# P-Channel Trench Power MOSFET

General Description

The CS3401A uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as -2.5V. This device is suitable for use as a load switch or in PWM applications.
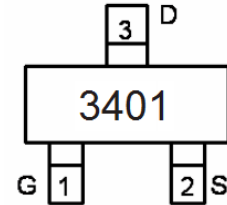
Features

- V_{DS} = -30V, ID =-4.2A
  $R_{DS(ON)}$ < 55mΩ @ V_{GS} =-10V
  $R_{DS(ON)}$ < 65mΩ @ V_{GS} =-4.5V
  $R_{DS(ON)}$ < 110mΩ @ V_{GS} =-2.5V

- High Power and current handing capability
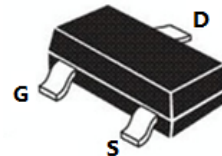- Lead free product is acquired
- Surface Mount Package

Application

- PWM applications
- Load switch
- Power management
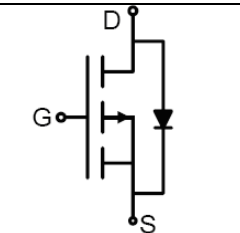
Schematic Diagram

Marking and pin Assignment

3401

SOT-23 top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
3401	CS3401A	SOT-23	Ø180mm	8mm	3000 units

Table 1. Absolute Maximum Ratings (T$_A$=25℃)

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage ($V_{GS=0V}$）	-30	V
V_{GS}	Gate-Source Voltage ($V_{DS=0V}$)	±12	V
I_D	Drain Current-Continuous	-4.2	A
$I_{DM\ (pluse)}$	Drain Current-Continuous@ Current-Pulsed [Note 1]	-30	A
P_D	Maximum Power Dissipation	1.3	W
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 To 150	℃

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature
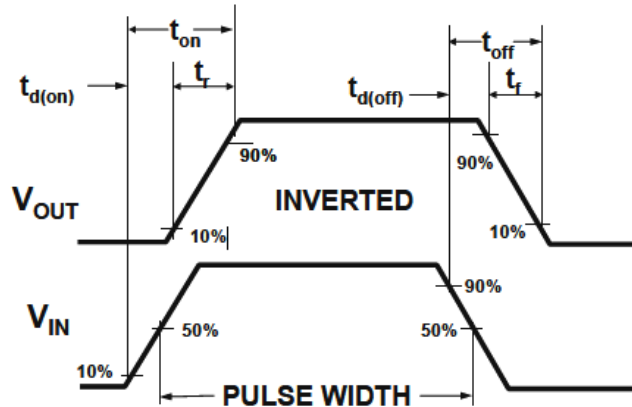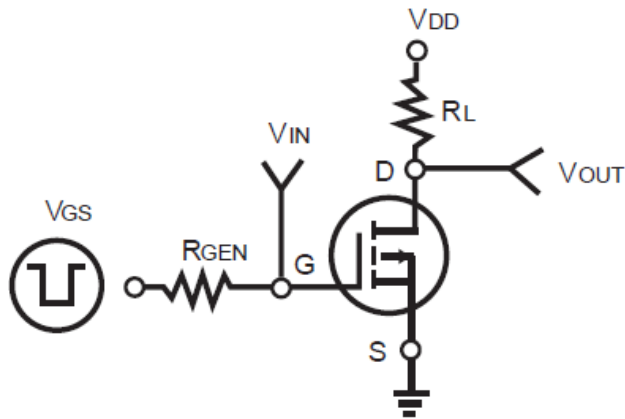
Table 2. Thermal Characteristic

Symbol	Parameter	Value	Unit
$R_{θJA}$	Thermal Resistance, Junction-to-Ambient	96	℃/W

