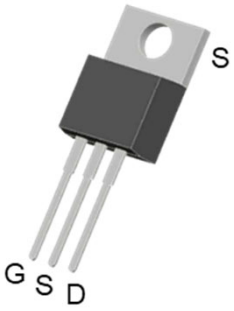
Prisemi®

PGCTO65R70B

650V GaN Power Transistor

Description

Product Summary		
V_{DS}(V)	$R_{DS(on)}$(mΩ)(Typ)	I_D(A)
650	70@ V_{GS} = 12V	27



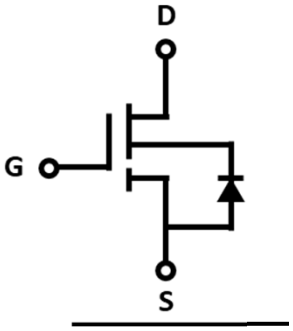
TO-220 (Top View)

Feature

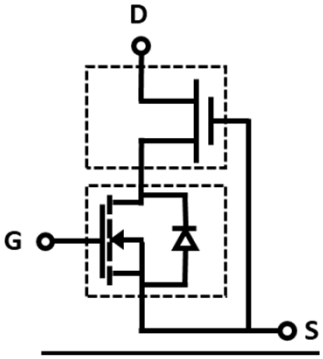
- Easy to use, compatible with standard gate drivers
- Excellent Q_G x $R_{DS(on)}$ figure of merit (FOM)
- Low Q_{RR}, no free-wheeling diode required
- Low switching loss
- RoHS compliant and Halogen-free

Applications

- High efficiency power supplies
- Telecom and datacom
- Automotive
- Servo motors



Schematic Symbol



Cascode
Device Structure

Absolute maximum rating@25℃

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V_{DS}	650	V
Gate-Source Voltage		V_{GS}	±20	V
Transient Drain-Source Voltage[1)]		V_{TDS}	800	V
Continuous Drain Current	T_C=25℃	I_D	27	A
	T_C=100℃		17	
Pulsed Drain Current (Pulse Width: 100μs)	T_C=25℃	I_{DM}	108	A
	T_C=100℃		80	
Power Dissipation		P_D	93	W
Soldering Peak Temperature		T_{CSOLD}	260	℃
Operating Junction and Storage Temperature		T_J, T_{STG}	-55 to 150	℃

Thermal Resistance

Parameter	Symbol	Min	Typ	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	-	1.34	-	℃/W
Thermal Resistance, Junction-to-Ambient[2)]	$R_{\theta JA}$	-	50	-	℃/W

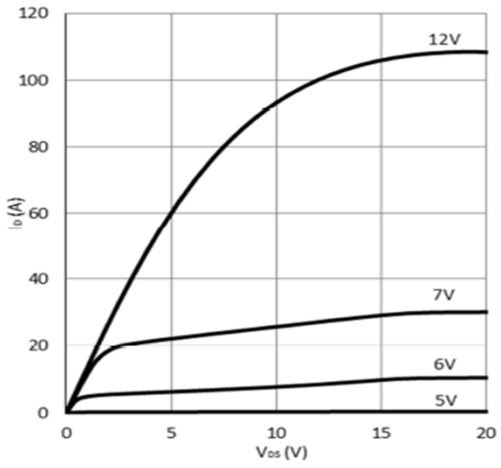
Electrical characteristics per line@25℃ (unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Units
Statistic Characteristics							
Maximum Drain-Source Voltage	V_{DS-Max}	V_{GS} = 0V		650	-	-	V
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS} = 0V,I_D = 250μA		-	1000	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=650V, V_{GS}=0V	T_J=25℃	-	10	30	μA
			T_J=150℃	-	50	-	
Gate-Body Leakage Current	I_{GSS}	V_{GS} = ±20V,V_{DS} = 0V		-	-	±150	nA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS},I_D = 500μA		3.0	4.0	5.0	V
Gate Threshold Voltage Temperature Coefficient	$\triangle V_{GS(th)}/T_J$			-	-11.3	-	mV/℃
Drain-Source On-State Resistance[3)]	$R_{DS(ON)}$	V_{GS}=12V, I_D=4A	T_J=25℃	-	70	90	mΩ
			T_J=150℃	-	140	-	
Dynamic Characteristics							
Input Capacitance	C_{lss}	V_{DS} = 400V,V_{GS} = 0V, f = 1MHz		-	354	-	pF
Output Capacitance	C_{oss}			-	79.7	-	
Reverse Transfer Capacitance	C_{rss}			-	1.9	-	
Effective Output Capacitance, Energy Related	$C_{o(er)}$	V_{GS} = 0V, V_{DS} = 0-400V		-	120	-	pF
Effective Output Capacitance, Time Related	$C_{o(tr)}$			-	217	-	
Output Charge	Q_{oss}			-	87	-	nC
Turn-on Delay Time	$t_{d(on)}$	V_{DS} = 400V,I_D = 10A, V_{GS} =0-12V,R_G=40Ω		-	44	-	ns
Turn-on Rise Time	t_r			-	16	-	
Turn-Off Delay Time	$t_{d(off)}$			-	40	-	
Turn-Off Fall Time	t_f			-	12	-	
Total Gate Charge	Q_g	V_{DS} = 400V,I_D = 6A, V_{GS} =0-12V		-	17	-	nC
Gate-Source Charge	Q_{gs}			-	4.6	-	
Gate-Drain Charge	Q_{gd}			-	5.6	-	
Reverse Diode Characteristics							
Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_S=8.5A		-	1.3	-	V
		V_{GS}=0V, I_S=17A	T_J=25℃	-	1.9	-	
			T_J=150℃	-	3	-	
Reverse Recovery Time	t_{rr}	V_{GS}=0V, I_S=17A, V_{DD}=400V, di/dt=1000A/μs		-	33	-	ns
Reverse Recovery Charge	Q_{rr}			-	87	-	nC

