

N-Channel Enhancement Mode Power MOSFET

Description

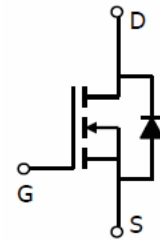
The HM60N05K uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

General Features

- $V_{DS} = 50V, I_D = 60A$
 $R_{DS(ON)} < 7.6m\Omega @ V_{GS}=10V$ (Typ:5.7m Ω)
 $R_{DS(ON)} < 8.0m\Omega @ V_{GS}=4.5V$ (Typ:6.3m Ω)
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Low gate to drain charge to reduce switching losses

Application

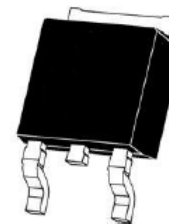
- Power switching application
- Load switch



Schematic diagram



Marking and pin assignment



TO-252-2L top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
HM60N05K	HM60N05K	TO-252-2L	Ø330mm	12mm	2500 units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	50	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	60	A
Drain Current-Continuous($T_C=100^\circ\text{C}$)	$I_D(100^\circ\text{C})$	42	A
Pulsed Drain Current	I_{DM}	180	A
Maximum Power Dissipation	P_D	3	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ\text{C}$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient ^(Note 2)	$R_{\theta JA}$	42	$^\circ\text{C/W}$
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Electrical Characteristics (TC=25°C unless otherwise noted)

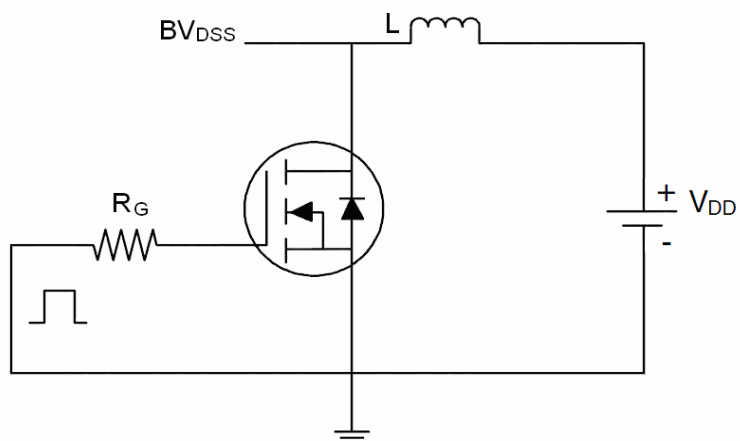
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	50		-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =50V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics ^(Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	0.9	1.2	1.8	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =60A	-	5.7	7.6	mΩ
		V _{GS} =4.5V, I _D =6A	-	6.3	8.0	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =60A	40	-	-	S
Dynamic Characteristics ^(Note4)						
Input Capacitance	C _{iss}	V _{DS} =30V, V _{GS} =0V, F=1.0MHz	-	4100	-	PF
Output Capacitance	C _{oss}		-	298	-	PF
Reverse Transfer Capacitance	C _{rss}		-	229	-	PF
Switching Characteristics ^(Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =30V, R _L =1Ω V _{GS} =10V, R _{GEN} =3Ω	-	8.5	-	nS
Turn-on Rise Time	t _r		-	7	-	nS
Turn-Off Delay Time	t _{d(off)}		-	40	-	nS
Turn-Off Fall Time	t _f		-	15	-	nS
Total Gate Charge	Q _g	V _{DS} =30V, I _D =60A, V _{GS} =10V	-	93	-	nC
Gate-Source Charge	Q _{gs}		-	9.7	-	nC
Gate-Drain Charge	Q _{gd}		-	20	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage ^(Note 3)	V _{SD}	V _{GS} =0V, I _S =60A	-	-	1.2	V
Diode Forward Current ^(Note 2)	I _S		-	-	60	A
Reverse Recovery Time	t _{rr}	TJ = 25°C, IF=60A	-	32	-	nS
Reverse Recovery Charge	Q _{rr}	di/dt = 100A/μs ^(Note3)	-	45	-	nC

Notes:

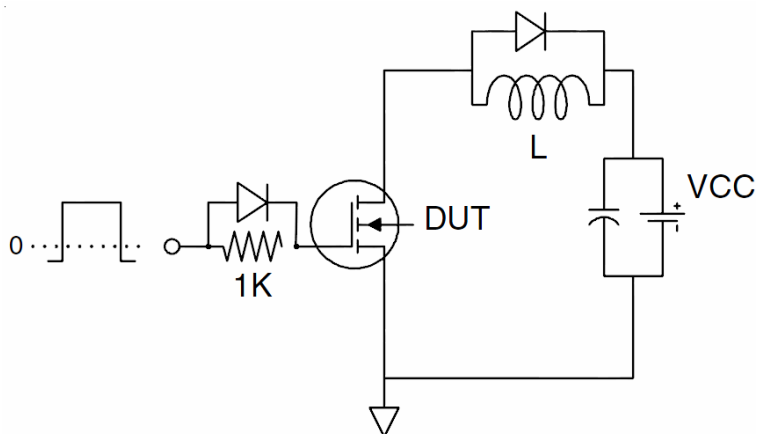
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

