μJ
Q_g	Total Gate Charge	V_{DD}=800V, I_D=40A, V_{GS}=-5/+18V	-	136	-	nC
Q_{gs}	Gate-Source Charge		-	47	-	nC
Q_{gd}	Gate-Drain Charge		-	39	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	V_{DD}=800V, I_D=40A, V_{GS}=-5/+18V, R_G=2.5Ω, L=150μH, T_J=25℃ Timing relative to V_{DS}	-	18	-	ns
t_r	Turn-on Rise Time		-	67	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	22	-	ns
t_f	Turn-off Fall Time		-	13	-	ns
E_{ON}	Turn-on Energy		-	2	-	mJ
E_{OFF}	Turn-off Fall Time Energy		-	0.3	-	mJ
Source-Drain Diode Characteristics						
V_{SD}	Diode Forward Voltage	V_{GS}=-5V, I_S=20A, T_J=25℃	-	5.1	-	V
		V_{GS}=-5V, I_S=20A, T_J=150℃	-	4.7	-	V
I_S	Continuous Diode Forward Current	V_{GS}=-5V, T_C=25℃	-	-	58	A
I_{SM}	Maximum Pulsed Diode Forward Current	V_{GS}=-5V, Pulse width t_p limited by T_{jmax}	-	-	180	A
I_{rrm}	Peak Reverse Recovery Current	V_{GS}=-5V, I_{SD}=40A, V_R=800V, di_F/dt=1210A/μs, T_J=25℃	-	20	-	A
T_{rr}	Reverse Recovery Time		-	52	-	ns
Q_{rr}	Reverse Recovery Charge		-	380	-	nC