Notes:
1. Off-state spike duty cycle < 0.01, spike duration < 2μs
2. Device on one layer epoxy PCB for drain connection (vertical and without air stream cooling, with 6cm²copper area and 70μm thickness)
3. Dynamic on-resistance; see Figure 18 and 19 for test circuit and configurations

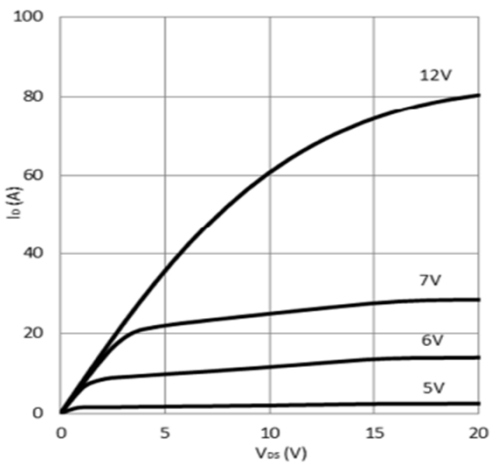
Typical Characteristics

Figure 1. Typical Output Characteristics T_J=25℃



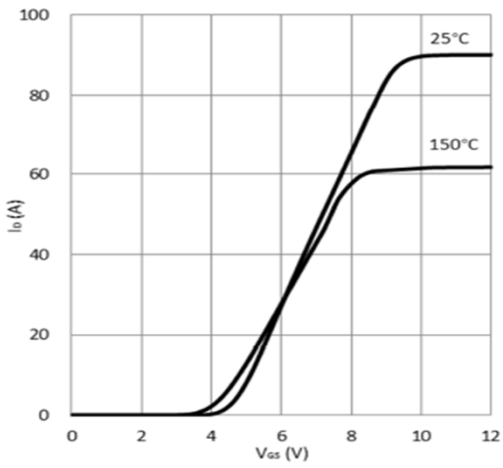
Parameter: V_{GS}

Figure 2. Typical Output Characteristics T_J=150℃



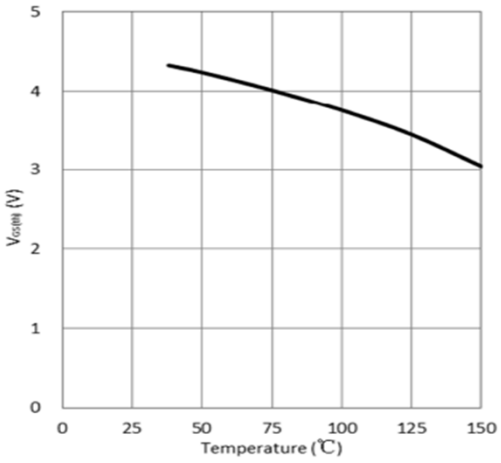