Test Circuit

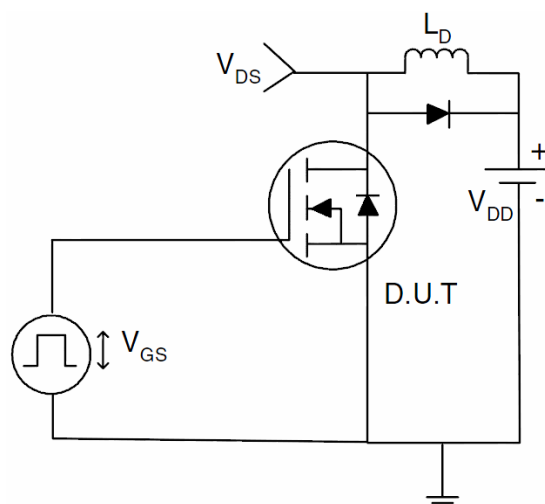
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

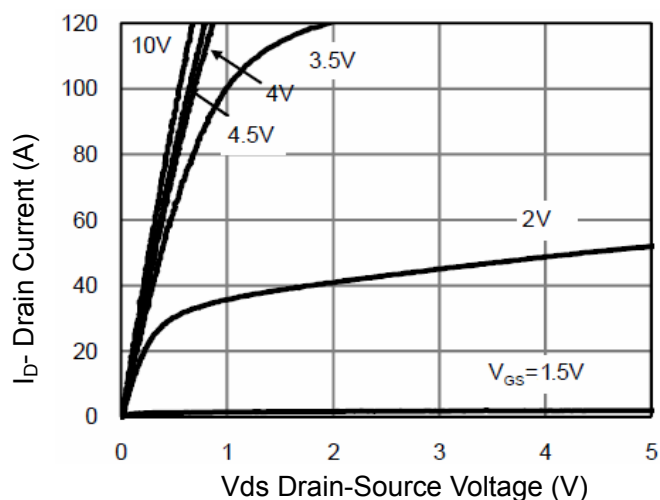


Figure 1 Output Characteristics

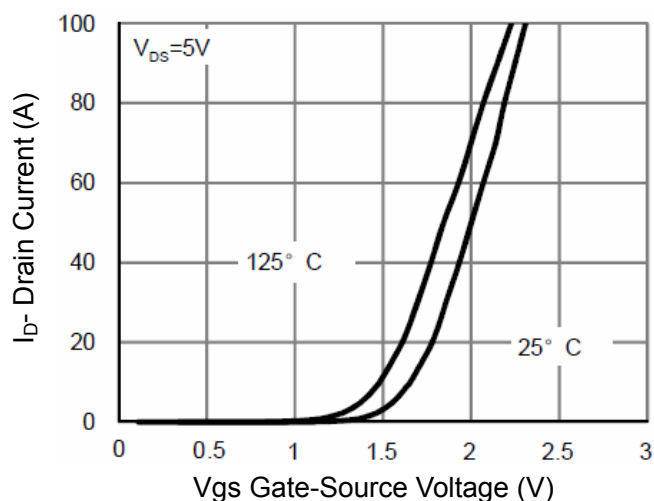


Figure 2 Transfer Characteristics

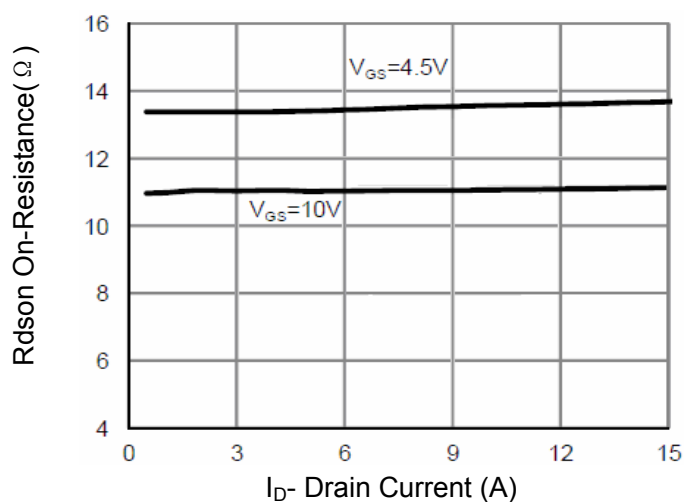