4. Typical Characteristics

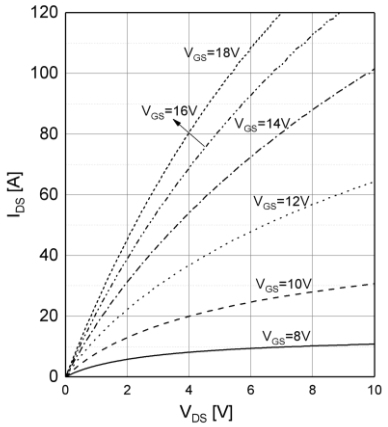


Figure 1. Output Characteristics

$I_{DS}=f(V_{DS})$, T_J=25℃

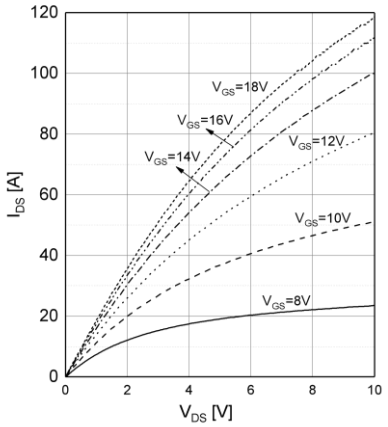


Figure 2. Output Characteristics

$I_{DS}=f(V_{DS})$, T_J=150℃

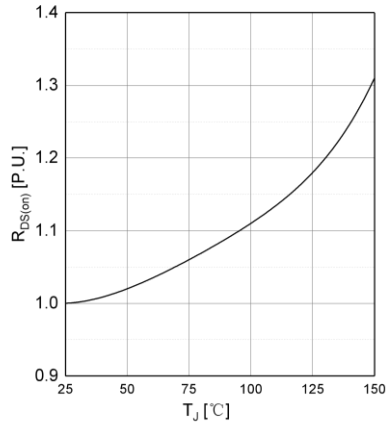


Figure 3. Output Characteristics

$R_{DS(on)}=f(T_J)$, I_{DS}=40A, V_{GS}=18V

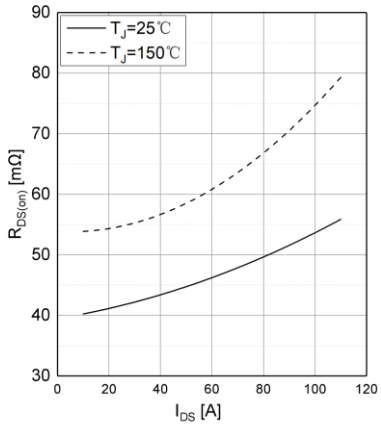


Figure 4. On-Resistance

$R_{DS(on)}=f(I_{DS})$, V_{GS}=18V

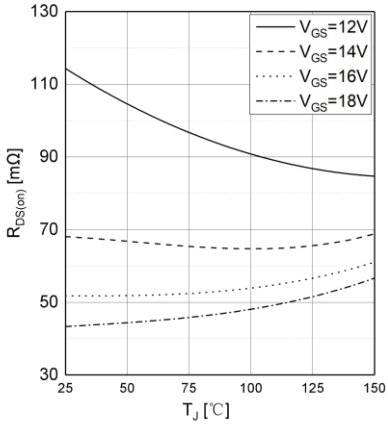


Figure 5. On-Resistance

$R_{DS(on)}=f(T_J)$, I_{DS}=40A

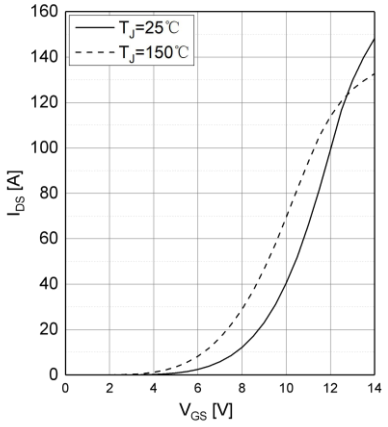


Figure 6. Transfer Characteristics

$I_{DS}=f(V_{GS})$, V_{DS}=20V

4. Typical Characteristics(cont.)

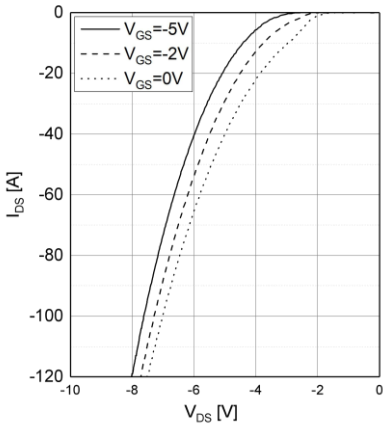


Figure 7. Body Diode Characteristics

$I_{DS}=f(V_{DS})$, $T_J=25℃$

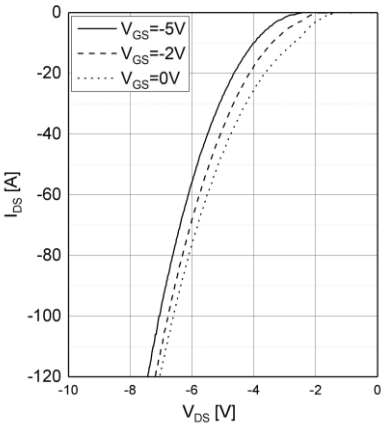


Figure 8. Body Diode Characteristics

$I_{DS}=f(V_{DS})$, $T_J=150℃$

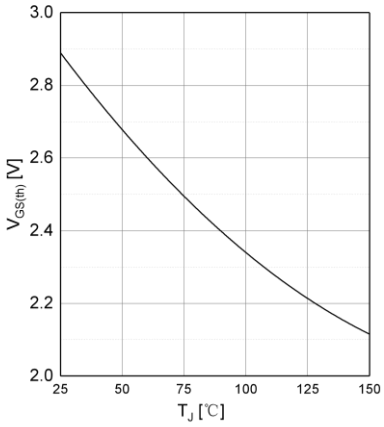


