

## DESCRIPTION

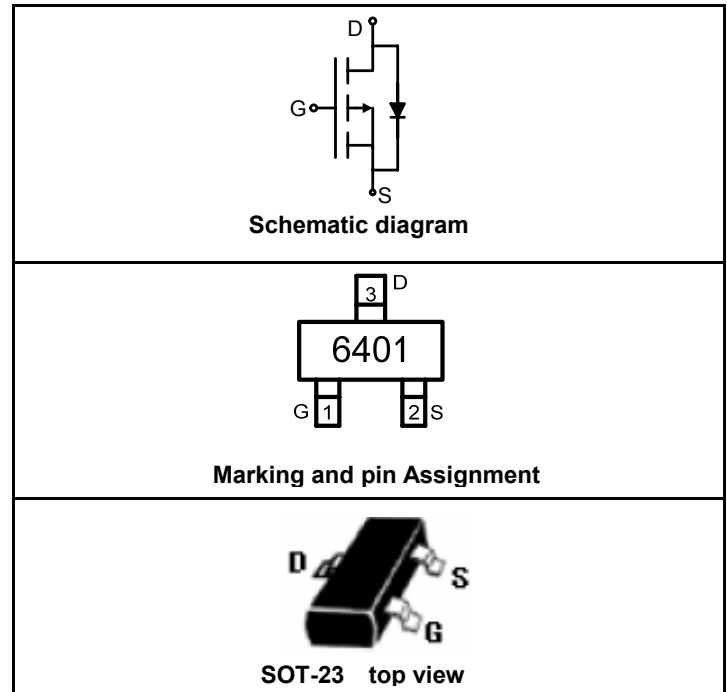
The SSF6401 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as -0.4V. This device is suitable for use as a load switch or in PWM applications.

## GENERAL FEATURES

- $V_{DS} = -20V, I_D = -4.3A$   
 $R_{DS(ON)} < 85m\Omega @ V_{GS} = -2.5V$   
 $R_{DS(ON)} < 50m\Omega @ V_{GS} = -4.5V$
- High Power and current handling capability
- Lead free product is acquired
- Surface Mount Package

## Application

- PWM applications
- Load switch
- Power management



## PACKAGE MARKING AND ORDERING INFORMATION

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
6401	SSF6401	SOT-23	Ø180mm	8 mm	3000 units

## ABSOLUTE MAXIMUM RATINGS(TA=25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-20	V
Gate-Source Voltage	$V_{GS}$	±12	V
Drain Current-Continuous@ Current-Pulsed (Note 1)	$I_D$	-4.3	A
	$I_{DM}$	-34	A
Maximum Power Dissipation	$P_D$	1.3	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	°C

## THERMAL CHARACTERISTICS

Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	100	°C/W
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## ELECTRICAL CHARACTERISTICS (TA=25°C unless otherwise noted)

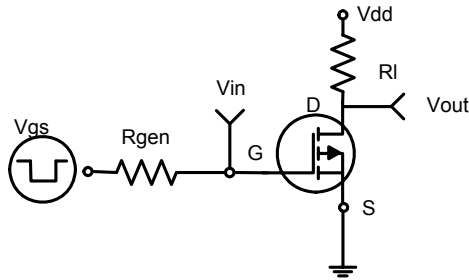
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-20			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=-20V, V_{GS}=0V$			-1	μA
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 12V, V_{DS}=0V$			±100	nA
<b>ON CHARACTERISTICS (Note 3)</b>						

Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.4		-1	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=-4.5V, I_D=-4.3A$			50	mΩ
		$V_{GS}=-2.5V, I_D=-2.5A$			85	
Forward Transconductance	$g_{FS}$	$V_{DS}=-5V, I_D=-4.3A$		7		S
<b>DYNAMIC CHARACTERISTICS (Note4)</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=-4V, V_{GS}=0V,$ $F=1.0MHz$		740		PF
Output Capacitance	$C_{oss}$			290		PF
Reverse Transfer Capacitance	$C_{rss}$			190		PF
<b>SWITCHING CHARACTERISTICS (Note 4)</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-10V, I_D=-1A R_L=10\Omega$ $, R_{GEN}=6\Omega$		27		nS
Turn-on Rise Time	$t_r$			60		nS
Turn-Off Delay Time	$t_{d(off)}$			110		nS
Turn-Off Fall Time	$t_f$			80		nS
Total Gate Charge	$Q_g$	$V_{DS}=-4V, I_D=-4.3A, V_{GS}=-4.5V$		7.8	15	nC
Gate-Source Charge	$Q_{gs}$			1.2		nC
Gate-Drain Charge	$Q_{gd}$			1.6		nC
<b>DRAIN-SOURCE DIODE CHARACTERISTICS</b>						
Diode Forward Voltage (Note 3)	$V_{SD}$	$V_{GS}=0V, I_S=-3.3A$			-1.2	V
Diode Forward Current (Note 2)	$I_S$				-1.4	A

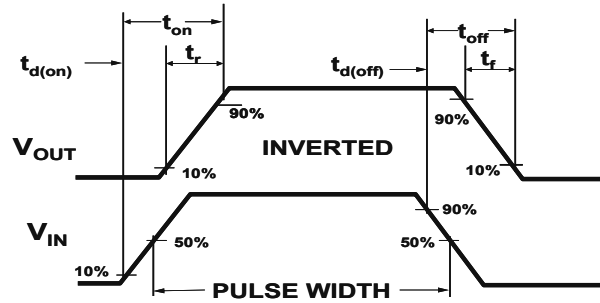
## NOTES:

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

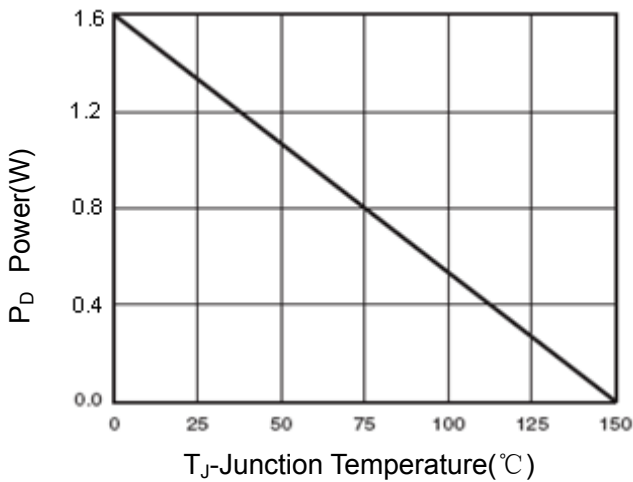
## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



