



TMN2060AD

N-Channel Enhancement Mosfet

General Description

- Low $R_{DS(ON)}$
- RoHS and Halogen-Free Compliant

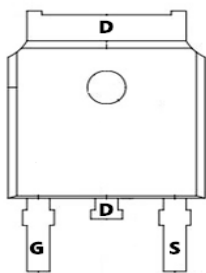
Applications

- Load switch
- PWM

General Features

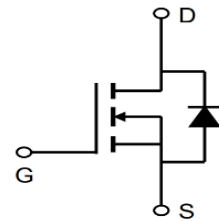
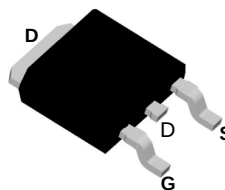
 $V_{DS} = 20V$ $I_D = 58A$ $R_{DS(ON)} = 4.9m\Omega (typ.) @ V_{GS} = 10V$

100% UIS Tested

100% R_g Tested

Marking: 60N02

D: TO-252-3L

Absolute Maximum Ratings ($T_C = 25^\circ C$ unless otherwise noted)

Symbol	Parameter	Rating	Unit
Common Ratings			
V_{DSS}	Drain-Source Voltage	20	V
V_{GSS}	Gate-Source Voltage	± 12	
T_J	Maximum Junction Temperature	150	$^\circ C$
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ C$
I_S	Diode Continuous Forward Current	$T_C = 25^\circ C$	A
		$T_C = 100^\circ C$	
I_D	Continuous Drain Current	$T_C = 25^\circ C$	A
		$T_C = 100^\circ C$	
I_{DM}^a	Pulse Drain Current Tested	$T_C = 25^\circ C$	A
P_D	Maximum Power Dissipation	$T_C = 25^\circ C$	W
		$T_C = 100^\circ C$	
$R_{\theta JC}$	Thermal Resistance-Junction to Case	Steady State	$^\circ C/W$
I_D	Continuous Drain Current	$T_A = 25^\circ C$	A
		$T_A = 70^\circ C$	
P_D	Maximum Power Dissipation	$T_A = 25^\circ C$	W
		$T_A = 70^\circ C$	
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient	$t \leq 10s$	$^\circ C/W$
		Steady State	
I_{AS}^b	Avalanche Current, Single pulse	$L = 0.5mH$	A
E_{AS}^b	Avalanche Energy, Single pulse	$L = 0.5mH$	mJ

Note a : *Current is limited by bond wire.

Note b : UIS tested and pulse width are limited by maximum junction temperature $150^\circ C$ (initial temperature $T_J = 25^\circ C$).



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Electrical Characteristics ($T_A = 25^\circ\text{C}$ Unless Otherwise Noted)

