

1200V 40A Insulated Gate Bipolar Transistors

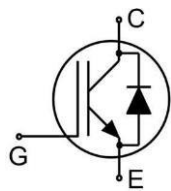
FEATURES

- $V_{CES}=1200V, I_C=40A(T_C=100^{\circ}C)$
- Saturation pressure is reduced and the switching speed is fast
- Saturation pressure drops to a positive temperature coefficient
- High reliability and thermal stability, good parameter consistency

APPLICATIONS

- UPS
- Inverter welder

SYMBOL



ASSEMBLY MESSAGE

Product Name	Package	Packaging
BXE40T1K2BHFSD	TO-247	Tube

ABSOLUTE MAXIMUM RATINGS ($T_C=25^{\circ}C$ unless otherwise noted)

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate- Emitter Voltage	± 20	V
I_C	Collector Current@ $T_C = 25^{\circ}C$	80	A
	Collector Current @ $T_C = 100^{\circ}C$	40	A
I_{Cplus}	Pulsed Collector Current, tp limited by Tjmax	160	A
I_F	Diode Continuous Forward Current @ $T_C = 25^{\circ}C$	80	A
	Diode Continuous Forward Current @ $T_C = 100^{\circ}C$	40	A
I_{FM}	Diode Maximum Forward Current	160	A
P_D	Power Dissipation @ $T_C = 25^{\circ}C$	278	W
T_J, T_{stg}	Operating Junction and Storage Temperature Range	-55 to +150	$^{\circ}C$
T_L	Maximum Temperature for Soldering	270	$^{\circ}C$

THERMAL CHARACTERISTICS

Parameter	Symbol	Max.	Units
Thermal Resistance, Junction to case for IGBT	$R_{\theta JC}$	0.45	$^{\circ}C/W$
Thermal Resistance, Junction to case for Diode	$R_{\theta JC}$	0.7	$^{\circ}C/W$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	40	$^{\circ}C/W$

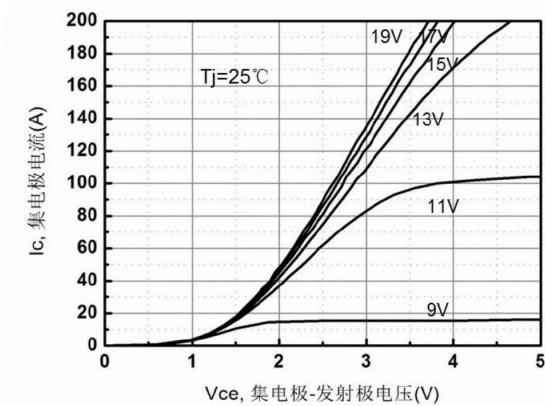
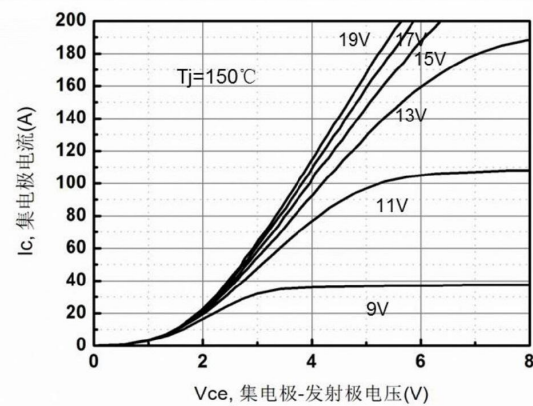
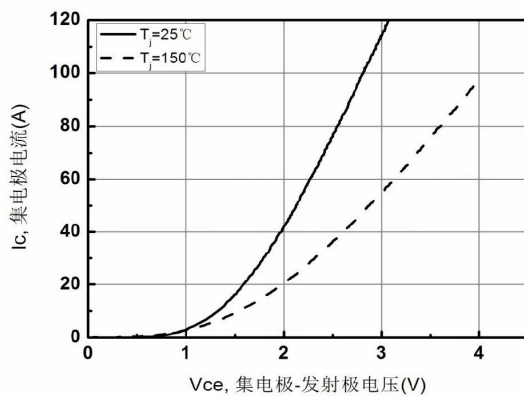
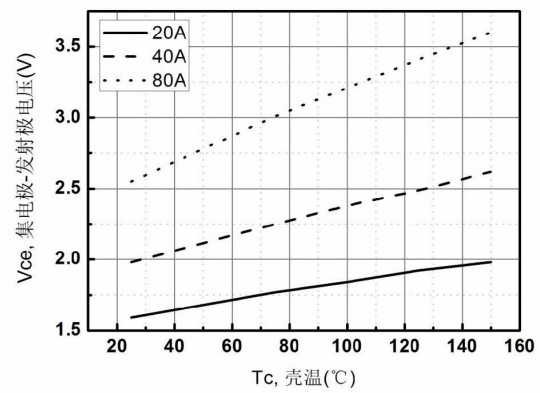
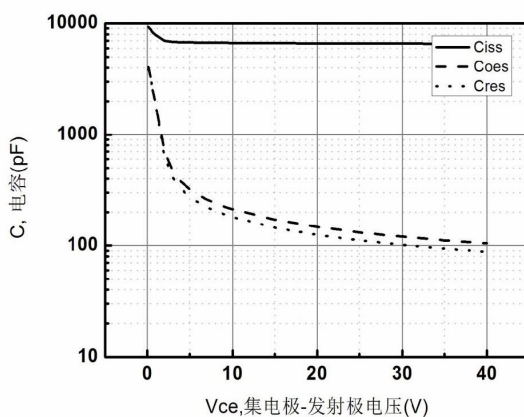
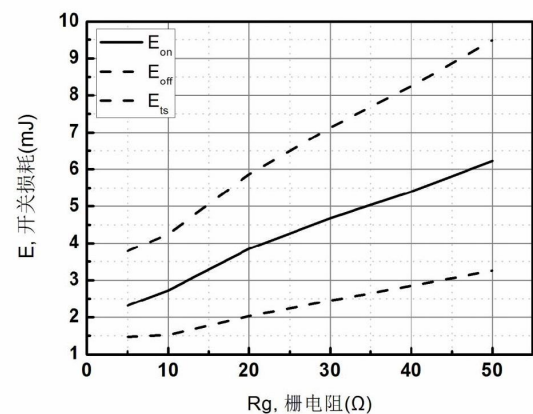
ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise Noted)

Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
Static Characteristics						
V _{(BR)CES}	Collector-Emitter Breakdown Voltage	V _{GE} =0V,I _{CE} =250uA	1200	--	--	V
I _{CES}	Collector-Emitter Leakage Current	V _{GE} =0V,V _{CE} =1200V	--	--	1	mA
I _{GES(F)}	Gate to Emitter Forward Leakage	V _{GE} =+20V,V _{CE} =0V	--	--	+250	nA
I _{GES(R)}	Gate to Source Reverse Leakage	V _{GE} =-20V,V _{CE} =0V	--	--	-250	nA
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C =40A,V _{GE} =15V	--	1.9	2.4	V
V _{GE(th)}	Gate Threshold Voltage	I _C =250uA,V _{CE} =V _{GE}	5	6	7	V
Dynamic Characteristics						
C _{ies}	Input Capacitance	V _{CE} =25V,V _{GE} =0V, f=1MHz	--	6618	--	pF
C _{oes}	Output Capacitance		--	131	--	
C _{res}	Reverse Transfer Capacitance		--	111	--	
Q _g	Total Gate Charge	V _{CE} =600V,I _C =40A, V _{GE} =15V	--	208	--	nC
Q _{ge}	Gate to Emitter Charge		--	53	--	
Q _{gc}	Gate to Collector Charge		--	88	--	
Switching Characteristics						
t _{d(ON)}	Turn-on Delay Time	V _{CE} =600V,I _C =40A, V _{GE} =15V, R _g =10Ω, Inductive Load, T _J =25°C	--	77	--	ns
t _r	Rise Time		--	47.5	--	
t _{d(OFF)}	Turn-Off Delay Time		--	238	--	
t _f	Fall Time		--	47	--	
E _{on}	Turn-On Switching Loss	T _J =25°C	--	2.8	--	mJ
E _{off}	Turn-Off Switching Loss		--	1.5	--	
E _{ts}	Total Switching Loss		--	4.3	--	
t _{d(ON)}	Turn-on Delay Time	V _{CE} =600V,I _C =40A, V _{GE} =15V, R _g =10Ω, Inductive Load, T _J =150°C	--	69	--	ns
t _r	Rise Time		--	50	--	
t _{d(OFF)}	Turn-Off Delay Time		--	267	--	
t _f	Fall Time		--	105	--	
E _{on}	Turn-On Switching Loss	T _J =150°C	--	2.86	--	mJ
E _{off}	Turn-Off Switching Loss		--	2	--	
E _{ts}	Total Switching Loss		--	4.86	--	

