

Power MOSFET

PRODUCT SUMMARY

V_{DS} (V)	1200	
$R_{DS(on)}$ (Ω)	$V_{GS} = 10\text{ V}$	4.5
Q_g (Max.) (nC)	170	
Q_{gs} (nC)	20	
Q_{gd} (nC)	110	
Configuration	Single	

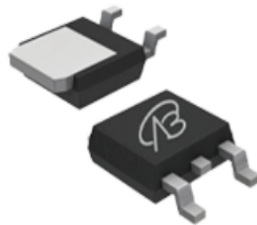
FEATURES

- Dynamic dV/dt Rating
- Repetitive Avalanche Rated
- Isolated Central Mounting Hole
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements
- Compliant to RoHS Directive 2002/95/EC



Available
RoHS*
 COMPLIANT

TO-252



Top View



N-Channel MOSFET

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

PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V _{DS}	1200	V
Gate-Source Voltage			V _{GS}	± 30	
Continuous Drain Current	V _{GS} at 10 V	T _C = 25 °C	I _D	2	A
		T _C = 100 °C		1.6	
Pulsed Drain Current ^a			I _{DM}	6	
Linear Derating Factor				1.5	W/°C
Single Pulse Avalanche Energy ^b			E _{AS}	800	mJ
Repetitive Avalanche Current ^a			I _{AR}	6.0	A
Repetitive Avalanche Energy ^a			E _{AR}	19	mJ
Maximum Power Dissipation	T _C = 25 °C		P _D	190	W
Peak Diode Recovery dV/dt ^c			dV/dt	1.0	V/ns
Operating Junction and Storage Temperature Range			T _J , T _{stg}	- 55 to + 150	°C
Soldering Recommendations (Peak Temperature)	for 10 s			300 ^d	
Mounting Torque	6-32 or M3 screw			10	lbf · in
				1.1	N · m

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = 50\text{ V}$, starting $T_J = 25\text{ }^\circ\text{C}$, $L = 40\text{ mH}$, $R_g = 25\text{ }\Omega$, $I_{AS} = 6.1\text{ A}$ (see fig. 12).
- $I_{SD} \leq 6.1\text{ A}$, $dI/dt \leq 120\text{ A}/\mu\text{s}$, $V_{DD} \leq 600$, $T_J \leq 150\text{ }^\circ\text{C}$.
- 1.6 mm from case.

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	40	°C/W
Case-to-Sink, Flat, Greased Surface	R_{thCS}	0.24	-	
Maximum Junction-to-Case (Drain)	R_{thJC}	-	0.65	

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 V, I _D = 250 μA		1200	-	-	V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	Reference to 25 °C, I _D = 1 mA		-	1.2	-	V/°C
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA		3.0	-	4.0	V
Gate-Source Leakage	I _{GSS}	V _{GS} = ± 30 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 960 V, V _{GS} = 0 V		-	-	100	μA
		V _{DS} = 960 V, V _{GS} = 0 V, T _J = 125 °C		-	-	500	
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 2 A ^b	-	4.5	-	Ω
Forward Transconductance	g _{fs}	V _{DS} = 100 V, I _D = 2A ^b		5.4	-	-	S
Dynamic							
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 25 V, f = 1.0 MHz, see fig. 5		-	500	-	pF
Output Capacitance	C _{oss}			-	250	-	
Reverse Transfer Capacitance	C _{rss}			-	84	-	
Total Gate Charge	Q _g	V _{GS} = 10 V	I _D = 2 A, V _{DS} = 400 V, see fig. 6 and 13 ^b	-	-	170	nC
Gate-Source Charge	Q _{gs}			-	-	20	
Gate-Drain Charge	Q _{gd}			-	-	110	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 500 V, I _D = 2 A, R _g = 6.2 Ω, R _D = 81 Ω, see fig. 10 ^b		-	19	-	ns
Rise Time	t _r			-	35	-	
Turn-Off Delay Time	t _{d(off)}			-	60	-	
Fall Time	t _f			-	36	-	
Internal Drain Inductance	L _D	Between lead, 6 mm (0.25") from package and center of die contact		-	5.0	-	nH
Internal Source Inductance	L _S			-	13	-	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I _S	MOSFET symbol showing the integral reverse p - n junction diode		-	-	2	A
Pulsed Diode Forward Current ^a	I _{SM}			-	-	6	
Body Diode Voltage	V _{SD}	T _J = 25 °C, I _S = 2 A, V _{GS} = 0 V ^b		-	-	1.8	V
Body Diode Reverse Recovery Time	t _{rr}	T _J = 25 °C, I _F = 2 A, dI/dt = 100 A/μs ^b		-	4	-	ns
Body Diode Reverse Recovery Charge	Q _{rr}			-	3.5	5.3	μC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L _S and L _D)					

Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
 b. Pulse width $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\%$.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

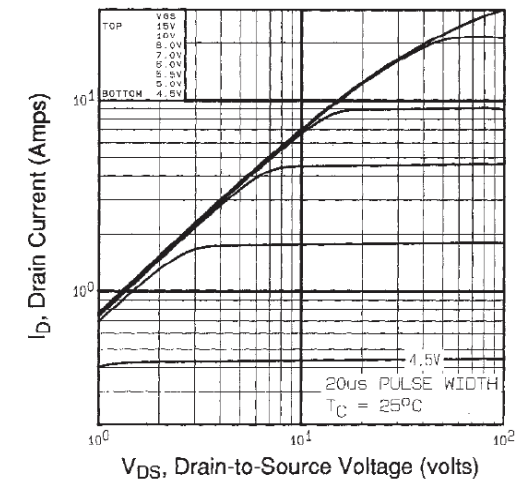


Fig. 1 - Typical Output Characteristics, $T_C = 25\text{ }^{\circ}\text{C}$

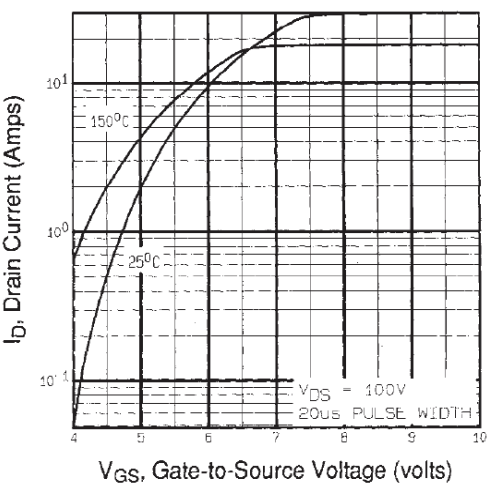


Fig. 3 - Typical Transfer Characteristics

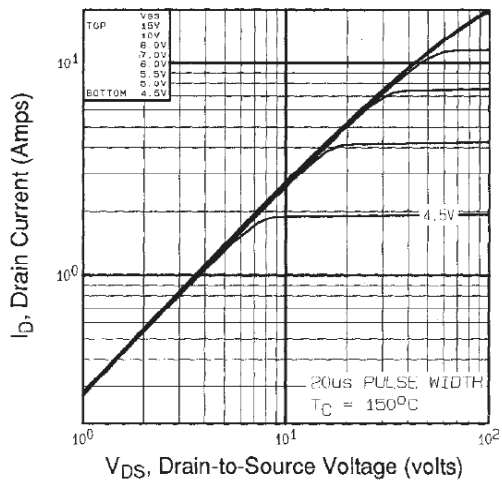


Fig. 2 - Typical Output Characteristics, $T_C = 150\text{ }^{\circ}\text{C}$

