



Description

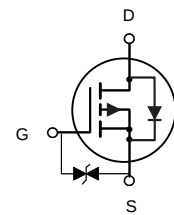
The HAO3415 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

General Features

$V_{DS} = -20V$ $I_D = -4.1A$
 $R_{DS(ON)} < 45m\Omega @ V_{GS} = -4.5V$
ESD Rating: 1500V HBM

Application

Battery protection
Load switch
Uninterruptible power supply



P-Channel MOSFET

Ordering Information

Product ID	Pack	Marking	Qty(PCS)
HAO3415	SOT-23-3L	AFTV	3000

Absolute Maximum Ratings ($T_A = 25^\circ C$ unless otherwise noted)

Symbol	Parameter	Limit	Unit
V_{DS}	Drain-Source Voltage	-20	V
V_{GS}	Gate-Source Voltage	± 10	V
I_D	Drain Current-Continuous	-4.1	A
I_{DM}	Drain Current-Pulsed (Note 1)	-30	A
P_D	Maximum Power Dissipation	1.4	W
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 To 150	$^\circ C$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 2)	89.3	$^\circ C/W$



Electrical Characteristics (T_A=25°C unless otherwise noted)

Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-20V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±10V, V _{DS} =0V	-	-	±10	μA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-0.35	-0.55	-0.9	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-4.5V, I _D =-4A	-	34	45	mΩ
		V _{GS} =-2.5V, I _D =-4A	-	44	60	mΩ
Forward Transconductance	g _{FS}	V _{DS} =-5V, I _D =-4A	8	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =-10V, V _{GS} =0V, F=1.0MHz	-	950	-	PF
Output Capacitance	C _{oss}		-	165	-	PF
Reverse Transfer Capacitance	C _{rss}		-	120	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-10V, R _L =2. 5Ω V _{GS} =-4.5V, R _{GEN} =3Ω	-	12		nS
Turn-on Rise Time	t _r		-	10		nS
Turn-Off Delay Time	t _{d(off)}		-	19		nS
Turn-Off Fall Time	t _f		-	25		nS
Total Gate Charge	Q _g	V _{DS} =-10V, I _D =-4A, V _{GS} =-4.5V	-	12		nC
Gate-Source Charge	Q _{gs}		-	1.4	-	nC
Gate-Drain Charge	Q _{gd}		-	3.6	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =-4A	-	-	-1.2	V
Diode Forward Current (Note 2)	I _S		-	-	-4	A

Notes:

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



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

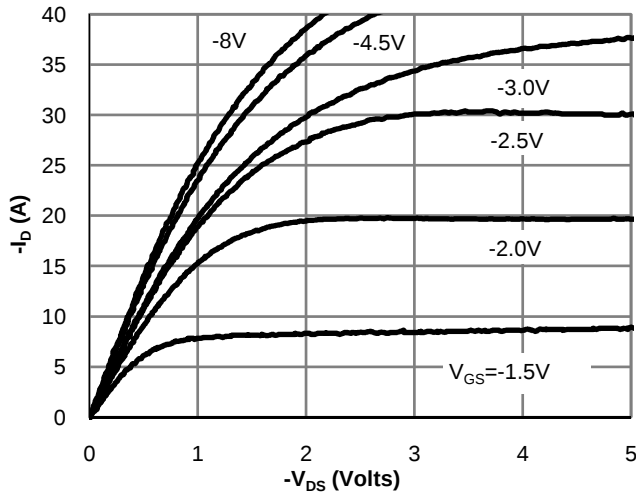


Fig 1: On-Region Characteristics (Note E)