Figure 3 $R_{DS(on)}$ - Drain Current

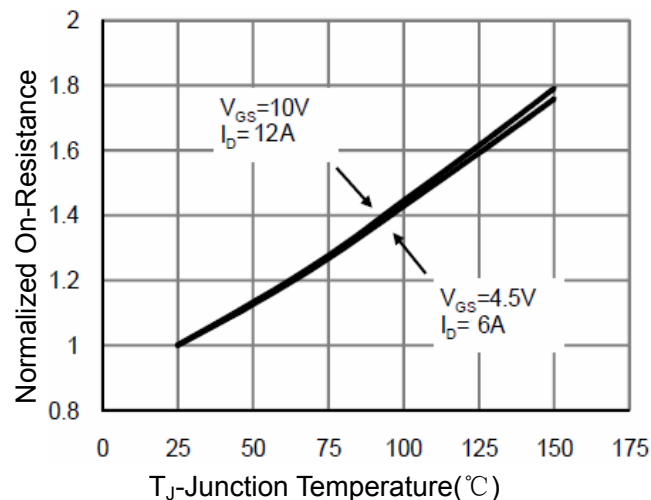


Figure 4 $R_{DS(on)}$ -Junction Temperature

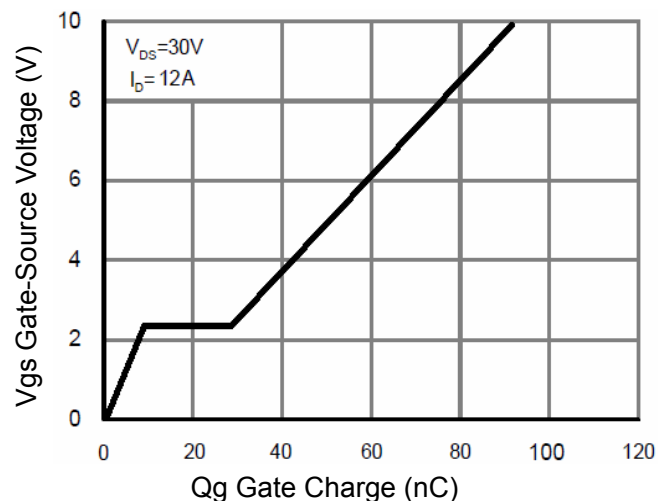


Figure 5 Gate Charge

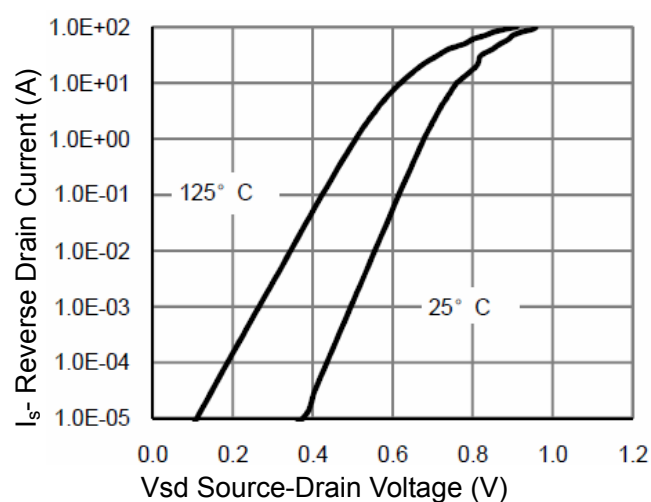


Figure 6 Source- Drain Diode Forward

