



Description

The HAOD538 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

General Features

$V_{DS} = 30V$ $I_D = 150A$

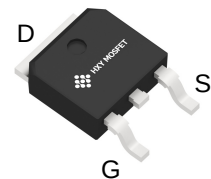
$R_{DS(ON)} < 2.9m\Omega @ V_{GS}=10V$

Application

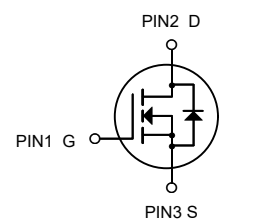
Battery protection

Load switch

Uninterruptible power supply



TO-252-2L



N-Channel MOSFET

Ordering Information

Product ID	Pack	Brand	Qty(PCS)
HAOD538	TO-252-2L	HXY MOSFET	2500

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

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	30	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D @ T_C=25^{\circ}C$	Continuous Drain Current, $V_{GS} @ 10V^1$	150	A
$I_D @ T_C=100^{\circ}C$	Continuous Drain Current, $V_{GS} @ 10V^1$	80	A
I_{DM}	Pulsed Drain Current ²	450	A
EAS	Single Pulse Avalanche Energy ³	580	mJ
I_{AS}	Avalanche Current	60	A
$P_D @ T_C=25^{\circ}C$	Total Power Dissipation ⁴	87	W
T_{STG}	Storage Temperature Range	-55 to 150	$^{\circ}C$
T_J	Operating Junction Temperature Range	-55 to 150	$^{\circ}C$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient 1	62	$^{\circ}C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case1	2.1	$^{\circ}C/W$



Electrical characteristic ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain to source breakdown voltage	$V_{GS}=0V, I_D=250\mu A$	30			V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown voltage temperature coefficient	$I_D=250\mu A$, referenced to 25°C		0.02		V/ $^\circ\text{C}$
I_{DSS}	Drain to source leakage current	$V_{DS}=30V, V_{GS}=0V$			1	μA
		$V_{DS}=24V, T_J=125^\circ\text{C}$			50	μA
I_{GSS}	Gate to source leakage current, forward	$V_{GS}=20V, V_{DS}=0V$			100	nA
	Gate to source leakage current, reverse	$V_{GS}=-20V, V_{DS}=0V$			-100	nA
$V_{GS(TH)}$	Gate threshold voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.2		2.4	V
$R_{DS(ON)}$	Drain to source on state resistance	$V_{GS}=4.5V, I_D=30A, T_J=25^\circ\text{C}$		2.2	4.8	m Ω
		$V_{GS}=10V, I_D=30A, T_J=25^\circ\text{C}$		1.5	2.9	m Ω
		$V_{GS}=10V, I_D=30A, T_J=125^\circ\text{C}$		2.5		m Ω
G_{fs}	Forward transconductance	$V_{DS}=5V, I_D=30A$		73		S
C_{iss}	Input capacitance	$V_{GS}=0V, V_{DS}=15V, f=1\text{MHz}$		6272		pF
C_{oss}	Output capacitance			1022		
C_{rss}	Reverse transfer capacitance			718		
$t_{d(on)}$	Turn on delay time	$V_{DS}=15V, I_D=30A, R_G=4.7\Omega, V_{GS}=10V$ (note 4,5)		20		ns
t_r	Rising time			58		
$t_{d(off)}$	Turn off delay time			158		
t_f	Fall time			77		
Q_g	Total gate charge	$V_{DS}=24V, V_{GS}=10V, I_D=30A, I_G=5mA$ (note 4,5)		143		nC
Q_{gs}	Gate-source charge			17		
Q_{gd}	Gate-drain charge			43		
R_g	Gate resistance	$V_{DS}=0V$, Scan F mode		4.2		Ω
I_S	Continuous source current	Integral reverse p-n Junction diode in the MOSFET			110	A
I_{SM}	Pulsed source current				440	A
V_{SD}	Diode forward voltage drop.	$I_S=45A, V_{GS}=0V$			1.4	V
t_{rr}	Reverse recovery time	$I_S=30A, V_{GS}=0V,$		26		ns
Q_{rr}	Reverse recovery charge	$dI_F/dt=100A/\mu s$		10		nC

※. Notes

1. Repetitive rating : pulse width limited by junction temperature.
2. $L=0.5mH, I_{AS}=48A, V_{DD}=30V, R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$
3. $I_{SD}\leq 30A, di/dt=100A/\mu s, V_{DD}\leq BV_{DSS}$, Starting $T_J=25^\circ\text{C}$
4. Pulse Test : Pulse Width $\leq 300\mu s$, duty cycle $\leq 2\%$.