Parameter: V_{GS}

Figure 3. Typical Transfer Characteristics



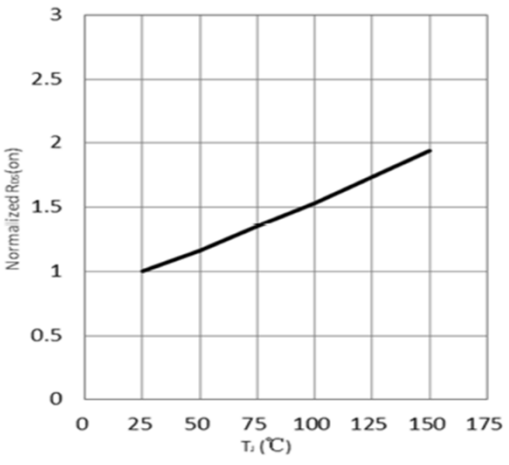
V_{DS}=10V, Parameter: T_J

Figure 4. $V_{GS(th)}$ Vs Temperature Characteristics



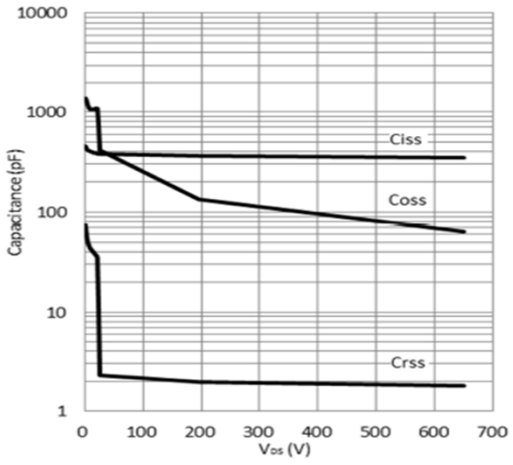
I_D=500uA

Figure 5. Normalized On-resistance



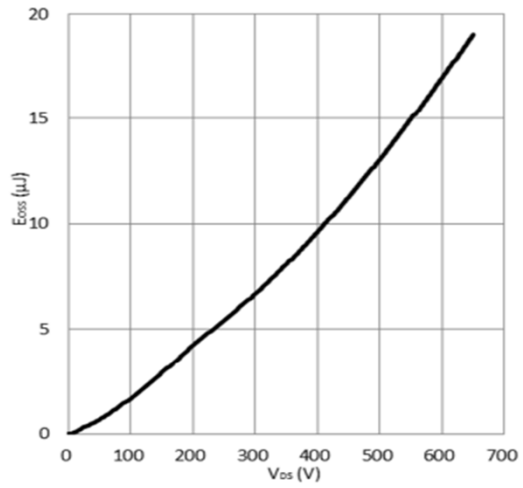
I_D=4A, V_{GS}=12V

Figure 6. Typical Capacitance



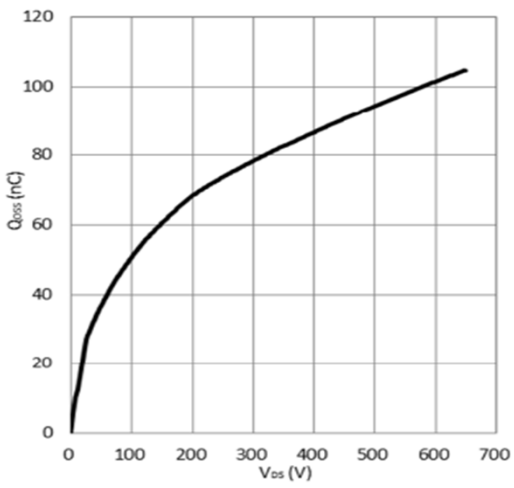
V_{GS}=0V, f=1MHz

Figure 7. Typical Coss Stored Energy



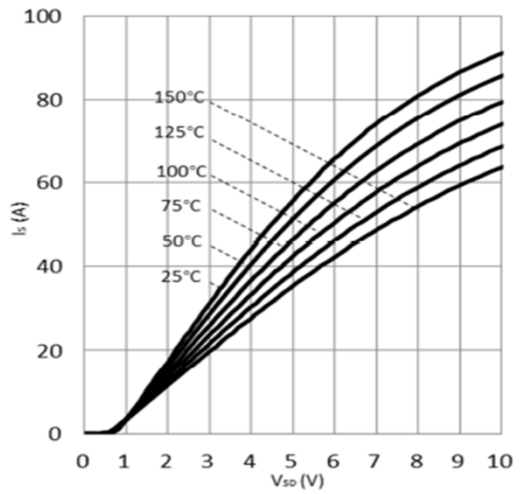
V_{GS}=0V, f=1MHz

