

MOSFET – Power, Single N-Channel

40 V, 1.25 mΩ, 451 A

NVMJST1D2N04C

Features

- Small Footprint (5x7 mm) for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- TCPAK57 5x7 Top Cool Package
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

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

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	40	V
Gate-to-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current $R_{\theta JC}$ (Notes 1, 3)	I_D	451	A
		319	
Power Dissipation $R_{\theta JC}$ (Note 1)	P_D	454	W
		227	
Pulsed Drain Current	I_{DM}	900	A
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +175	°C
Source Current (Body Diode)	I_S	379	A
Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = 24$ A)	E_{AS}	1541	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	T_L	260	°C

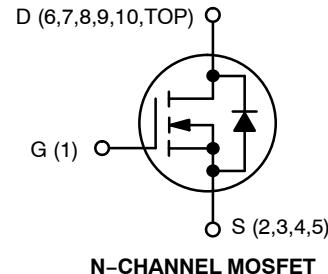
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE MAXIMUM RATINGS

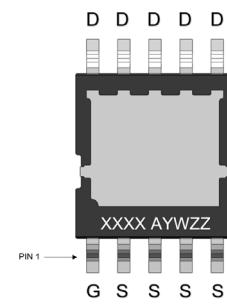
Parameter	Symbol	Value	Unit
Junction-to-Case – Steady State	$R_{\theta JC}$	0.33	°C/W
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	29	
Junction-to-Drain Lead	Ψ_{JL}	5.2	
Junction-to-Source Lead	Ψ_{JL}	5.16	
Junction-to-Heatsink Top (Note 2)	Ψ_{JH}	1.5	

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. 2s2p JEDEC51-7 standard PCB mounted to a 25x25x3 (mm) aluminum heatsink with a 12 w/mK TIM interface.
3. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

$V_{(BR)DSS}$	$R_{DS(on)} \text{ MAX}$	$I_D \text{ MAX}$
40 V	1.25 mΩ @ 10 V	451 A



MARKING DIAGRAM



XXXX = Specific Device Code

A = Assembly Location

Y = Year

W = Work Week

ZZ = Assembly Lot Code

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 5 of this data sheet.

NVMJST1D2N04C

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = 250 μA		40			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /T _J				20		mV/°C
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V, V _{DS} = 40 V	T _J = 25 °C		10		μA
			T _J = 125°C			100	
Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0 V, V _{GS} = 20 V				100	nA
ON CHARACTERISTICS (Note 4)							
Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = 200 μA		2.0		4.0	V
Threshold Temperature Coefficient	V _{GS(TH)} /T _J				-7.7		mV/°C
Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 50 A		1.06	1.25	mΩ
Forward Transconductance	g _{FS}	V _{DS} = 5 V, I _D = 50 A			161		S
CHARGES, CAPACITANCES & GATE RESISTANCE							
Input Capacitance	C _{ISS}	V _{GS} = 0 V, f = 1 MHz, V _{DS} = 20 V			5340		pF
Output Capacitance	C _{OSS}				3500		
Reverse Transfer Capacitance	C _{rss}				140		
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 10 V, V _{DS} = 32 V; I _D = 50 A			82		nC
Threshold Gate Charge	Q _{G(TH)}	V _{GS} = 10 V, V _{DS} = 32 V; I _D = 50 A			5.3		
Gate-to-Source Charge	Q _{GS}				21		
Gate-to-Drain Charge	Q _{GD}				23		
Plateau Voltage	V _{GP}				4.7		
SWITCHING CHARACTERISTICS (Note 5)							
Turn-On Delay Time	t _{d(ON)}	V _{GS} = 10 V, V _{DS} = 32 V, I _D = 50 A, R _G = 2.5 Ω			22		ns
Rise Time	t _r				19		
Turn-Off Delay Time	t _{d(OFF)}				54		
Fall Time	t _f				20		
DRAIN-SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 50 A	T _J = 25°C		0.8	1.2	V
			T _J = 125°C		0.65		
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, dI _S /dt = 100 A/μs, I _S = 50 A			113		ns
Charge Time	t _a				52		
Discharge Time	t _b				61		
Reverse Recovery Charge	Q _{RR}				236		

