

NTMFS4701N

Power MOSFET

30 V, 20 A, Single N-Channel, SO-8 Flat Lead Package

Features

- Thermally and Electrically Enhanced Packaging Compatible with Standard SO-8
- New Package Provides Capability of Inspection and Probe After Board Mounting
- Ultra Low $R_{DS(on)}$ (at 4.5 V_{GS}), Low Gate Resistance and Low Q_G
- Optimized for High Side Control Applications
- High Speed Switching Capability
- This is a Pb-Free Device

Applications

- Notebook Computer Vcore Applications
- Network Applications
- DC-DC Converters

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating		Symbol	Value	Unit	
Drain-to-Source Voltage		V _{DSS}	30	V	
Gate-to-Source Voltage		V _{GS}	±20	V	
Continuous Drain Current (Note 1)	Steady State	T _A = 25°C	I _D	12.3	A
		T _A = 70°C		9.8	
	t ≤ 10 s	T _A = 25°C	I _D	20	
Power Dissipation (Note 1)	Steady State	T _A = 25°C	P _D	2.3	W
	t ≤ 10 s	T _A = 25°C	P _D	6.0	
Continuous Drain Current (Note 2)	Steady State	T _A = 25°C	I _D	7.7	A
		T _A = 70°C		6.2	
		T _A = 25°C	P _D	0.9	W
Power Dissipation (Note 2)					
Pulsed Drain Current	t _p = 10 μs	I _{DM}	60	A	
Operating and Storage Temperature		T _J , T _{stg}	-55 to 150	°C	
Source Current (Body Diode)		I _S	6.0	A	
Single Pulse Drain-to-Source Avalanche Energy (V _{DD} = 25 V, V _{GS} = 10 V, I _{PK} = 7.5 A, L = 10 mH, R _G = 25 Ω)		E _{AS}	280	mJ	
Lead Temperature for Soldering Purposes (1/8 in from case for 10 s)		T _L	260	°C	

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. Surface-mounted on FR4 board using 1 in sq. pad size (Cu area 1.127 in sq. [1 oz] including traces).
2. Surface-mounted on FR4 board using minimum recommended pad size (Cu area 0.412 in sq.).

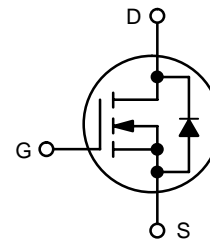


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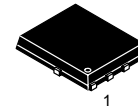
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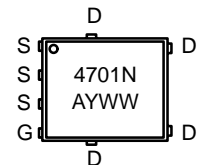
V _{(BR)DSS}	R _{DS(on)} TYP	I _D MAX
30 V	6.0 mΩ @ 10 V	20 A
	8.0 mΩ @ 4.5 V	



MARKING DIAGRAM



SO-8 FLAT LEAD
CASE 488AA



- 4701N = Specific Device Code
- A = Assembly Location
- Y = Year
- WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping†
NTMFS4701NT1G	SO-8 FL (Pb-Free)	1500 Tape & Reel
NTMFS4701NT3G	SO-8 FL (Pb-Free)	5000 Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

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THERMAL RESISTANCE RATINGS

Rating	Symbol	Value	Unit
Junction-to-Case – Steady State	$R_{\theta JC}$	4.0	°C/W
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	140	
Junction-to-Ambient – $t \leq 10$ s (Note 1)	$R_{\theta JA}$	21	
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	55	

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0$ V, $I_D = 250$ μA	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			7.2		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0$ V, $V_{DS} = 24$ V	$T_J = 25^\circ\text{C}$		1.0	μA
			$T_J = 125^\circ\text{C}$		50	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0$ V, $V_{GS} = \pm 20$ V			± 100	nA

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}$, $I_D = 250$ μA	1.0		3.0	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			5.0		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 4.5$ V, $I_D = 17$ A		8.0	11	m Ω
			$V_{GS} = 10$ V, $I_D = 20$ A		6.0	
Forward Transconductance	g_{FS}	$V_{DS} = 15$ V, $I_D = 20$ A		70		S

CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{GS} = 0$ V, $f = 1.0$ MHz, $V_{DS} = 24$ V		1280		pF
Output Capacitance	C_{OSS}			500		
Reverse Transfer Capacitance	C_{RSS}			120		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5$ V, $V_{DS} = 15$ V, $I_D = 20$ A		11	15	nC
Threshold Gate Charge	$Q_{G(TH)}$			1.1		
Gate-to-Source Charge	Q_{GS}			2.0		
Gate-to-Drain Charge	Q_{GD}			6.0		
Gate Resistance	R_G			1.4		

