

FH1804D
N-Channel Trench Power MOSFET
Description

These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and with stand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

Applications

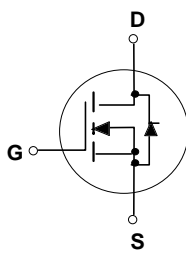
- ◆ Motor Drives
- ◆ UPS
- ◆ DC-DC Converter

Product Summary

V_{DSS}	40V
$R_{DS(on)max} @ V_{GS}=10V$	4.9m Ω
I_D	100A

Features

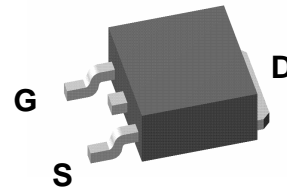
- ◆ Improved dv/dt capability
- ◆ Fast switching
- ◆ 100% EAS Guaranteed
- ◆ Green device available



Schematic diagram

TO-252


Marking and pin assignment



TO-252 top view

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

Parameter	Symbol	Value	Unit
Drain Source Voltage	V_{DSS}	40	V
Continuous drain current ($T_C = 25^\circ\text{C}$)	I_D	100	A
Continuous drain current ($T_C = 100^\circ\text{C}$)		70	A
Pulsed drain current ¹⁾	I_{DM}	400	A
Gate Source voltage	V_{GSS}	± 20	V
Avalanche energy ²⁾	E_{AS}	156	mJ
Power Dissipation ($T_C = 25^\circ\text{C}$)	P_D	100	W
Storage Temperature Range	T_{STG}	-55 to +150	$^\circ\text{C}$
Operating Junction Temperature Range	T_J	55 to +150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.25	$^\circ\text{C/W}$

Electrical Characteristics

$T_J = 25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain source breakdown voltage	BV_{DSS}	$V_{GS}=0\text{ V}, I_D=250\mu\text{A}$	40			V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.0		2.0	V
Drain-source leakage current	I_{DSS}	$V_{DS}=40\text{ V}, V_{GS}=0\text{ V}, T_J = 25^\circ\text{C}$	---	---	1	μA
		$V_{DS}=32\text{ V}, V_{GS}=0\text{ V}, T_J = 125^\circ\text{C}$	---	---	30	μA
Gate leakage current, Forward	I_{GSSF}	$V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$			100	nA
Gate leakage current, Reverse	I_{GSSR}	$V_{GS}=-20\text{ V}, V_{DS}=0\text{ V}$	---	---	-100	nA
Drain source on state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=40\text{ A}$	---	3.8	4.9	$\text{m}\Omega$
		$V_{GS}=4.5\text{ V}, I_D=30\text{ A}$	---	4.7	6.2	$\text{m}\Omega$
Forward transconductance	g_{fs}	$V_{DS}=5\text{ V}, I_D=30\text{ A}$	---	79	---	S
Dynamic characteristics						
Input capacitance	C_{iss}	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V},$ $F = 1\text{MHz}$		4023.6		pF
Output capacitance	C_{oss}		---	410.4	---	
Reverse transfer capacitance	C_{rss}		---	338.5	---	
Turn on delay time	$t_{d(on)}$	$V_{DD} = 30\text{V}, V_{GS}=10\text{V}, I_D =30\text{ A}$		231.6		ns
Rise time	t_r		---	213.6	---	
Turn-off delay time	$t_{d(off)}$		---	219.2	---	
Fall time	t_f		---	74	---	
Gate resistance	R_g	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, F=1\text{MHz}$	---	2.4	---	Ω
Gate charge characteristics						
Gate to source charge	Q_{gs}	$V_{DS}=30\text{ V}, I_D=30\text{A},$ $V_{GS}=10\text{V}$	---	11	---	nC
Gate to drain charge	Q_{gd}		---	16.7	---	
Gate charge total	Q_g		---	66.7	---	
Drain-Source diode characteristics and Maximum Ratings						
Continuous Source Current	I_S				100	A
Pulsed Source Current ³⁾	I_{SM}				400	A
Diode Forward Voltage	V_{SD}	$V_{GS}=0\text{V}, I_S=40\text{A}, T_J=25^\circ\text{C}$	---	---	1.2	V
Reverse Recovery Time	t_{rr}	$I_S=20\text{A}, di/dt=100\text{A}/\mu\text{s}, T_J=25^\circ\text{C}$	---	41.4	---	ns
Reverse Recovery Charge	Q_{rr}		---	29	---	nC

Notes:

1: Repetitive Rating: Pulse width limited by maximum junction temperature.