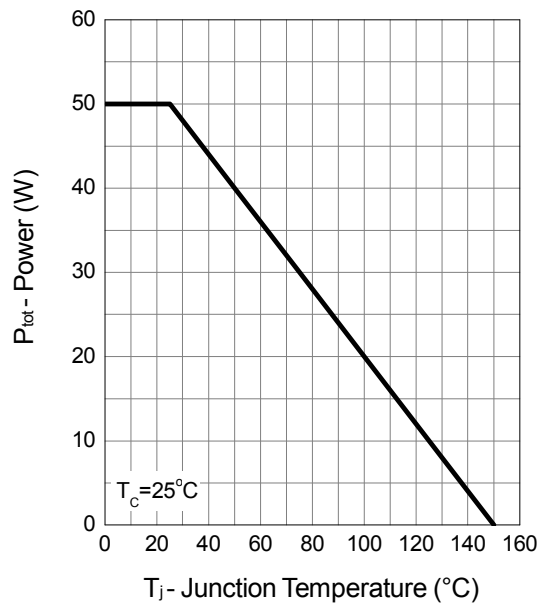
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250μA	20	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =20V, V _{GS} =0V T _J =85°C	-	-	1 30	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250μA	0.5	0.75	1	V
I _{GSS}	Gate Leakage Current	V _{GS} =±12V, V _{DS} =0V	-	-	±100	nA
R _{DS(ON)} ^c	Drain-Source On-state Resistance	V _{GS} =10V, I _{DS} =60A T _J =125°C	-	5.3	6.4	mΩ
			-	3.9	-	
		V _{GS} =4.5V, I _{DS} =60A	-	6.5	9	
		V _{GS} =2.5V, I _{DS} =50A	-	7.8	10	
Diode Characteristics						
V _{SD} ^c	Diode Forward Voltage	I _{SD} =10A, V _{GS} =0V	-	0.7	1.1	V
t _{rr}	Reverse Recovery Time	I _{DS} =20A, dI _{SD} /dt=100A/μs	-	16	-	ns
t _a	Charge Time		-	9.2	-	
t _b	Discharge Time		-	7	-	
Q _{rr}	Reverse Recovery Charge		-	7.5	-	nC
Dynamic Characteristics ^d						
R _G	Gate Resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz	-	2.5	5	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, Frequency=1.0MHz	-	2450	-	pF
C _{oss}	Output Capacitance		-	270	-	
C _{rss}	Reverse Transfer Capacitance		-	190	-	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =15V, R _L =15Ω, I _{DS} =1A, V _{GEN} =10V, R _G =6Ω	-	13	-	ns
t _r	Turn-on Rise Time		-	11.6	-	
t _{d(OFF)}	Turn-off Delay Time		-	85	-	
t _f	Turn-off Fall Time		-	42	-	
Gate Charge Characteristics ^d						
Q _g	Total Gate Charge	V _{DS} =15V, V _{GS} =4.5V, I _{DS} =25A	-	23	-	nC
Q _g	Total Gate Charge	V _{DS} =15V, V _{GS} =10V, I _{DS} =25A	-	50	-	
Q _{gth}	Threshold Gate Charge		-	1.25	-	
Q _{gs}	Gate-Source Charge		-	2.8	-	
Q _{gd}	Gate-Drain Charge		-	8.2	-	

Note c : Pulse test ; pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

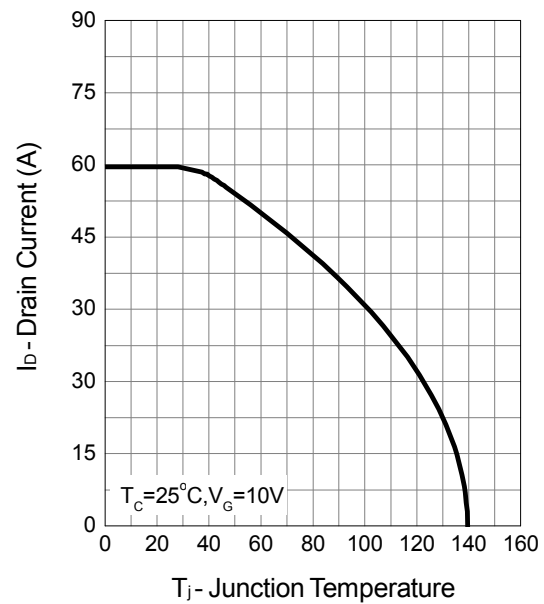
Note d : Guaranteed by design, not subject to production testing.