Typical Electrical and Thermal Characteristics

Fig. 1. On-state characteristics

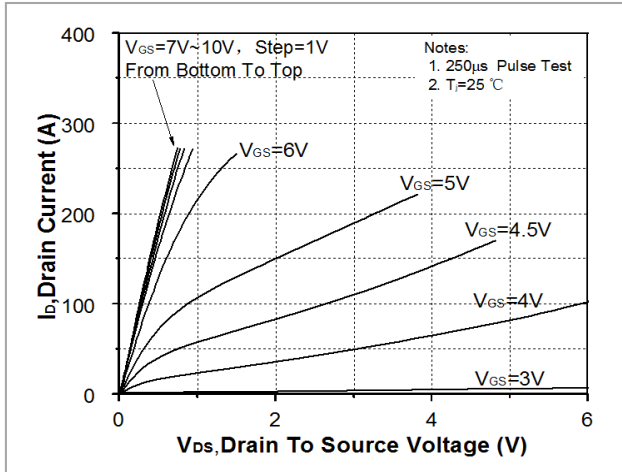


Fig. 2. Transfer Characteristics

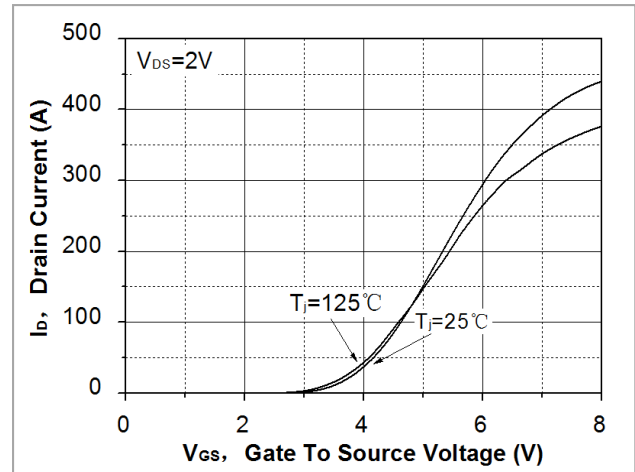


Fig. 3. On-resistance variation vs. drain current and gate voltage

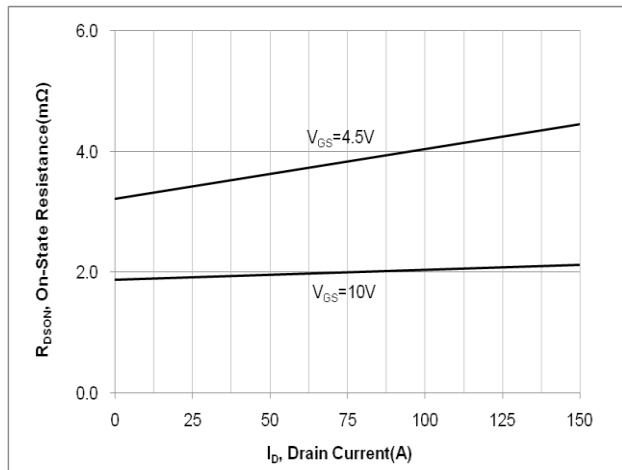