2: $V_{DD}=20\text{V}, V_{GS}=10\text{V}, L=0.5\text{mH}, I_{AS}=25\text{A}, R_G=25\Omega,$ Starting $T_J=25^\circ\text{C}$

3: Pulse Test: Pulse Width $\leq 300\ \mu\text{s},$ Duty Cycle $\leq 2\%$

Electrical Characteristics Diagrams

Figure 1. Typ. Output Characteristics

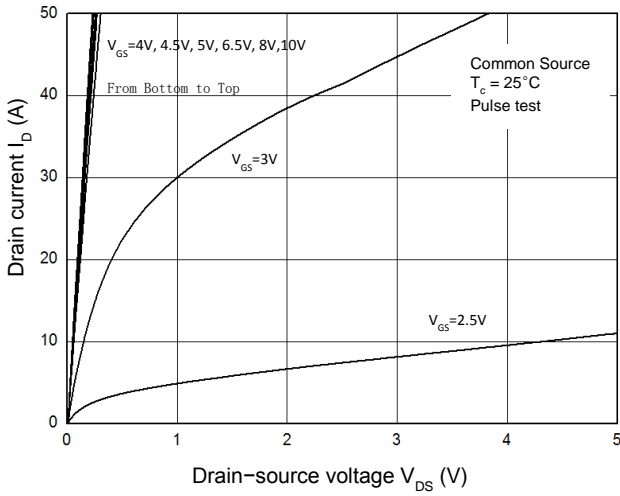


Figure 2. Transfer Characteristics

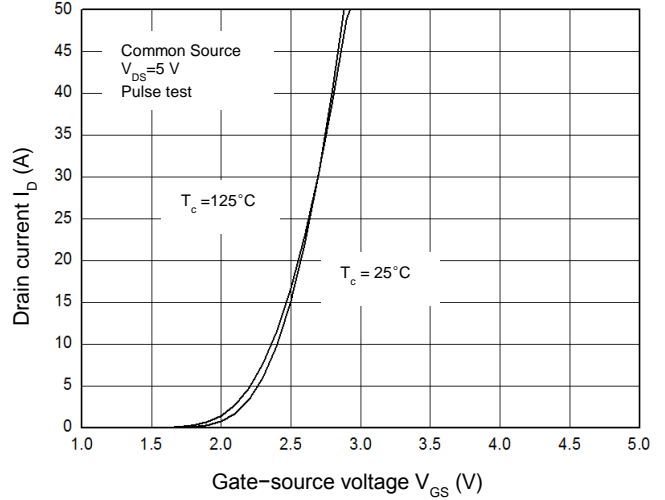