Typical Operating Characteristics

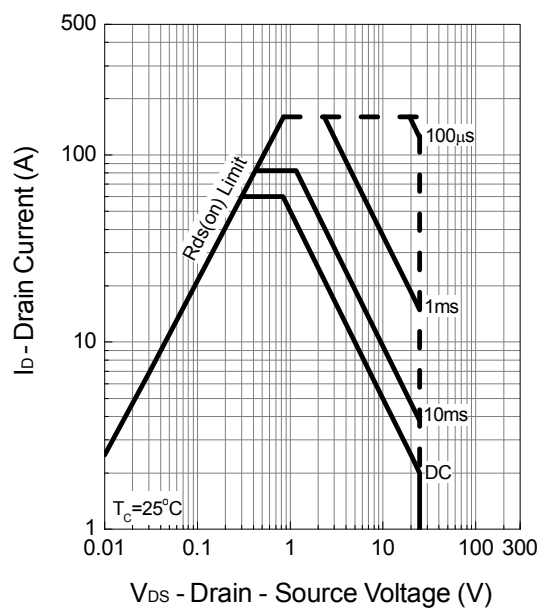
Power Dissipation



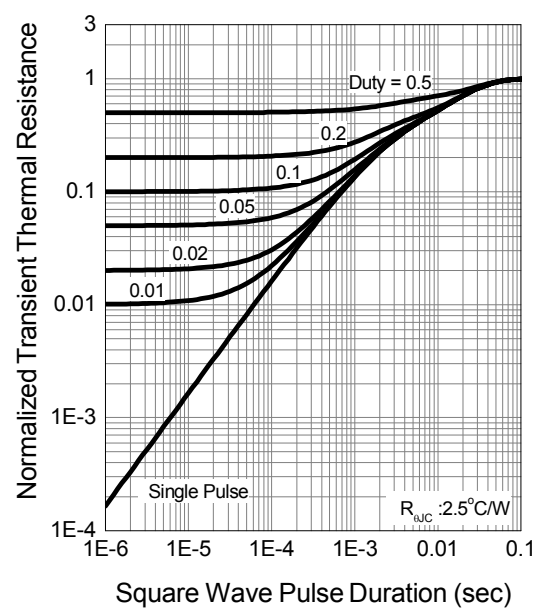
Drain Current



Safe Operation Area



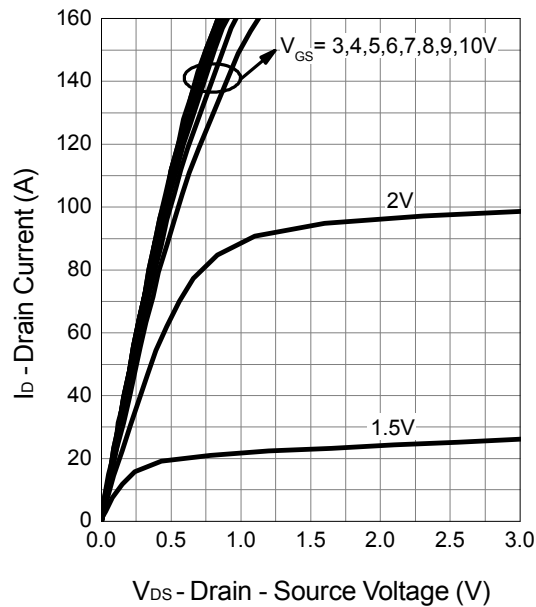
Thermal Transient Impedance



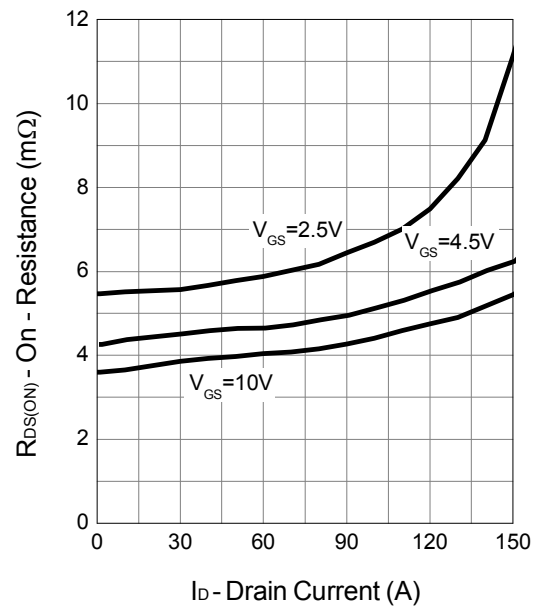
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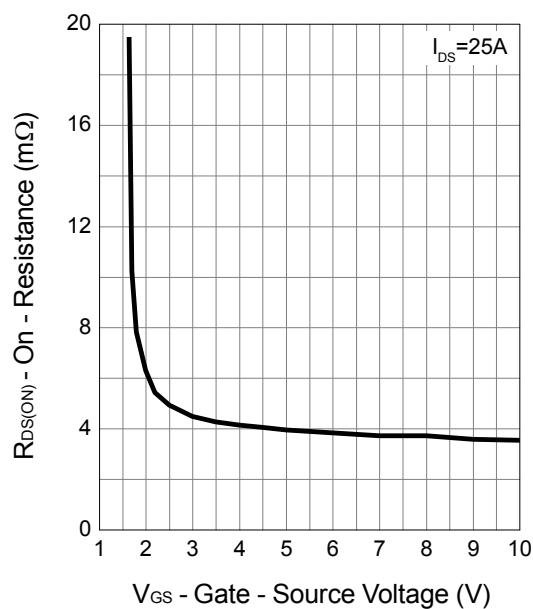
Output Characteristics