Fig. 4. On-state current vs. diode forward voltage

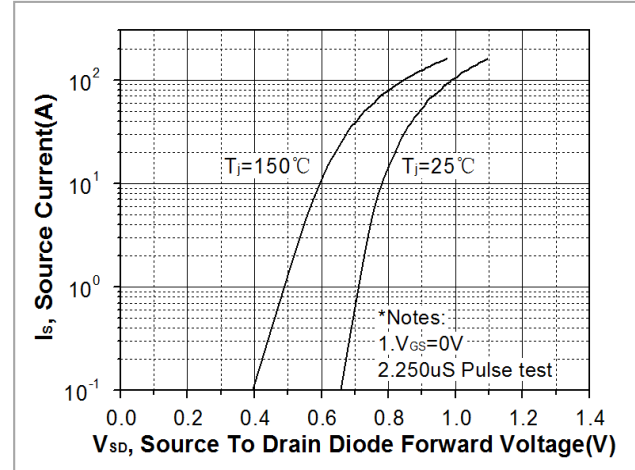


Fig 5. Breakdown voltage variation vs. junction temperature

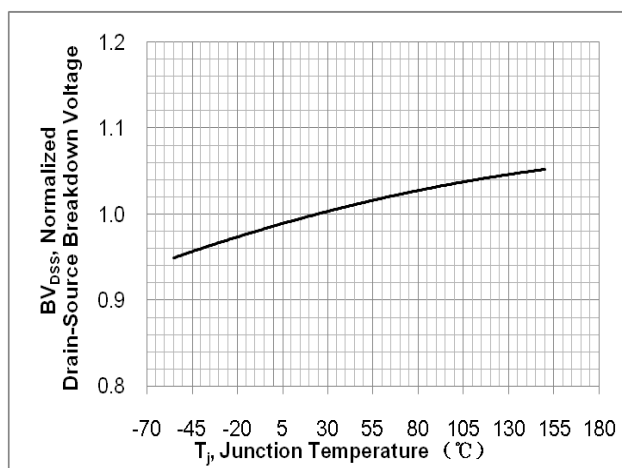


Fig. 6. On-resistance variation vs. junction temperature

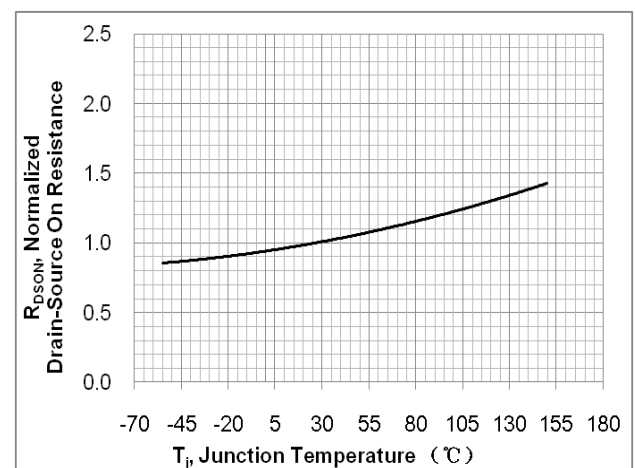




Fig. 7. Gate charge characteristics