Figure 3. Capacitance Characteristics

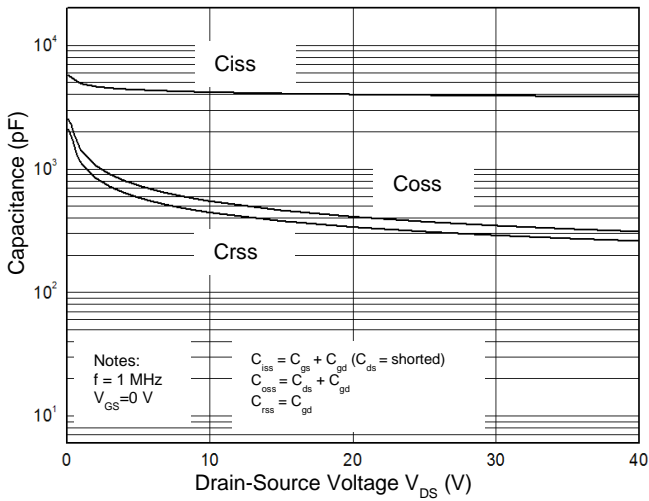


Figure 4. Gate Charge Waveform

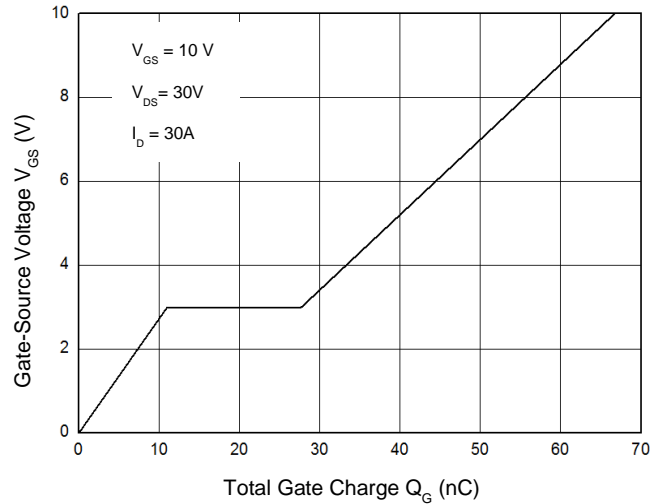


Figure 5. Body-Diode Characteristics

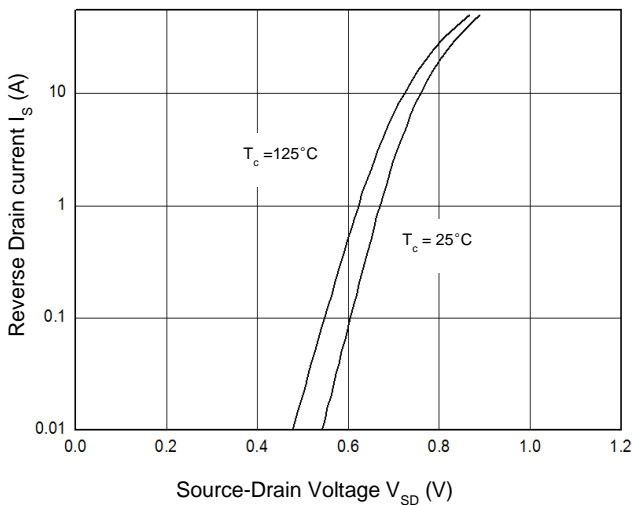


Figure 6. Rds(on)-Drain Current

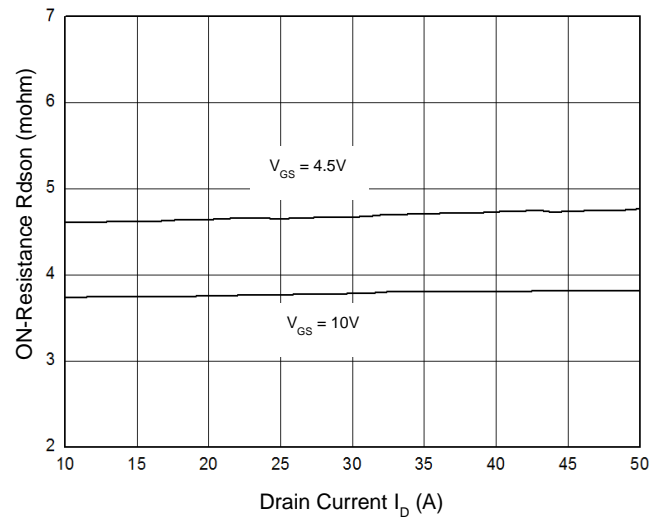


Figure 7. R_{ds(on)}-Junction Temperature(°C)