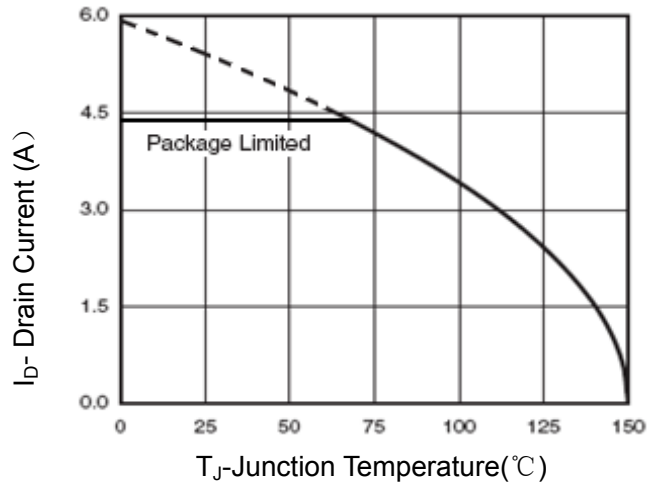
**Figure 1: Switching Test Circuit**



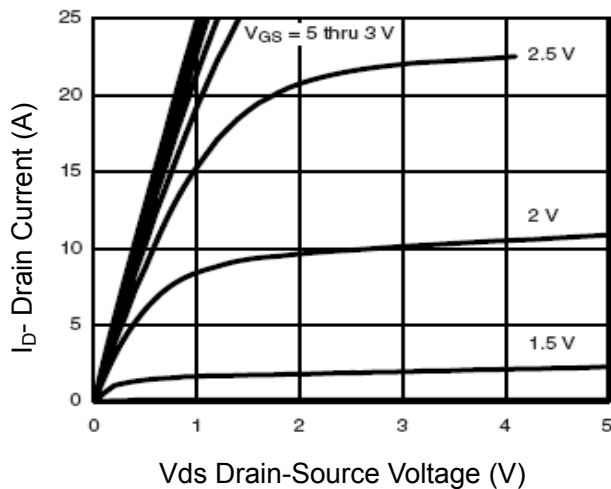
**Figure 2: Switching Waveforms**



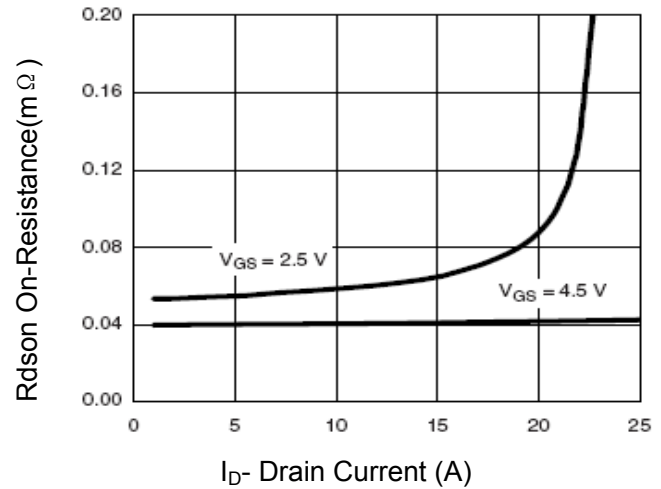
**Figure 3 Power Dissipation**



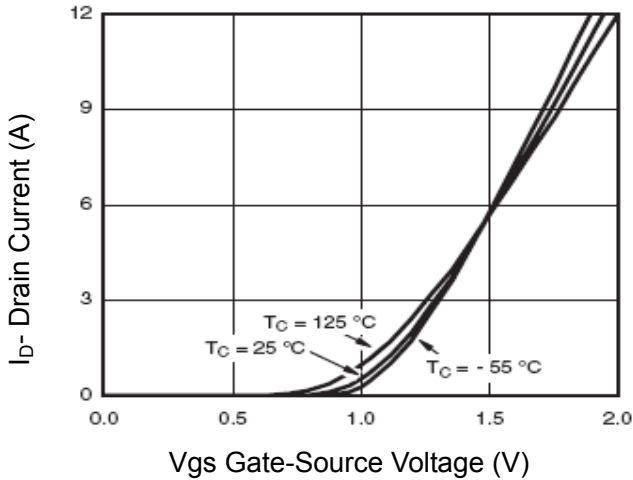
**Figure 4 Drain Current**



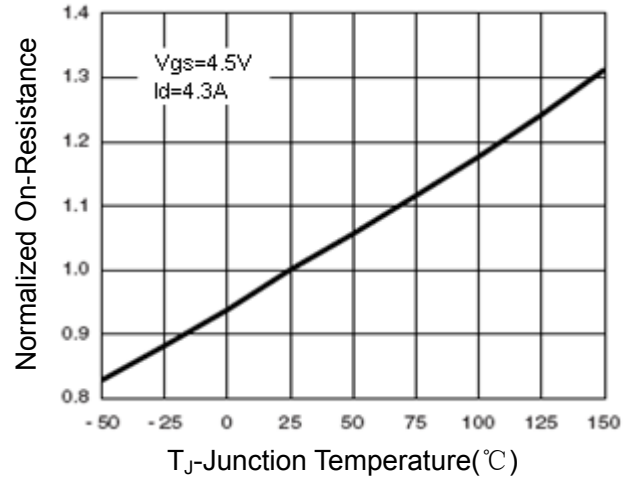
