



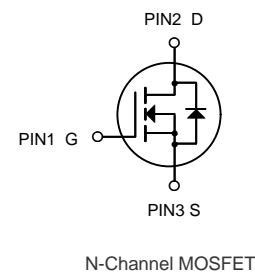
## General Description

The DI040N10D1 use advanced SGT MOSFET technology to provide low  $R_{DS(ON)}$ , low gate charge, fast switching and excellent avalanche characteristics. This device is specially designed to get better ruggedness.



## General Features

$V_{DS} = 100V$   $I_D = 60A$   
 $R_{DS(ON)} < 17m\Omega @ V_{GS} = 10V$



## Applications

Consumer electronic power supply Motor control  
Synchronous-rectification Isolated DC  
Synchronous-rectification applications

## Ordering Information

Product ID	Pack	Brand	Qty(PCS)
DI040N10D1	TO252-2L	HXY MOSFET	2500

## Absolute Maximum Ratings at $T_j = 25^\circ C$ unless otherwise noted

Parameter	Symbol	Value	Unit
Drain source voltage	$V_{DS}$	100	V
Gate source voltage	$V_{GS}$	$\pm 20$	V
Continuous drain current <sup>1)</sup>	$I_D$	60	A
Pulsed drain current <sup>2)</sup>	$I_D, \text{ pulse}$	180	A
Power dissipation <sup>3)</sup>	$P_D$	67.5	W
Single pulsed avalanche energy <sup>5)</sup>	EAS	80	mJ
Operation and storage temperature	$T_{stg}, T_j$	-55 to 150	$^\circ C$
Thermal resistance, junction-case	$R_{\theta JC}$	1.85	$^\circ C/W$
Thermal Resistance Junction-Ambient <sup>1</sup>	$R_{\theta JA}$	45	$^\circ C/W$



**Electrical Characteristics (T<sub>J</sub>= 25°C, unless otherwise noted)**

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
<b>Static Characteristics</b>							
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	100	-	-	V	
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±20V	-	-	±100	nA	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 100V, V <sub>GS</sub> = 0V	T <sub>J</sub> =25°C	-	-	1	μA
			T <sub>J</sub> =100°C	-	-	100	
Gate-Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	1	1.7	2.5	V	
Drain-Source on-Resistance <sup>4</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 20A	-	13.5	17	mΩ	
		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 10A	-	17	20		
Forward Transconductance <sup>4</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 10V, I <sub>D</sub> = 20A	-	54	-	S	
<b>Dynamic Characteristics<sup>5</sup></b>							
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 50V, V <sub>GS</sub> = 0V, f = 1MHz	-	1208	-	pF	
Output Capacitance	C <sub>oss</sub>		-	144	-		
Reverse Transfer Capacitance	C <sub>rss</sub>		-	11.3	-		
Gate Resistance	R <sub>G</sub>	f = 1MHz	-	1.8	-	Ω	
<b>Switching Characteristics<sup>5</sup></b>							
Total Gate Charge	Q <sub>g</sub>	V <sub>GS</sub> = 10V, V <sub>DS</sub> = 50V, I <sub>D</sub> = 20A	-	22.7	-	nC	
Gate-Source Charge	Q <sub>gs</sub>		-	3	-		
Gate-Drain Charge	Q <sub>gd</sub>		-	5	-		
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = 10V, V <sub>DD</sub> = 50V, R <sub>G</sub> = 3Ω, I <sub>D</sub> = 20A	-	9.2	-	ns	
Rise Time	t <sub>r</sub>		-	3.6	-		
Turn-off Delay Time	t <sub>d(off)</sub>		-	25.6	-		
Fall Time	t <sub>f</sub>		-	4.4	-		
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 20A, dI/dt = 100A/μs	-	30	-	ns	
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>		-	42	-	nC	
<b>Drain-Source Body Diode Characteristics</b>							
Diode Forward Voltage <sup>4</sup>	V <sub>SD</sub>	I <sub>S</sub> = 20A, V <sub>GS</sub> = 0V	-	-	1.2	V	
Continuous Source Current	I <sub>S</sub>	T <sub>C</sub> =25°C	-	-	60	A	