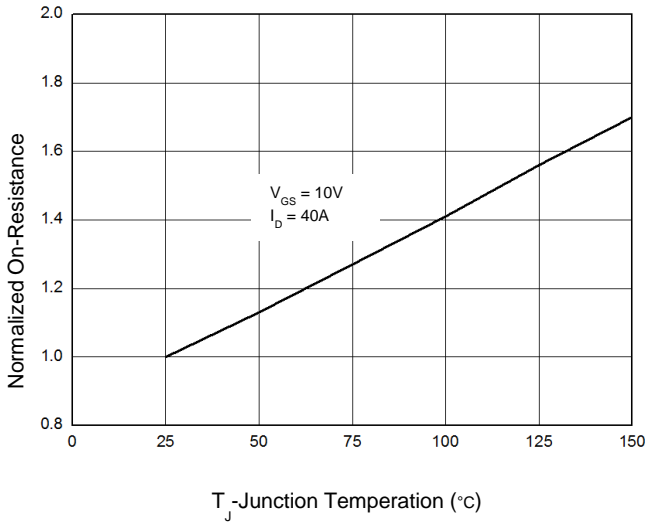


Figure 8. Maximum Safe Operating Area

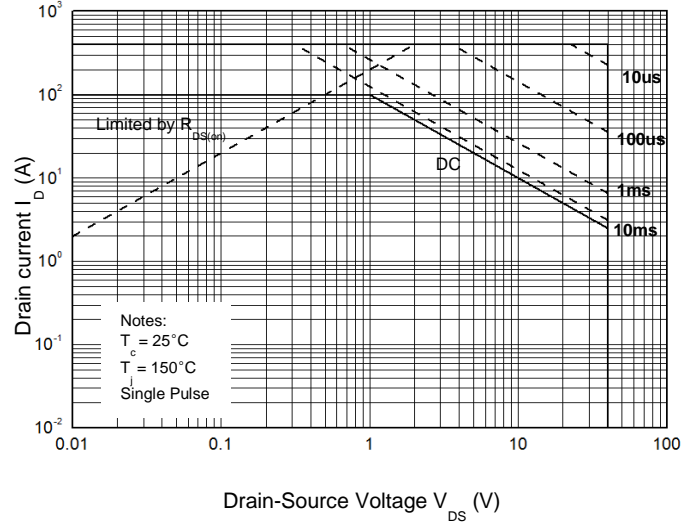
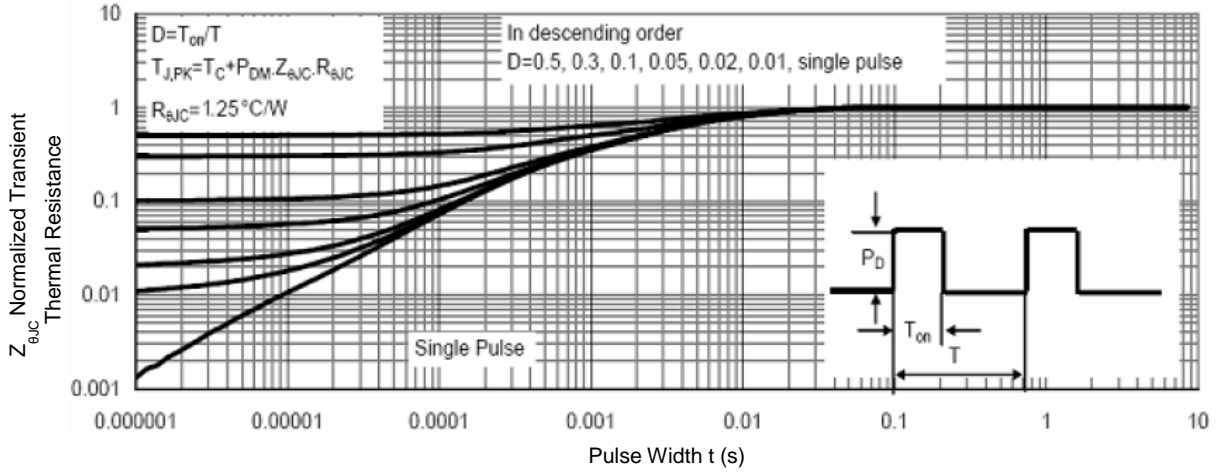