**Figure 5 Output CHARACTERISTICS**



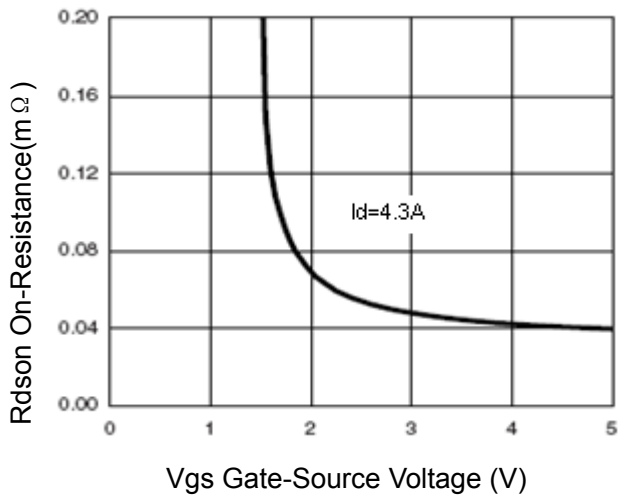
**Figure 6 Drain-Source On-Resistance**



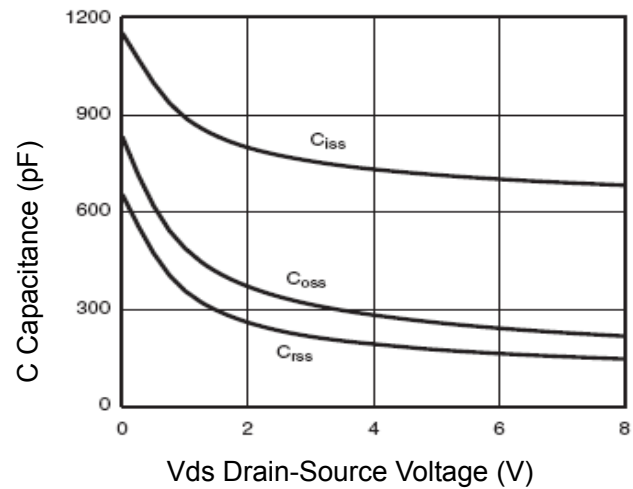
**Figure 7 Transfer Characteristics**



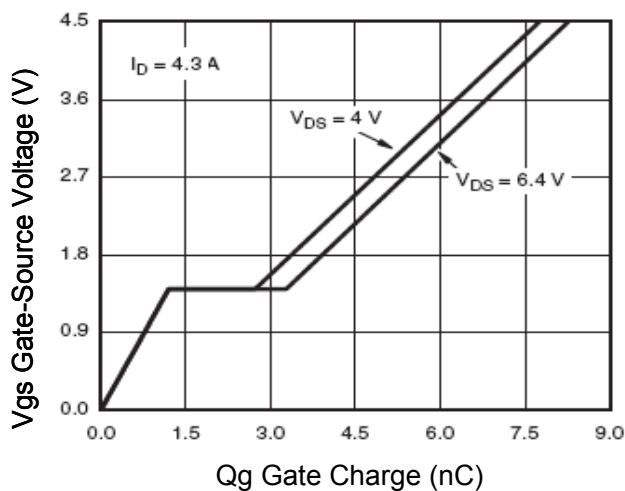
**Figure 8 Drain-Source On-Resistance**



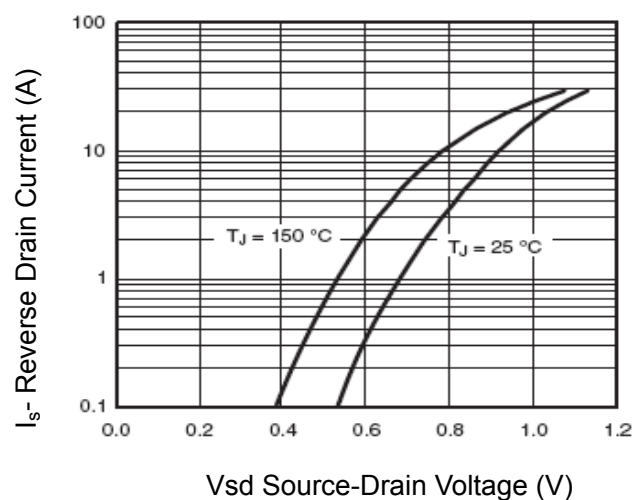
**Figure 9  $R_{DS(on)}$  vs  $V_{GS}$**



