

N-Channel 200-V (D-S) MOSFET

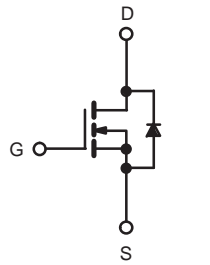
PRODUCT SUMMARY

$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)
200	0.122 at $V_{GS} = 10$ V	25

TO-220 Pin Configuration



Top View



N-Channel MOSFET

FEATURES

- DT-Trench Power MOSFET
- 175 °C Junction Temperature
- Low Thermal Resistance Package
- 100 % R_g and UIS tested



RoHS*
COMPLIANT

APPLICATIONS

- LCD/LED TV
- Consumer Appliances
- Lighting
- AC-DC Power Supply

ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-Source Voltage	V_{DS}	200	V	
Gate-Source Voltage	V_{GS}	± 20		
Continuous Drain Current	V_{GS} at 10 V	$T_C = 25$ °C	25 ^a	A
		$T_C = 100$ °C	18 ^a	
Pulsed Drain Current	I_{DM}	100		
Single Pulse Avalanche Energy	E_{AS}	365	mJ	
Avalanche Current	I_{AR}	25	A	
Repetitive Avalanche Energy	E_{AR}	14	mJ	
Maximum Power Dissipation	P_D	$T_C = 25$ °C	3.1 ^c	W
		$T_A = 25$ °C ^b	130	
Peak Diode Recovery dV/dt	dV/dt	5.0	V/ns	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to + 175	°C	
Soldering Recommendations (Peak Temperature)	for 10 s	300		

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient (PCB Mounted, Steady-State)	R_{thJA}	-	65	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	4.98	

a. Package limited.

b. When Mounted on 1" square PCB (FR-4 material).

c. See SOA curve for voltage derating.

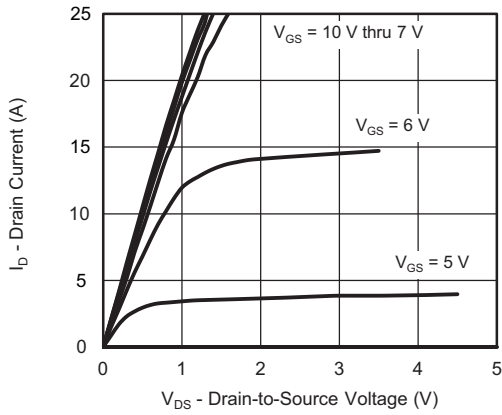
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	200	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2	-	4	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$	-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 160\text{ V}, V_{GS} = 0\text{ V}$	-	-	1	μA
		$V_{DS} = 160\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	-	100	
		$V_{DS} = 160\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$	-	-	2	mA
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 10\text{ V}, V_{GS} = 10\text{ V}$	25	-	-	A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 10\text{ A}$	-	0.122	0.145	Ω
		$V_{GS} = 7.5\text{ V}, I_D = 8\text{ A}$	-	0.135	0.158	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 20\text{ V}, I_D = 10\text{ A}$	-	15	-	S
Dynamic ^b						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = 160\text{ V}, f = 1\text{ MHz}$	-	2450	-	pF
Output Capacitance	C_{oss}		350			
Reverse Transfer Capacitance	C_{rss}		-	90	-	
Total Gate Charge ^c	Q_g	$V_{DS} = 160\text{ V}, V_{GS} = 10\text{ V}, I_D = 10\text{ A}$	-	25	41	nC
Gate-Source Charge ^c	Q_{gs}		4.5			
Gate-Drain Charge ^c	Q_{gd}		13			
Gate Resistance	R_g	$f = 1\text{ MHz}$	-	3.9	-	Ω
Turn-On Delay Time ^c	$t_{d(on)}$	$V_{DD} = 160\text{ V}, R_L = 1.67\text{ }\Omega$ $I_D \cong 10\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$	-	15	26	ns
Rise Time ^c	t_r		25	44		
Turn-Off Delay Time ^c	$t_{d(off)}$		-	27	54	
Fall Time ^c	t_f		-	9	20	
Drain-Source Body Diode Ratings and Characteristics ^b ($T_C = 25\text{ }^\circ\text{C}$)						
Pulsed Current ($t = 100\text{ }\mu\text{s}$)	I_{SM}		-	-	100	A
Forward Voltage ^a	V_{SD}	$I_F = 20\text{ A}, V_{GS} = 0\text{ V}$	-	0.75	1.5	V
Reverse Recovery Time	t_{rr}	$I_F = 20\text{ A}, d/dt = 100\text{ A}/\mu\text{s}$	-	88	176	ns
Peak Reverse Recovery Charge	$I_{RM(REC)}$		-	5	10	A
Reverse Recovery Charge	Q_{rr}		0.22	0.44	μC	