Figure 9. Normalized Maximum Transient Thermal Impedance (R_{thJC})



Test Circuit & Waveform

Figure 8. Gate Charge Test Circuit & Waveform

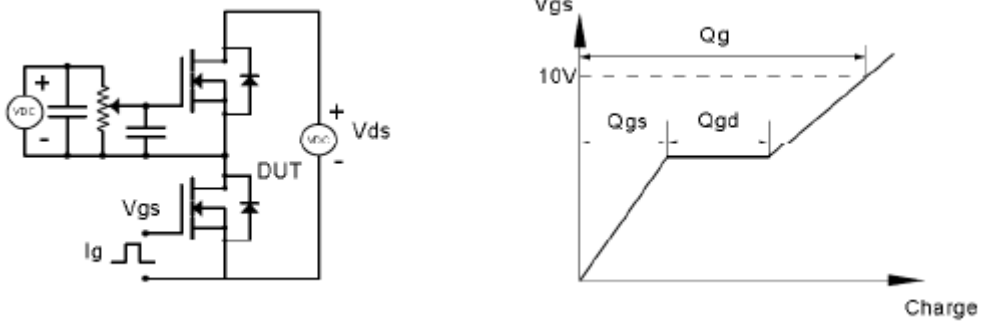


Figure 9. Resistive Switching Test Circuit & Waveforms

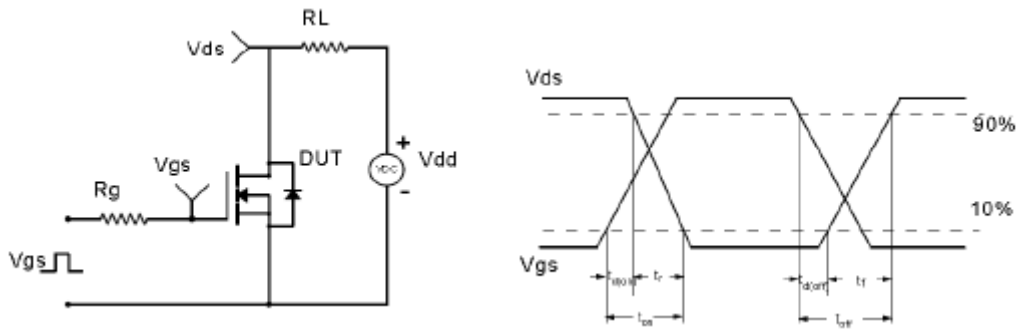