Notes:

1. Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub>=150°C.
2. The EAS data shows Max. rating . The test condition is V<sub>DD</sub>=25V, V<sub>GS</sub>=10V, L=0.4mH, I<sub>AS</sub>=20A.
3. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper, The value in any given application depends on the user's specific board design.
4. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
5. This value is guaranteed by design hence it is not included in the production test..



### Typical Characteristics

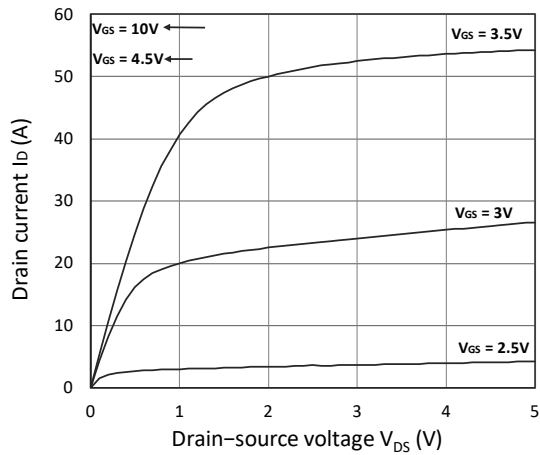


Figure 1. Output Characteristics

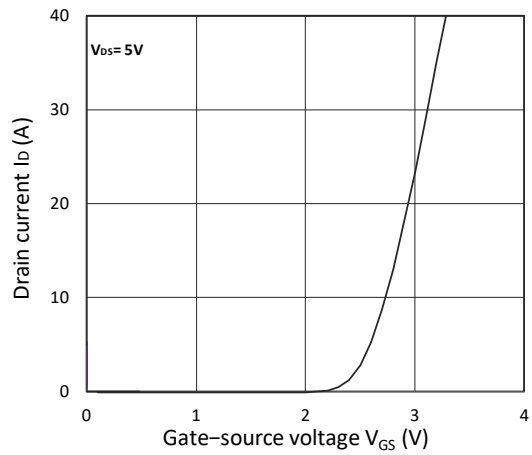


Figure 2. Transfer Characteristics

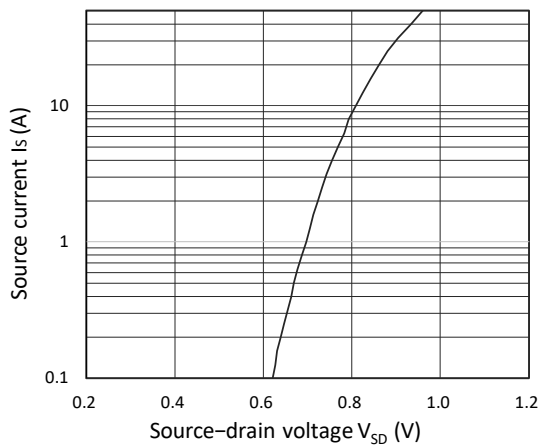


Figure 3. Forward Characteristics of Reverse