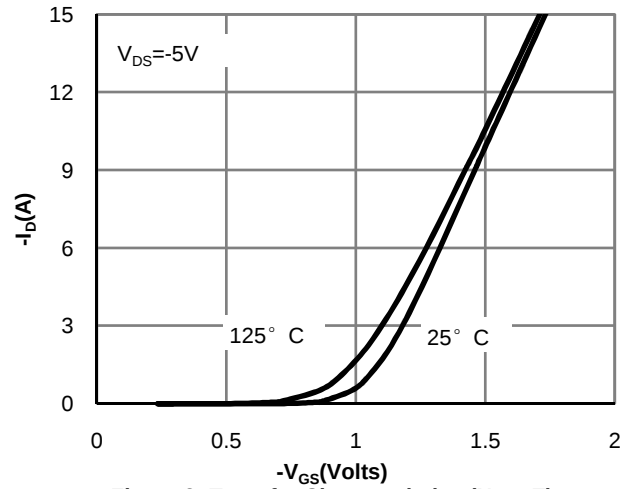


Figure 2: Transfer Characteristics (Note E)

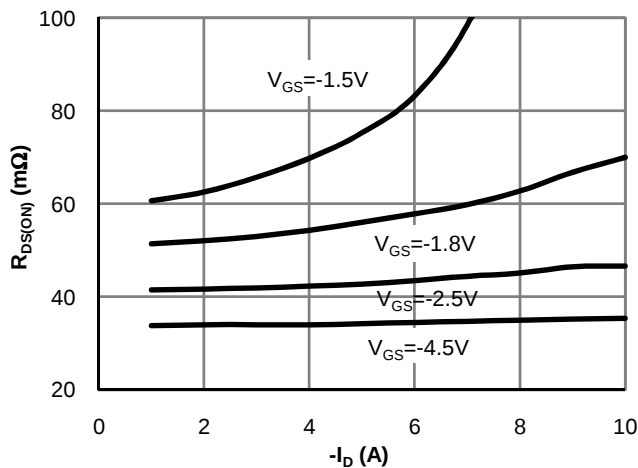


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

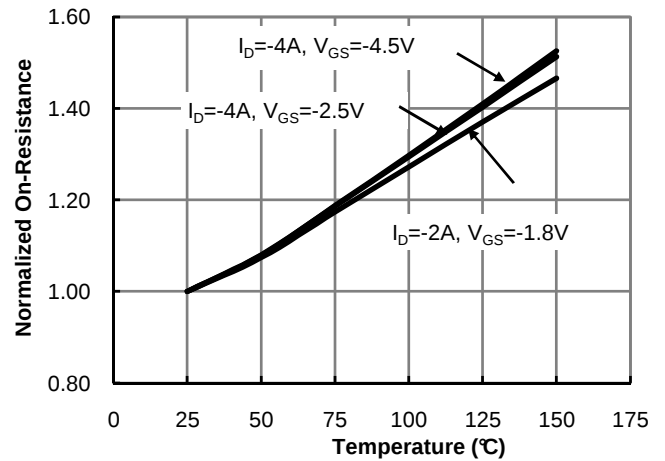


Figure 4: On-Resistance vs. Junction Temperature (Note E)