Figure 10. Unclamped Inductive Switching (UIS) Test Circuit & Waveform

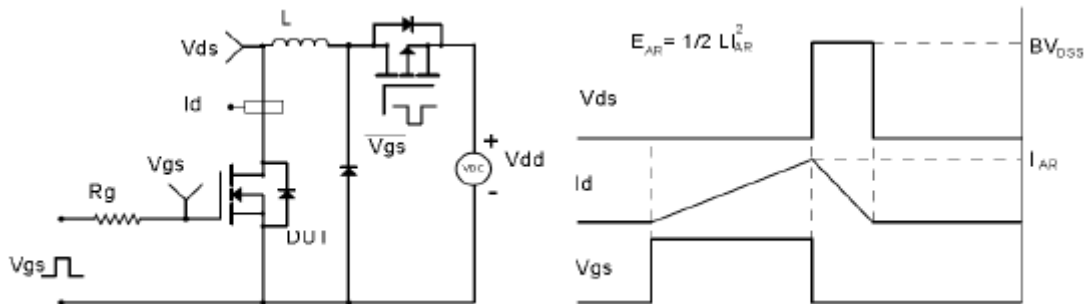
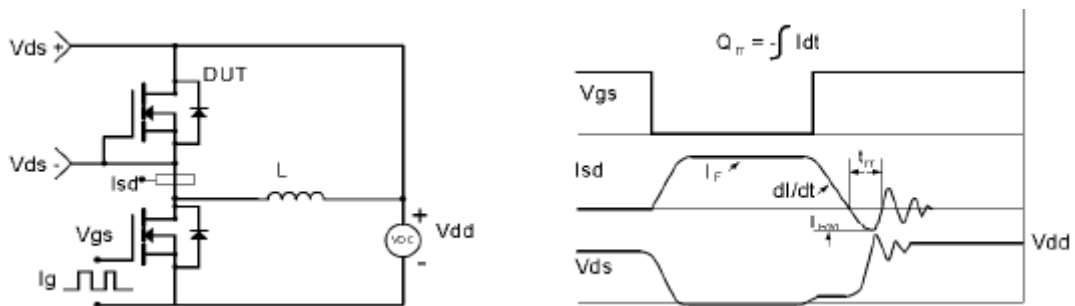
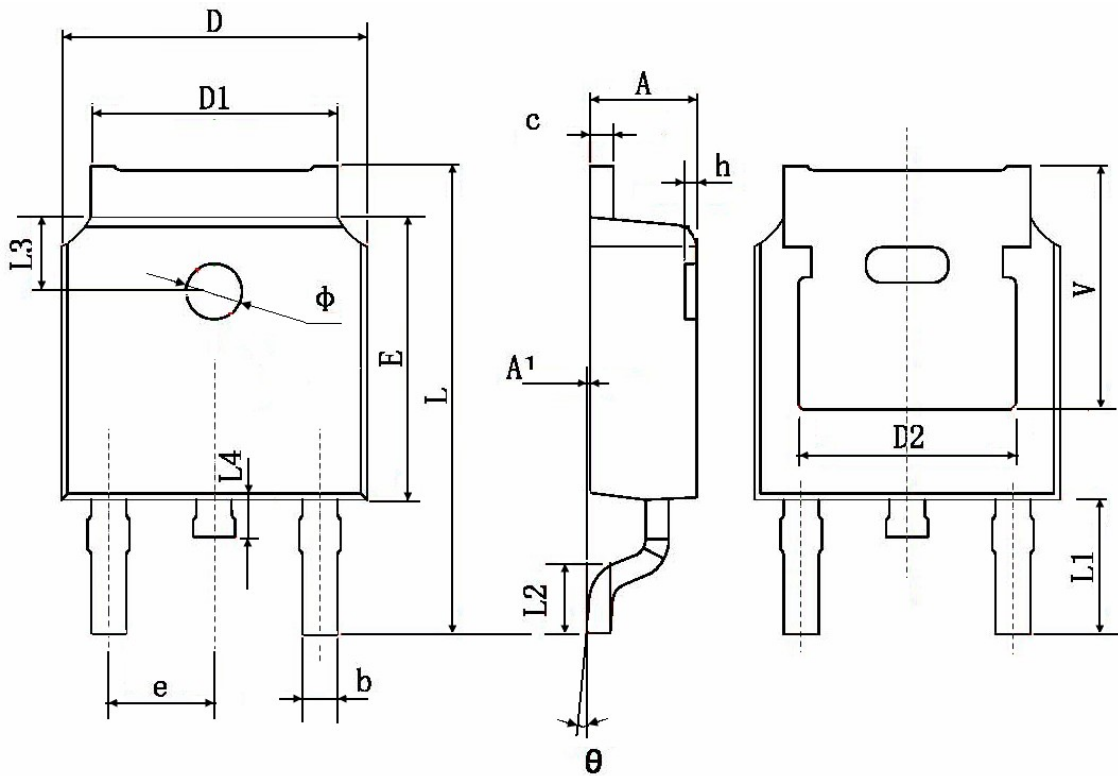


Figure 11. Diode Recovery Circuit & Waveform



Package Information : TO-252



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.	