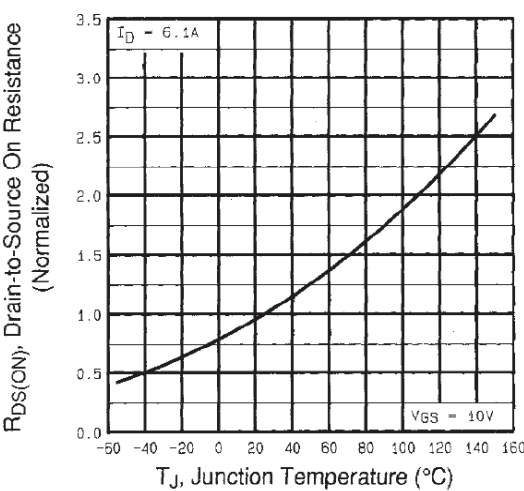


Fig. 4 - Normalized On-Resistance vs. Temperature

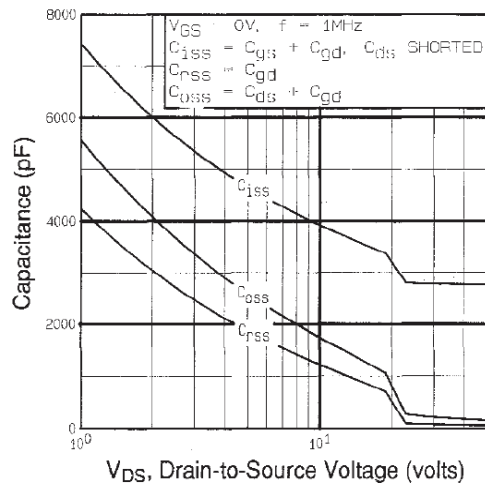


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

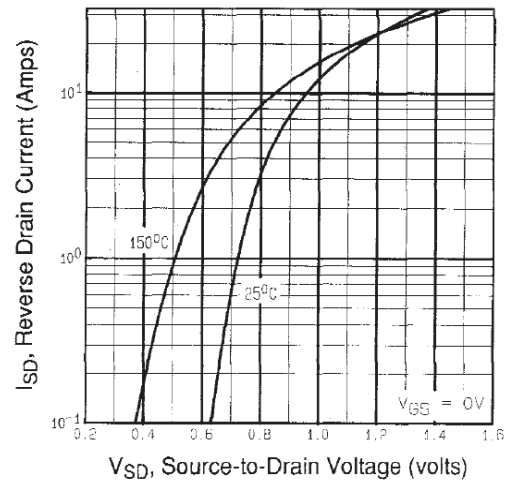


Fig. 7 - Typical Source-Drain Diode Forward Voltage

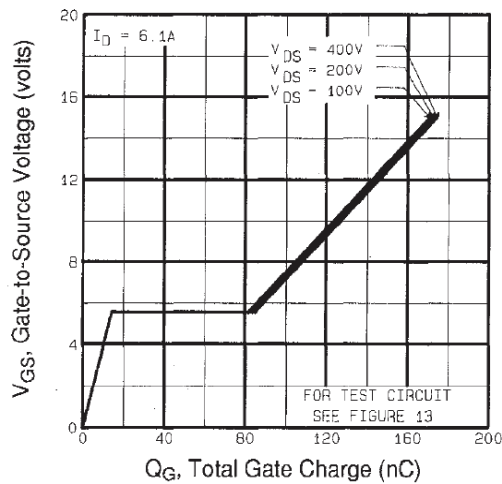


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

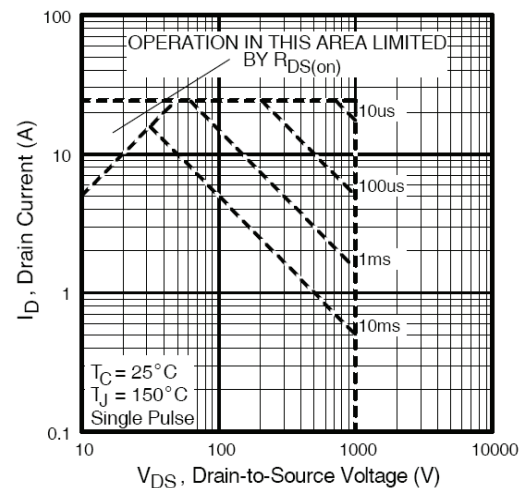


Fig. 8 - Maximum Safe Operating Area

