GC2M040120**D**

Silicon Carbide Power MOSFET

N-Channel Enhancement Mode

V_{DS}	=	1200	V
$R_{DS(on)}$	=	40	m
$I_{D@25°C}$	=	60	A

Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Easy to Parallel and Simple to Drive
- Avalanche Ruggedness
- Halogen Free, RoHS Compliant

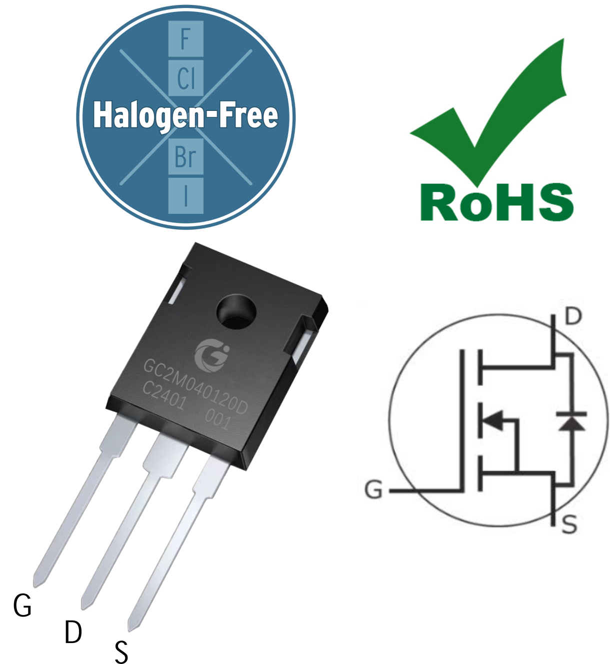
Benefits

- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

Applications

- Solar Inverters
- Switch Mode Power Supplies
- High Voltage DC/DC Converters
- Battery Chargers
- Motor Drives
- Pulsed Power applications

Package



Part Number	Package
GC2M040120**D**	**TO-247-3**

Maximum Ratings (T_c = 25°C unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain - Source Voltage	1200	V	V_{GS}=0V,I_D=100μA	
V_{GSmax}	Gate - Source Voltage	-8/+20	V	Absolute maximum values	
V_{GSop}	Gate - Source Voltage	-5/+18	V	Recommended operational values	
I_D	Continuous Drain Current	60 40	A	V_{GS}=20V, T_C=25°C V_{GS}=20V, T_C=100°C	
I_{DM}	Pulse Drain Current	100	A	Pulse width limited by T_{jmax}	
P_D	Power Dissipation	312	W	T_C=25°C, T_J=175°C	Fig. 11
T_J, T_{stg}	Operating Junction and Storage Temperature	-55 to +175	°C		

Electrical Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	1200			V	V_{GS}=0V,I_D=100μA	
$V_{GS(th)}$	Gate Threshold Voltage	2.0	3.2	4.0	V	V_{GS}= V_{DS}, I_{DS}=10mA,T_C=25°C	Fig. 6
			2.0			V_{GS}= V_{DS}, I_{DS}=10mA,T_C=150°C	
I_{DSS}	Zero Gate Voltage Drain Current		1	100	μA	V_{DS}= 1200V, V_{GS}=0V	
I_{GSS}	Gate-Source Leakage Current			200	nA	V_{GS}=20V, V_{DS}= 0V	
$R_{DS(on)}$	Drain-Source on-state Resistance		45	60	mΩ	V_{GS}= 18 V, I_D=33A, T_C=25°C	Fig. 4
			68		mΩ	V_{GS}= 18 V, I_D=33A, T_C=175°C	
g_{fs}	Transconductance		20		S	V_{DS} = 20 V, I_D = 33A, T_J = 25 °C	Fig. 5
			18.3		S	V_{DS} = 20 V, I_D = 33A,T_J = 175 °C	
Ciss	Input Capacitance		2900		pF	V_{GS}=0V, V_{DS}=1000 V, f=1MHz, V_{AC}=25 mV	Fig. 9
Coss	Output Capacitance		118				
Crss	Reverse Transfer Capacitance		11.6				
E_{ON}	Turn-OnSwitching Energy		1.20		mJ	V_{DS}=800V, V_{GS}=-5/18V,I_D= 33A, $R_{G(ext)}$ = 5Ω, L= 80μH	
E_{OFF}	Turn-Off Switching Energy		0.44				
$t_{d(on)}$	Turn-On Delay Time		60		ns	V_{DD}=800V, V_{GS}=-5/18V I_D = 33A, $R_{G(ext)}$ = 5 Ω , Timing relative to V_{DS}	
t_r	Rise Time		140				
$t_{d(off)}$	Turn-Off Delay Time		50				
t_f	Fall Time		42				
$R_{G(int)}$	Internal Gate Resistance		2.1		Ω	f=1 MHz, V_{AC}=25mV	
Q_{gs}	Gate to Source Charge		40		nC	V_{DD}=800V, V_{GS}=-5/18V I_D = 33A	Fig. 10
Q_{gd}	Gate to Drain Charge		37				
Q_g	Total Gate Charge		128				