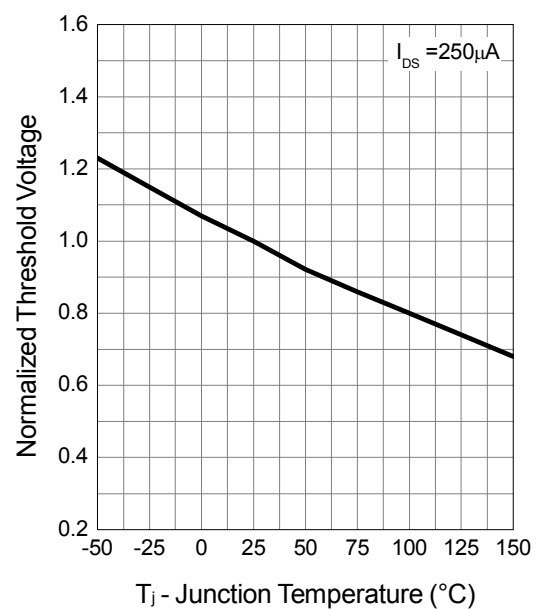
Drain-Source On Resistance



Gate-Source On Resistance



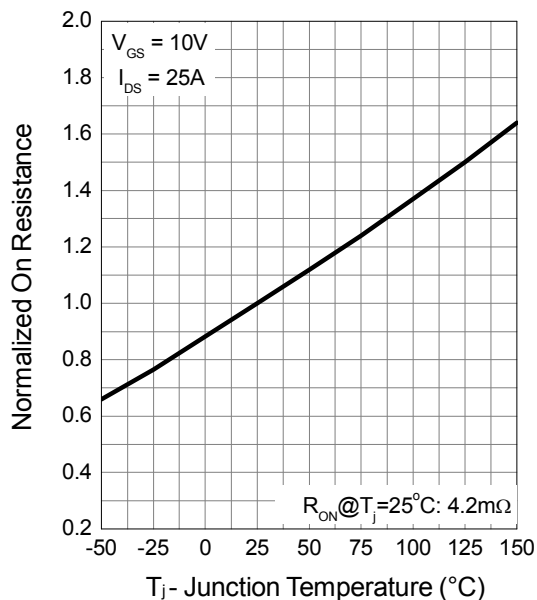
Gate Threshold Voltage



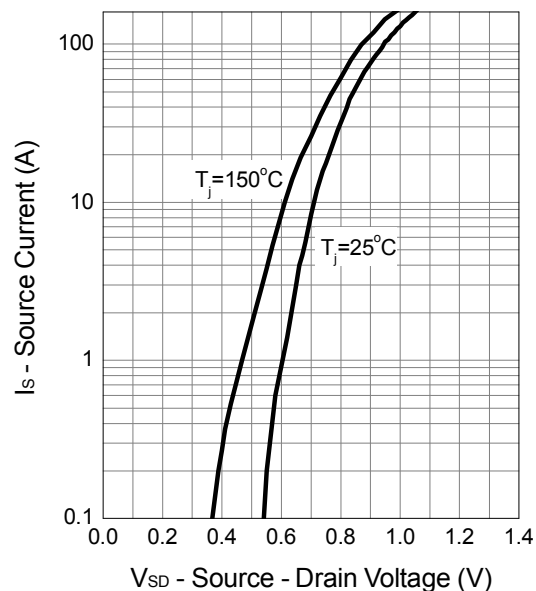
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