Notes

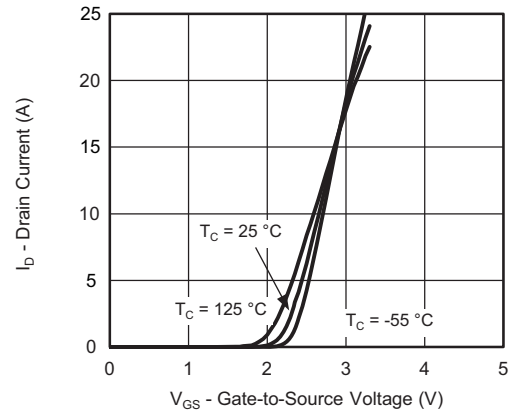
- Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

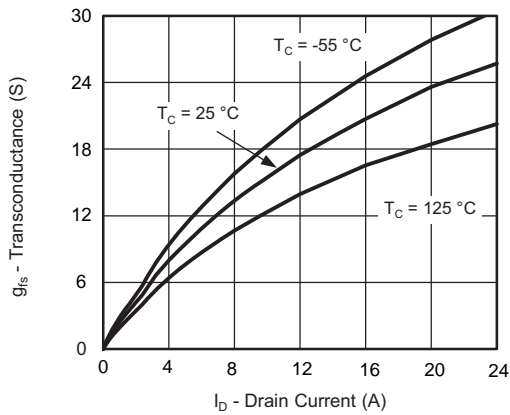
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