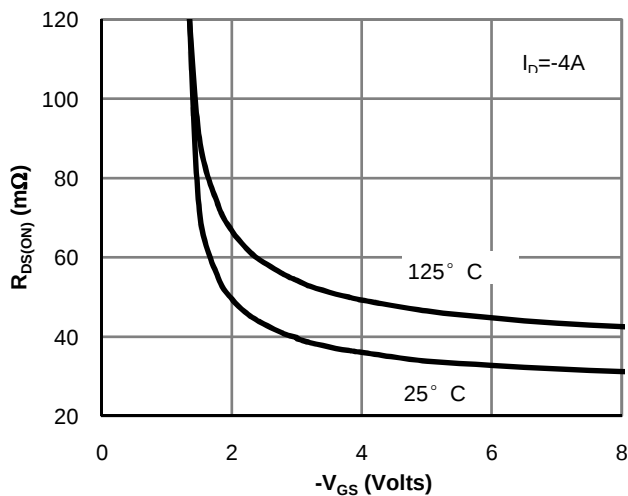


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

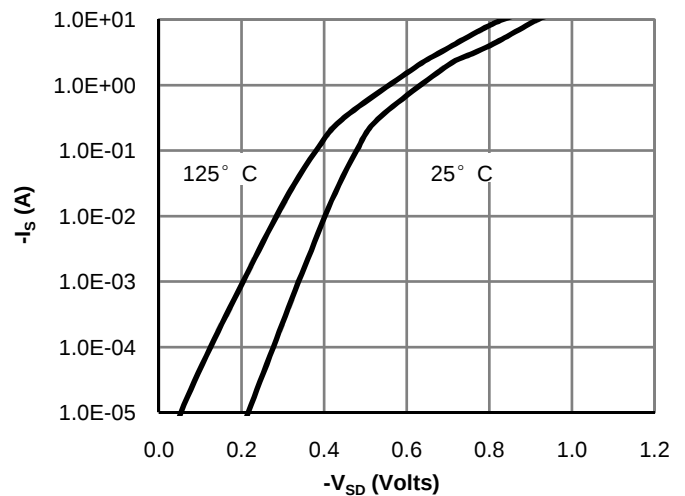
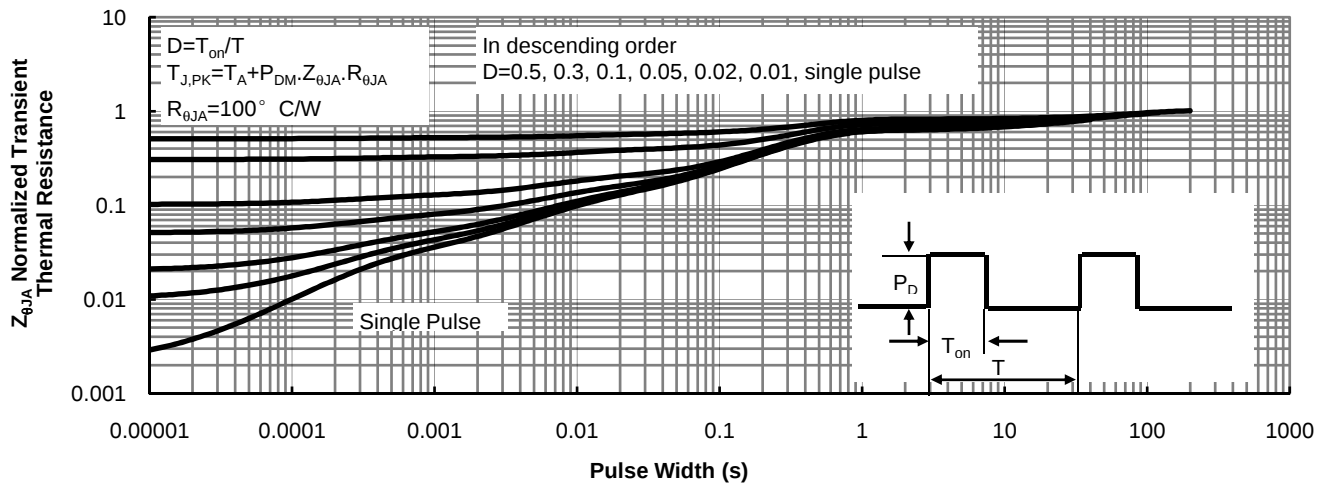