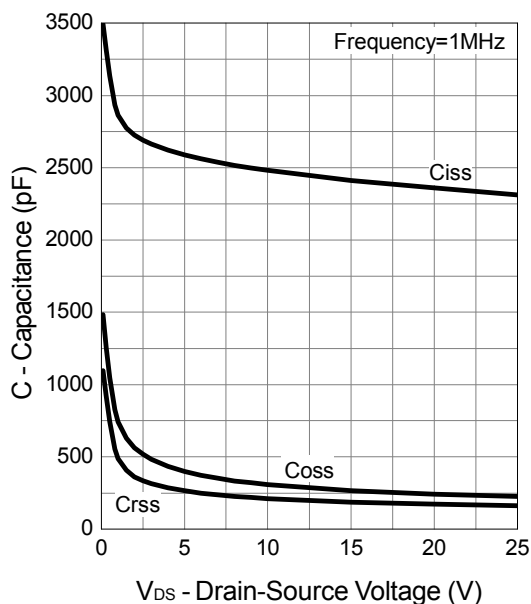
Drain-Source On Resistance



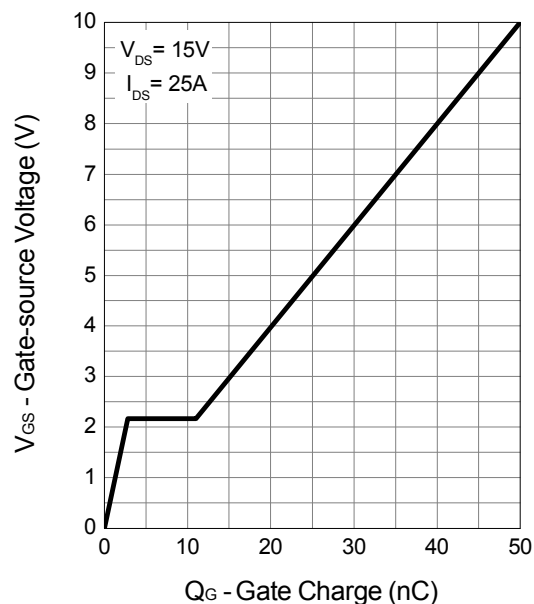
Source-Drain Diode Forward



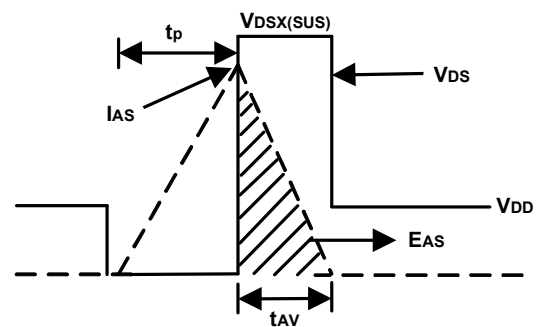
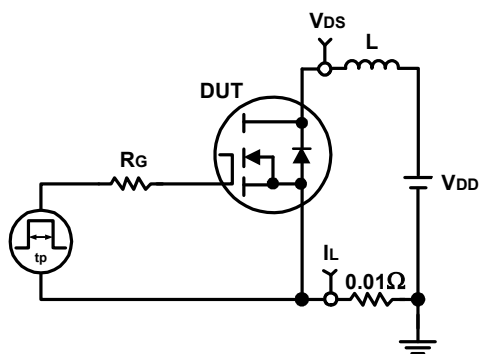
Capacitance