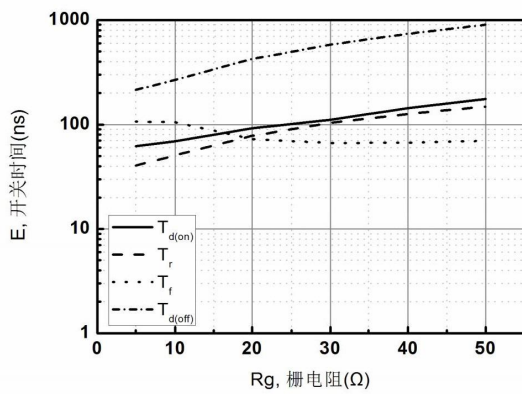
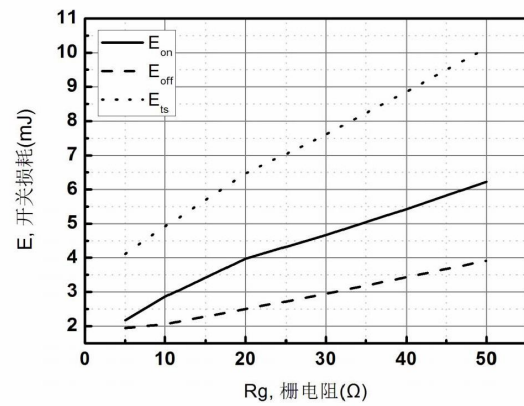
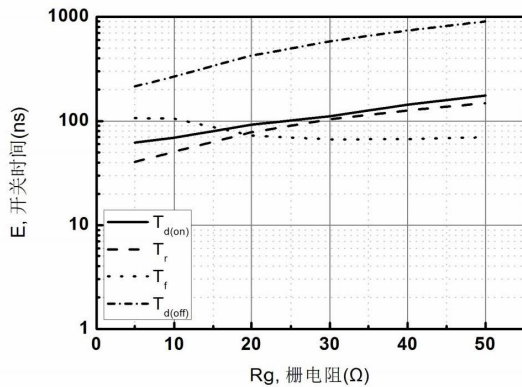
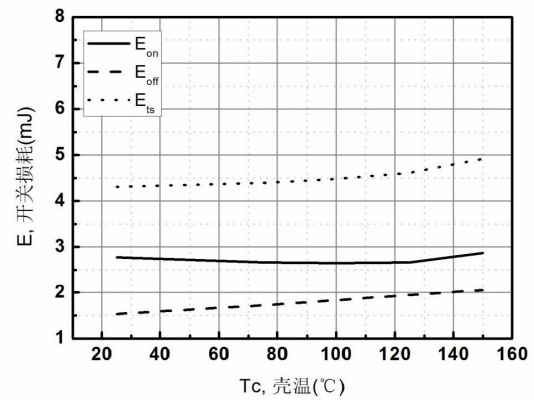
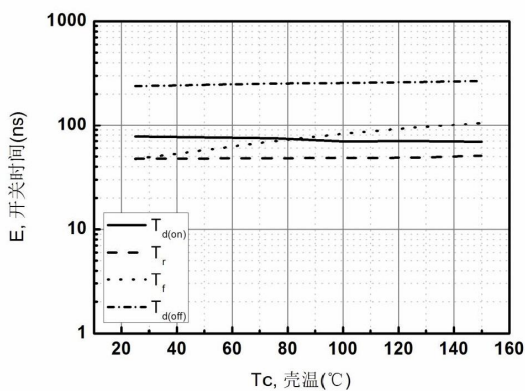
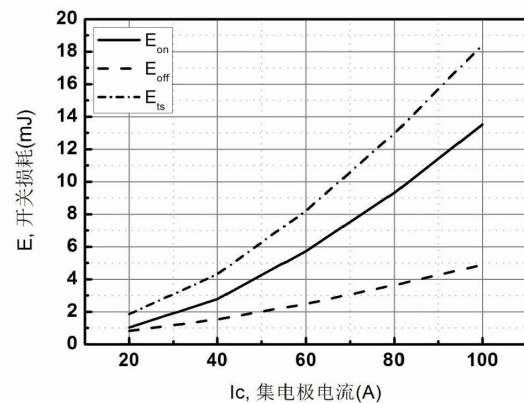
ELECTRICAL CHARACTERISTICS OF THE DIODE(T_C=25°C, unless otherwise Noted)

Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V _F	Diode Forward Voltage	I _F =40A	--	2.27	2.8	V
T _{rr}	Reverse Recovery Time	I _F =40A, di/dt=100A/us	--	88	--	ns
I _{RRM}	Diode Peak Reverse Recovery Current		--	7.6	--	A
Q _{rr}	Reverse Recovery Charge		--	326	--	nC

Note: Pulse width ≤ 300μs, Duty cycle ≤ 2%

TYPICAL PERFORMANCE CHARACTERISTICS

Figure 1. Output Characteristics

Figure 2. Output Characteristics

Figure 3. Saturation Voltage Characteristics

Figure 4. Saturation Voltage - T_c Characteristics

Figure 5. Capacitance Characteristics

Figure 6. Switching Loss- R_g Characteristics

$V_{CE}=600V, I_C=40A, R_g=10\Omega, V_{GE}=15V$, Inductive Load, $T_a=25^\circ C$


Figure 7. Switching Time- R_g Characteristics
 $V_{CE}=600V, I_C=40A, R_g=10\Omega, V_{GE}=15V$, Inductive Load, $T_a=25^\circ C$

Figure 8. Switching Loss- R_g Characteristics
 $V_{CE}=600V, I_C=40A, R_g=10\Omega, V_{GE}=15V$, Inductive Load, $T_a=150^\circ C$

Figure 9. Switching Time- R_g Characteristics
 $V_{CE}=600V, I_C=40A, R_g=10\Omega, V_{GE}=15V$, Inductive Load, $T_a=150^\circ C$

Figure 10. Switching Loss- T_c Characteristics
 $V_{CE}=600V, I_C=40A, R_g=10\Omega, V_{GE}=15V$, Inductive Load,

Figure 11. Switching Time- T_c Characteristics
 $V_{CE}=600V, I_C=40A, R_g=10\Omega, V_{GE}=15V$, Inductive Load,

Figure 12. Switching Loss- I_c Characteristics
 $V_{CE}=600V, R_g=10\Omega, V_{GE}=15V$, Inductive Load, $T_a=25^\circ C$