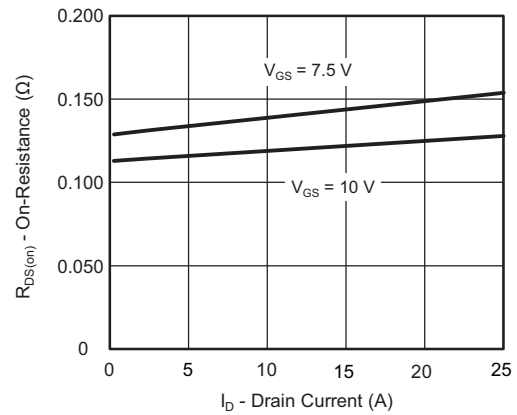
Output Characteristics



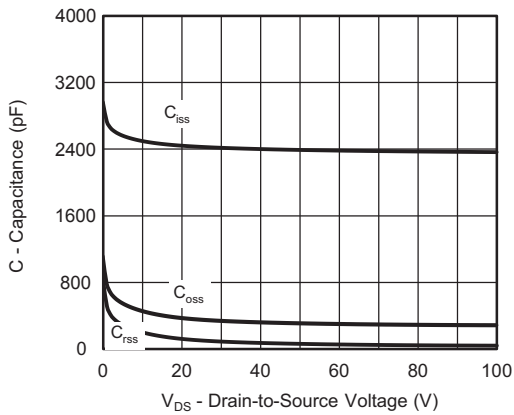
Transfer Characteristics



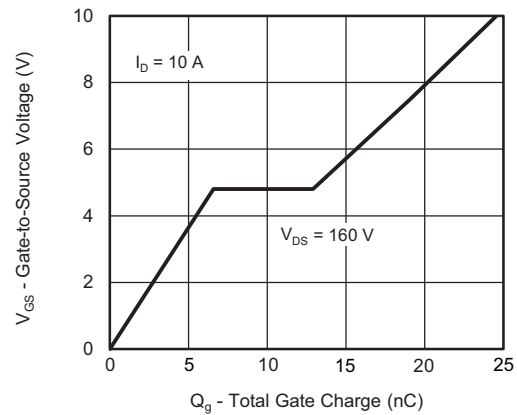
Transconductance



On-Resistance vs. Drain Current

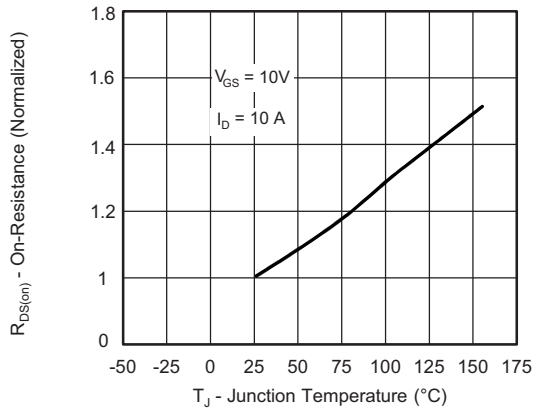


Capacitance

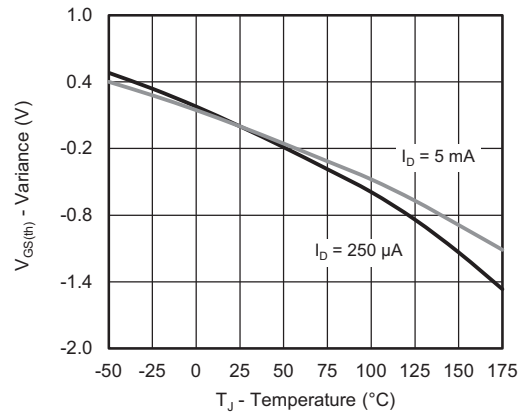


Gate Charge

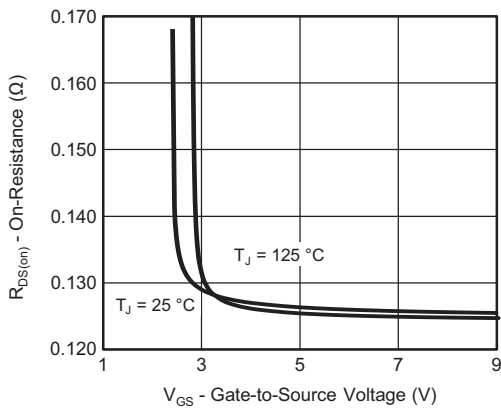
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



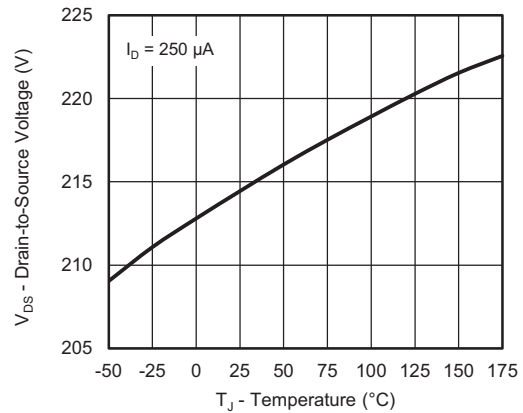
On-Resistance vs. Junction Temperature



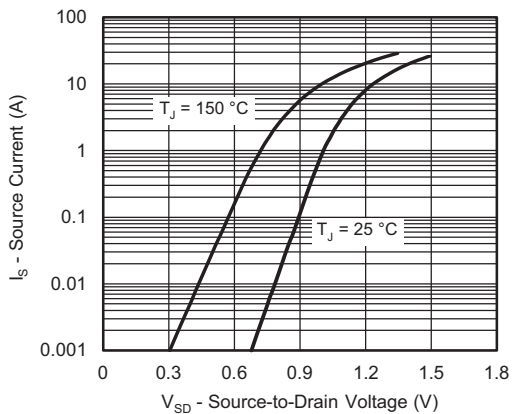
Threshold Voltage



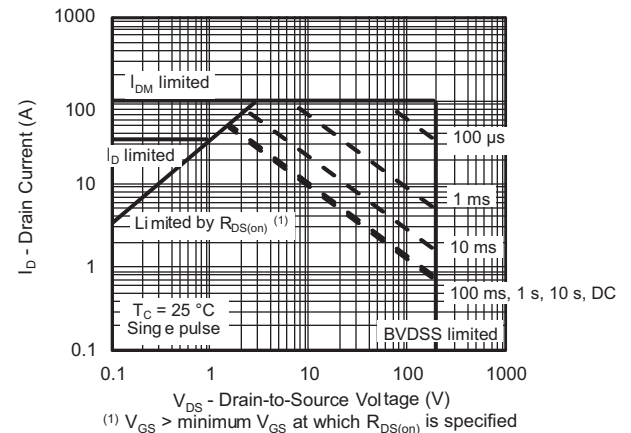
On-Resistance vs. Gate-to-Source Voltage



Drain Source Breakdown vs. Junction Temperature



Source Drain Diode Forward Voltage



(1) $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area

THERMAL RATINGS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)