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

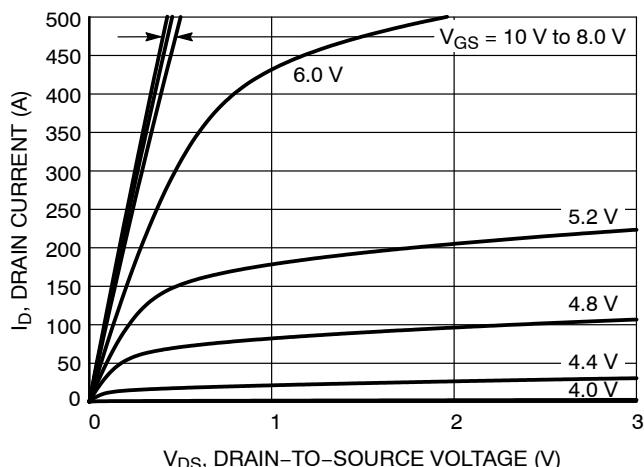


Figure 1. On-Region Characteristics

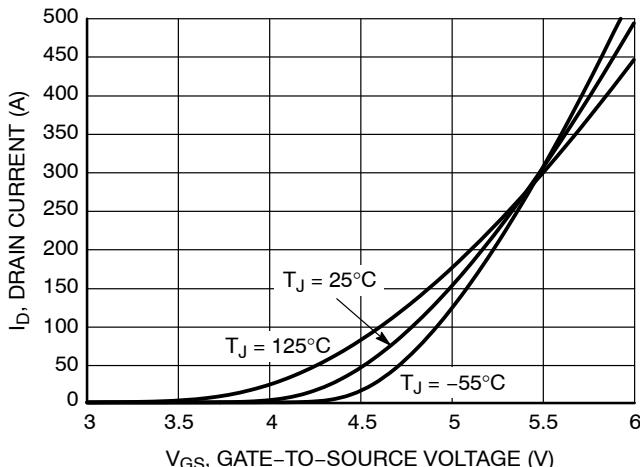


Figure 2. Transfer Characteristics

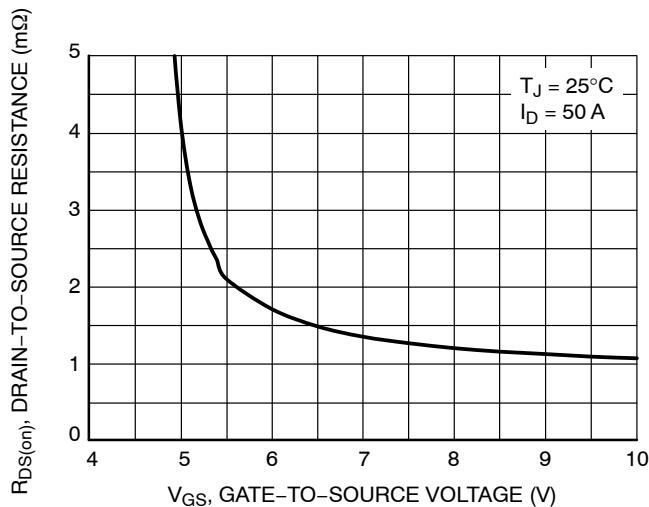


Figure 3. On-Resistance vs. Gate-to-Source Voltage

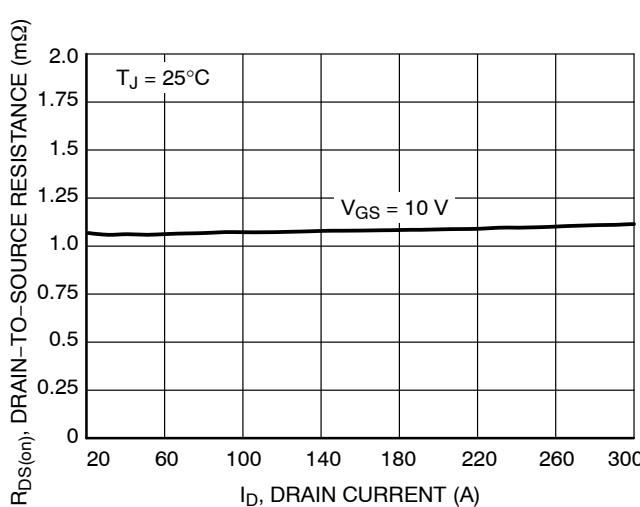


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

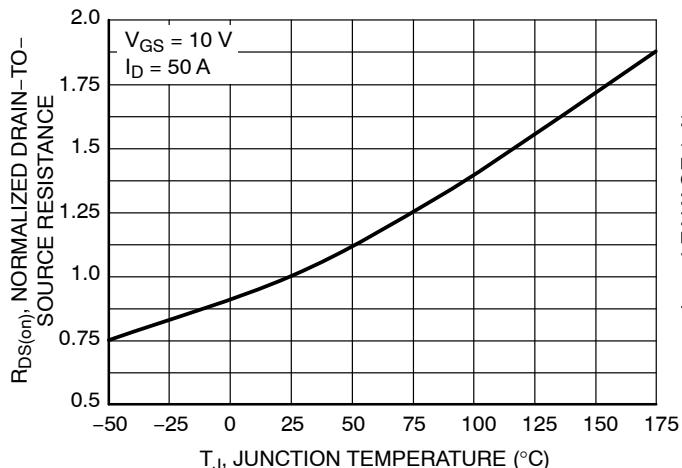


Figure 5. On-Resistance Variation with Temperature

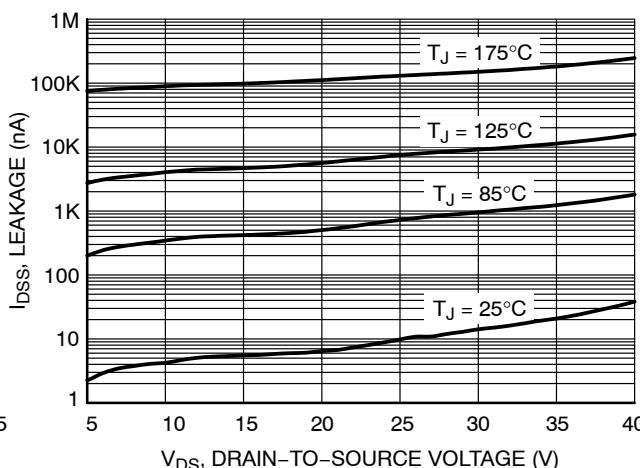


