

FH1604B

N-Channel Trench Power MOSFET

Description

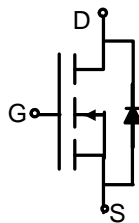
These N Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on state resistance, provide superior switching performance, and with stand high energy pulse in the avalanche and commutation mode. These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

General Features

- ◆ $V_{DSS}=40V$, $I_D=85A$
 $R_{DS(ON)}=7.3m\Omega$ (MAX) @ $V_{GS}=10V$
- ◆ Improved dv/dt capability
- ◆ Fast switching
- ◆ 100% EAS Guaranteed
- ◆ Green device available

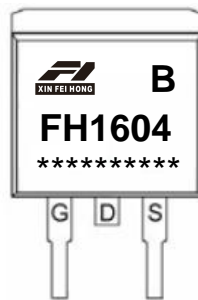
Applications

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

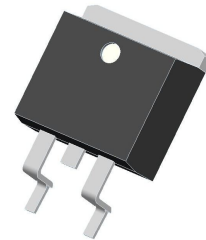


Schematic diagram

TO-263



Marking and pin assignment



TO-263 top view

Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	40	V
Continuous drain current ($T_C = 25^\circ C$)	I_D	85	A
Continuous drain current ($T_C = 100^\circ C$)		55	A
Pulsed drain current ¹⁾	I_{DM}	340	A
Gate Source voltage	V_{GSS}	± 20	V
Avalanche energy ²⁾	E_{AS}	165	mJ
Power Dissipation ($T_C = 25^\circ C$)	P_D	125	W
Storage Temperature Range	T_{STG}	-55 to +150	°C
Operating Junction Temperature Range	T_J	-55 to +150	°C

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.0	°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
		$V_{DS}=32\text{ V}, V_{GS}=0\text{ V}, T_J=125^\circ\text{C}$	---	---	10	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	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=30\text{ A}$	---	5.2	7.3	m Ω
		$V_{GS}=4.5\text{ V}, I_D=20\text{ A}$		6.8	9.3	m Ω
Forward transconductance	g_{fs}	$V_{DS}=5\text{ V}, I_D=20\text{ A}$	---	63	---	S
Dynamic characteristics						
Input capacitance	C_{iss}	$V_{DS}=20\text{ V}, V_{GS}=0\text{ V},$ $F=1\text{ MHz}$	---	2365	---	pF
Output capacitance	C_{oss}		---	314	---	
Reverse transfer capacitance	C_{rss}		---	210	---	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=32\text{ V}, V_{GS}=10\text{ V}, I_D=20\text{ A}$	---	6.6	---	ns
Rise time	t_r		---	110.6	---	
Turn off delay time	$t_{d(off)}$		---	285.4	---	
Fall time	t_f		---	121.1	---	
Gate resistance	R_g	$V_{GS}=0\text{ V}, V_{DS}=0\text{ V}, F=1\text{ MHz}$	---	1.7	---	Ω
Gate charge characteristics						
Gate to source charge	Q_{gs}	$V_{DS}=32\text{ V}, I_D=20\text{ A},$ $V_{GS}=10\text{ V}$	---	9.2	---	nC
Gate to drain charge	Q_{gd}		---	9.6	---	
Gate charge total	Q_g		---	51.2	---	
Drain-Source diode characteristics and Maximum Ratings						
Continuous Source Current	I_S		---	---	85	A
Pulsed Source Current ³⁾	I_{SM}		---	---	340	A
Diode Forward Voltage	V_{SD}	$V_{GS}=0\text{ V}, I_S=20\text{ A}, T_J=25^\circ\text{C}$	---	---	1.2	V
Reverse Recovery Time	t_{rr}	$I_S=20\text{ A}, di/dt=100\text{ A}/\mu\text{s}, T_J=25^\circ\text{C}$	---	22.4	---	ns
Reverse Recovery Charge	Q_{rr}		---	10.5	---	nC

Notes:

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

2: $V_{DD}=20\text{ V}, V_{GS}=10\text{ V}, L=0.5\text{ mH}, I_{AS}=24\text{ A}, R_G=25\Omega$, 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