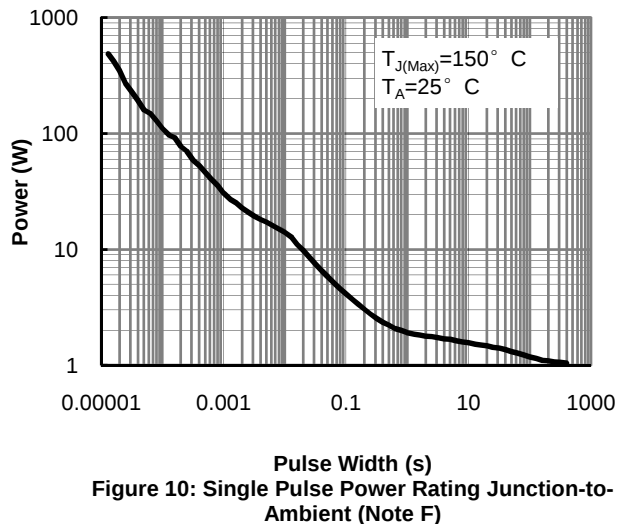
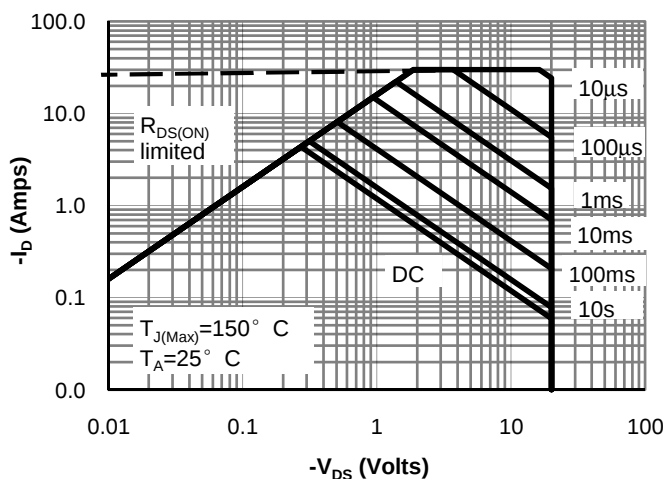
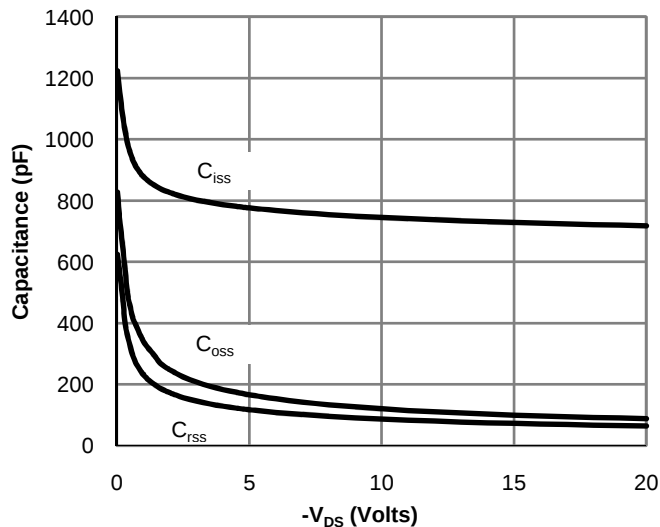
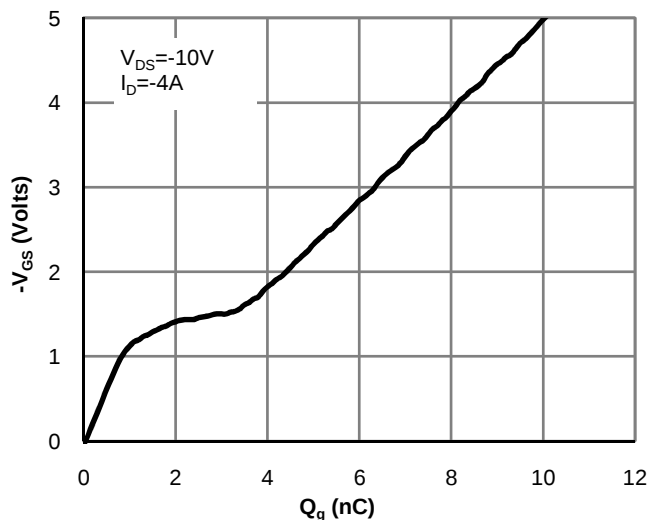