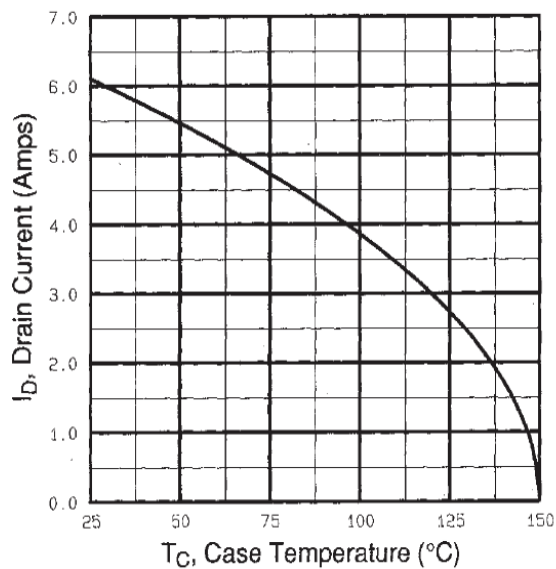


Fig. 9 - Maximum Drain Current vs. Case Temperature

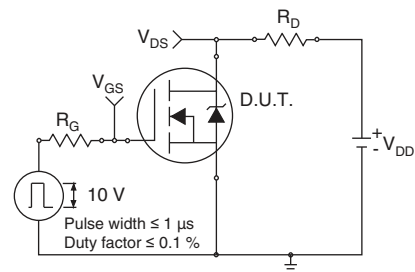


Fig. 10a - Switching Time Test Circuit

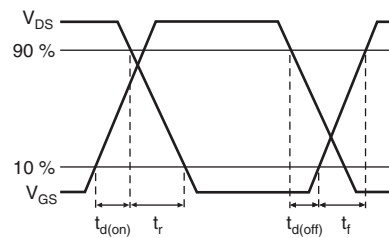


Fig. 10b - Switching Time Waveforms

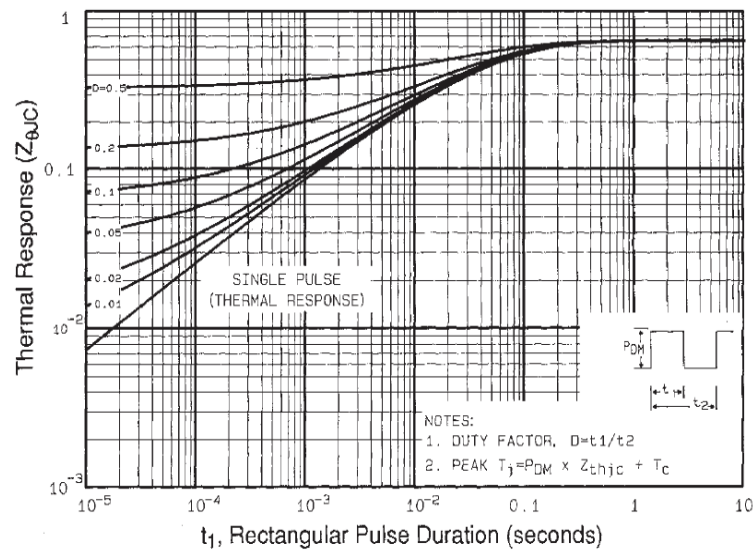


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

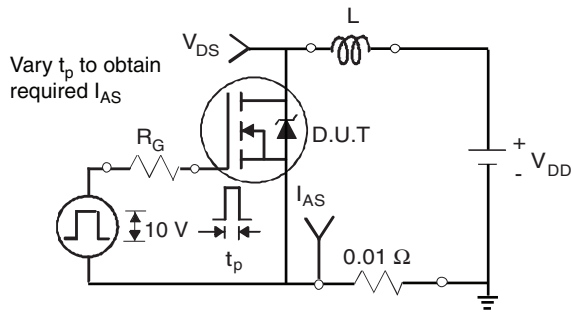


Fig. 12a - Unclamped Inductive Test Circuit