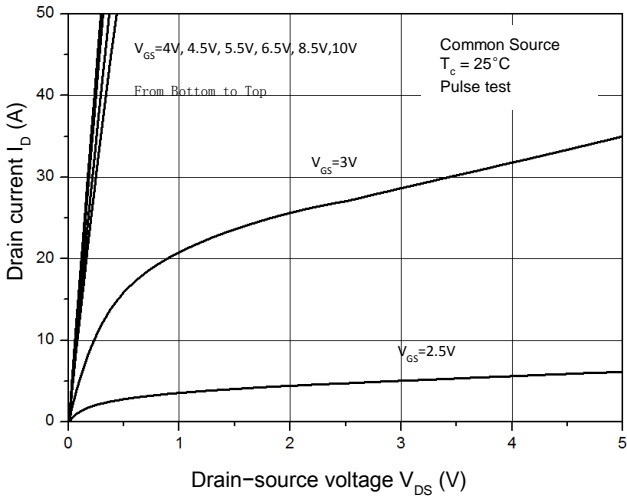


Figure 2. Transfer Characteristics

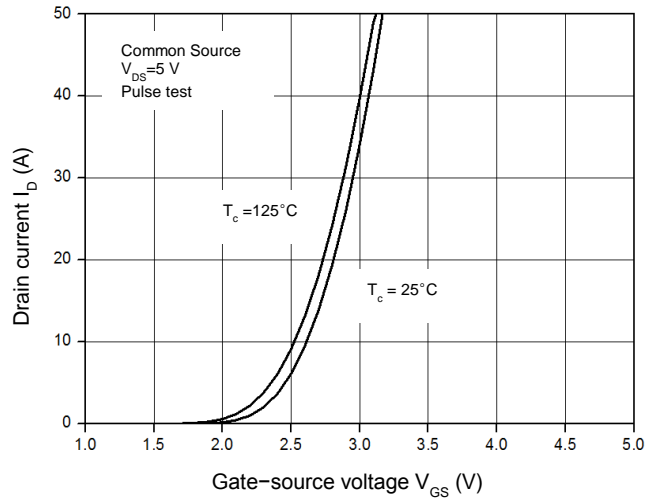


Figure 3. Capacitance Characteristics

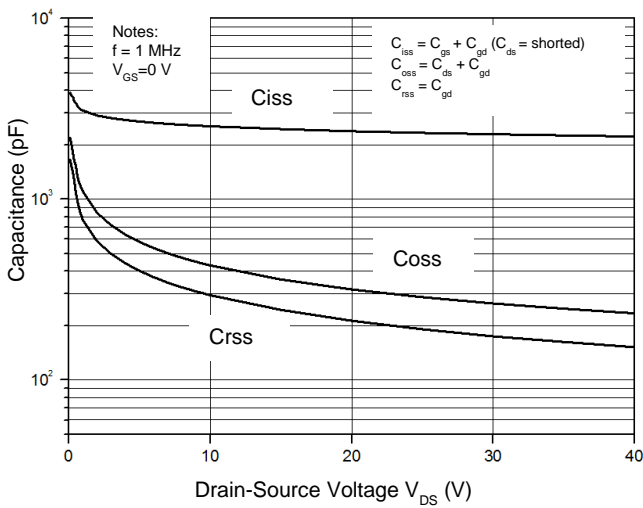


Figure 4. Gate Charge Waveform