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	3.6		V	V_{GS} =-5V, I_{SD} = 20 A, T_J = 25 °C	Fig. 7
		3.3		V	V_{GS} =-5V, I_{SD} = 20 A, T_J = 150 °C	Fig. 8
I_S	Continuous Diode Forward Current		60	A	T_C = 25°C	
t_{rr}	Reverse Recovery time	37		ns	V_{GS} =-5V, I_{SD} = 33 A, V_R= 800V, dif/dt=1200A/μs;	
Q_{rr}	Reverse Recovery Charge	165		nC		
I_{rrm}	Peak Reverse Recovery Current	16		A		

Thermal Characteristics

Symbol	Parameter	Typ.	Unit	Test Conditions	Note
$R_{θJC}$	Thermal Resistance from Junction to Case	0.48	℃/W		Fig. 12
$R_{θJA}$	Thermal Resistance From Junction to Ambient	42			

Typical Performance

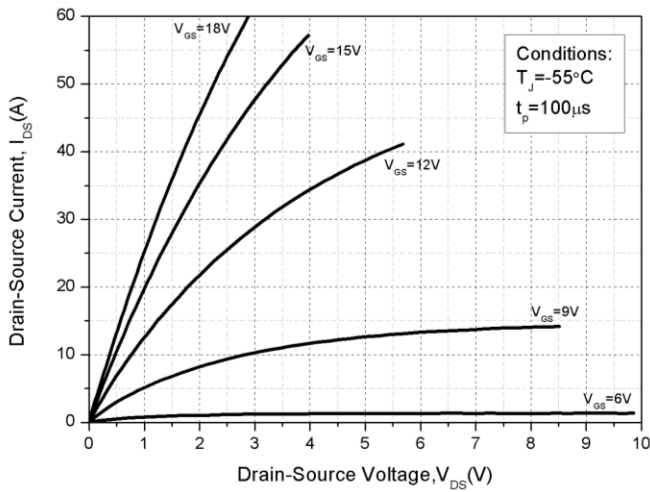


Figure 1. Output Characteristics T_J = -55 ℃

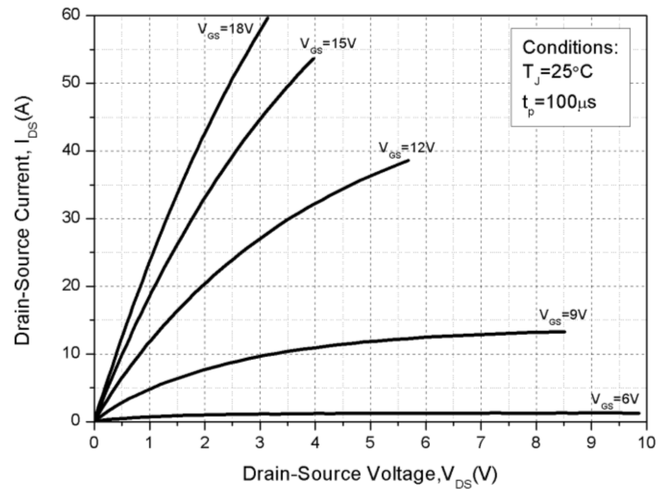


Figure 2. Output Characteristics T_J = 25 ℃

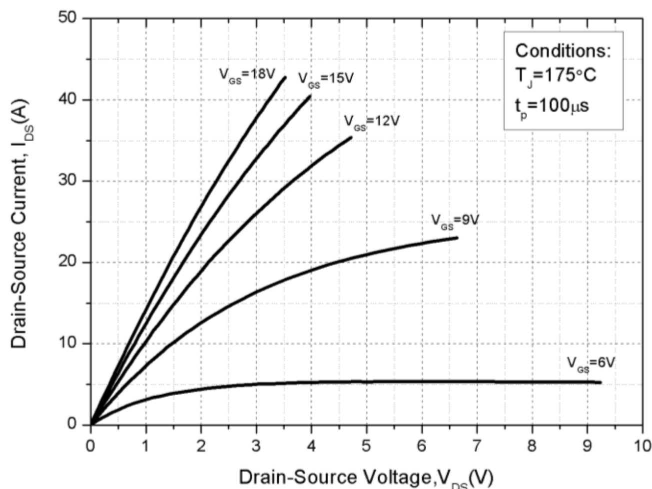


Figure 3. Output Characteristics T_J =150 ℃

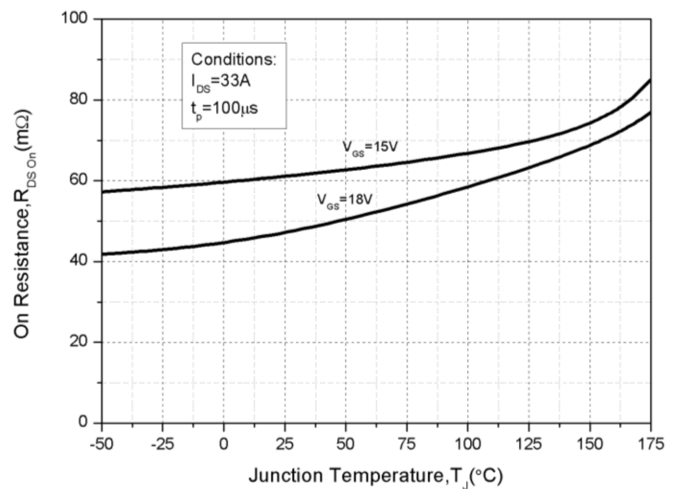


Figure 4. On-Resistance For Various Gate Voltage

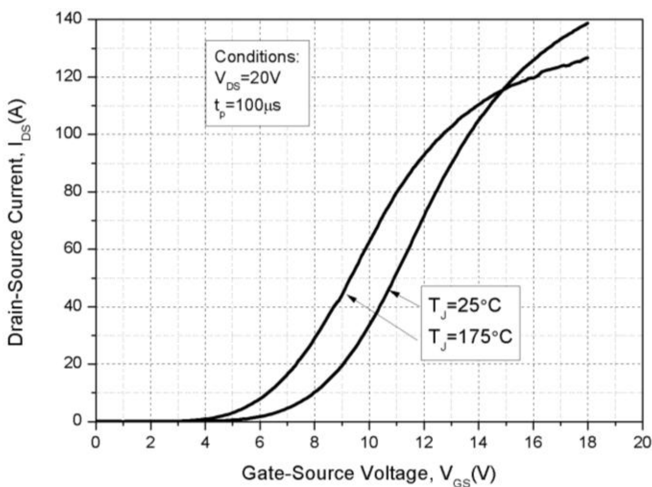


