HT3401

P-Channel Enhancement Mode Field Effect Transistor

General Description

The HT3401 uses advanced trench technology to Provide excellent RDS(ON),low gate change and Operation with gate voltages as low as 2.5V.This Device is suitable for use as a load switch or in PWM applications. Standard product HT3401 is Pb-free (meets ROHS & Sony 259 specifications).

Features

V_{DS}(V)=-30V

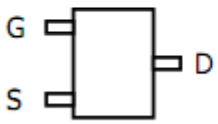
I_D=-4.2A(V_{GS}=-10V)

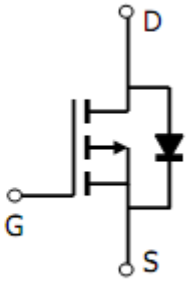
$R_{DS(ON)}$<50mΩ (V_{GS}=-10V)

$R_{DS(ON)}$<65mΩ (V_{GS}=-4.5V)

$R_{DS(ON)}$<120mΩ (V_{GS}=-2.5V)

TO-236
(SOT-23)
Top View





Absolute Maximum Ratings (TA=25°C unless otherwise noted)

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		VDS	-30	V
Gate-Source Voltage		VGS	±12	V
Continuous Drain Current (A)	TA=25°C	ID	-4.2	A
	TA=70°C		-3.5	
Junction and Storage Temperature Range		IDM	-3.0	
Power Dissipation (A)	TA=25°C	PD	1.4	W
	TA=70°C		1	
Junction and Storage Temperature Range		TJ,TSTG	-55 to 150	℃

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum junction-to-Ambient(A)	t≤ 10s	RθJA	65	90	°C/W
Maximum junction-to-Ambient(A)	Steady-State		85	125	°C/W
Maximum junction-to-Lead(C)	Steady-State	RθJL	43	60	°C/W

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	ID=-250μA, VGS=0V	-30			V
IDSS	Zero Gate Voltage Drain Current	VDS=-24V,VGS=0V			-1	μA
		TJ=55℃			-5	
IGSS	Gate-Body leakage current	VDS=0V, VGS=±12V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	VDS=VGS ID=-250μA	-0.7	-1	-1.3	V
ID(ON)	On state drain current	VGS=-4.5V, VDS=-5V	-25			A
RDS(ON)	Static Drain-Source On-Resistance	VGS=-10V, ID=-4.2A		42	50	mΩ
		TJ=125°C			75	
		VGS=-4.5V, ID=-4A		53	65	mΩ
		VGS=-2.5V, ID=-1A		80	120	mΩ
g_{FS}	Forward Transconductance	VDS=-5V, ID=-5A	7	11		S
V_{SD}	Diode Forward Voltage	IS=-1A,VGS=0V		-0.75	-1	V
Is	Maximum Body-Diode Continuous Current				-2.2	A
I_{SM}	Pulsed Body-Diode Current[B]				-30	A
DYNAMIC PARAMETERS						
Ciss	Input Capacitance	VGS=0V, VDS=-15V, f=1MHz		954		pF
Coss	Output Capacitance			115		pF
Crss	Reverse Transfer Capacitance			77		pF
Rg	Gate resistance	VGS=0V, VDS=0V, f=1MHz		6		Ω
SWITCHING PARAMETERS						
Qg	Total Gate Charge	VGS=4.5V, VDS=-15V, ID=-4A		9.4		nC
Qgs	Gate Source Charge			2		nC
Qgd	Gate Drain Charge			3		nC
tD(on)	Turn-On DelayTime	VGS=-10V,VDS=-15V, RL=3.6Ω, RGEN=6Ω		6.3		nC
tr	Turn-On Rise Time			3.2		ns
tD(off)	Turn-Off DelayTime			38.2		ns
tf	Turn-Off Fall Time			12		ns
trr	Body Diode Reverse Recovery Time	IF=-4A, dI/dt=100A/μs		20.2		ns
Qrr	Body Diode Reverse Recovery Charge	IF=-4A, dI/dt=100A/μs		11.2		nC

A: The value of R θJA is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T A =25°C. The value in any a given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C. The R θJA is the sum of the thermal impedence from junction to lead R θJL and lead to ambient.