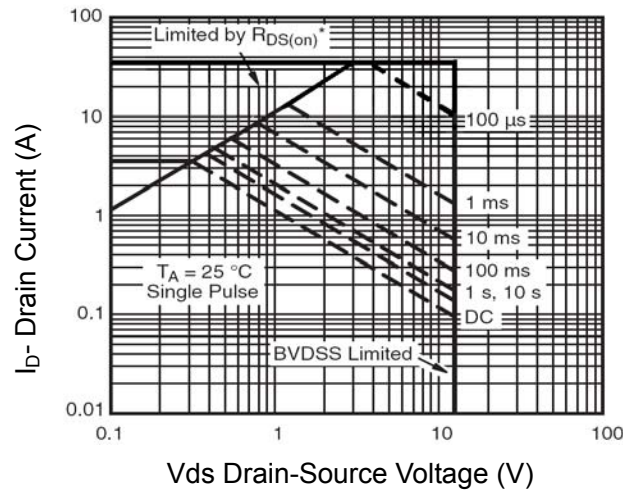
**Figure 10 Capacitance vs  $V_{DS}$**



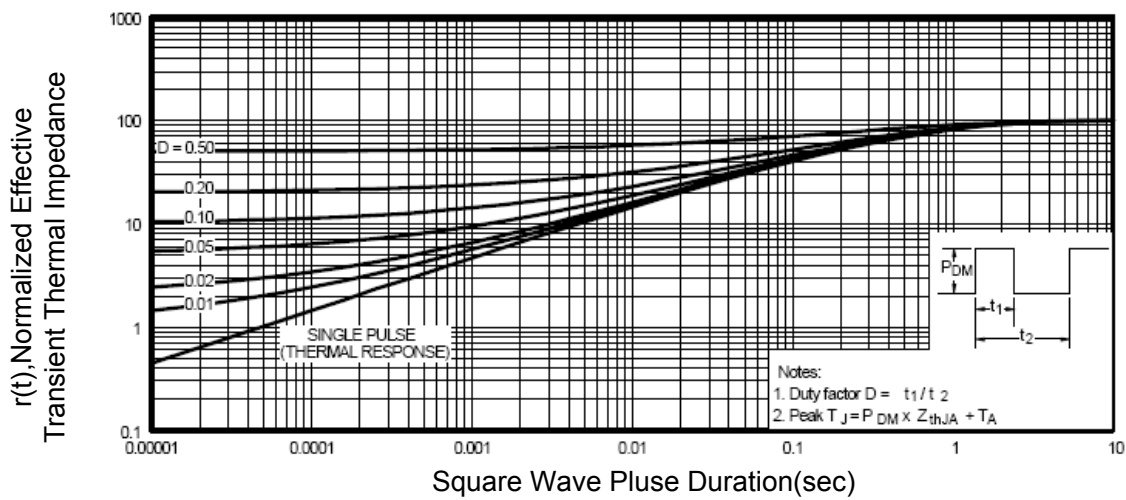
**Figure 11 Gate Charge**



**Figure 12 Source- Drain Diode Forward**



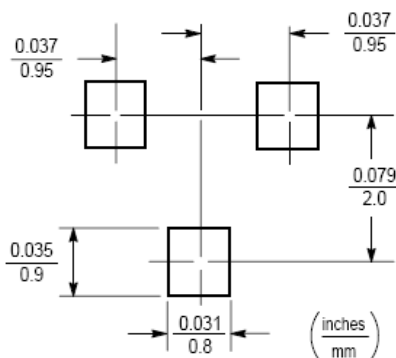
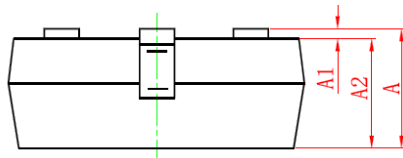
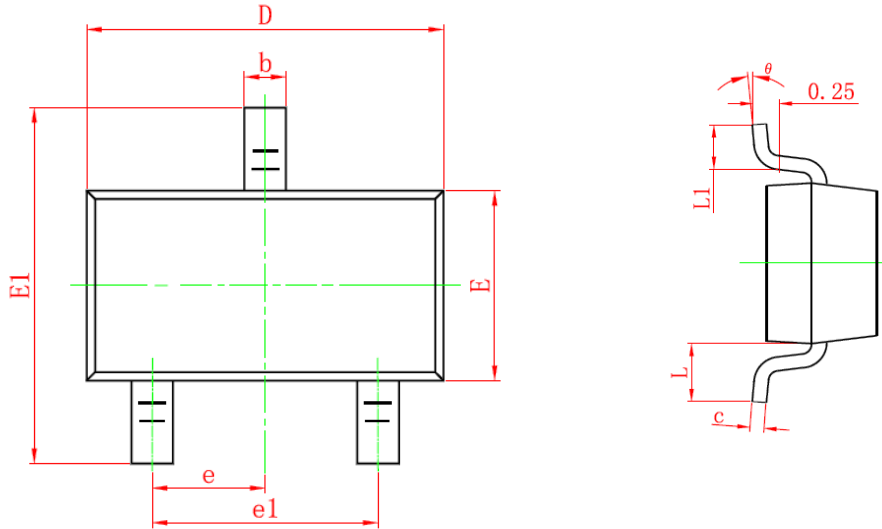
**Figure 13 Safe Operation Area**



**Figure 14 Normalized Maximum Transient Thermal Impedance**

## SOT-23 PACKAGE INFORMATION

Dimensions in Millimeters (UNIT:mm)



Symbol	Dimensions in Millimeters	
	MIN.	MAX.
<b>A</b>	<b>0.900</b>	<b>1.150</b>
<b>A1</b>	<b>0.000</b>	<b>0.100</b>
<b>A2</b>	<b>0.900</b>	<b>1.050</b>
<b>b</b>	<b>0.300</b>	<b>0.500</b>
<b>c</b>	<b>0.080</b>	<b>0.150</b>
<b>D</b>	<b>2.800</b>	<b>3.000</b>
<b>E</b>	<b>1.200</b>	<b>1.400</b>
<b>E1</b>	<b>2.250</b>	<b>2.550</b>
<b>e</b>	<b>0.950TYP</b>	
<b>e1</b>	<b>1.800</b>	<b>2.000</b>
<b>L</b>	<b>0.550REF</b>	
<b>L1</b>	<b>0.300</b>	<b>0.500</b>
<b>θ</b>	<b>0°</b>	<b>8°</b>

### NOTES

1. All dimensions are in millimeters.
2. Tolerance  $\pm 0.10\text{mm}$  (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

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