Figure 9. Threshold Voltage

$V_{GS(th)}=f(T_J)$, $V_{GS}=V_{DS}$, $I_{DS}=10mA$

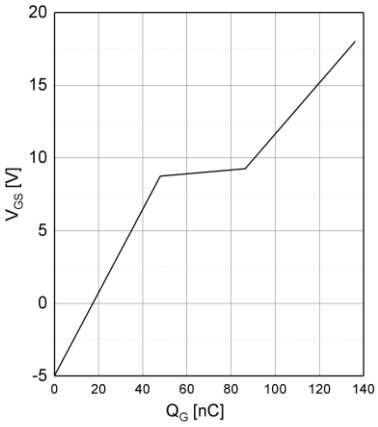


Figure 10. Gate Charge Characteristics

$V_{GS}=f(Q_G)$, $I_{DS}=40A$, $I_{GS}=50mA$, $V_{DS}=800V$, $T_J=25℃$

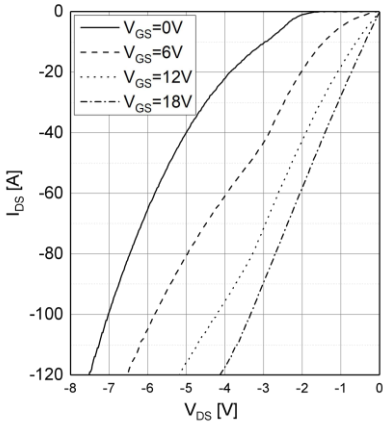


Figure 11. 3rd Quadrant Characteristics

$I_{DS}=f(V_{DS})$, $T_J=25℃$

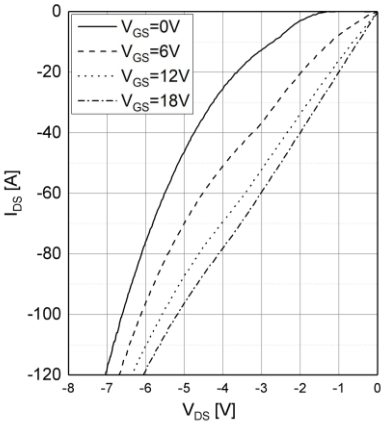


Figure 12. 3rd Quadrant Characteristics

$I_{DS}=f(V_{DS})$, $T_J=150℃$

4. Typical Characteristics(cont.)

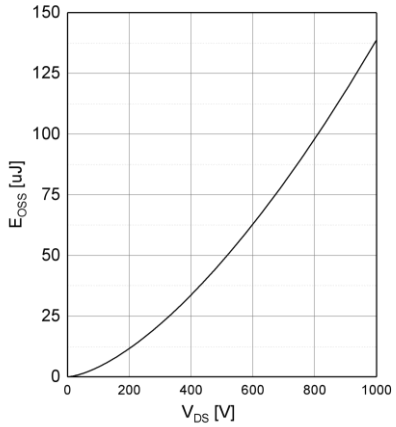


Figure 13. Output Capacitor Stored Energy
$E_{OSS}=f(V_{DS})$

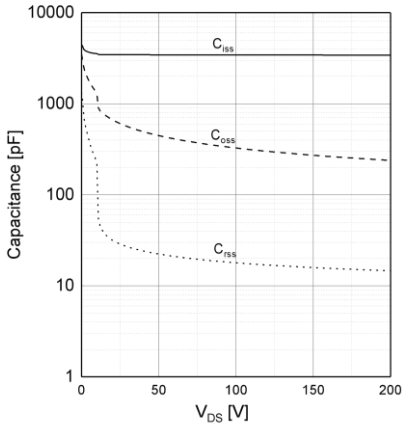


Figure 14. Capacitances
Capacitances=f(V_{DS}), T_J=25℃, V_{AC}=25mV, f=100kHz, (0-200V)

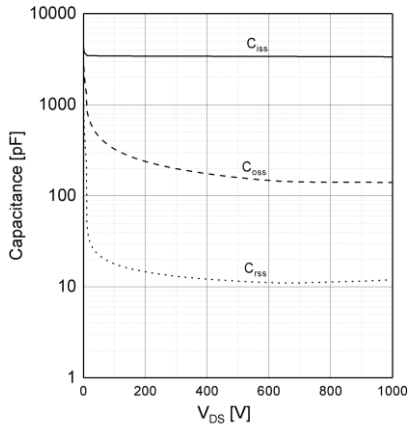


Figure 15. Capacitances
Capacitances=f(V_{DS}), T_J=25℃, V_{AC}=25mV, f=100kHz, (0-1000V)

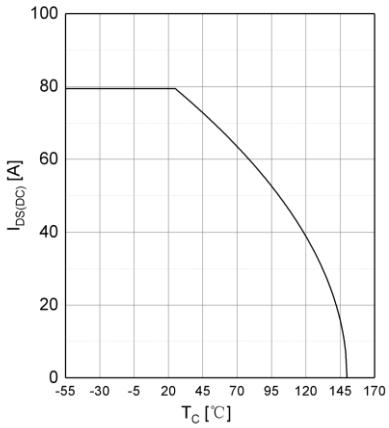


Figure 16. Continuous Drain Current Derating
$I_{DS(DC)}=f(T_C)$, $T_J \leqslant 150℃$

