

N-Channel Enhancement Mode Power MOSFET

General Description

The series of Power MOSFETs use advanced technology and design. This high voltage MOSFET fits Switched applications.

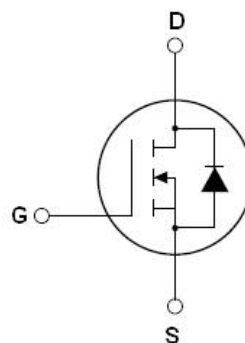
Features

- High speed switching
- Intrinsic capacitances and Qg minimized
- 100% Avalanche Tested

Application

- Switched applications

$V_{DS\ min@T_{jmax}}$	1650	V
$R_{DS(ON)TYP}$	5.5	Ω
I_D	3	A
Q_g	32	nC



Schematic diagram

Package Marking And Ordering Information

Device	Device Package	Marking
NCE3N150T	TO-247	NCE3N150T



TO-247

Table 1. Absolute Maximum Ratings ($T_J=25^{\circ}C$)

Parameter	Symbol	Value	Unit
Drain-Source Voltage ($V_{GS}=0V$)	V_{DS}	1500	V
Gate-Source Voltage ($V_{DS}=0V$) DC	V_{GS}	± 30	V
Continuous Drain Current at $T_c=25^{\circ}C$	$I_{D(DC)}$	3	A
Continuous Drain Current at $T_c=100^{\circ}C$	$I_{D(DC)}$	2.1	A
Pulsed drain current (Note 1)	$I_{DM(pluse)}$	9	A
Maximum Power Dissipation($T_c=25^{\circ}C$)	P_D	187	W
Derate above $25^{\circ}C$		1.24	W/ $^{\circ}C$
Single pulse avalanche energy (Note 2)	E_{AS}	225	mJ
Single pulse avalanche current (Note 2)	I_{AS}	3	A
Operating Junction and Storage Temperature Range	T_J, T_{STG}	$-55...+175$	$^{\circ}C$

* limited by maximum junction temperature

Table 2. Thermal Characteristic

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Maximum)	R_{thJC}	0.8	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient (Maximum)	R_{thJA}	50	$^{\circ}\text{C}/\text{W}$

Table 3. Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
On/off states						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =1mA	1500			V
Zero Gate Voltage Drain Current(Tc=25℃)	I _{DSS}	V _{DS} =1500V, V _{GS} =0V			1	μA
Zero Gate Voltage Drain Current(Tc=125℃)	I _{DSS}	V _{DS} =1500V, V _{GS} =0V			100	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±30V, V _{DS} =0V			±100	nA
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	3	4	5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =1.5A		5.5	7.5	Ω
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =40V, V _{GS} =0V, F=1.0MHz		1700		pF
Output Capacitance	C _{oss}			61		pF
Reverse Transfer Capacitance	C _{rss}			5.5		pF
Total Gate Charge	Q _g	V _{DS} =1200V, I _D =1.5A, V _{GS} =10V		32		nC
Gate-Source Charge	Q _{gs}			8.7		nC
Gate-Drain Charge	Q _{gd}			12		nC
Intrinsic gate resistance	R _G	f = 1 MHz open drain		2		Ω
Switching times						
Turn-on Delay Time	t _{d(on)}	V _{DD} =750V, I _D =1.5A, R _G =3Ω, V _{GS} =10V		22		nS
Turn-on Rise Time	t _r			45		nS
Turn-Off Delay Time	t _{d(off)}			42		nS
Turn-Off Fall Time	t _f			58		nS
Source- Drain Diode Characteristics						
Source-drain current(Body Diode)	I _{SD}	T _C =25℃			3	A
Pulsed Source-drain current(Body Diode)	I _{SDM}				9	A
Forward On Voltage	V _{SD}	T _j =25℃, I _{SD} =3A, V _{GS} =0V		0.8	1.1	V
Reverse Recovery Time	t _{rr}	T _j =25℃, I _F =3A, di/dt=100A/μs		390		nS
Reverse Recovery Charge	Q _{rr}			2.2		uC
Peak Reverse Recovery Current	I _{rrm}			11		A