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

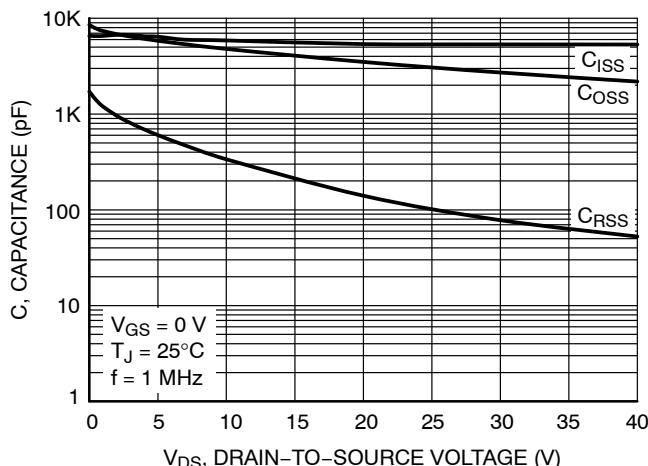


Figure 7. Capacitance Variation

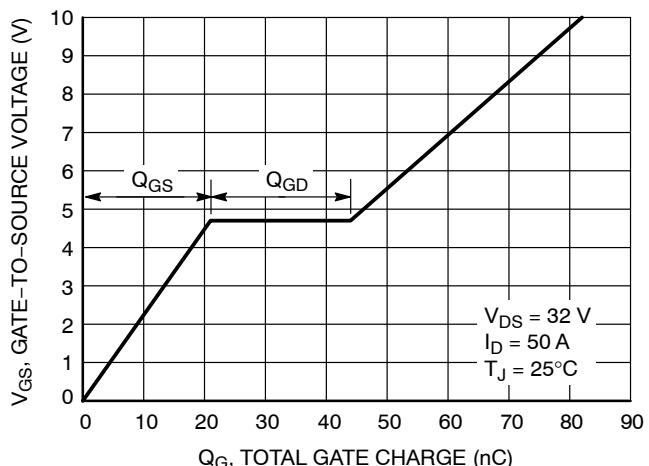


Figure 8. Gate-to-Source vs. Total Charge

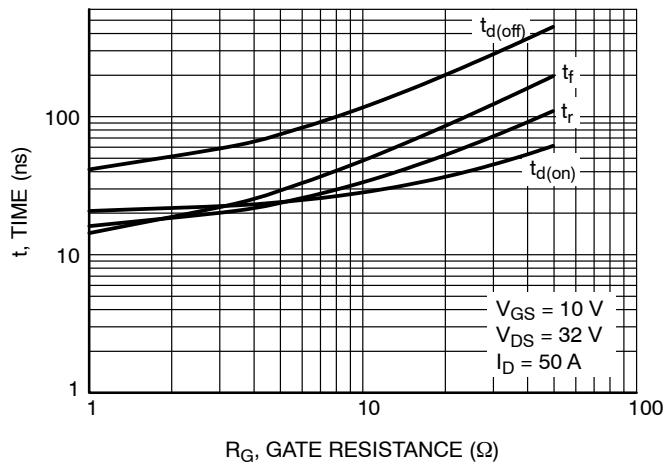


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

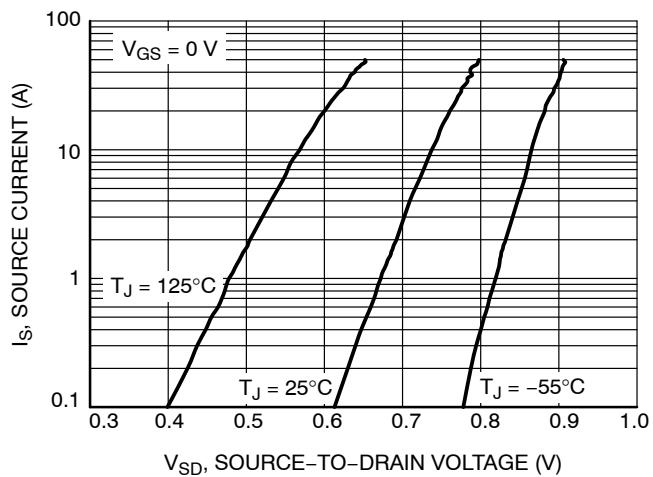


Figure 10. Diode Forward Voltage vs. Current

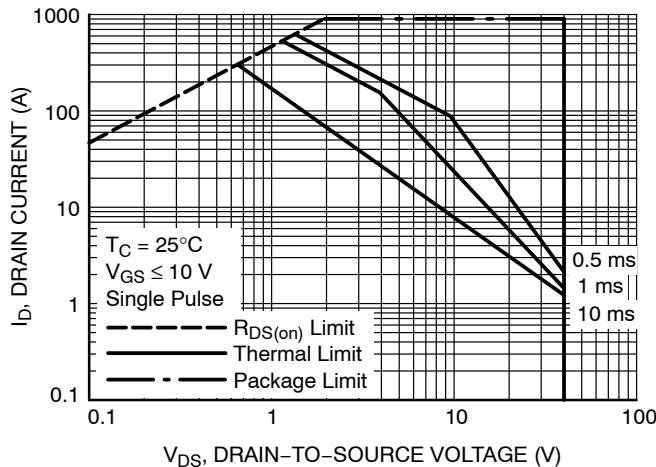


Figure 11. Maximum Rated Forward Biased Safe Operating Area

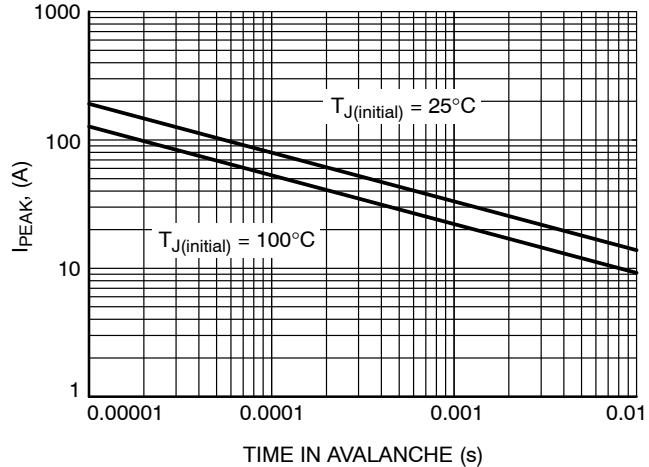