Table 3. Electrical Characteristics (T_A=25℃ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
On/Off States						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V I_D=-250µA	-30			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-24V,V_{GS}=0V			1	µA
I_{GSS}	Gate-Body Leakage Current	V_{GS}=±12V,V_{DS}=0V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS},I_D=-250µA	-0.6	-0.9	-1.4	V
g_{FS}	Forward Transconductance	V_{DS}=-5V,I_D=-4.2A		11		S
$R_{DS(ON)}$	Drain-Source On-State Resistance	V_{GS}=-10V, I_D=-4.2A		41	55	mΩ
		V_{GS}=-4.5V, I_D=-4A		49	65	mΩ
		V_{GS}=-2.5V, I_D=-2A		70	110	mΩ
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS}=-15V,V_{GS}=0V, f=1.0MHz		680		pF
C_{oss}	Output Capacitance			105		pF
C_{rss}	Reverse Transfer Capacitance			68		pF
Switching Times						
$t_{d(on)}$	Turn-on Delay Time	V_{DD}=-15V,I_D=-1A,R_L=15Ω V_{GS}=-10V,R_G=2.5Ω		5		nS
t_r	Turn-on Rise Time			6		nS
$t_{d(off)}$	Turn-Off Delay Time			28		nS
t_f	Turn-Off Fall Time			7		nS
Q_g	Total Gate Charge	V_{DS}=-15V,I_D=-4.2A, V_{GS}=-10V		10		nC
Q_{gs}	Gate-Source Charge			2		nC
Q_{gd}	Gate-Drain Charge			3		nC
Source-Drain Diode Characteristics						
I_{SD}	Source-Drain Current(Body Diode)				-4.2	A
V_{SD}	Forward on Voltage[Note 1]	V_{GS}=0V,I_S=-1A		-0.78	-1.2	V

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

Switch Time Test Circuit and Switching Waveforms：

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (Curves)
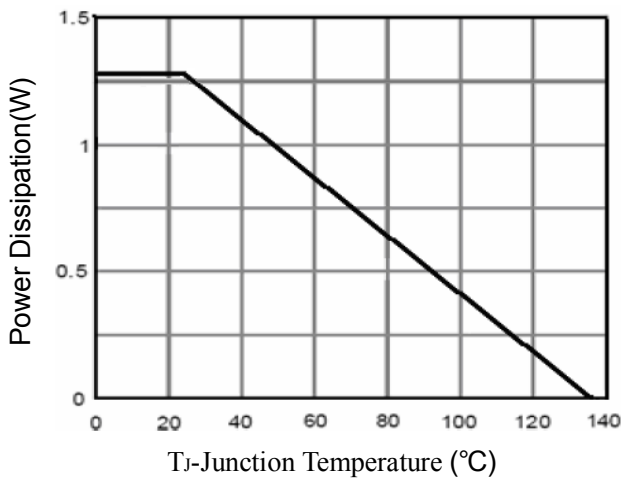
Figure1. Power Dissipation
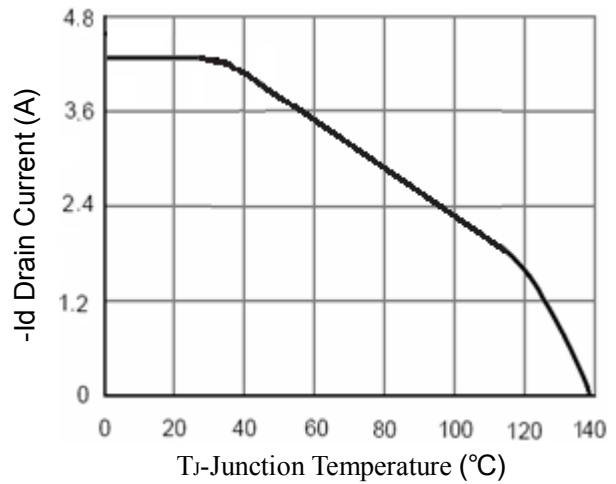

T_J-Junction Temperature (℃)

Figure2. Drain Current

T_J-Junction Temperature (℃)
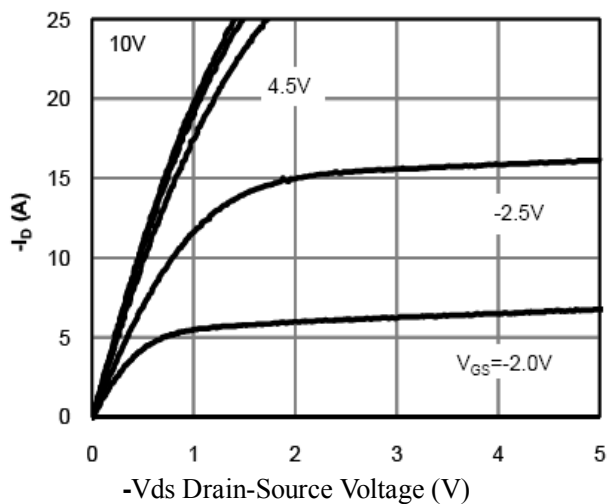
Figure3. Output Characteristics

-Vds Drain-Source Voltage (V)