Figure 6: Body-Diode Characteristics (Note E)

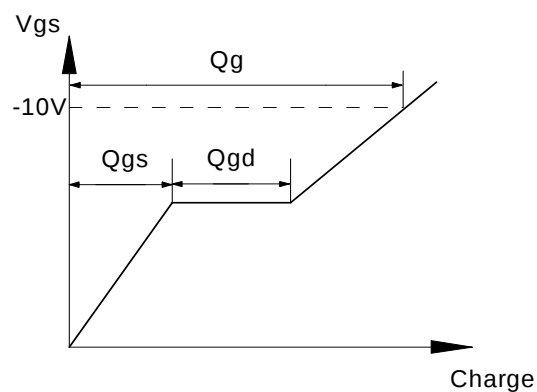
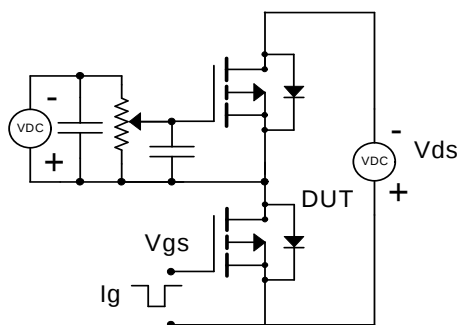


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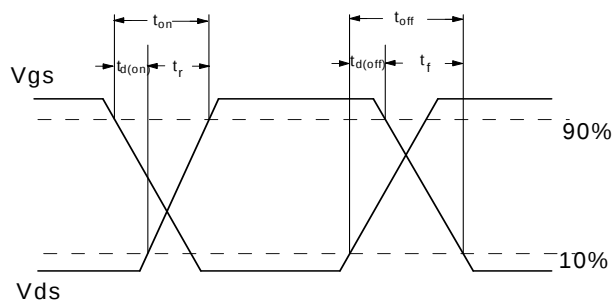
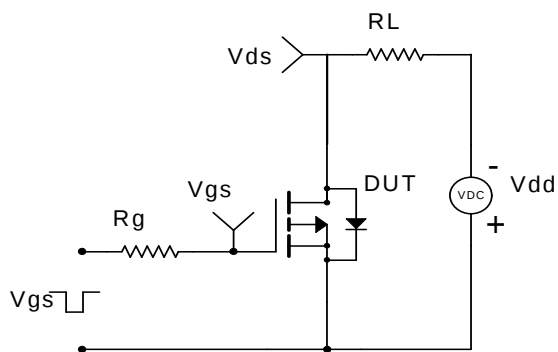




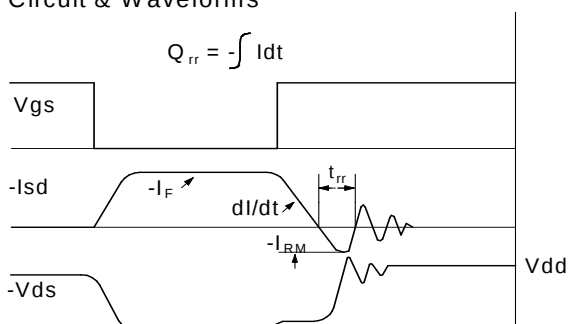
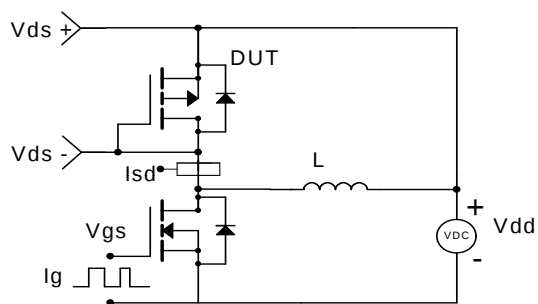
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms





SOT-23-3L Package Information



Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	1.050	1.250
A1	0.000	0.100
A2	1.050	1.150
b	0.300	0.500
c	0.100	0.200
D	2.800	3.000
E	1.500	1.700
E1	2.650	2.950
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.600
θ	0°	8°



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