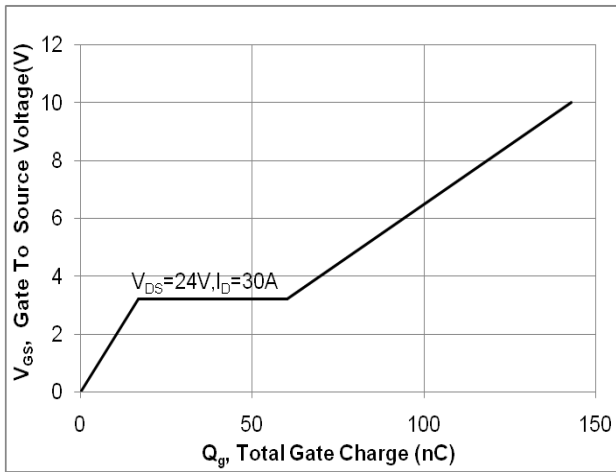


Fig. 8. Capacitance Characteristics

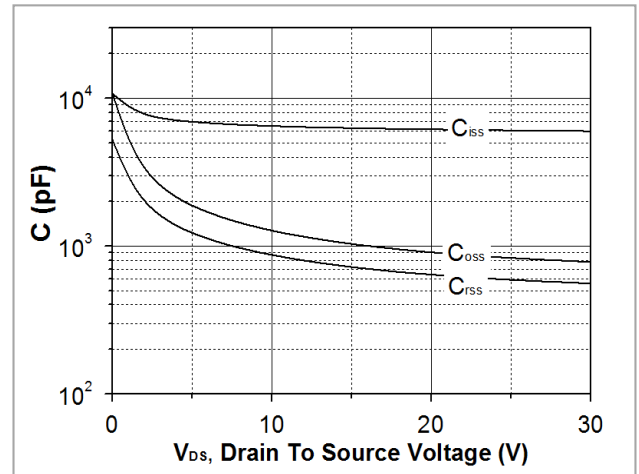


Fig. 9. Maximum safe operating area

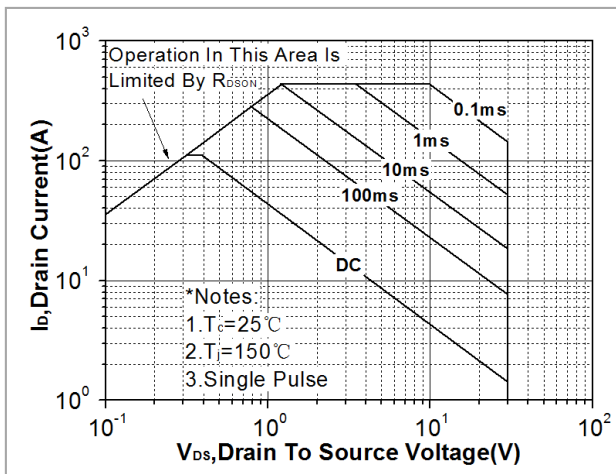


Fig. 10. Maximum drain current vs. case temperature

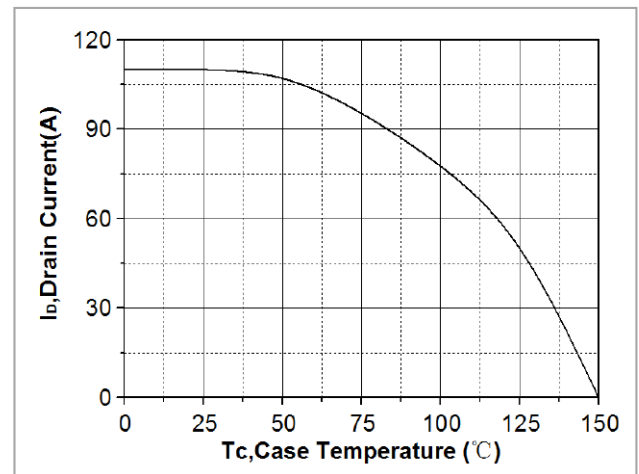
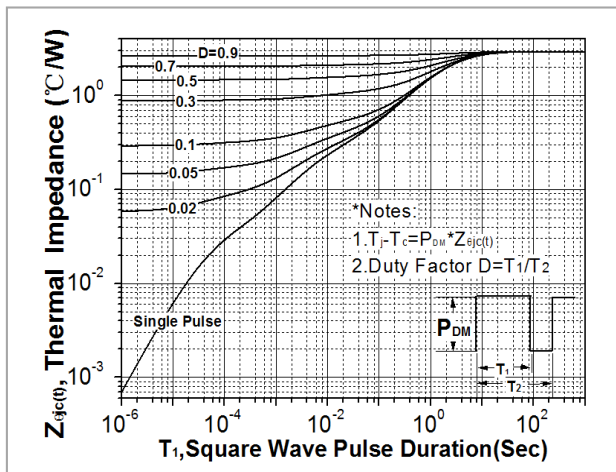