Figure4. Transfer Characteristics
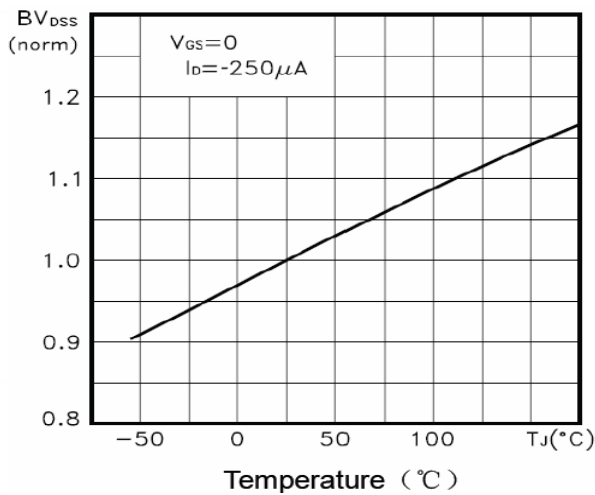

-Vgs Gate-Source Voltage (V)
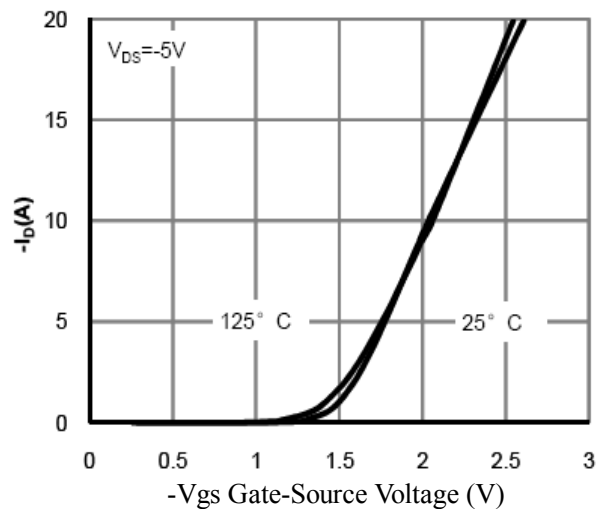
Figure5. Capacitance
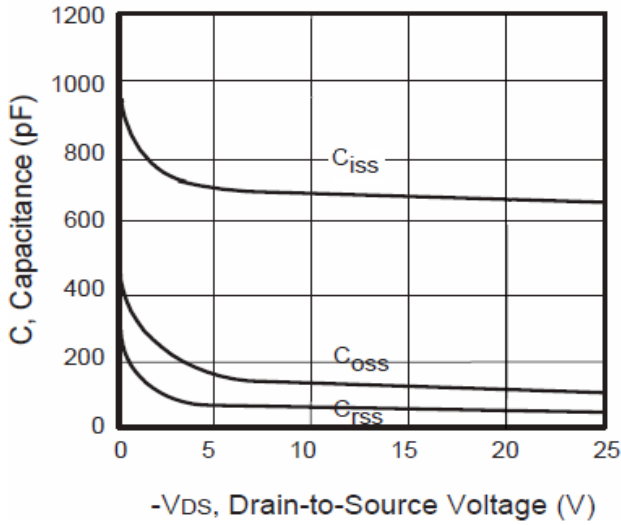