SWITCHING CHARACTERISTICS, $V_{GS} = 4.5$ V (Note 4)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10$ V, $V_{DD} = 15$ V, $I_D = 1.0$ A, $R_G = 6.0$ Ω		9.0		ns
Rise Time	t_r			4.0		
Turn-Off Delay Time	$t_{d(OFF)}$			29		
Fall Time	t_f			19		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0$ V, $I_S = 6.0$ A	$T_J = 25^\circ\text{C}$		0.75	1.0	V
			$T_J = 125^\circ\text{C}$		0.55		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0$ V, $dI_S/dt = 100$ A/ μs , $I_S = 6.0$ A			34		ns
Charge Time	t_a				16		
Discharge Time	t_b				18		
Reverse Recovery Charge	Q_{RR}				27		

3. Pulse Test: Pulse Width ≤ 300 μs , Duty Cycle $\leq 2\%$.

4. Switching characteristics are independent of operating junction temperatures.

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TYPICAL PERFORMANCE CURVES

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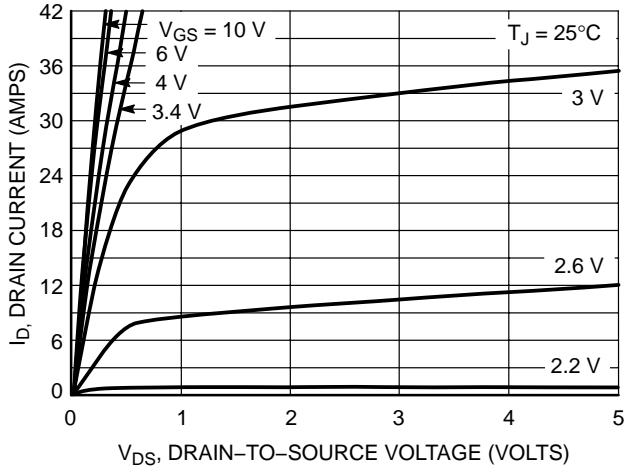