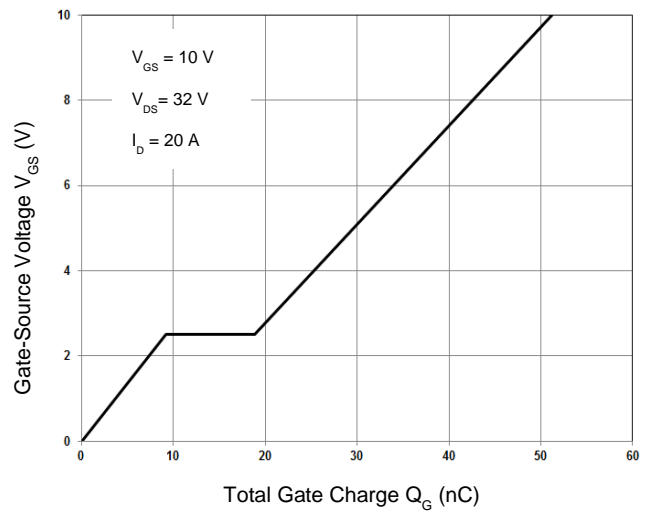


Figure 5. Body-Diode Characteristics

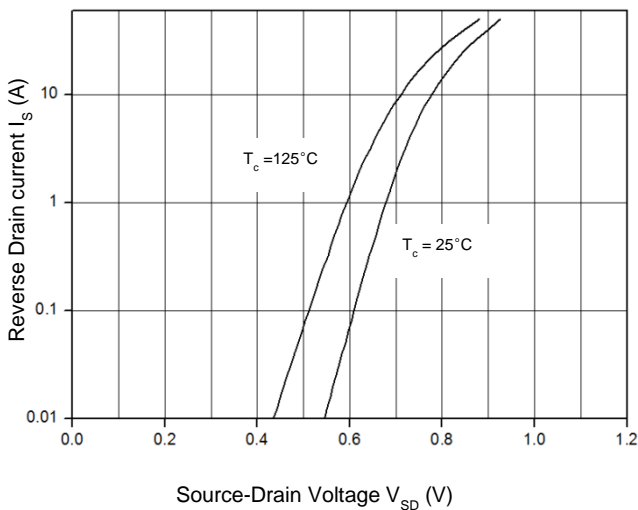


Figure 6. Rds(on)-Drain Current

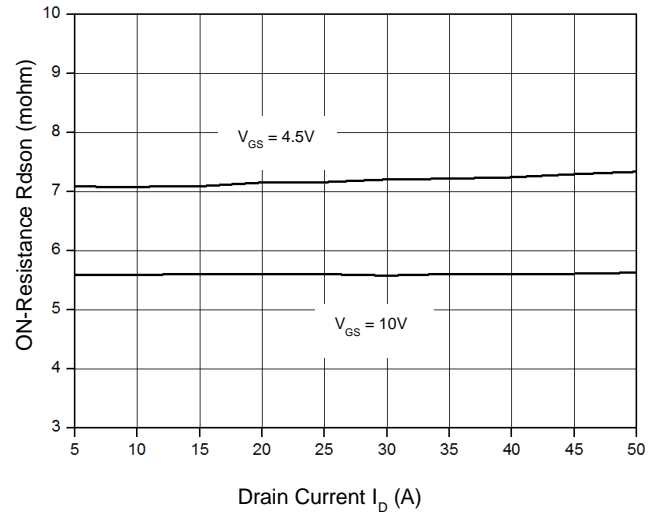


Figure 7. Rdson-Junction Temperature(°C)