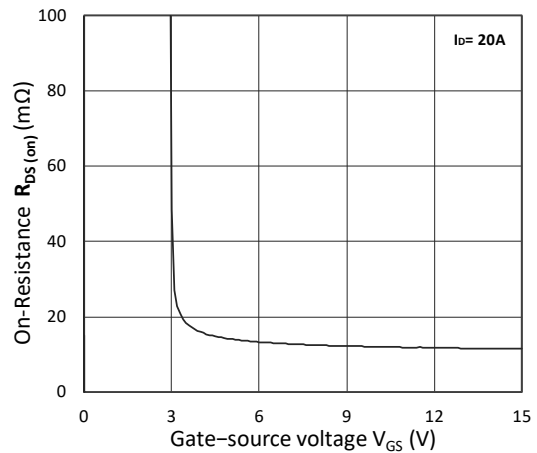


Figure 4.  $R_{DS(ON)}$  vs.  $V_{GS}$

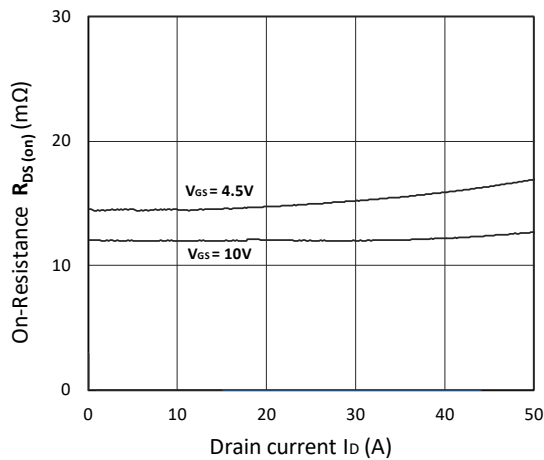


Figure 5.  $R_{DS(ON)}$  vs.  $I_D$

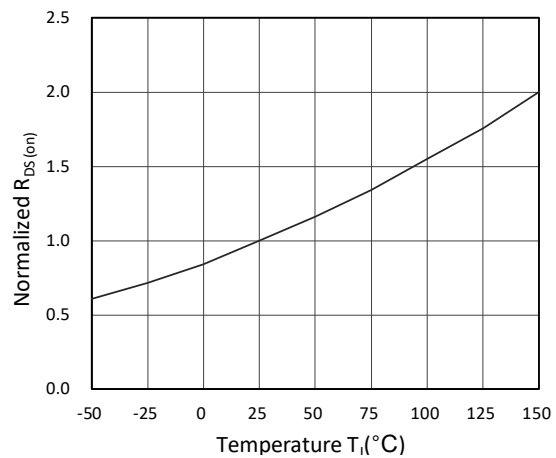


Figure 6. Normalized  $R_{DS(on)}$  vs. Temperature

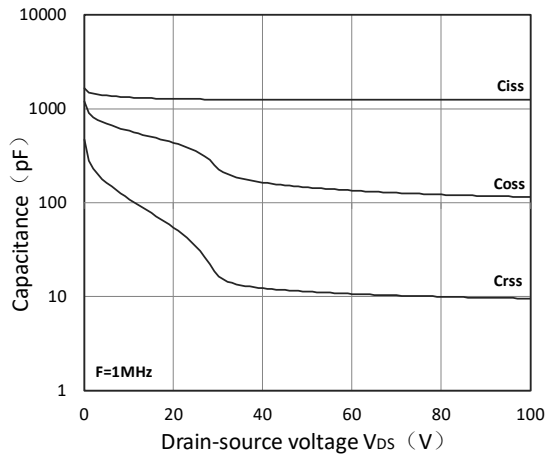


Figure 7. Capacitance Characteristics

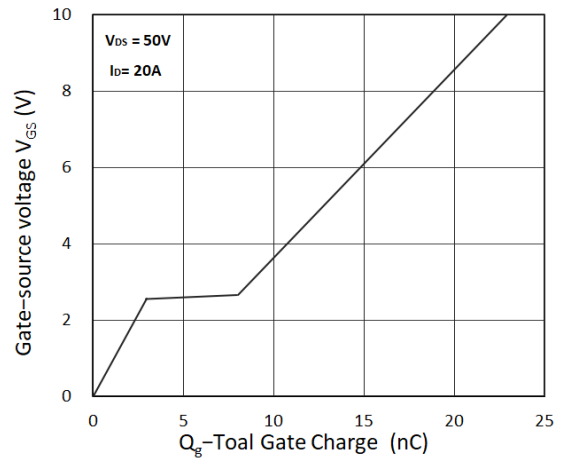