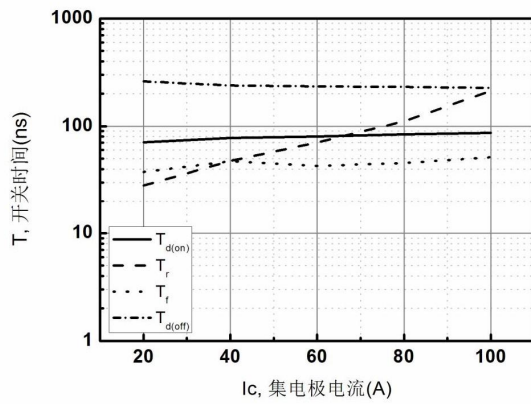


Figure 13. Switching Time-Ic Characteristics

$V_{CE}=600V, R_g=10\Omega, V_{GE}=15V$, Inductive Load, $T_a=25^\circ C$

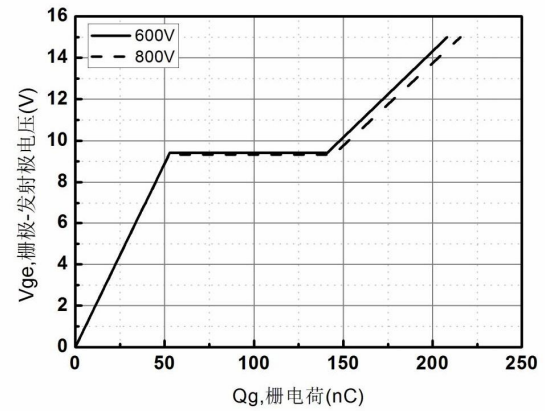


Figure 14. Gate Charge Characteristics

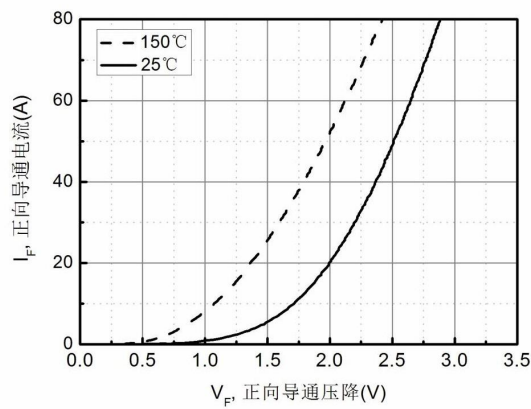


Figure 15. Diode Forward Characteristics

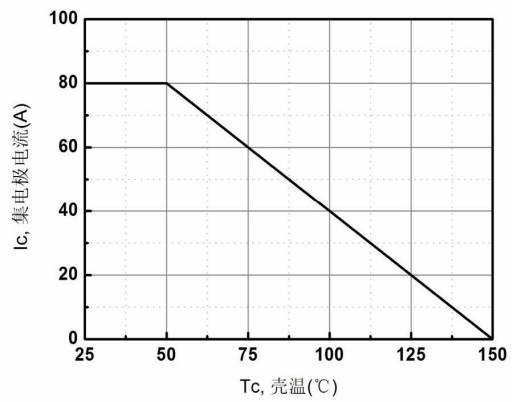


Figure 16. Collector Current-Tc Characteristics

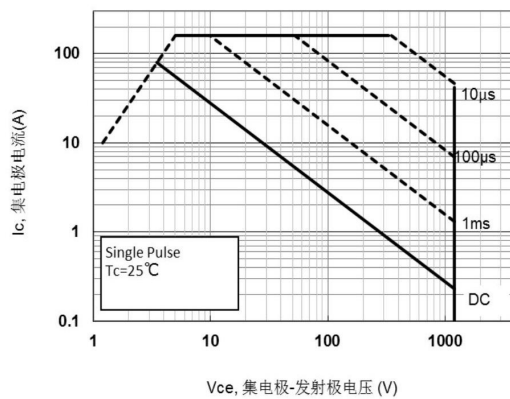
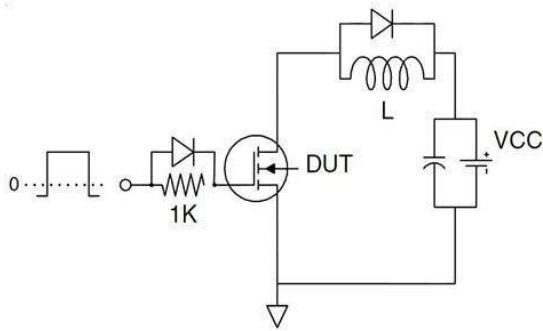
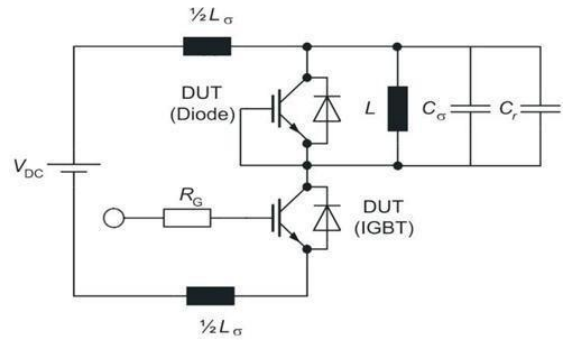