Figure 1. On-Region Characteristics

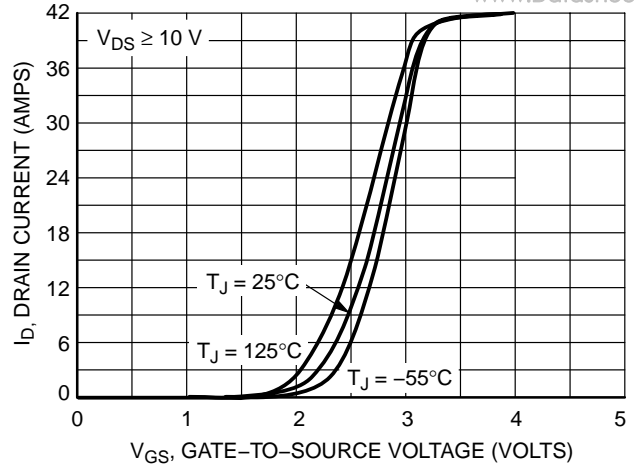


Figure 2. Transfer Characteristics

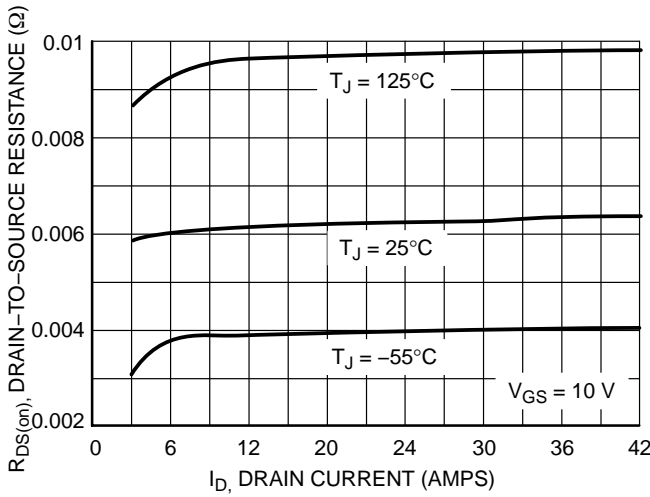


Figure 3. On-Resistance vs. Drain Current and Temperature

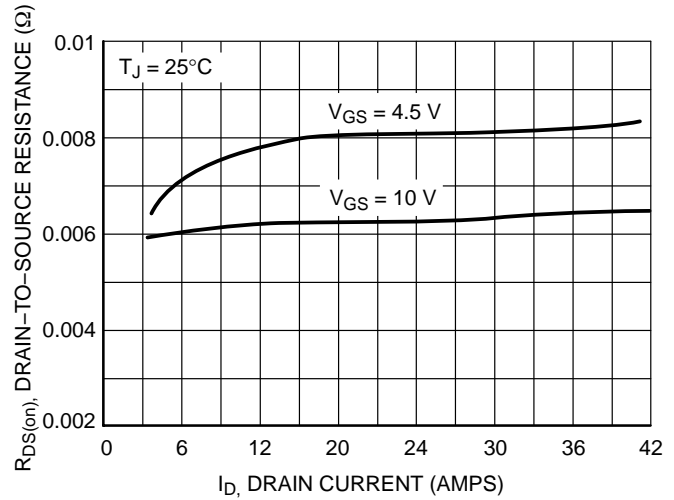


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

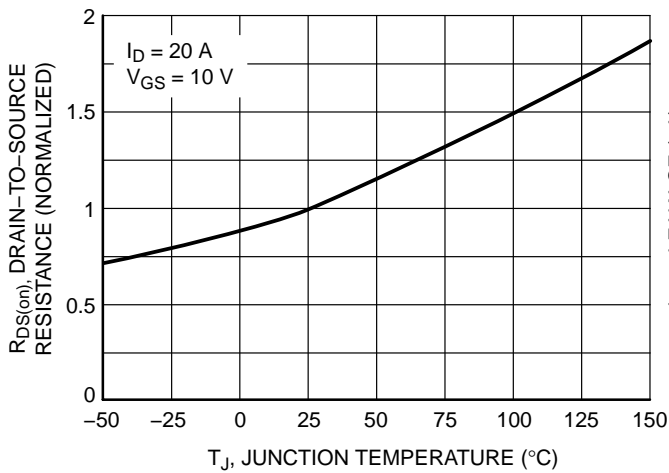


Figure 5. On-Resistance Variation with Temperature

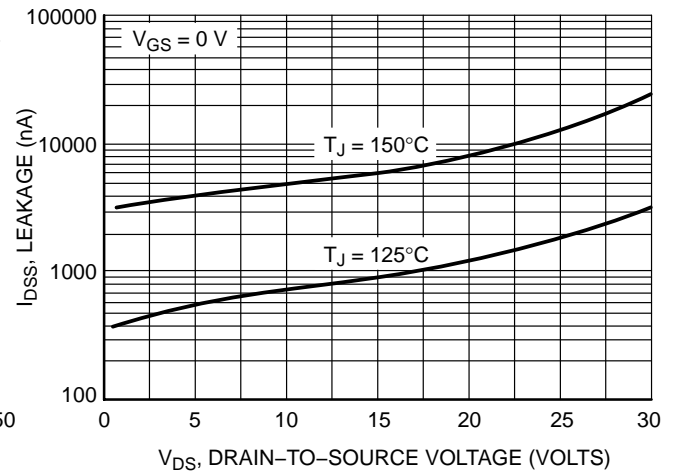


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES

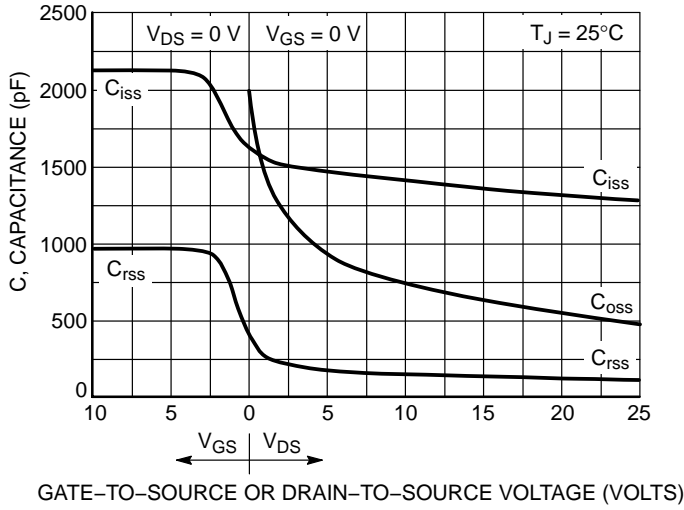