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature

2. $T_J=25^{\circ}\text{C}, V_{DD}=50V, V_G=10V, R_G=25\Omega$

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)

Figure1. Safe operating area

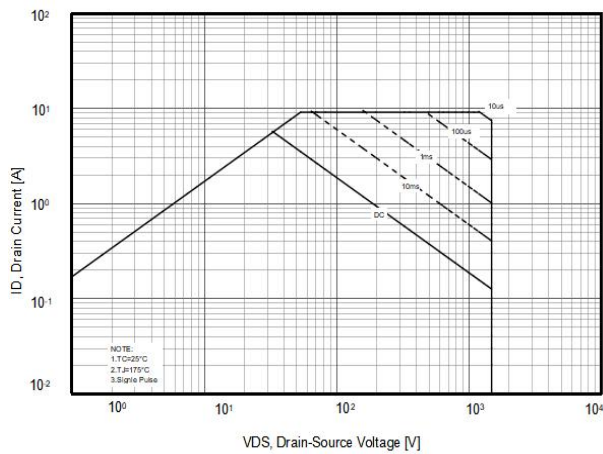


Figure2. Source-Drain Diode Forward Voltage

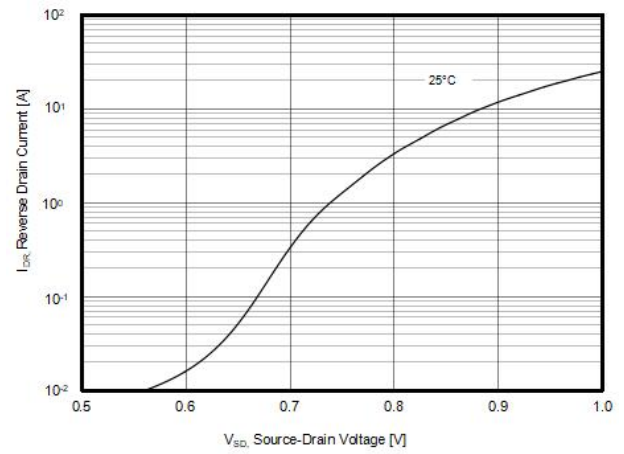


Figure3. $R_{DS(ON)}$ vs Junction Temperature