Figure 17. Forward Bias Safe Operating Area

TEST CIRCUIT

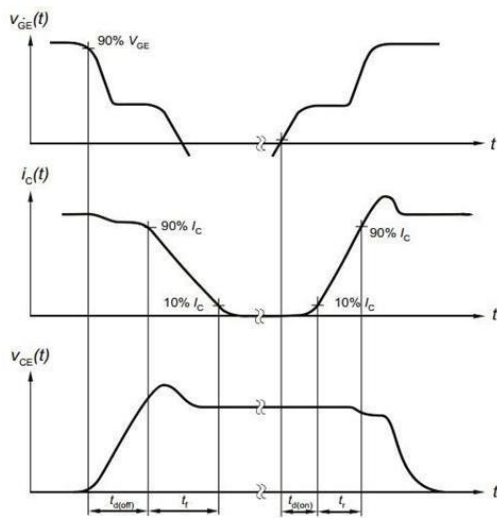


Gate Charge Test Circuit

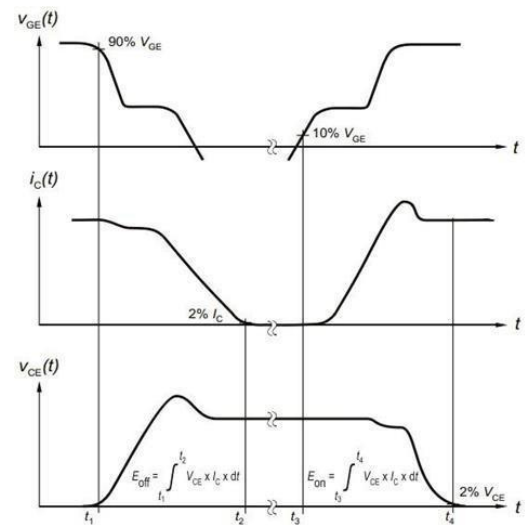


Switch Time Test Circuit

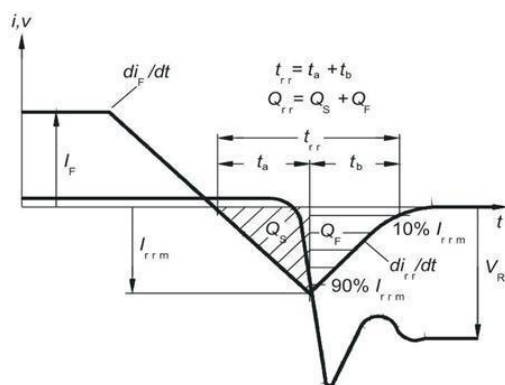
SWITCHING CHARACTERISTICS



Definition of switching times

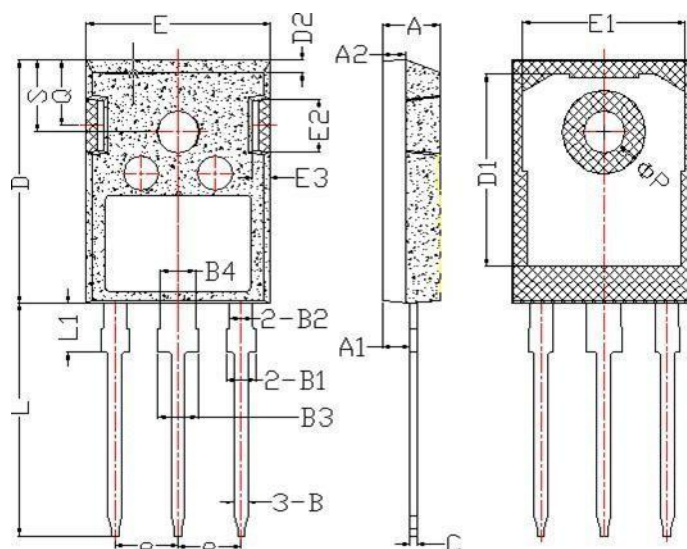


Definition of switching losses



Definition of diode switching characteristics

TO-247 Package



SYMBOL	T0-247(mm)	
	MIN	MAX
A	4.6	5.2
A1	2,2	2.6
B	0.9	1.4
B1	1.75	2.35
B2	1.75	2.15
B3	2.8	3.35
B4	2.8	3.15
C	0.5	0.7
D	20.60	21.30
D1	16	18
E	15.5	16.10
E1	13	14.7
E2	3.80	5.3
E3	0.8	2.60
e	5.2	5.7
L	19	20.5
L1	3.9	4.6
ΦP	3.3	3.70
Q	5.2	6.00
S	5.8	6.6

Revision history

Document revision history

Date	Revision	Changes
15-Oct-2021	1.0	First release



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