Figure 5. Transfer Characteristic
for Various Junction Temperatures

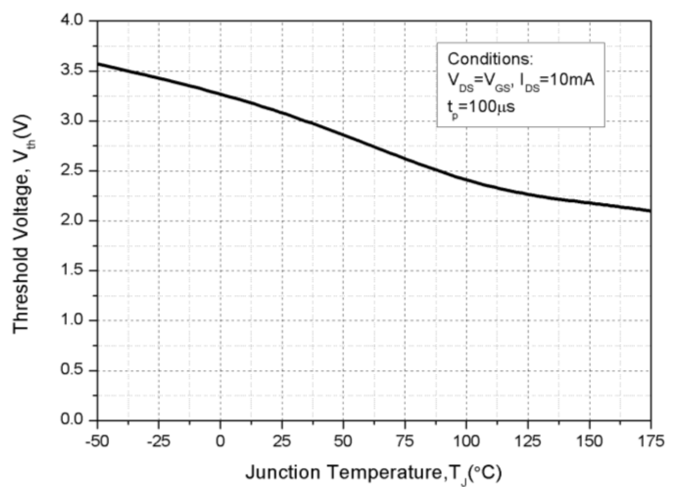


Figure 6. Threshold Voltage vs. Temperature

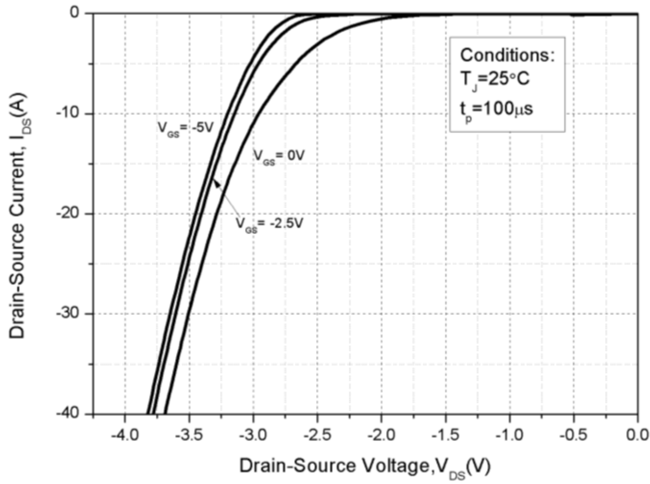


Figure 7.Body Diode Characteristics

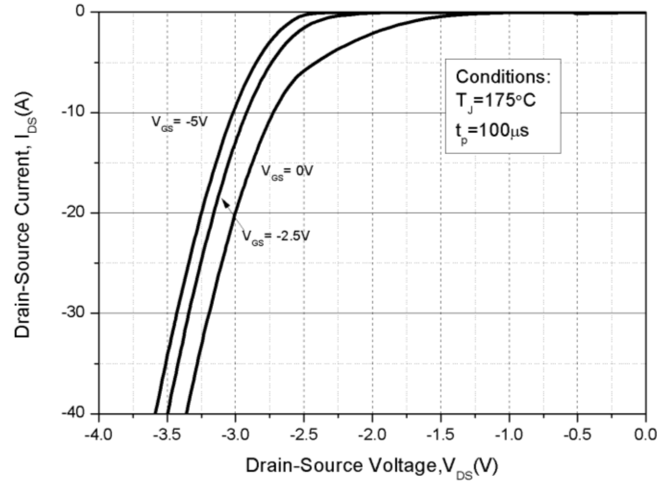


Figure 8.Body Diode Characteristics

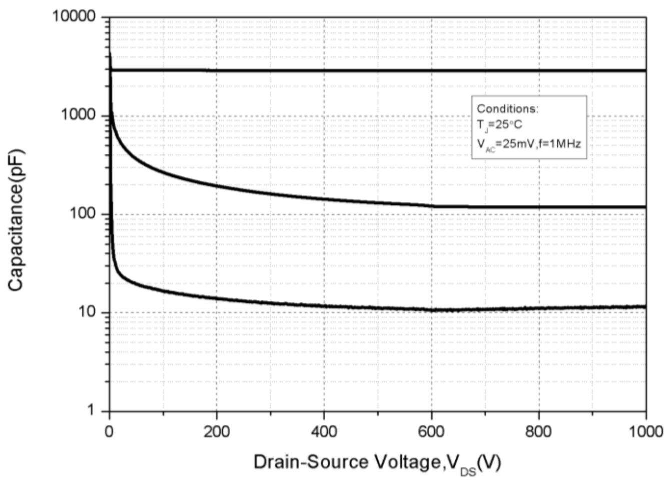


Figure 9.Capacitances vs. Drain-Source Voltage

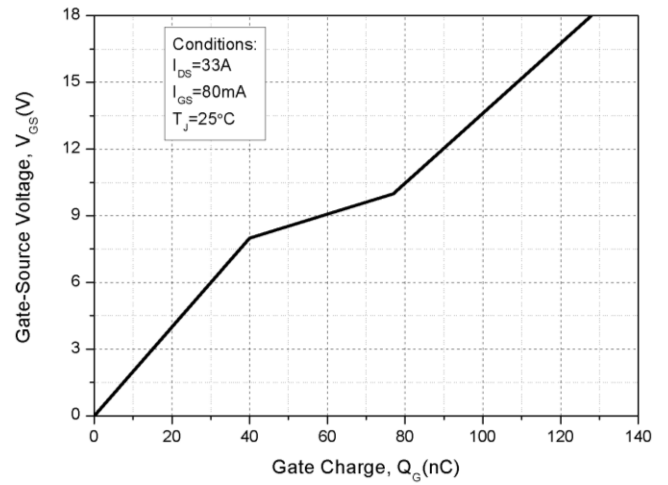


Figure 10. Gate Charge Characteristics