Figure 8. Typical Qoss



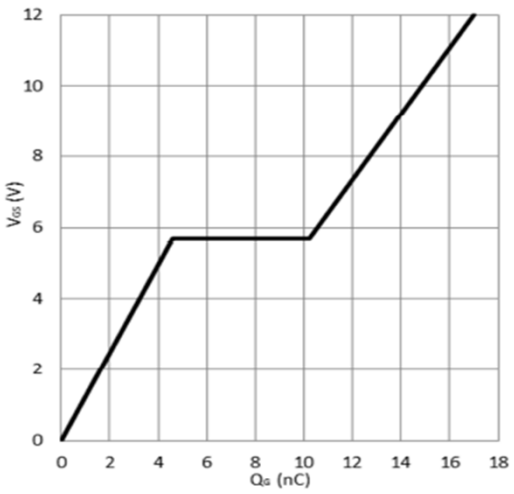
V_{GS}=0V, f=1MHz

Figure 9. Forward Characteristic of Rev. Diode



$I_S=f(V_{SD})$, Parameter T_J

Figure 10. Typical Gate Charge



I_{DS}=6A, V_{DS}=400V

Figure 11. Power Dissipation

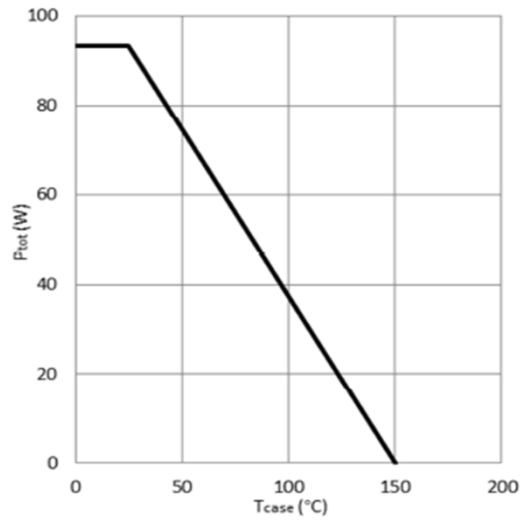


Figure 12. Current Derating

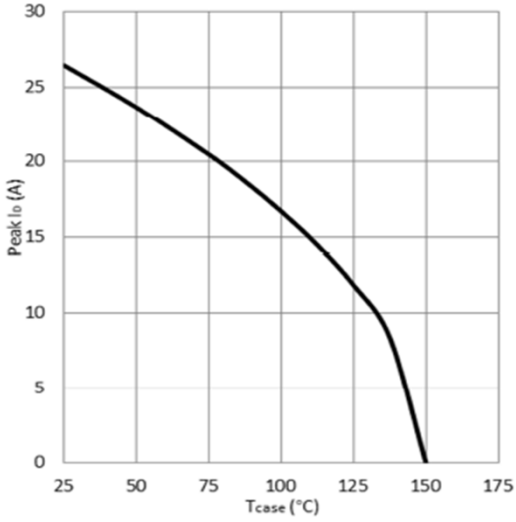


Figure 13. Transient Thermal Resistance

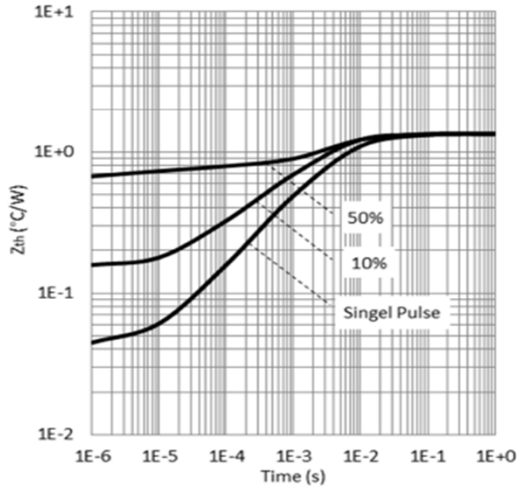
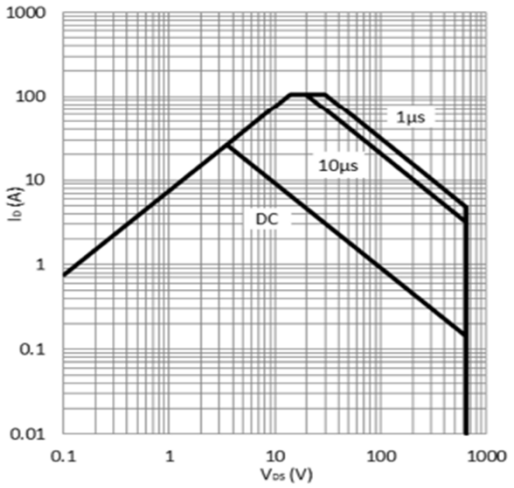
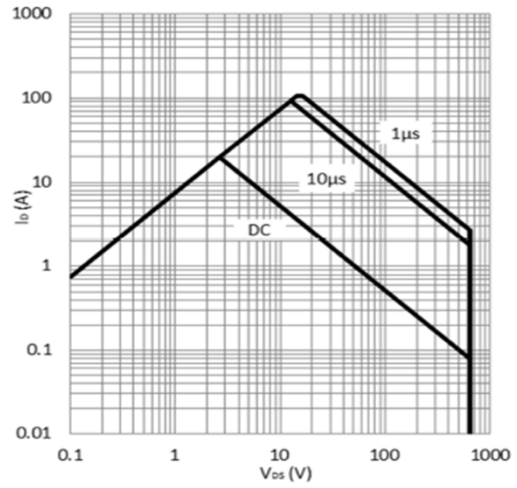