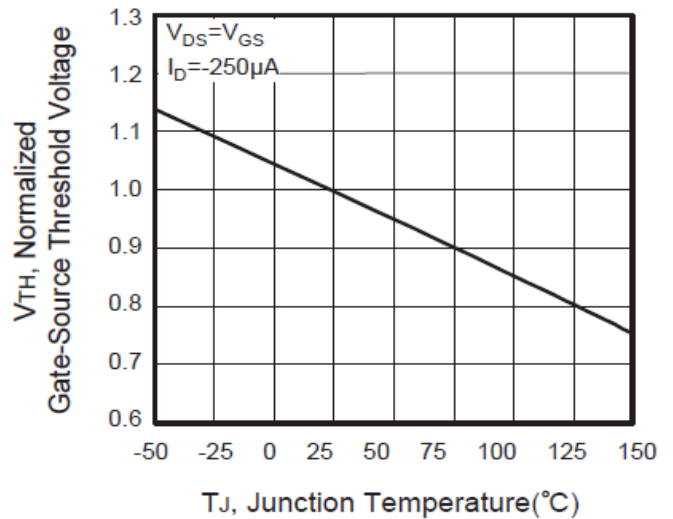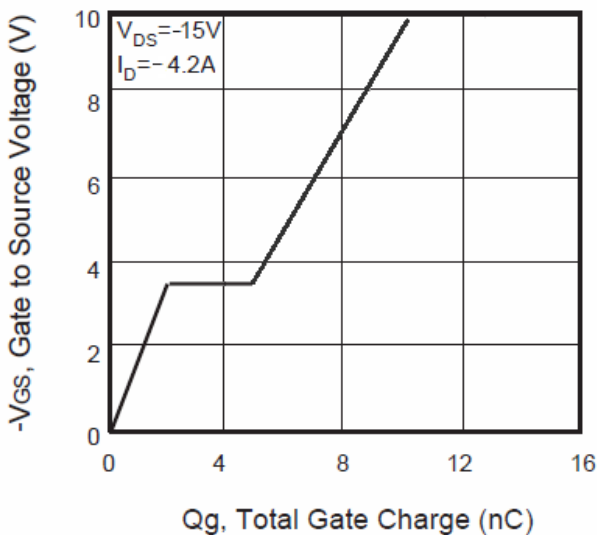## Figure6. $R_{DS(ON)}$ vs Junction Temperature
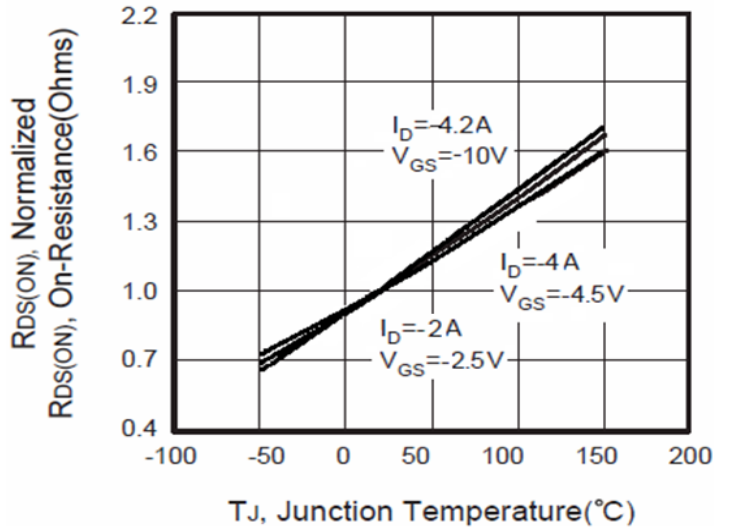
Figure7. Max BV_{DSS} vs Junction Temperature