Figure 12. I_{PEAK} vs. Time in Avalanche

TYPICAL CHARACTERISTICS

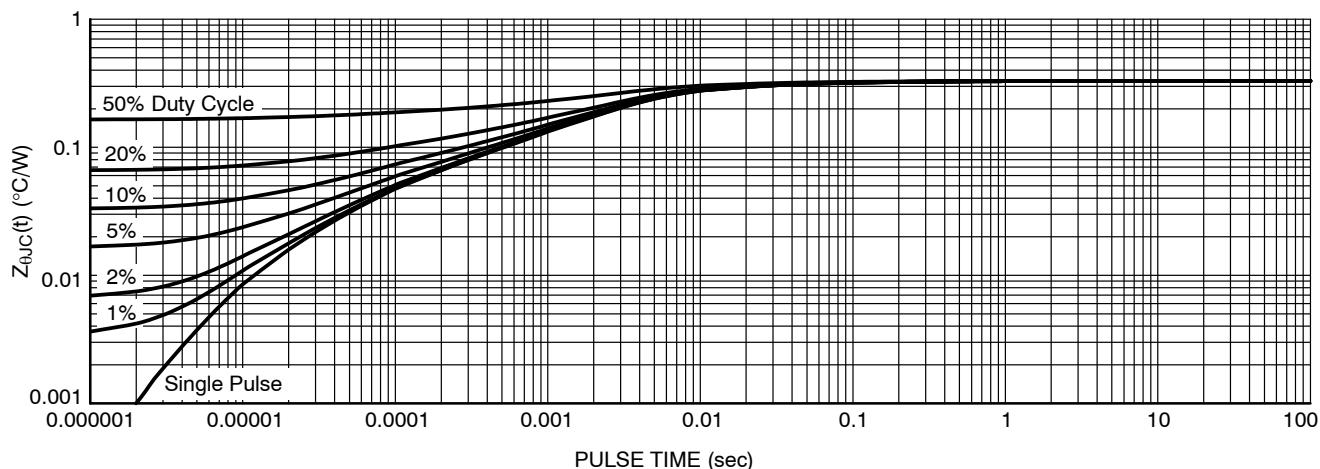


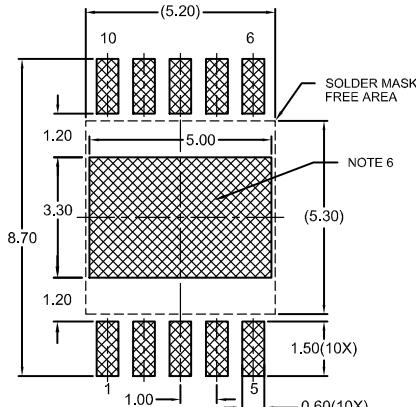
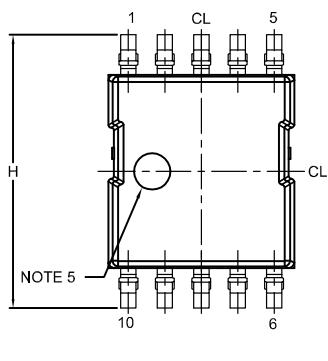
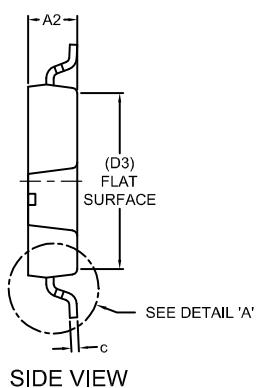
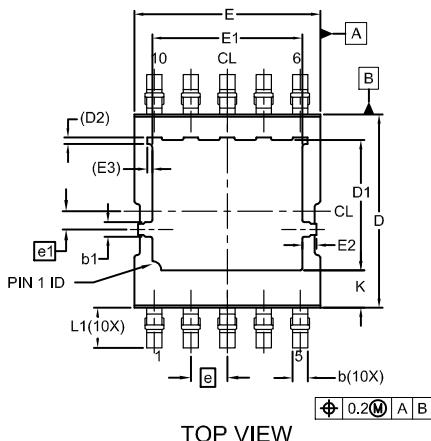
Figure 13. Thermal Characteristics

DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping [†]
NVMJST1D2N04CTXG	1D24C	TCPAK57 (Pb-Free)	3000 / Tape & Reel

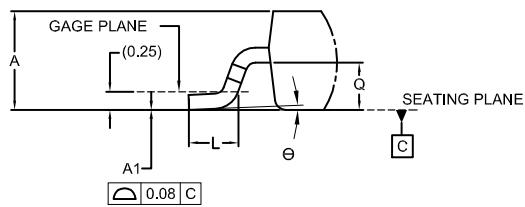
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

PACKAGE DIMENSIONS

LFPAK10 7.5x5
CASE 760AG
ISSUE C

*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

MILLIMETERS			
DIM	MIN	NOM	MAX
A	1.30	1.35	1.45
A1	-0.05	0.00	0.05
A2	1.30	1.35	1.40
b	0.36	0.41	0.46
b1	0.30	0.40	0.50
c	0.16	0.21	0.26
D	5.20	5.30	5.40
D1	3.47	3.57	3.67
D2	0.17 REF		
D3	4.82 REF		
E	5.00	5.10	5.20
E1	4.02	4.12	4.22
E2	0.30	0.40	0.50
E3	0.14 REF		
e	1.00 BSC		
e1	0.50 BSC		
K	0.93	1.03	1.13
H	7.30	7.50	7.70
L	0.49	0.69	0.89
L1	0.90	1.10	1.30
Q	0.60	0.65	0.70
Θ	0°	2.5°	5°



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