Figure 7. Capacitance Variation

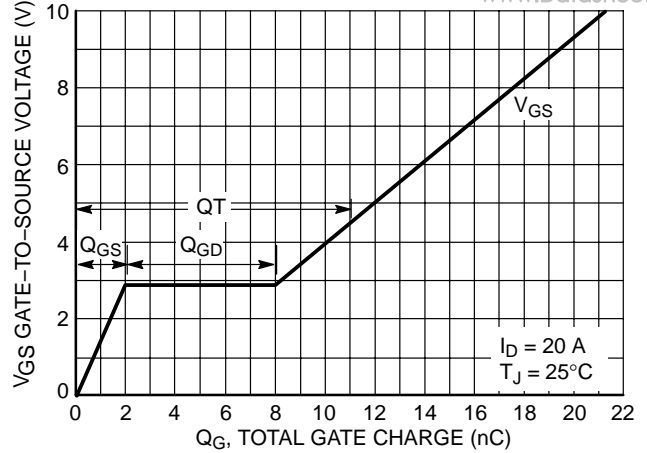


Figure 8. Gate-To-Source and Drain-To-Source Voltage vs. Total Charge

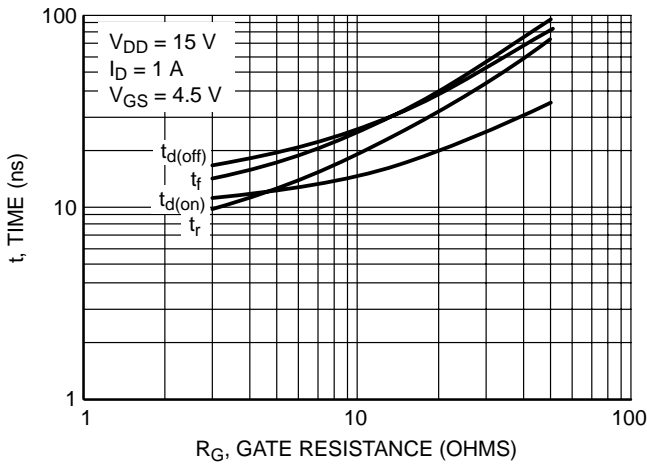


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

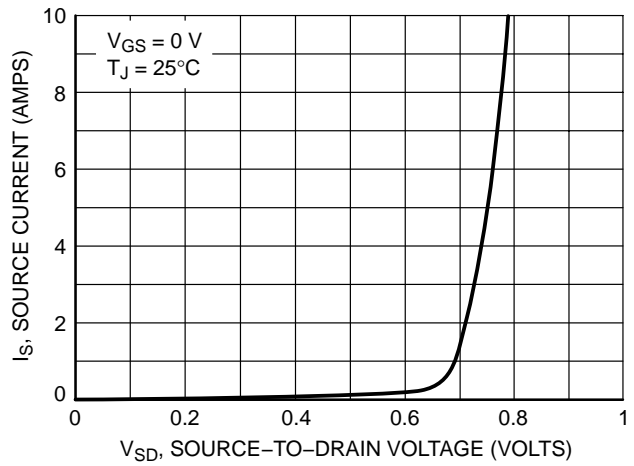


Figure 10. Diode Forward Voltage vs. Current

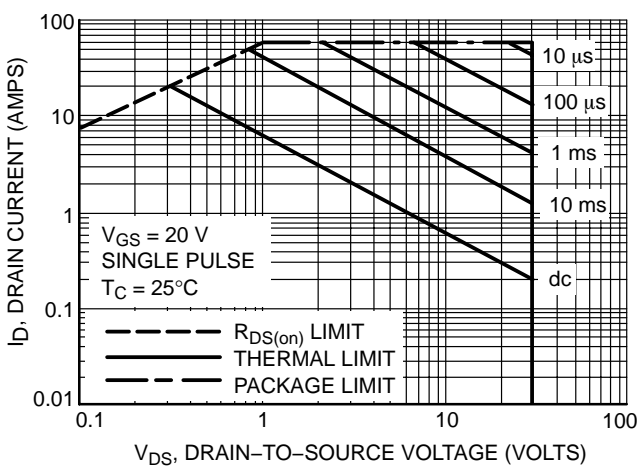


Figure 11. Maximum Rated Forward Biased Safe Operating Area

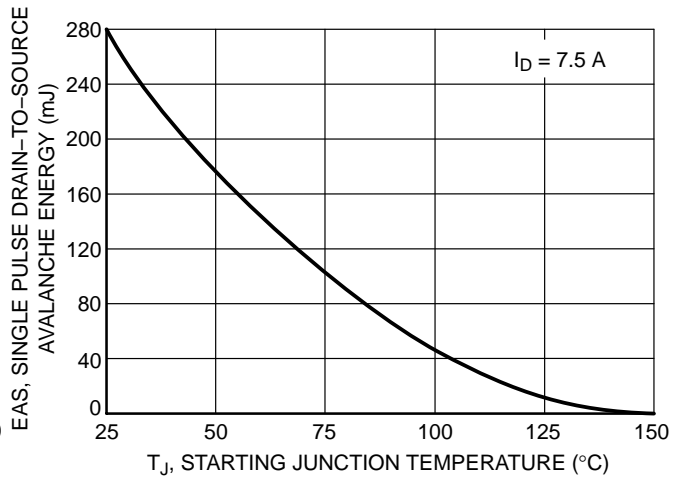


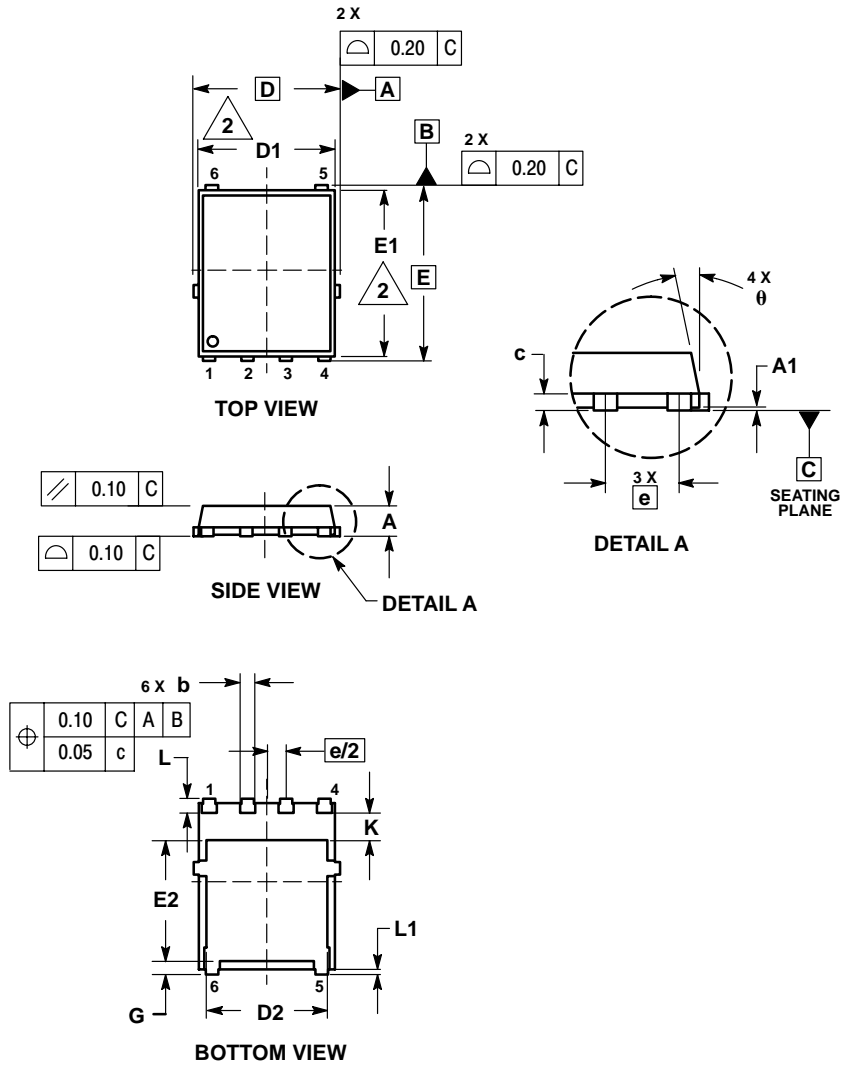
Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

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PACKAGE DIMENSIONS


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SO-8 FLAT LEAD
CASE 488AA-01
ISSUE A



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.90	0.99	1.20
A1	0.00	----	0.05
b	0.33	0.41	0.51
c	0.23	0.28	0.33
D	5.15 BSC		
D1	4.50	4.90	5.10
D2	3.50	----	4.22
E	6.15 BSC		
E1	5.50	5.80	6.10
E2	3.45	----	4.30
e	1.27 BSC		
G	0.51	0.61	0.71
K	0.51	----	----
L	0.51	0.61	0.71
L1	0.05	0.17	0.20
θ	0°	----	12°

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