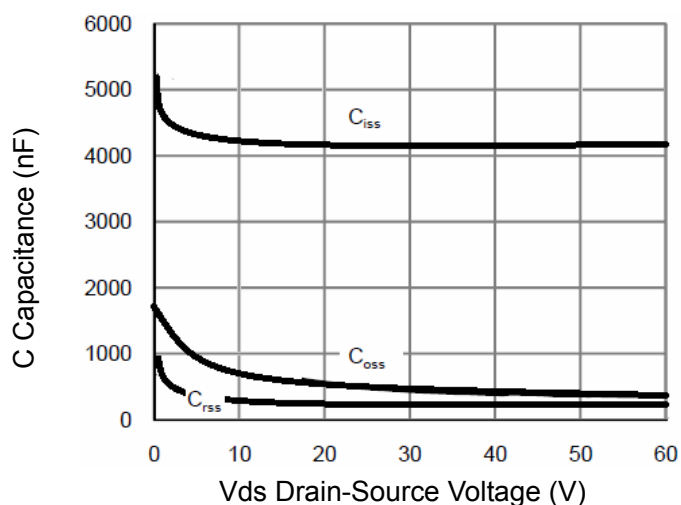


Figure 7 Capacitance vs Vds

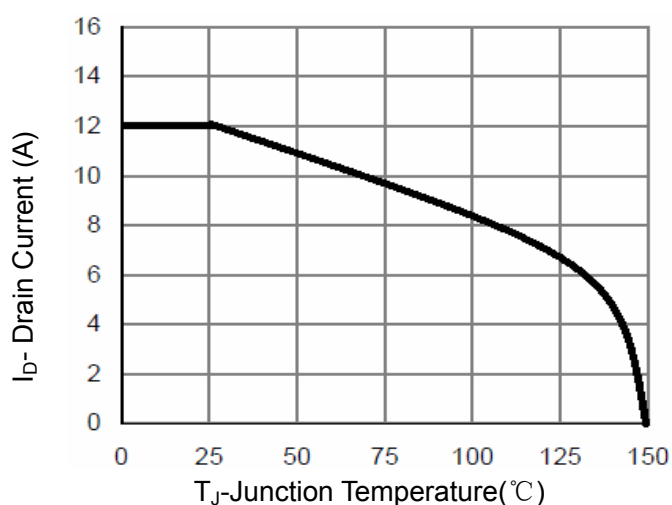


Figure 9 Current De-rating

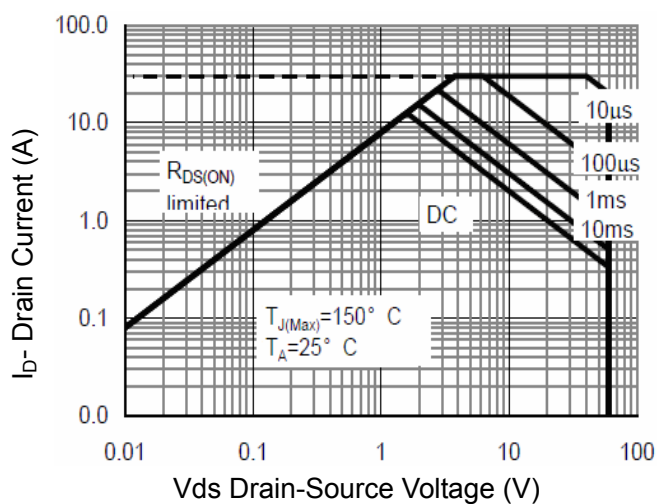


Figure 8 Safe Operation Area

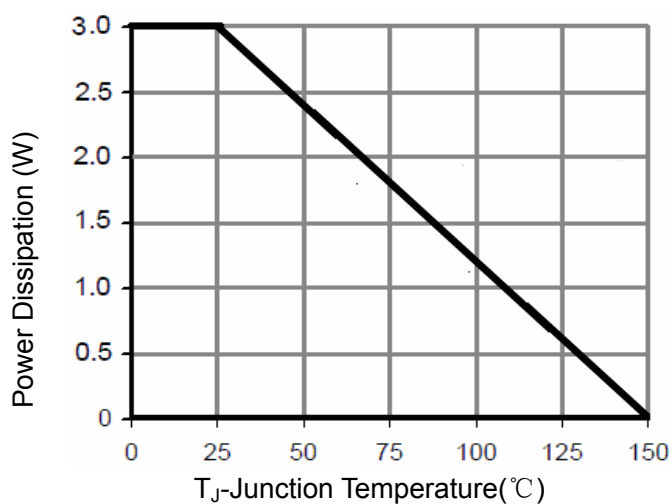


Figure 10 Power De-rating

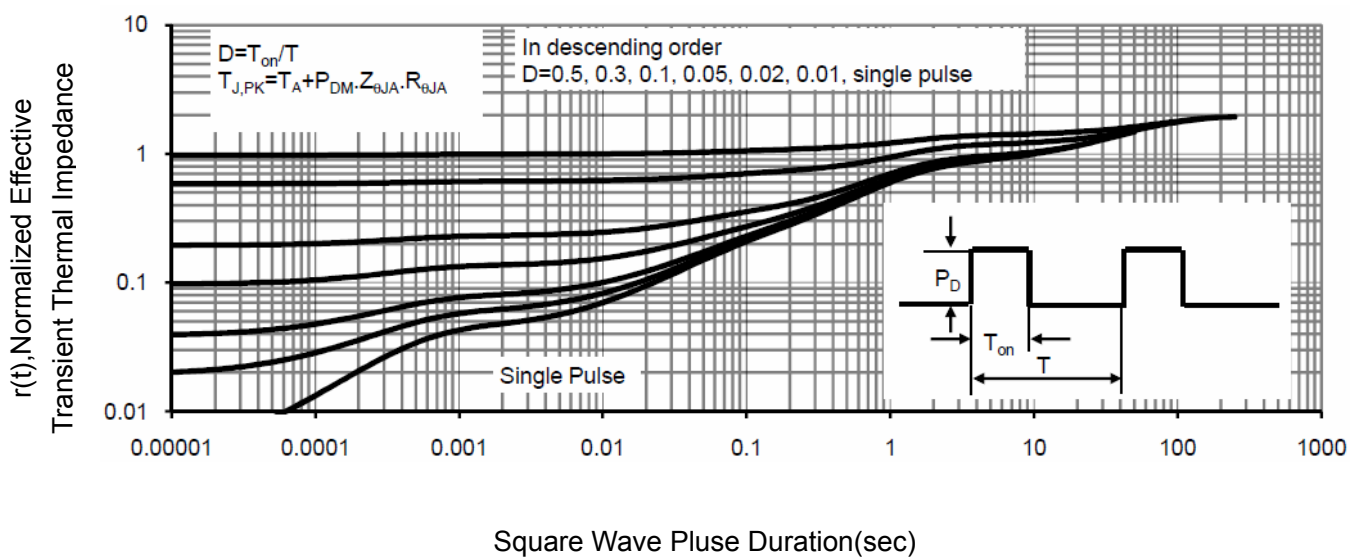