Figure 8. Gate Charge Characteristics

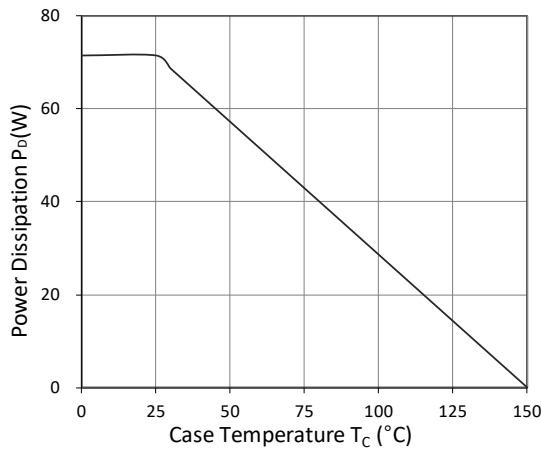


Figure 9. Power Dissipation

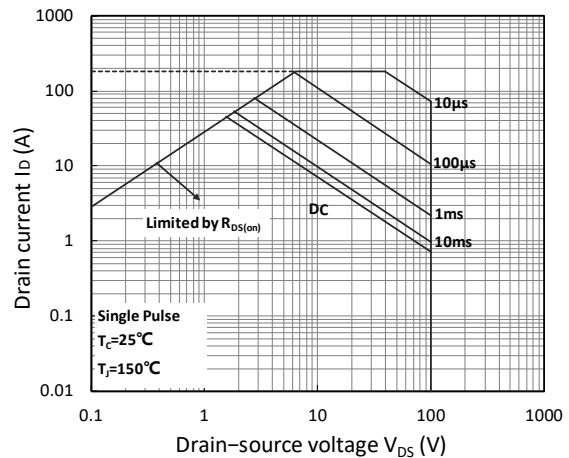


Figure 10. Safe Operating Area

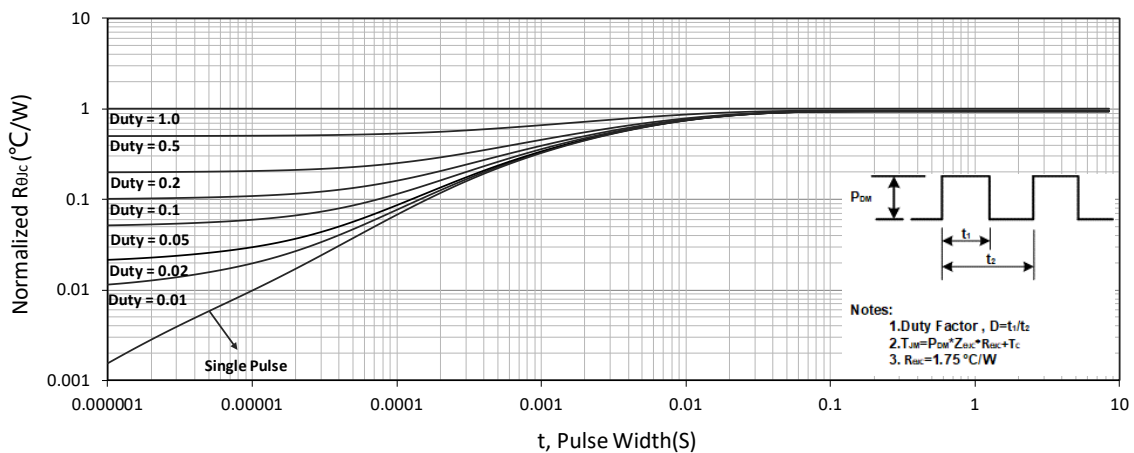


Figure 11. Normalized Maximum Transient Thermal Impedance



### Test Circuit

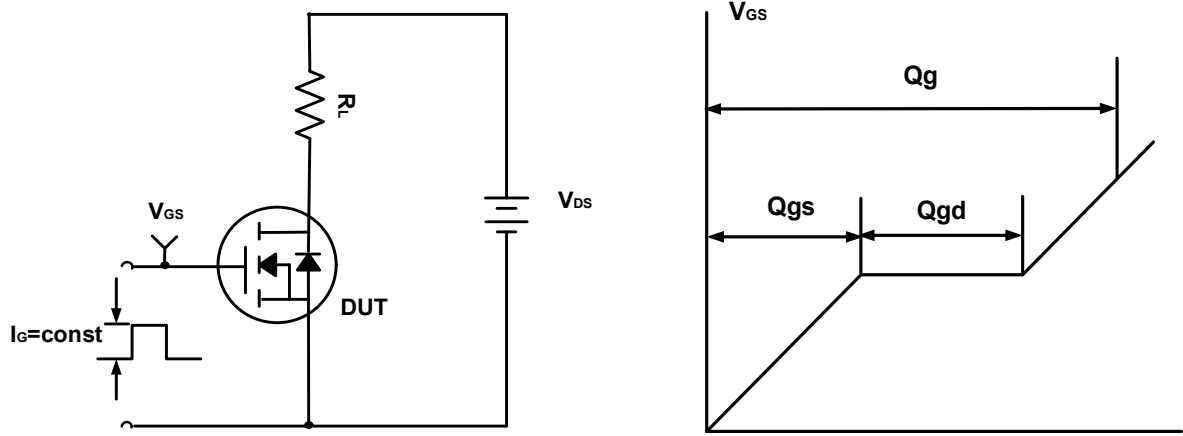


Figure A. Gate Charge Test Circuit & Waveforms