Fig. 11. Transient thermal response curve





Test Circuit

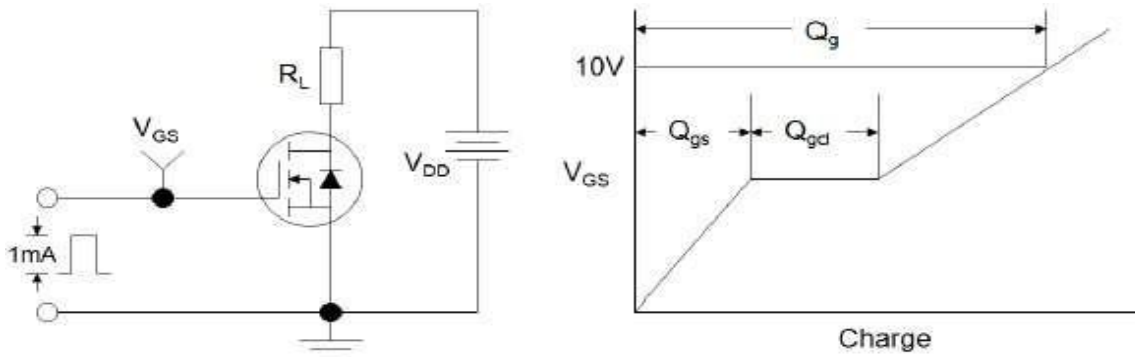


Figure1:Gate Charge Test Circuit & Waveform

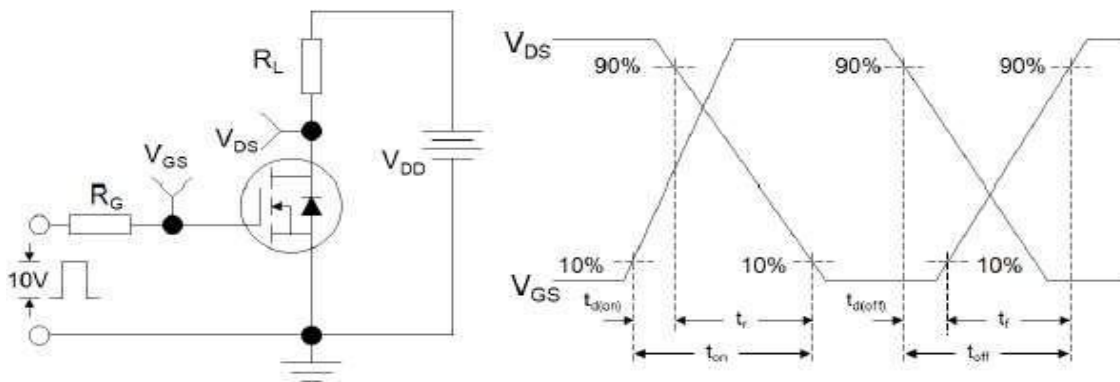


Figure 2: Resistive Switching Test Circuit & Waveforms

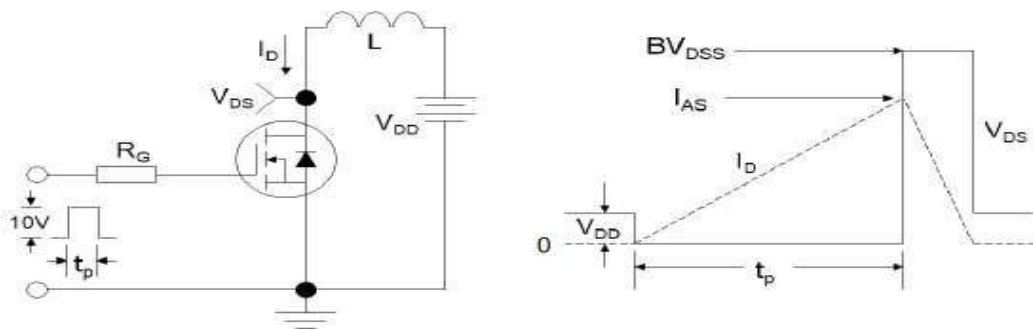
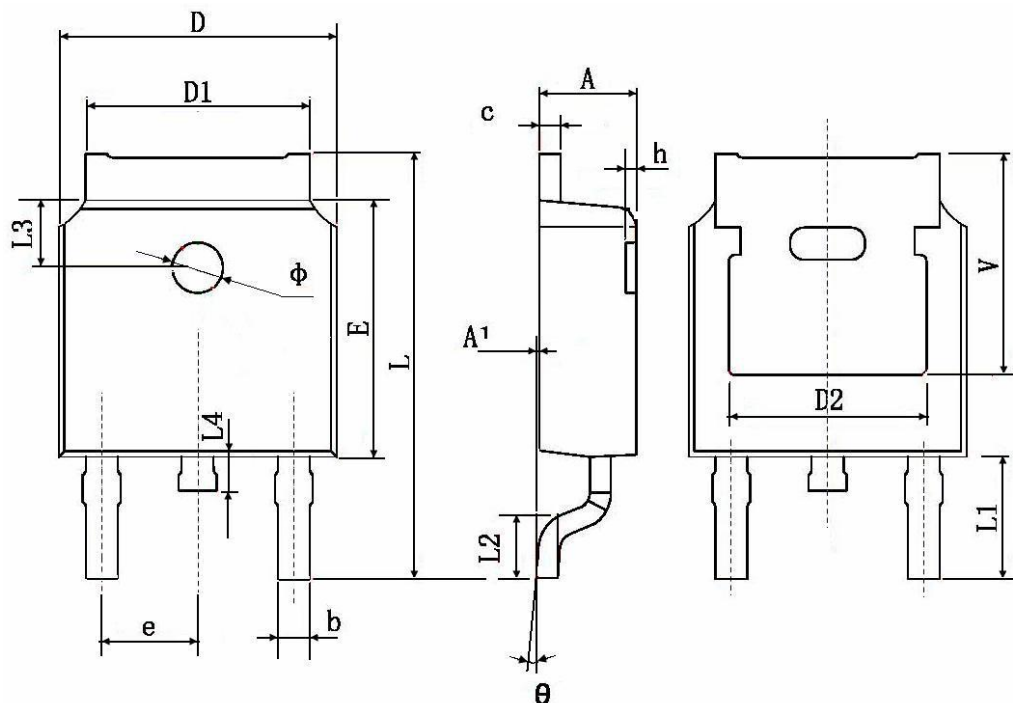


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms



TO-252-2L 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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