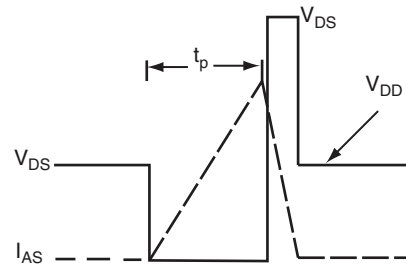


Fig. 12b - Unclamped Inductive Waveforms

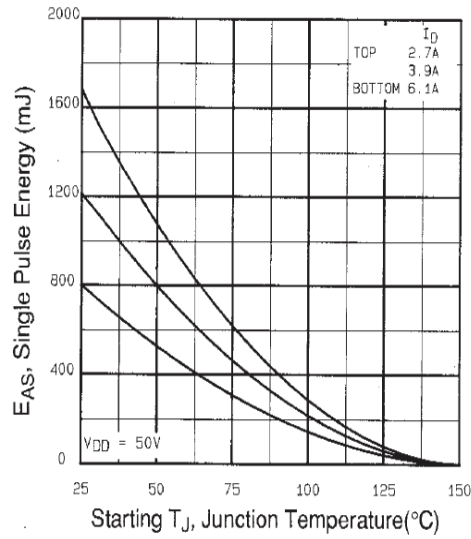


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

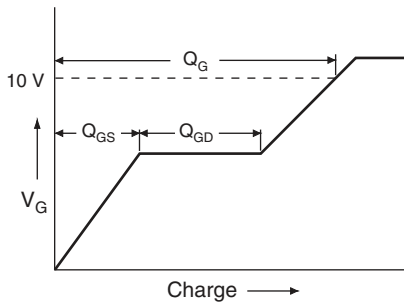


Fig. 13a - Basic Gate Charge Waveform

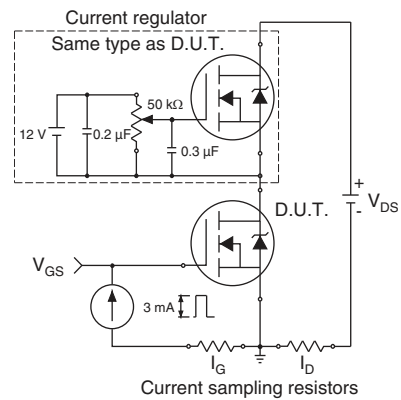


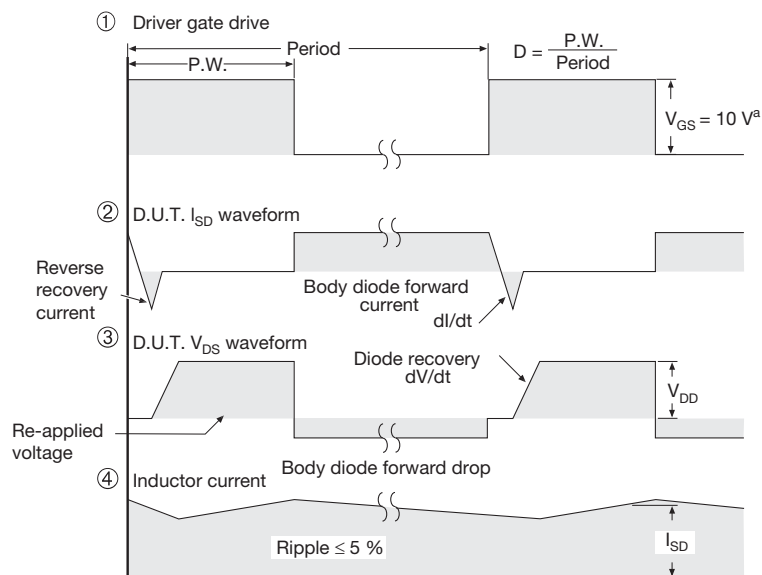
Fig. 13b - Gate Charge Test Circuit

Circuit layout considerations

- Low stray inductance
- Ground plane
- Low leakage inductance current transformer