Figure 14. Safe Operating Area T_C=25℃



calculated based on thermal limit

Figure 15. Safe Operating Area T_C=80℃



calculated based on thermal limit

Test Circuits and Waveforms

Figure 16. Switching Time Test Circuit

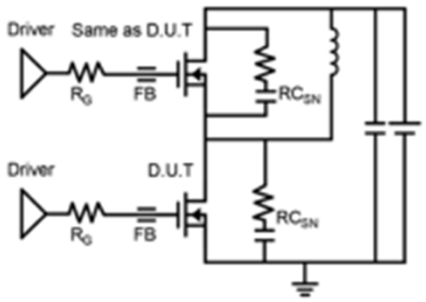


Figure 17. Switching Time Waveform

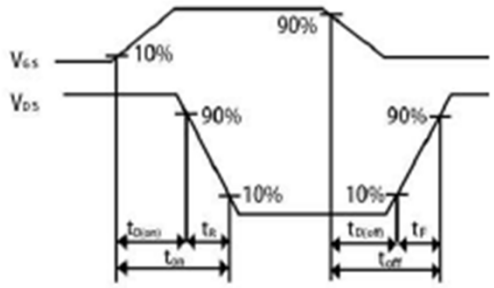


Figure 18. Dynamic $R_{DS(on)}$ Test Circuit

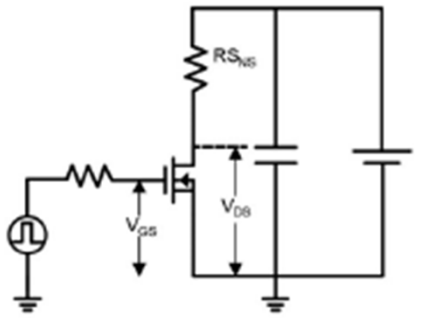


Figure 19. Dynamic $R_{DS(on)}$ Waveform

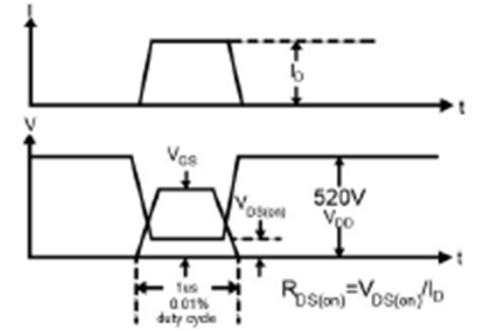