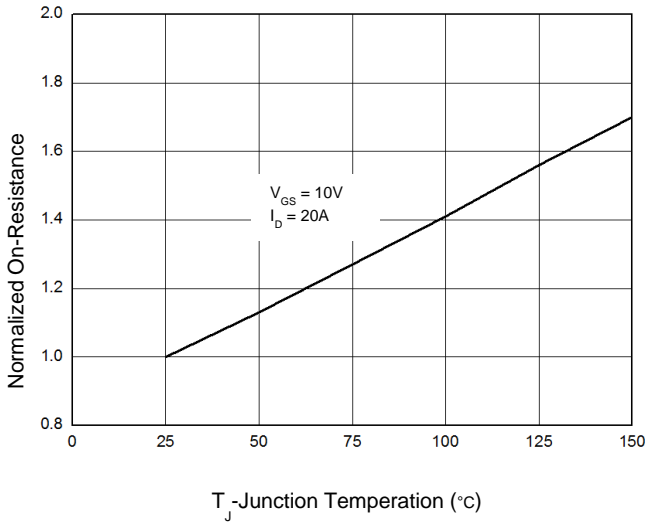


Figure 8. Maximum Safe Operating Area

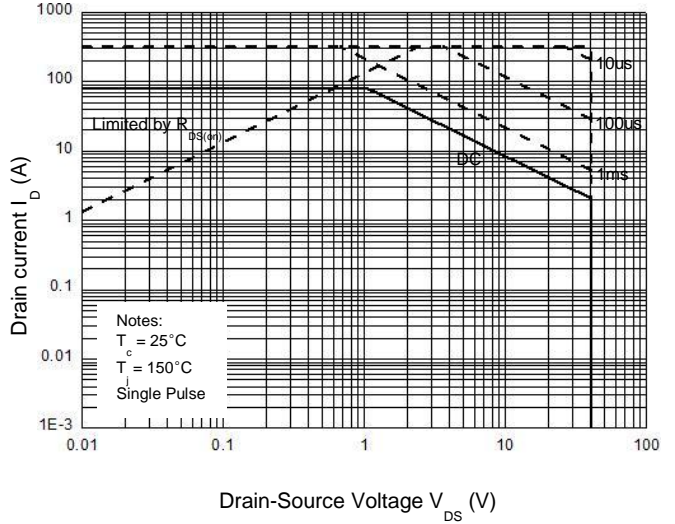
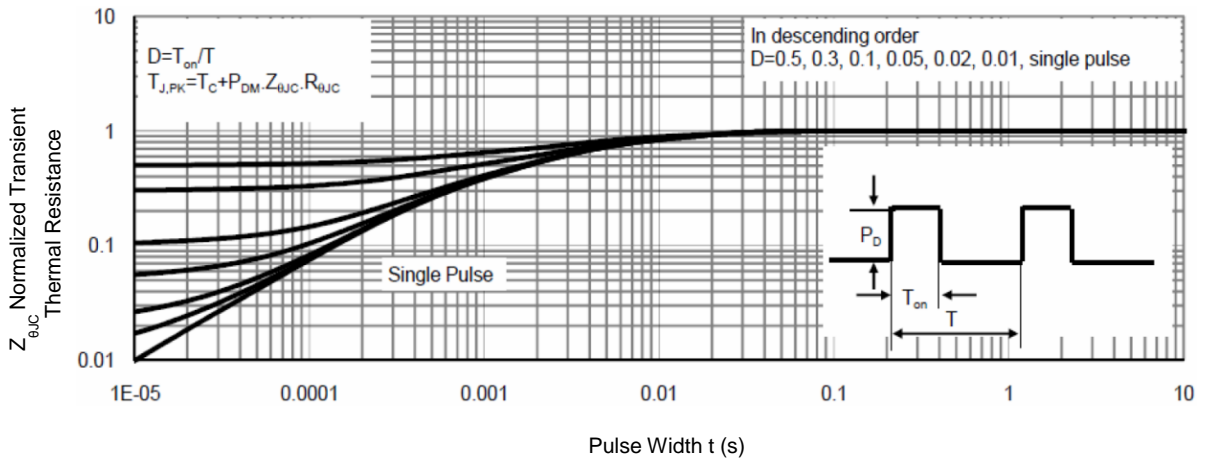


Figure 9. Normalized Maximum Transient Thermal Impedance (RthJC)