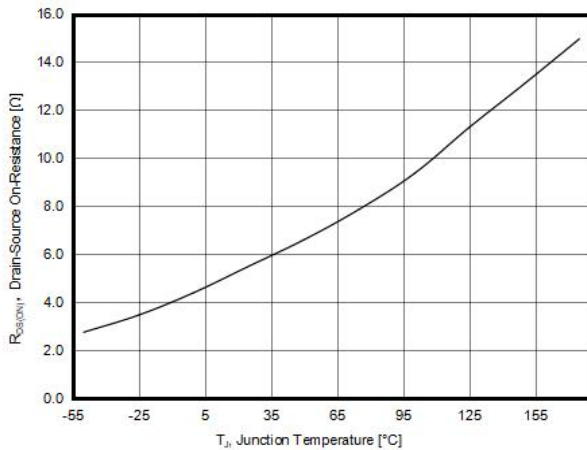


Figure4. BV_{DSS} vs Junction Temperature

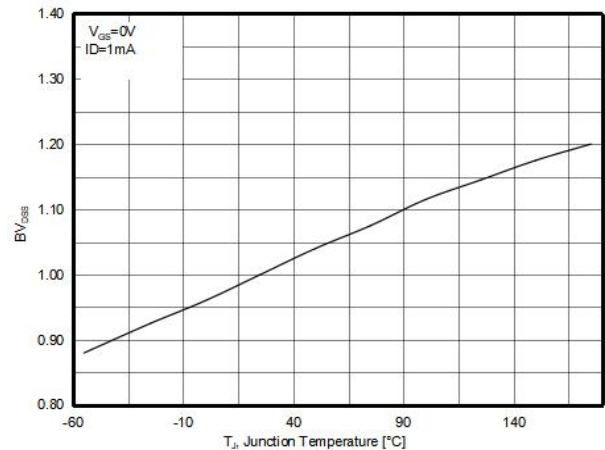


Figure5. Maximum I_D vs Junction Temperature

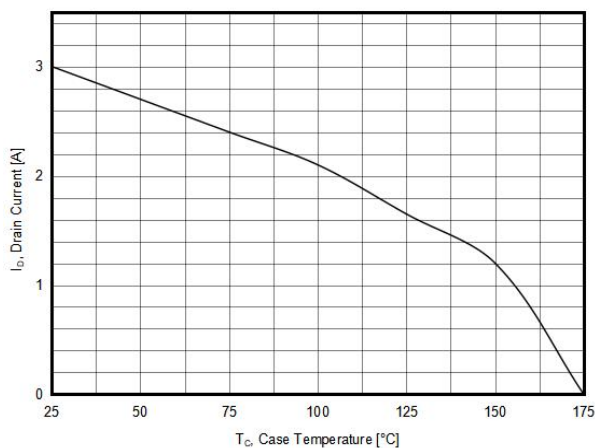


Figure6. Output characteristics

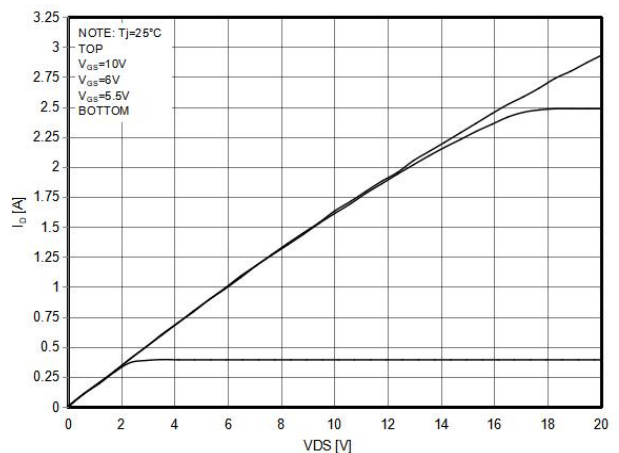


Figure7. Capacitance

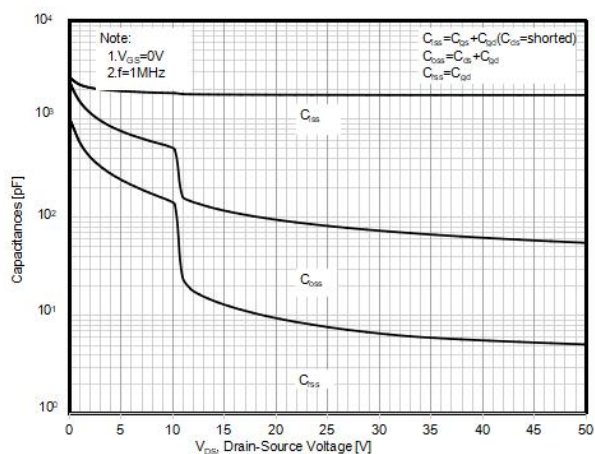


Figure8. Transfer characteristics