D. The static characteristics in Figures 1 to 6,12,14 are obtained using <300 μs pulses, duty cycle 0.5% max.

E. These tests are performed with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with T A=25°C. The SOA curve provides a single pulse rating.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

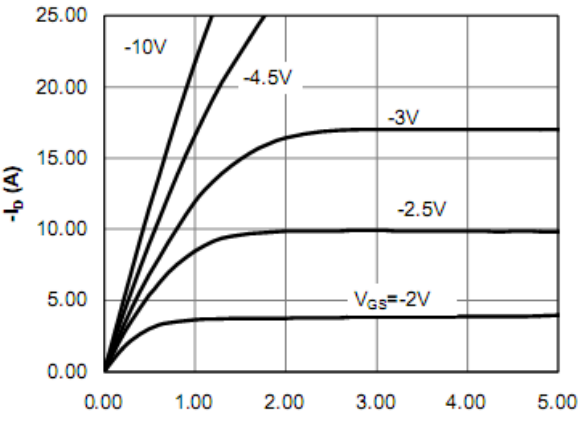


Fig 1: On-Region Characteristics

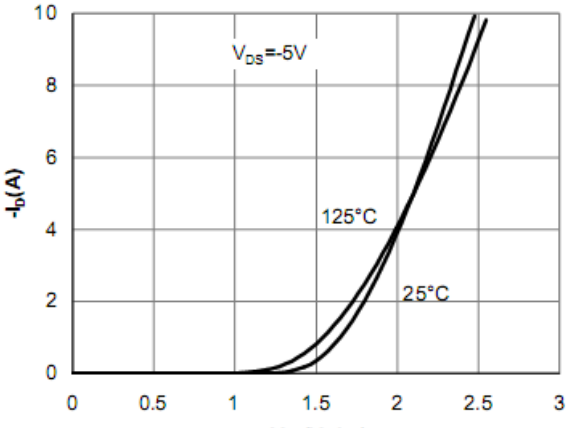


Figure 2: Transfer Characteristics

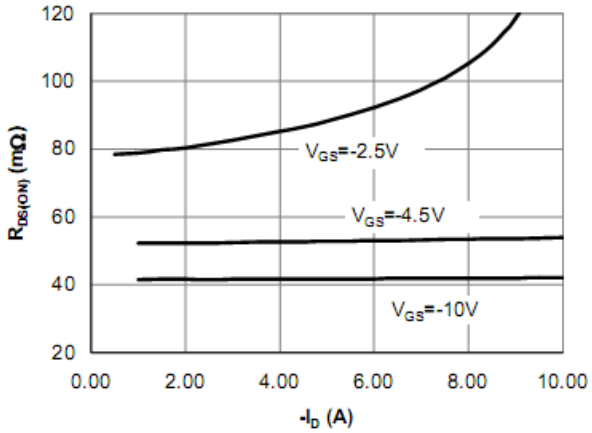


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

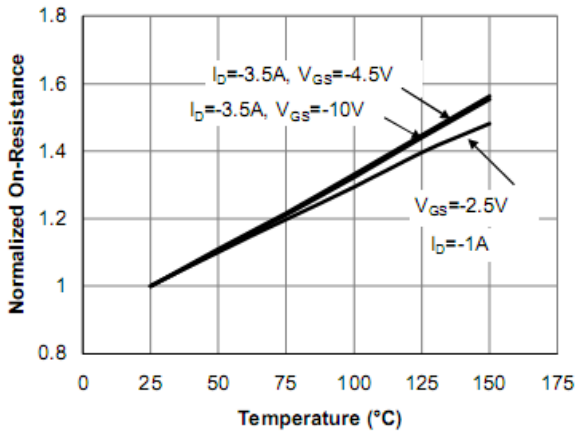


Figure 4: On-Resistance vs. Junction Temperature