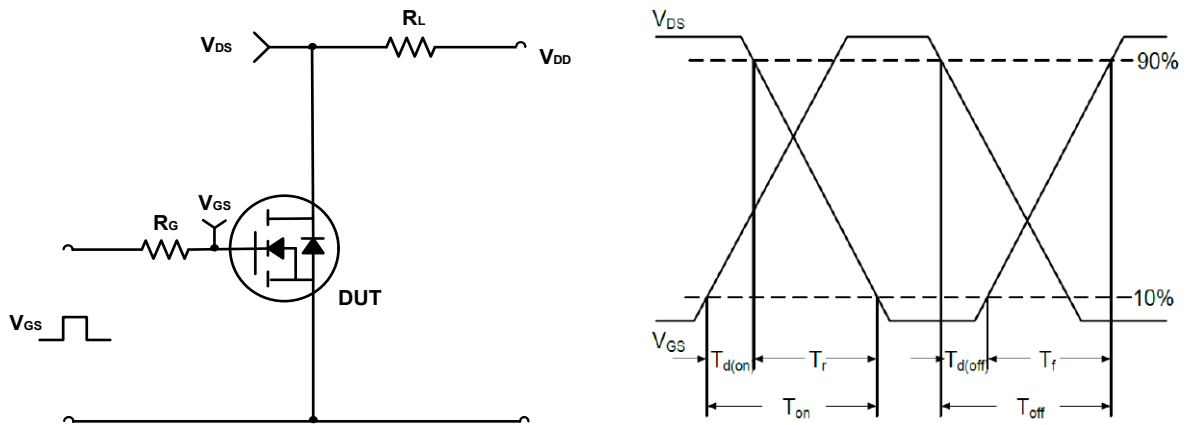


Figure B. Switching Test Circuit & Waveforms

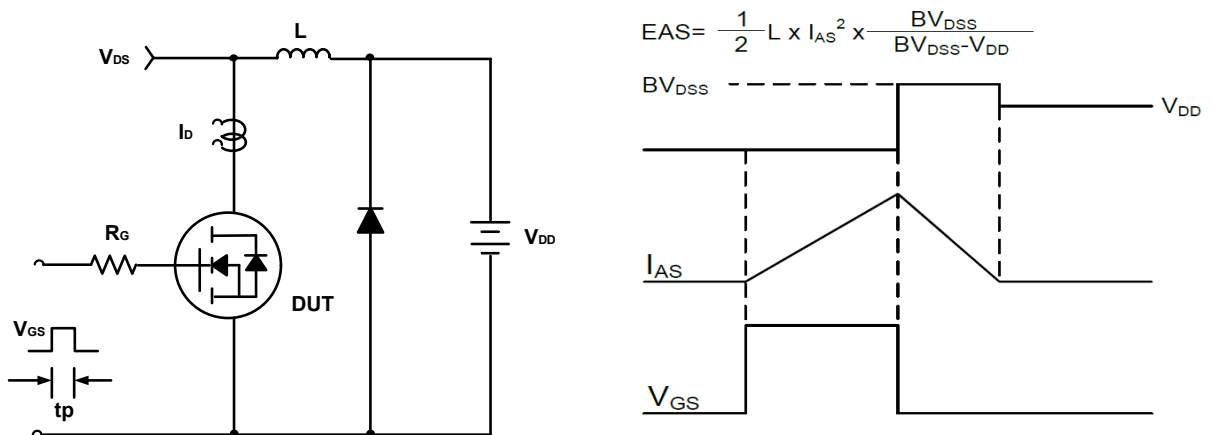
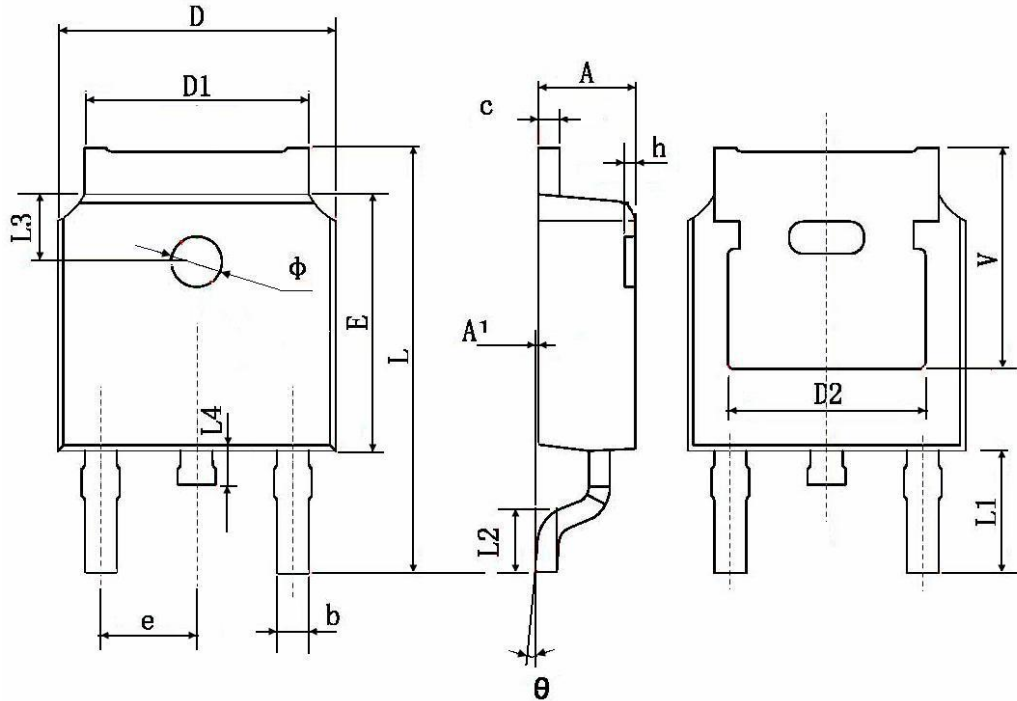


Figure C. Unclamped Inductive Switching Circuit & Waveforms



### TO252-2L 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.	



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