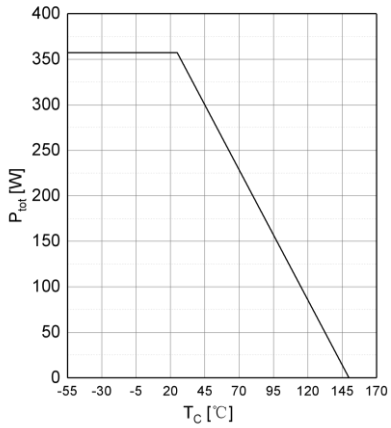


Figure 17. Maximum Power Dissipation Derating
$P_{tot}=f(T_C)$, $T_J \leqslant 150℃$

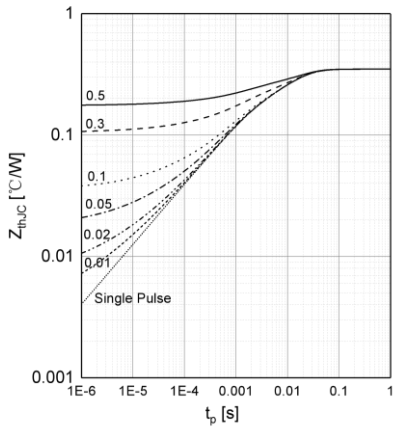


Figure 18. Transient Thermal Impedance (Junction-Case)
$Z_{thJC}=f(t_p)$

4. Typical Characteristics(cont.)

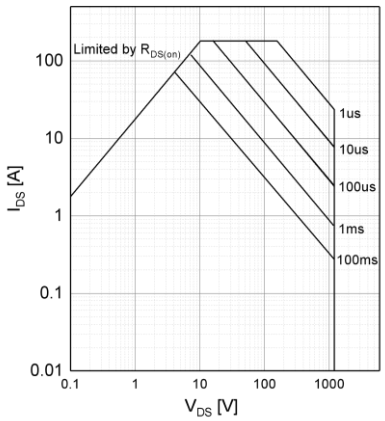


Figure 19. Safe Operating Area
I_{DS}=f(V_{DS}), T_C=25℃, D=0, Parameter: t_p

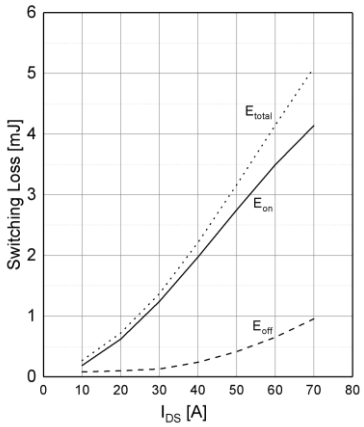


Figure 20. Switching Energy
Switching Loss=f(I_{DS}), T_J=25℃, V_{DD}=800V, $R_{G(ext)}$=2.5Ω, V_{GS}=-5V/+18V, L=150uH

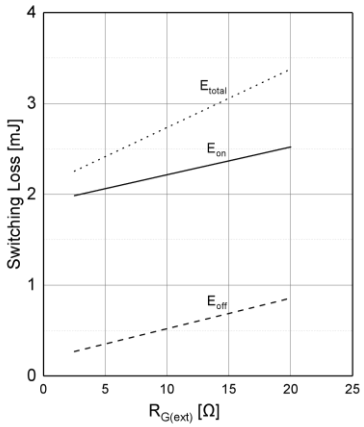


Figure 21. Switching Energy
Switching Loss=f($R_{G(ext)}$), T_J=25℃, V_{DD}=800V, I_{DS}=40A, V_{GS}=-5V/+18V, L=150uH

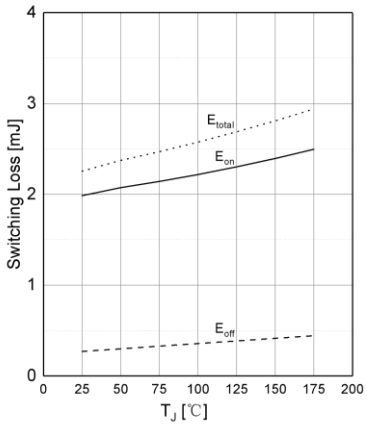


Figure 22. Switching Energy
Switching Loss=f(T_J), V_{DD}=800V, I_{DS}=40A, $R_{G(ext)}$=2.5Ω, V_{GS}=-5V/+18V, L=150uH