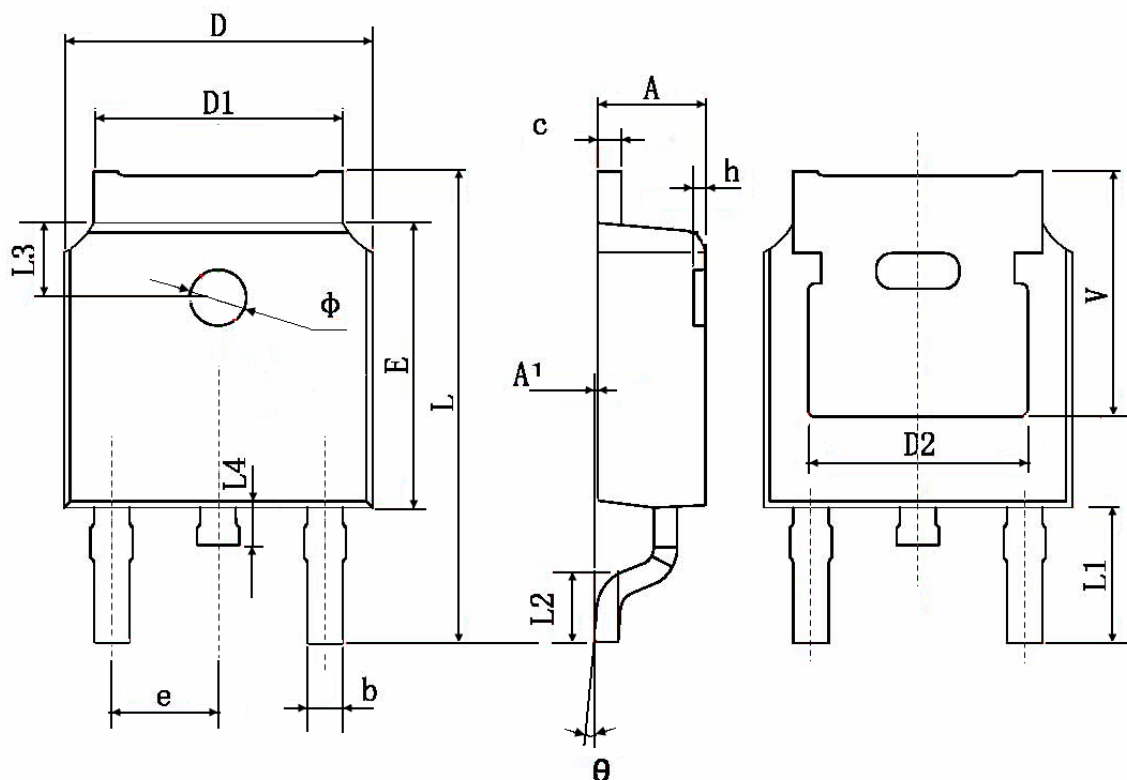


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-252 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	0.660	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	0.483 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.	