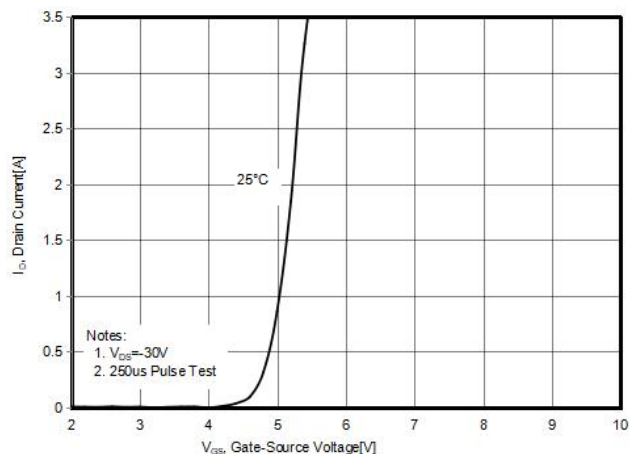


Figure9. Static drain-source on resistance

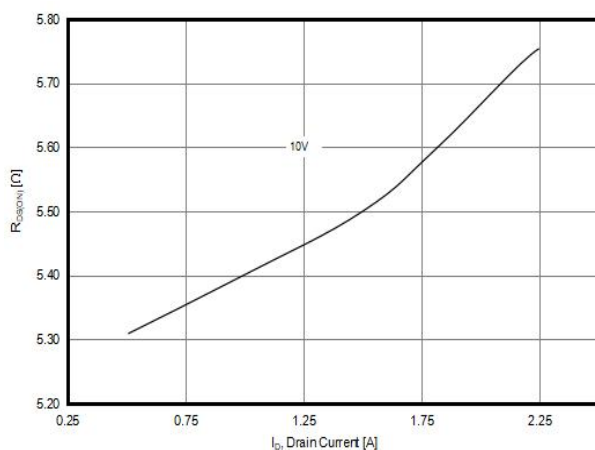
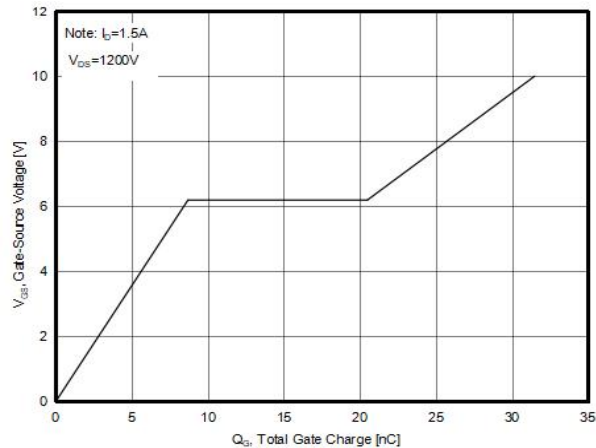
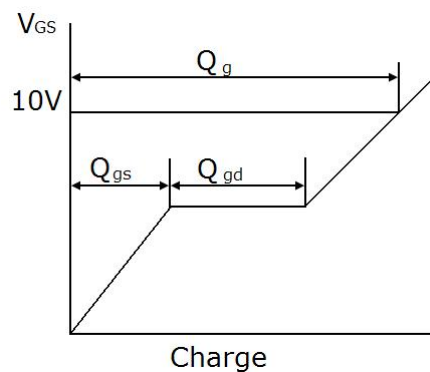
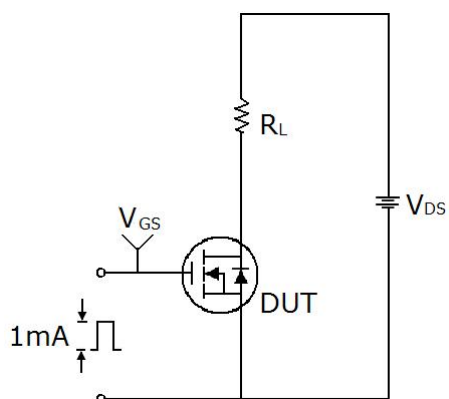


Figure9. Gate charge waveforms

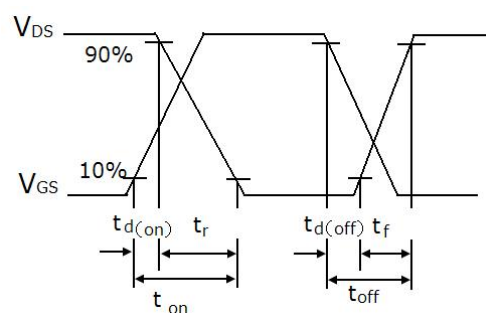
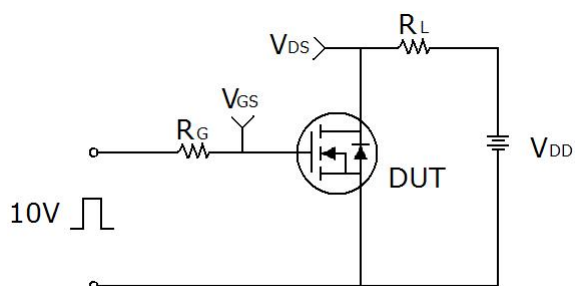