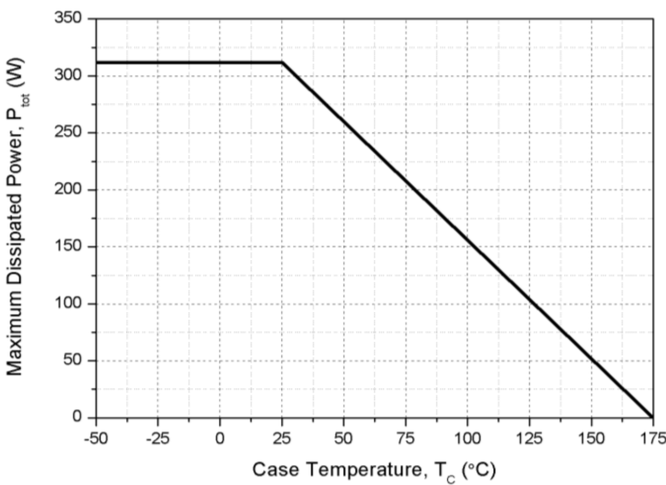


Figure 11.Power Dissipation Derating

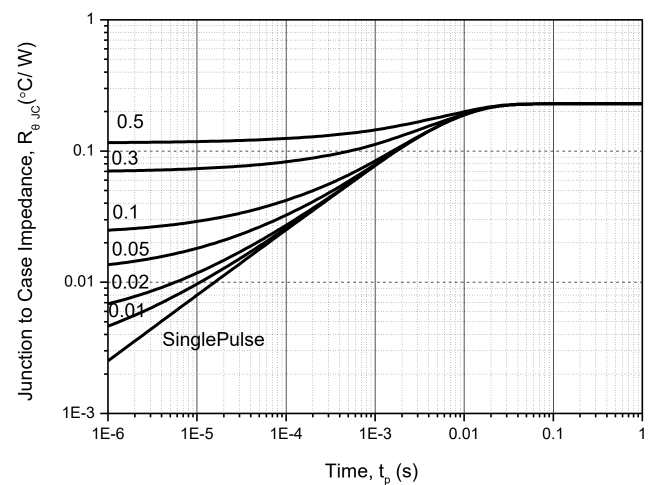
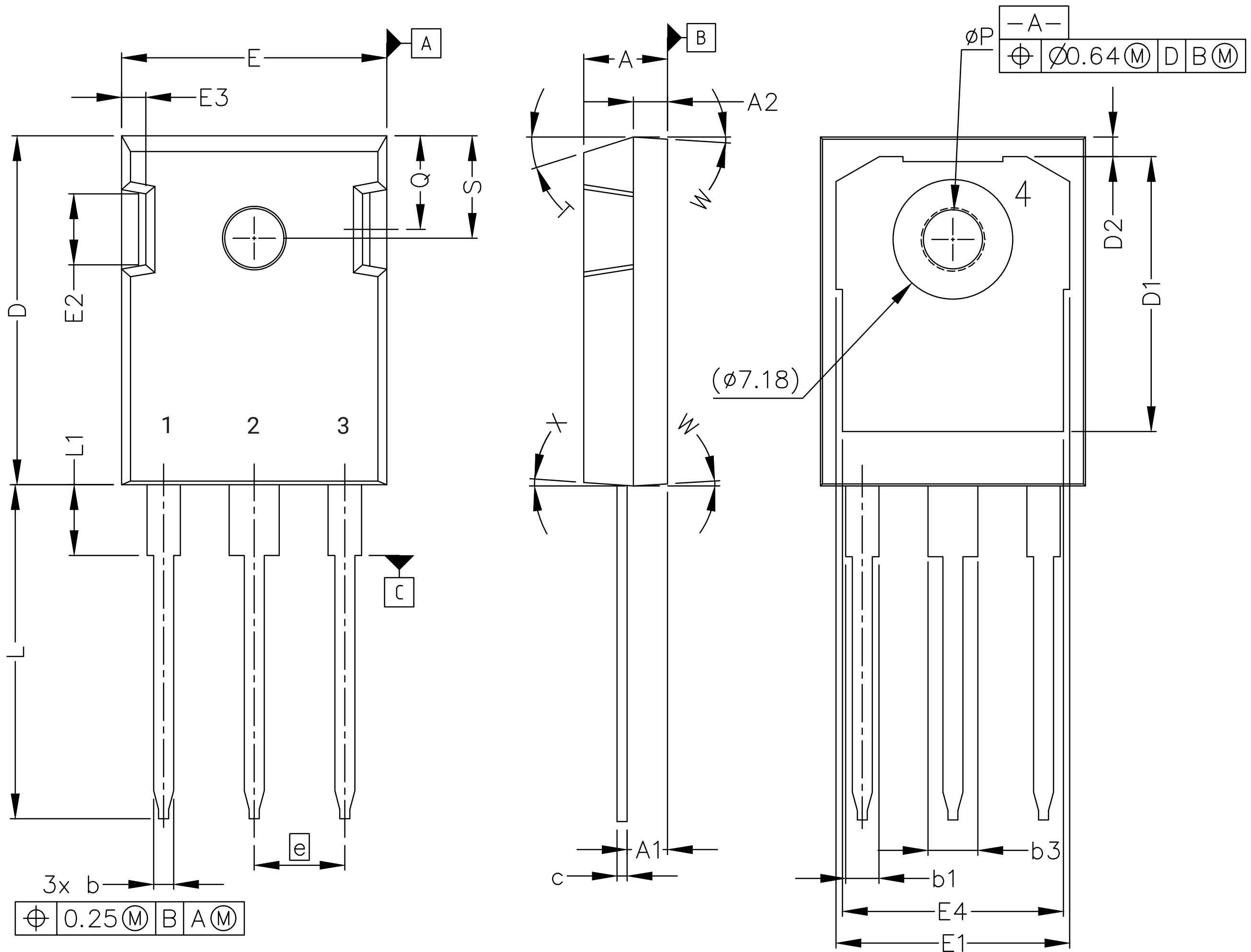


Figure 12. Transient Thermal Impendance

Package Dimensions: TO-247-3



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.
5. DIMENSION DO NOT INCLUDE BURR OR MOLD FLASH.

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

Package Dimensions: TO-247-3

SYM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	.190	.205
A1	2.29	2.54 2	.090	.100
A2	1.91	.16 1.	.075	.085
b	1.07	33	.042	.052
b1	1.91	2.41 3	.075	.095
b3	2.87	.38	.113	.133
c	0.55	0.68	.022	.027
D	20.80	21.10	.819	.831
D1	16.25	17.65	.640	.695
D2	0.95	1.25	.037	.049
E	15.75	16.13	.620	.635
E1	13.10	14.15	.516	.557
E2	3.68	5.10	.145	.201
E3	1.00	1.90	.039	.075
E4	12.38	13.43	.487	.529
e	5.44 BSC		.214 BSC	
N	3		3	
L	19.81	20.32	.780	.800
L1	4.10	4.40	.161	.173
ϕP	3.51	3.65	.138	.144
Q	5.49	6.00	.216	.236
S	6.04	6.30	.238	.248
T	17.5° REF.			
W	3.5° REF.			
X	4° REF.