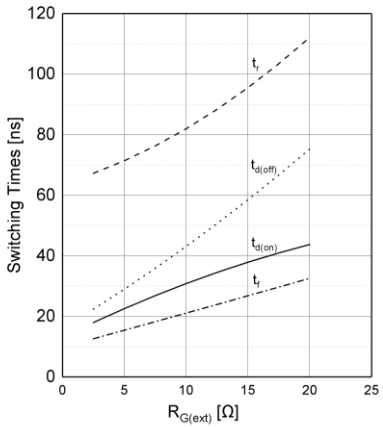


Figure 23. Switching Times
Switching Times=f($R_{G(ext)}$), T_J=25℃, V_{DD}=800V, I_{DS}=40A, V_{GS}=-5V/+18V, L=150uH

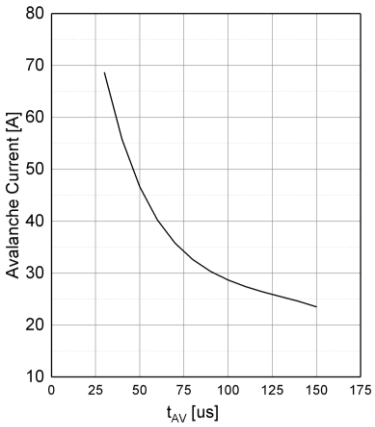
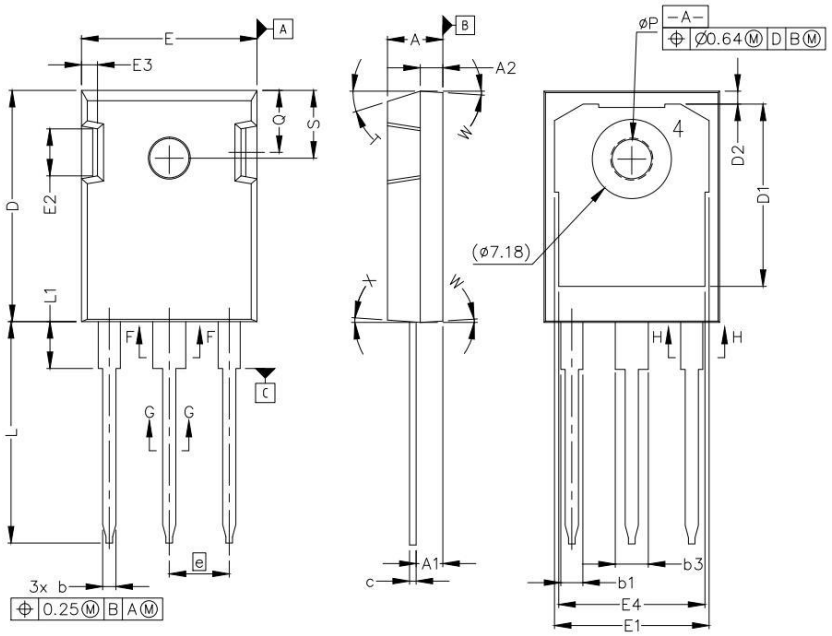


Figure 24. Single Avalanche Safe Operating Area
Avalanche Current=f(t_{AV}), T_J=25℃, V_{DD}=50V

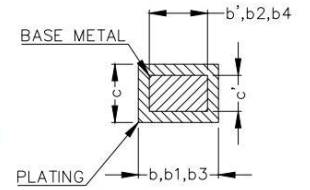
5. Package Mechanical Data

TO-247-3L Package



NOTE ;
1. ALL METAL SURFACES: TIN PLATED,EXCEPT AREA OF CUT
2. DIMENSIONING & TOLERANCEING CONFIRM TO ASME Y14.5M-1994.
3. ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.
4. THIS DRAWING WILL MEET ALL DIMENSIONS REQUIREMENT OF JEDEC outlines TO-247 AD.

1 - GATE
2 - DRAIN (COLLECTOR)
3 - SOURCE (EMITTER)
4 - DRAIN (COLLECTOR)



SECTION "F−F", "G−G" AND "H−H"
SCALE: NONE

Symbol	MIN	MAX
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b'	1.07	1.28
b	1.07	1.33
b1	1.91	2.41
b2	1.91	2.16
b3	2.87	3.38
b4	2.87	3.13
c'	0.55	0.65
c	0.55	0.68
D	20.80	21.10
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	5.44 BSC	
N	3	
L	19.81	20.32
L1	4.10	4.40
ΦP	3.51	3.65
Q	5.49	6.00
S	6.04	6.30
T	17.5° REF.	
W	3.5° REF.	
X	4° REF.	