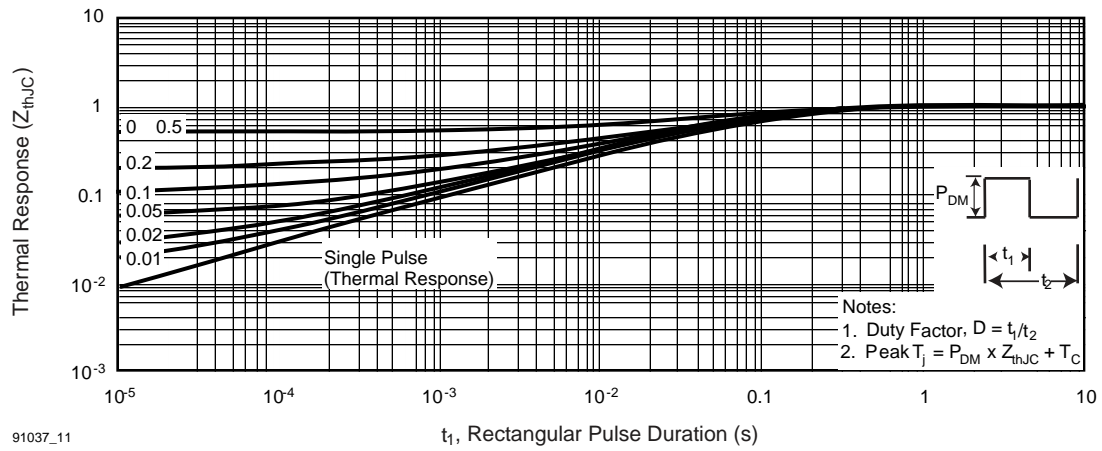
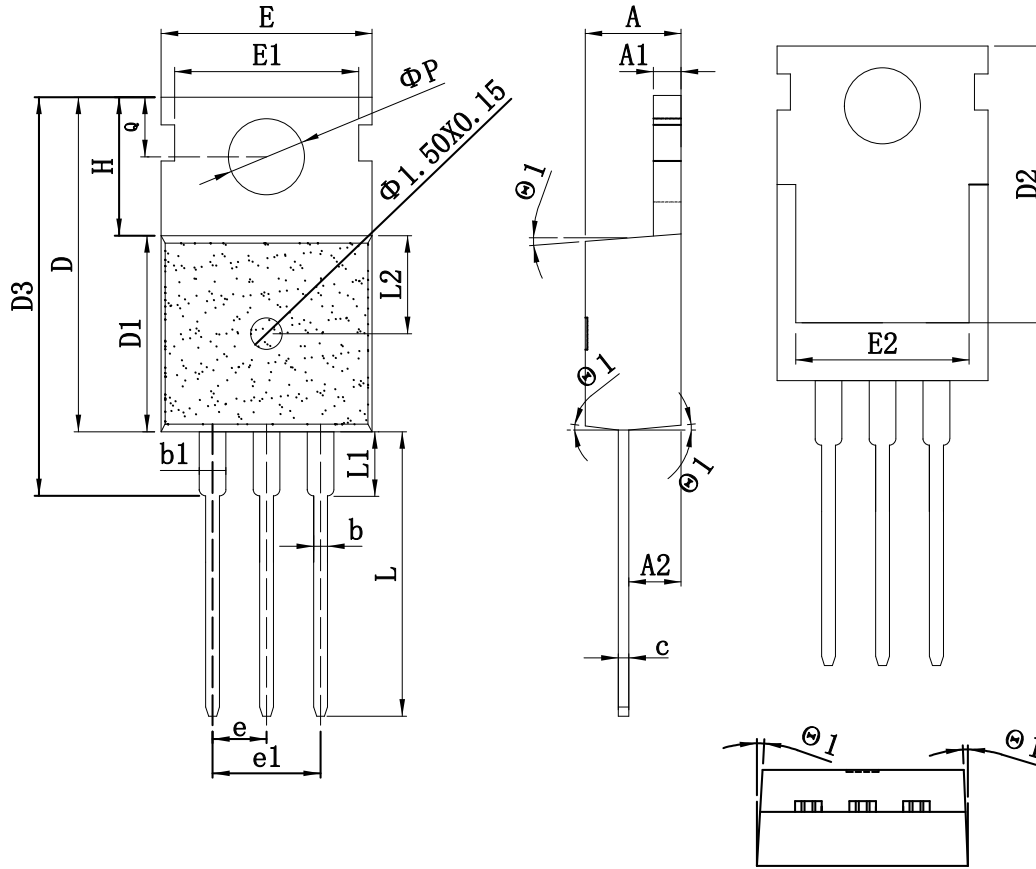