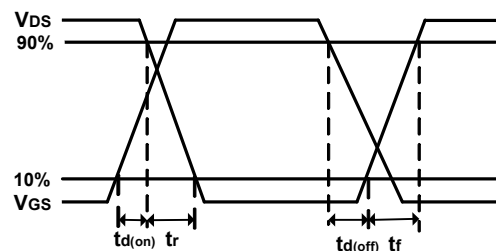
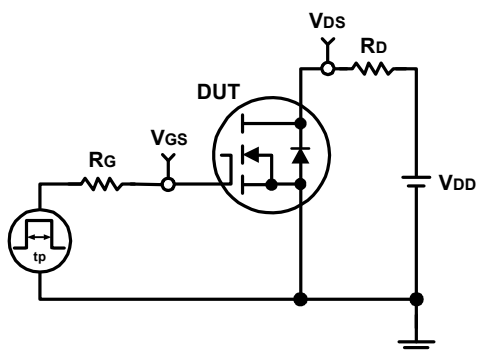
Gate Charge



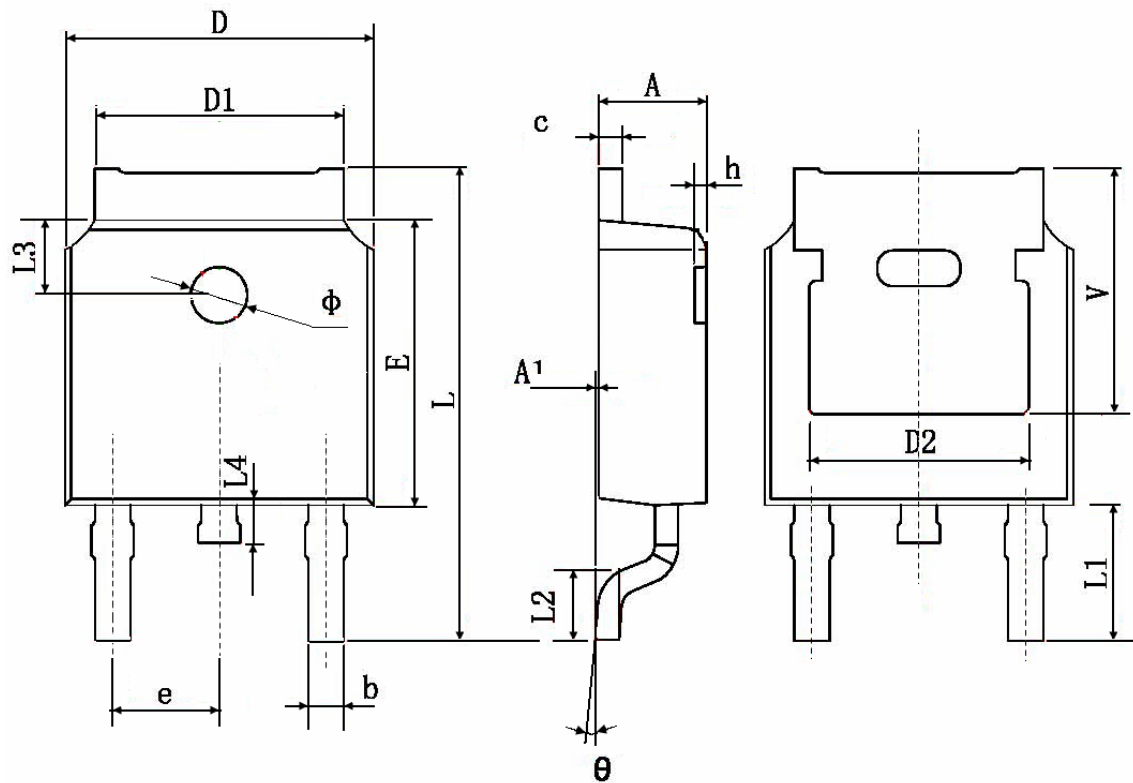
Avalanche Test Circuit and Waveforms



Switching Time Test Circuit and Waveforms



Package Information:TO-252-3L



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	0.660	0.860	0.026	0.034
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 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
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	5.350 TYP.		0.211 TYP.	