Test circuit

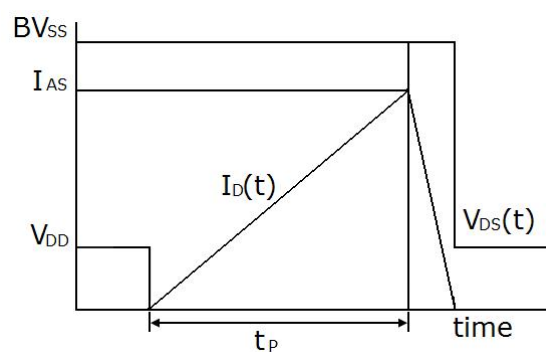
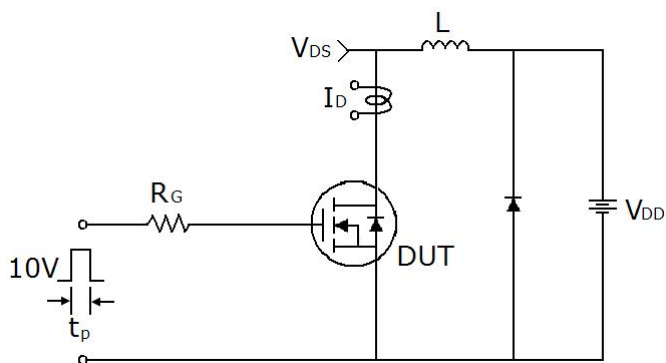
1) Gate charge test circuit & Waveform



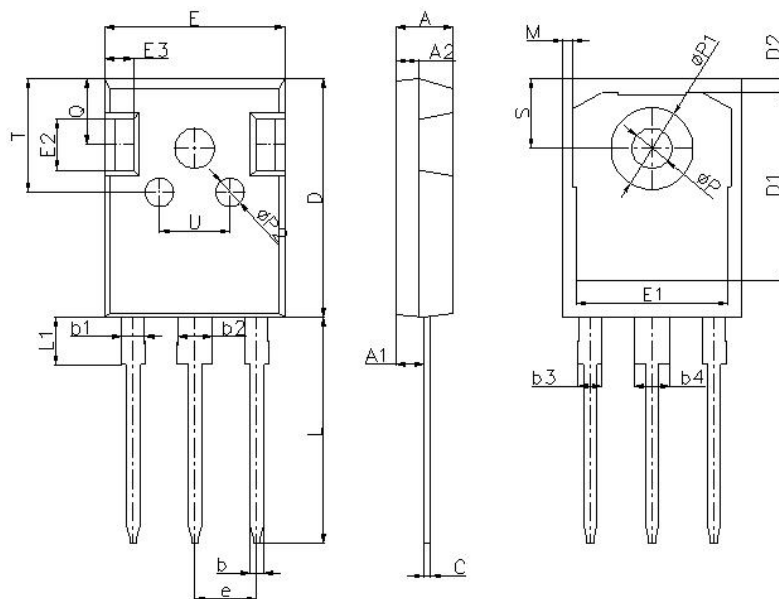
2) Switch Time Test Circuit:



3) Unclamped Inductive Switching Test Circuit & Waveforms

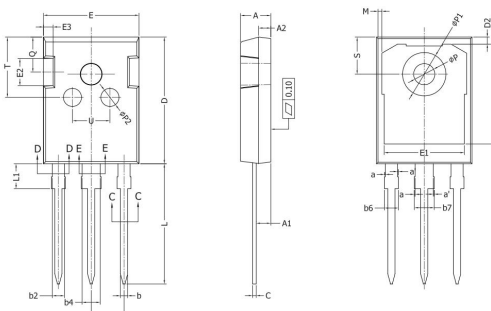


TO-247-E Package Information



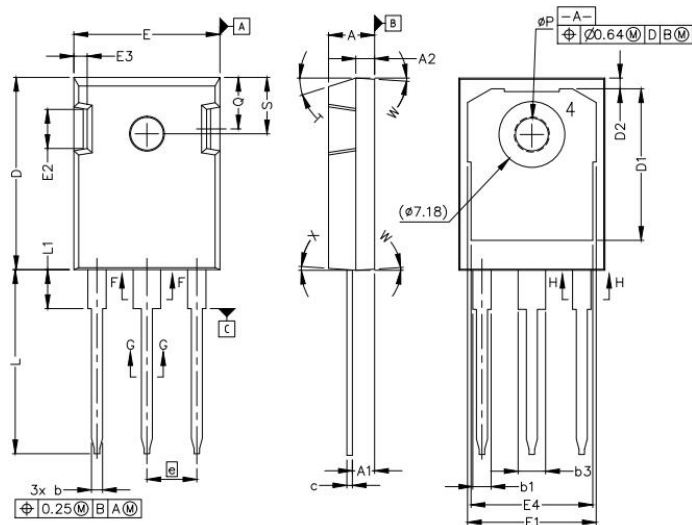
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.90	5.10	0.193	0.201
A1	2.31	2.51	0.091	0.099
A2	1.90	2.10	0.075	0.083
b	1.16	1.26	0.046	0.050
b1	1.96	2.06	0.077	0.081
b2	2.96	3.06	0.117	0.120
b3	-	2.25	-	0.089
b4	-	3.25	-	0.128
C	0.59	0.66	0.023	0.026
D	20.90	21.10	0.823	0.831
D1	16.25	16.85	0.640	0.663
D2	1.05	1.35	0.041	0.053
E	15.70	15.90	0.618	0.626
E1	13.10	13.50	0.516	0.531
E2	4.40	4.60	0.173	0.181
E3	2.40	2.60	0.094	0.102
e	5.436BSC		0.214BSC	
L	19.80	20.10	0.780	0.791
L1	-	4.30	-	0.169
M	0.35	0.95	0.014	0.037
Q	5.60	6.00	0.220	0.236
S	6.05	6.25	0.238	0.246
T	9.80	10.20	0.386	0.402
U	6.00	6.40	0.236	0.252

TO-247-P Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.90	5.10	0.193	0.201
A1	2.31	2.41	0.091	0.095
A2	1.90	2.00	0.075	0.079
b	1.16	1.26	0.046	0.050
b1	1.15	1.22	0.045	0.048
b2	1.96	2.06	0.077	0.081
b3	1.95	2.02	0.077	0.080
b4	2.96	3.06	0.117	0.120
b5	2.96	3.02	0.117	0.119
b6		2.25	0.000	0.089
b7		3.25	0.000	0.128
c	0.59	0.66	0.023	0.026
c1	0.58	0.62	0.023	0.024
D	20.9	21.10	0.823	0.831
D1	16.25	16.85	0.640	0.663
D2	1.05	1.35	0.041	0.053
E	15.70	15.90	0.618	0.626
E1	13.10	13.50	0.516	0.531
E2	4.40	4.60	0.173	0.181
E3	2.40	2.60	0.094	0.102
e	5.436 BSC		0.214 BSC	
L	19.80	20.10	0.780	0.791
L1		4.30	0.000	0.169
M	0.35	0.95	0.014	0.037
P	3.40	3.60	0.134	0.142
P1	7.00	7.40	0.276	0.291
P2	2.40	2.60	0.094	0.102
Q	5.60	6.00	0.220	0.236
S	6.05	6.25	0.238	0.246
T	9.80	10.20	0.386	0.402
U	6.00	6.40	0.236	0.252

TO-247-B Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.83	5.21	0.190	0.205
A1	2.29	2.54	0.090	0.100
A2	1.91	2.16	0.075	0.085
b'	1.07	1.28	0.042	0.050
b	1.07	1.33	0.042	0.052
b1	1.91	2.41	0.075	0.095
b2	1.91	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
c'	0.55	0.65	0.022	0.026
D	20.80	21.10	0.819	0.831
D1	16.25	17.65	0.640	0.695
D2	0.95	1.25	0.037	0.049
E	15.75	16.13	0.620	0.635
E1	13.10	14.15	0.516	0.557
E2	3.68	5.10	0.145	0.201
E3	1.00	1.90	0.039	0.075
E4	12.38	13.43	0.487	0.529
e	5.44 BSC		0.214 BSC	
L	19.81	20.32	0.780	0.800
L1	4.10	4.40	0.161	0.173
Q	5.60	6.00	0.220	0.236
S	6.05	6.25	0.238	0.246

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