Test Circuit & Waveform

Figure 8. Gate Charge Test Circuit & Waveform

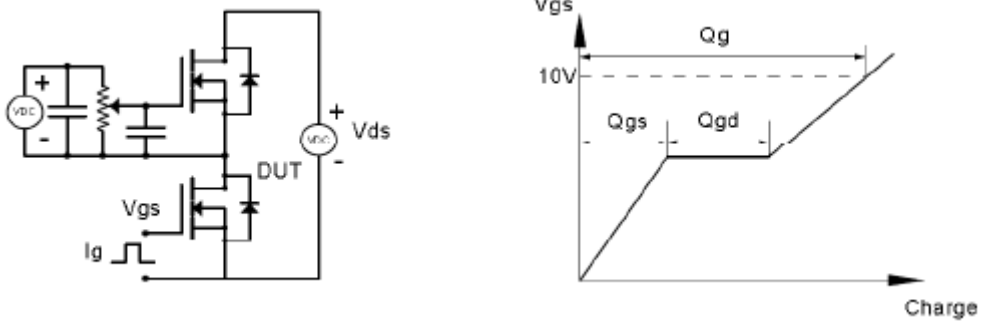


Figure 9. Resistive Switching Test Circuit & Waveforms

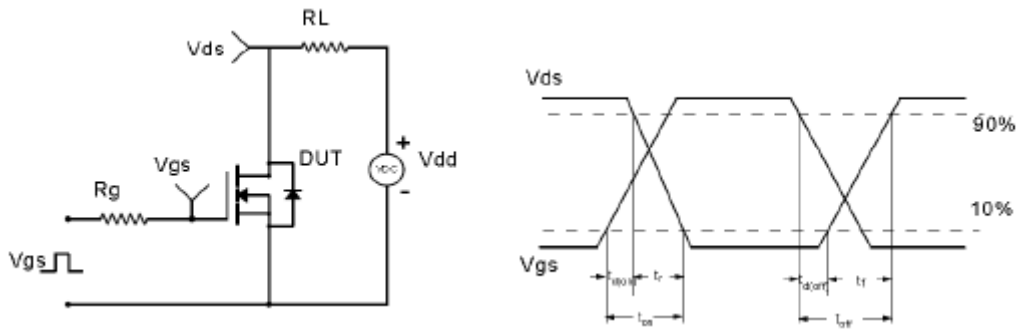


Figure 10. Unclamped Inductive Switching (UIS) Test Circuit & Waveform

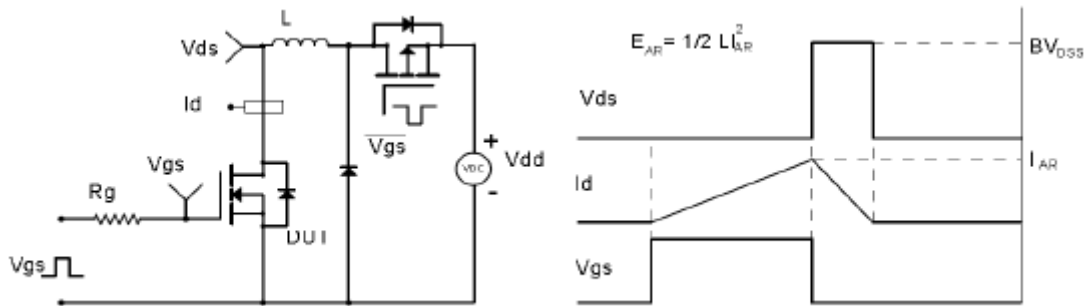
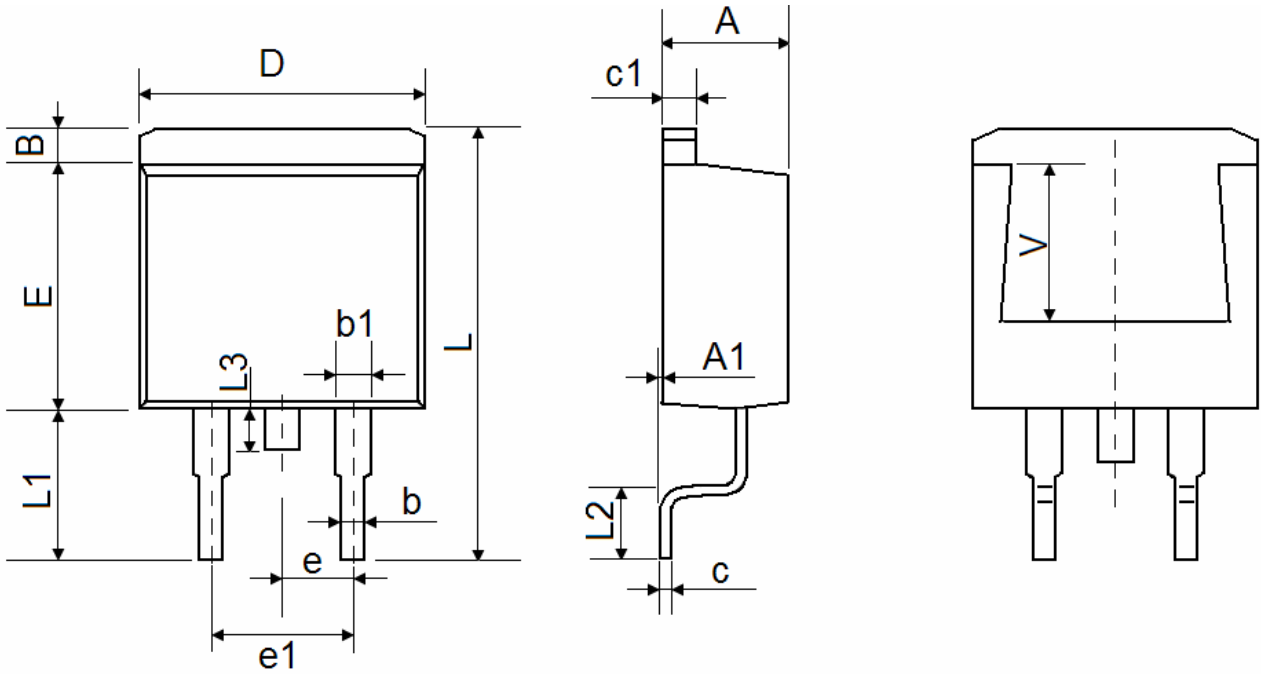


Figure 11. Diode Recovery Circuit & Waveform



Package Information : TO-263



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.470	4.670	0.176	0.184
A1	0.000	0.150	0.000	0.006
B	1.170	1.370	0.046	0.054
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.170	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	0.350
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
L	15.050	15.450	0.593	0.608
L1	5.080	5.480	0.200	0.216
L2	2.340	2.740	0.092	0.108
L3	1.300	1.700	0.051	0.067
V	5.600 REF		0.220 REF	