Device parameters and control:

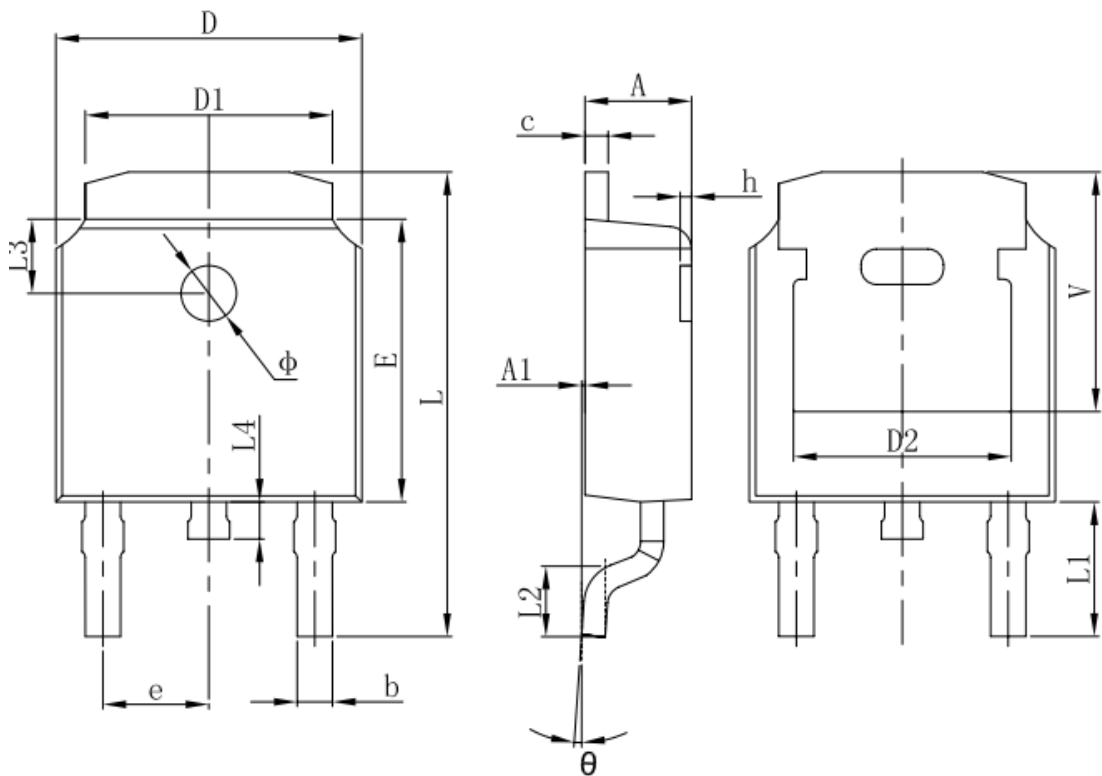
- dV/dt controlled by R_g
- Driver same type as D.U.T.
- I_{SD} controlled by duty factor "D"
- D.U.T. - device under test



a. $V_{GS} = 5 \text{ V}$ for logic level devices

Fig. 14 - For N-Channel

TO252 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.635	0.770	0.025	0.030
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.712	10.312	0.382	0.406
L1	2.900 REF.		0.114 REF.	
L2	1.400	1.700	0.055	0.067
L3	1.600 REF.		0.063 REF.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.250 REF.		0.207 REF.	

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