Figure 20. Diode Characteristic Test Circuits

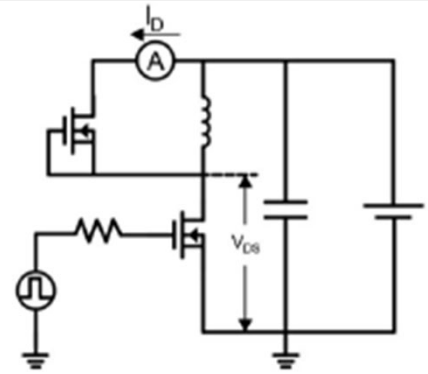
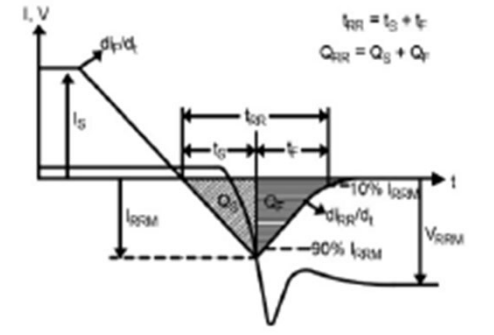
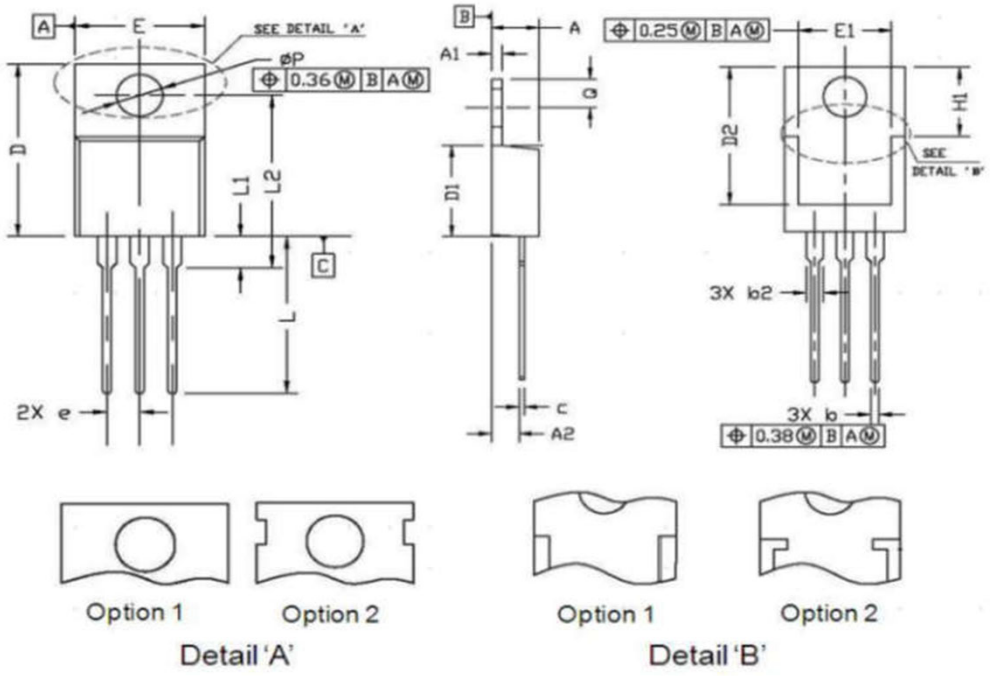


Figure 21. Diode Recovery Waveform



Product Dimension (TO-220)



SYMBOL	Millimeter	
	Min	Max
A	4.30	4.80
A1	1.20	1.45
A2	2.20	2.90
b	0.69	0.95
b2	1.00	1.60
c	0.33	0.65
D	14.70	16.20
D1	8.59	9.65
D2	11.75	13.60
e	2.54BSC	
E	9.60	10.60
E1	7.00	8.46
H1	6.20	7.00
L	12.60	14.80
L1	2.70	3.80
L2	12.13	16.50
Q	2.40	3.10
P	3.50	3.90

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