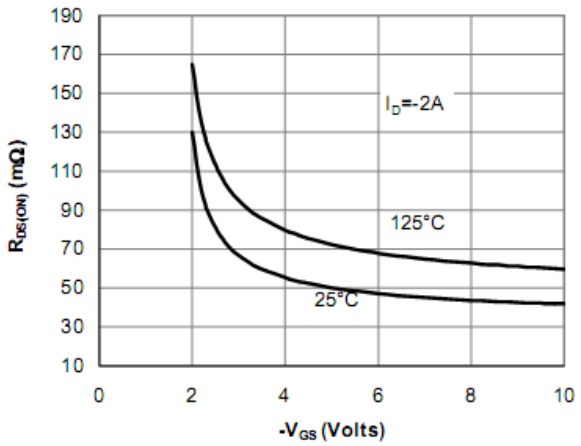


Figure 5: On-Resistance vs. Gate-Source Voltage

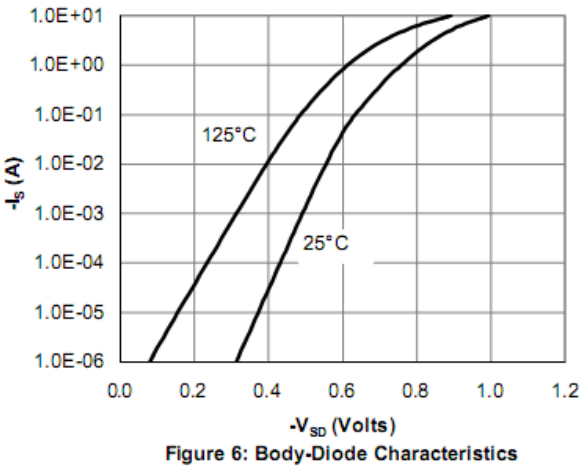


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

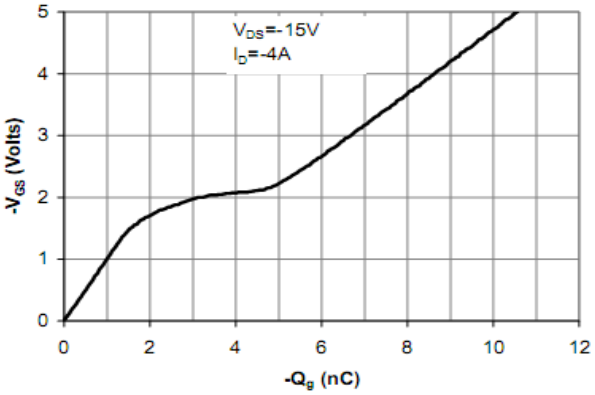


Figure 7: Gate-Charge Characteristics

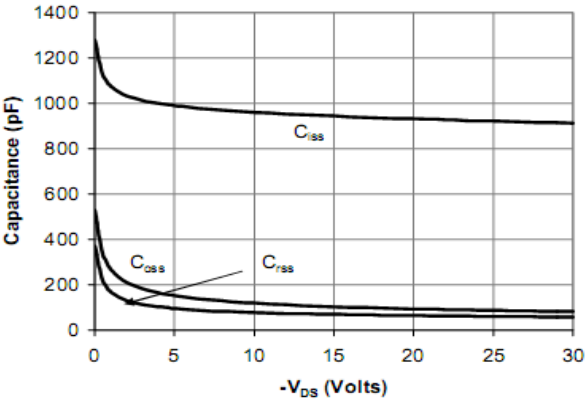


Figure 8: Capacitance Characteristics

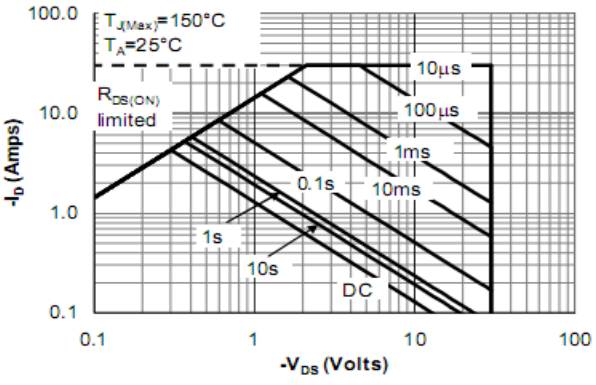


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

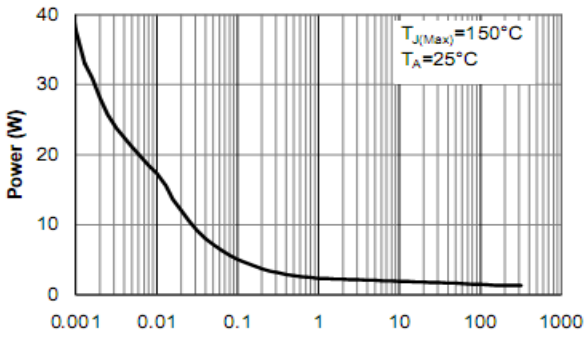


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

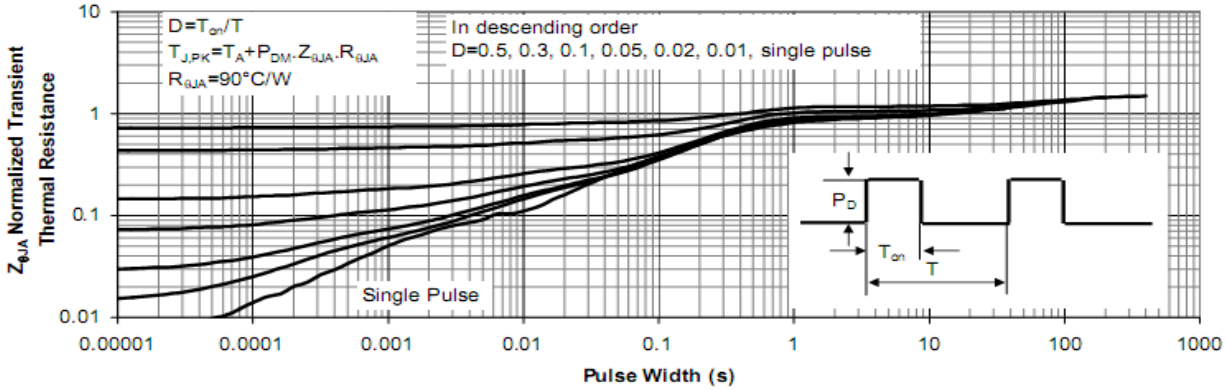


Figure 11: Normalized Maximum Transient Thermal Impedance