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

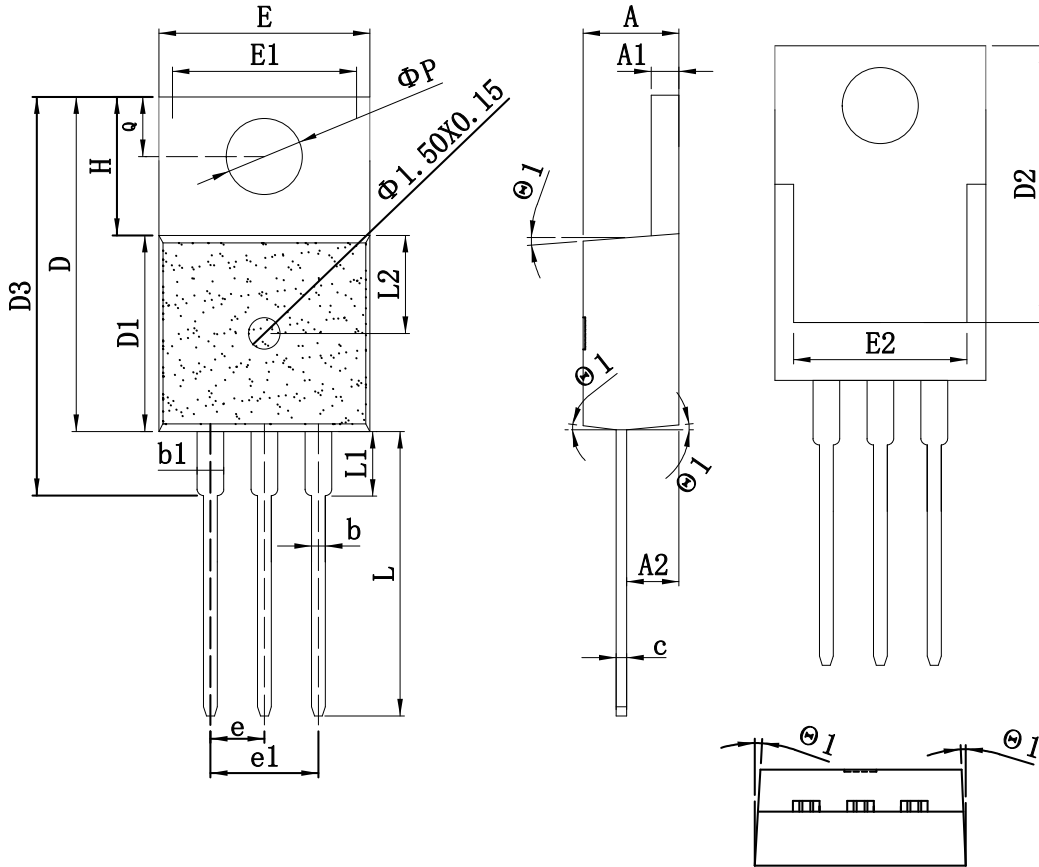
TO-220_3L-A PACKAGE OUTLINE



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	mm			SYMBOL	mm		
	MIN	TYP	MAX		MIN	TYP	MAX
A	4.15	4.50	4.80	E1	8.25	8.70	9.15
A1	1.15	1.30	1.50	E2	7.20	8.00	8.80
A2	2.10	2.40	2.65	e	2.38	2.54	2.74
b	0.65	0.80	1.00	e1	5.08REF		
b1	1.10	1.33	1.80	H	6.20	6.50	6.90
c	0.35	0.50	0.65	L	12.75	13.28	13.70
D	14.25	15.75	16.15	L1	-	-	3.50
D1	8.70	9.20	9.60	L2	2.30	4.65	7.00
D2	12.30	13.10	13.85	ϕP	3.40	3.65	3.85
D3	16.20	18.80	20.60	Q	2.50	2.80	3.00
E	8.68	10.02	11.00	θ	2°	-	7°

TO-220_3L-B PACKAGE OUTLINE



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	mm			SYMBOL	mm		
	MIN	TYP	MAX		MIN	TYP	MAX
A	4.15	4.50	4.80	E1	8.25	8.70	9.15
A1	1.15	1.30	1.50	E2	7.20	8.00	8.80
A2	2.10	2.40	2.65	e	2.38	2.54	2.74
b	0.65	0.80	1.00	e1	5.08REF		
b1	1.10	1.33	1.80	H	6.20	6.50	6.90
c	0.35	0.50	0.65	L	12.75	13.28	13.70
D	14.25	15.75	16.15	L1	-	-	3.50
D1	8.70	9.20	9.60	L2	2.30	4.65	7.00
D2	12.30	13.10	13.85	ϕP	3.40	3.65	3.85
D3	16.20	18.80	20.60	Q	2.50	2.80	3.00
E	8.68	10.02	11.00	θ	2°	-	7°

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