Figure8. $V_{GS(th)}$ vs Junction Temperature

Figure9. Gate Charge Waveforms

Figure10. Maximum Safe Operating Area
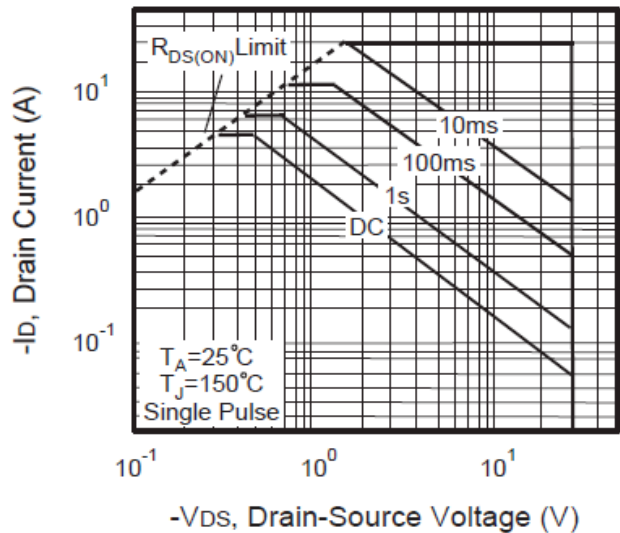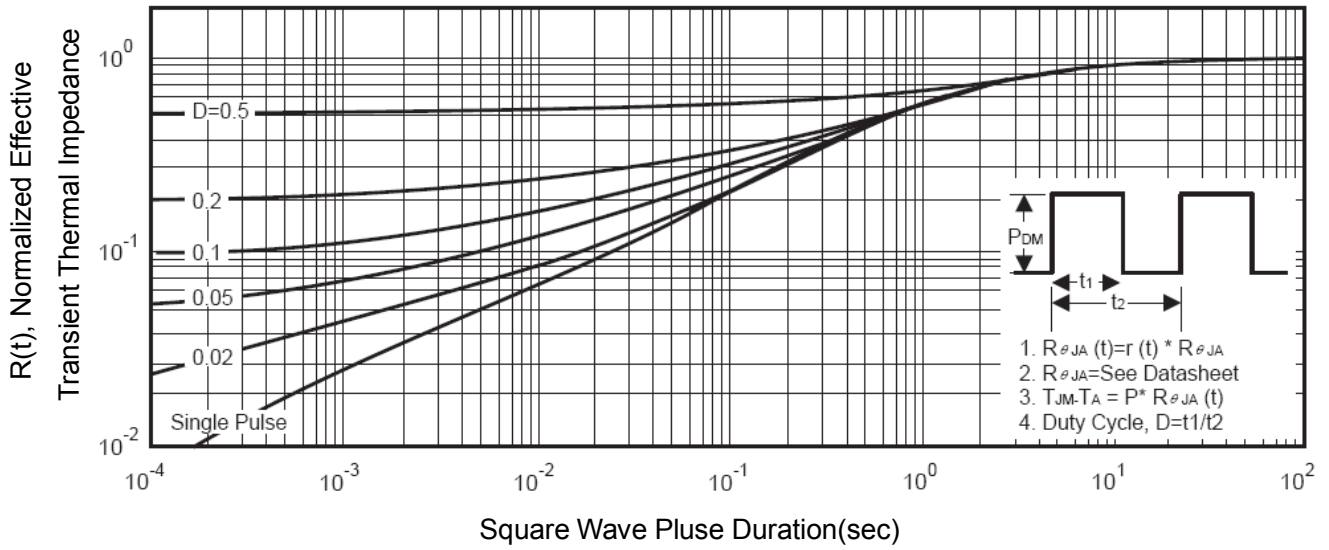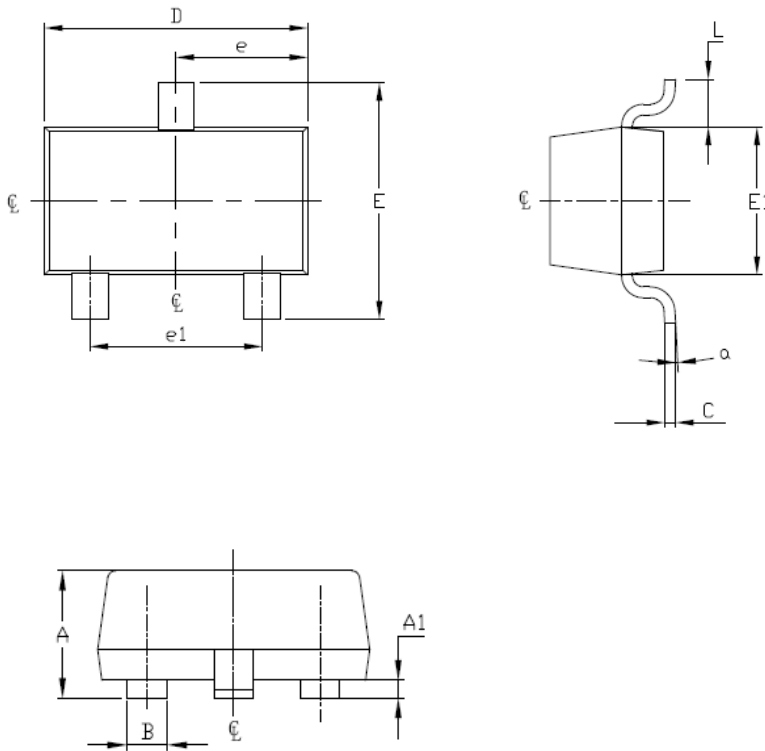
Figure11. Normalized Maximum Transient Thermal Impedance

Square Wave Pluse Duration(sec)

SOT-23 Package Information

COMMON DIMENSIONS			
SYMBOL	mm		
	MIN	NOM	MAX
A	0.9	1.0	1.1
A1	0.00	0.06	0.1
B	0.3	0.4	0.5
C	0.07	0.09	0.18
D	2.8	2.9	3.04
E	2.1	2.33	2.64
E1	1.2	1.3	1.4
e	1.4	1.45	1.5
e1	1.80	1.90	2.00
L	0.45	0.54	0.63
α	0°	2.5°	7°