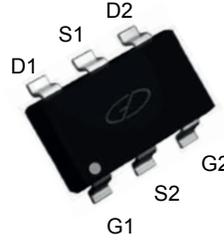
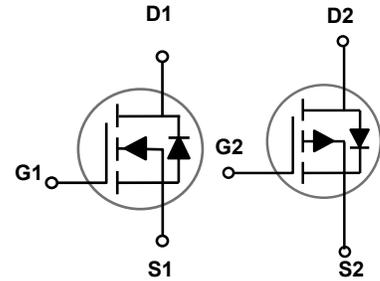


### Main Product Characteristics

Polarity	N-Ch	P-Ch
$V_{DSS}$	20V	-20V
$R_{DS(ON)}$ (Max.)	70m $\Omega$	130m $\Omega$
$I_D$	3.8A	-2.5A



SOT-23-6L



Schematic Diagram

### Features and Benefits

- Advanced MOSFET process technology
- Ideal for high efficiency switched mode power supplies
- Low on-resistance with low gate charge
- Fast switching and reverse body recovery
- AEC-Q101 qualified



### Description

The GSFR2116AU utilizes the latest techniques to achieve high cell density and low on-resistance. These features make this device extremely efficient and reliable for use in high efficiency switch mode power supplies and a wide variety of other applications.

### Absolute Maximum Ratings ( $T_A=25^\circ\text{C}$ unless otherwise specified)

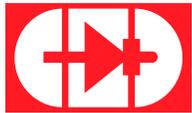
Parameter	Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage	$V_{DS}$	20	-20	V
Gate-Source Voltage	$V_{GS}$	$\pm 10$	$\pm 10$	V
Drain Current-Continuous ( $T_C=25^\circ\text{C}$ )	$I_D$	3.8	-2.5	A
Drain Current-Continuous ( $T_C=100^\circ\text{C}$ )		2.3	-1.5	A
Drain Current Pulsed <sup>1</sup>	$I_{DM}$	15.2	-10	A
Power Dissipation ( $T_C=25^\circ\text{C}$ )	$P_D$	1.25	1.25	W
Power Dissipation Derate above 25 $^\circ\text{C}$		0.01	0.01	W/ $^\circ\text{C}$
Max. Thermal Resistance Junction to Ambient	$R_{\theta JA}$	100		$^\circ\text{C}/\text{W}$
Storage Temperature Range	$T_{STG}$	-55 to +150		$^\circ\text{C}$
Operating Junction Temperature Range	$T_J$	-55 to +150		$^\circ\text{C}$

### N-Channel Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>On / Off Characteristics</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	20	-	-	V
BV <sub>DSS</sub> Temperature Coefficient	ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Reference to 25°C, I <sub>D</sub> =1mA	-	0.02	-	V/°C
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	-	-	1	μA
		V <sub>DS</sub> =16V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C	-	-	10	μA
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±10V, V <sub>DS</sub> =0V	-	-	±100	nA
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =2A	-	55	70	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =1A	-	68	90	
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250μA	0.45	0.6	1	V
V <sub>GS(th)</sub> Temperature Coefficient	ΔV <sub>GS(th)</sub>		-	-2	-	mV/°C
Forward Transconductance	g <sub>fs</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =2A	-	4.4	-	S
<b>Dynamic and Switching Characteristics</b>						
Total Gate Charge <sup>2,3</sup>	Q <sub>g</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =3A	-	5.8	10	nC
Gate-Source Charge <sup>2,3</sup>	Q <sub>gs</sub>		-	0.6	1.5	
Gate-Drain Charge <sup>2,3</sup>	Q <sub>gd</sub>		-	1.5	3	
Turn-On Delay Time <sup>2,3</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> =10V, V <sub>GS</sub> =4.5V, R <sub>G</sub> =25Ω, I <sub>D</sub> =1A	-	2.9	6	nS
Rise Time <sup>2,3</sup>	t <sub>r</sub>		-	8.4	16	
Turn-Off Delay Time <sup>2,3</sup>	t <sub>d(off)</sub>		-	19.2	38	
Fall Time <sup>2,3</sup>	t <sub>f</sub>		-	5.6	12	
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, F=1MHz	-	315	600	pF
Output Capacitance	C <sub>oss</sub>		-	50	80	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	40	60	
<b>Source-Drain Ratings and Characteristics</b>						
Continuous Source Current	I <sub>S</sub>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	-	-	3.8	A
Pulsed Source Current	I <sub>SM</sub>		-	-	7.6	A
Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =1A, T <sub>J</sub> =25°C	-	-	1	V

**Notes:**

1. Repetitive rating: Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed, pulse width ≤ 300μS, duty cycle ≤ 2%.
3. Essentially independent of operating temperature.


**P-Channel Electrical Characteristics** ( $T_J=25^\circ\text{C}$  unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>On / Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-20	-	-	V
$BV_{DSS}$ Temperature	$\Delta BV_{DSS}/\Delta T_J$	Reference to $25^\circ\text{C}$ , $I_D=-1\text{mA}$	-	-0.01	-	$V/^\circ\text{C}$
Coefficient Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=-20V, V_{GS}=0V, T_J=25^\circ\text{C}$	-	-	-1	$\mu A$
		$V_{DS}=-16V, V_{GS}=0V, T_J=125^\circ\text{C}$	-	-	-10	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 10V, V_{DS}=0V$	-	-	$\pm 100$	nA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=-4.5V, I_D=-2A$	-	98	130	m $\Omega$
		$V_{GS}=-2.5V, I_D=-1A$	-	130	180	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=-250\mu A$	-0.45	-0.65	-1.0	V
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}$		-	3	-	mV/ $^\circ\text{C}$
Forward Transconductance	gfs	$V_{DS}=-10V, I_D=-1A$	-	2.2	-	S
<b>Dynamic and Switching Characteristics</b>						
Total Gate Charge <sup>2,3</sup>	$Q_g$	$V_{DS}=-10V, V_{GS}=-4.5V, I_D=-2A$	-	4.8	10	nC
Gate-Source Charge <sup>2,3</sup>	$Q_{gs}$		-	0.5	1	
Gate-Drain Charge <sup>2,3</sup>	$Q_{gd}$		-	1.9	4	
Turn-On Delay Time <sup>2,3</sup>	$t_{d(on)}$	$V_{DD}=-10V, V_{GS}=-4.5V, R_G=25\Omega, I_D=-1A$	-	3.5	7	nS
Rise Time <sup>2,3</sup>	$t_r$		-	12.6	24	
Turn-Off Delay Time <sup>2,3</sup>	$t_{d(off)}$		-	32.6	62	
Fall Time <sup>2,3</sup>	$t_f$		-	8.4	16	
Input Capacitance	$C_{iss}$	$V_{DS}=-15V, V_{GS}=0V, F=1\text{MHz}$	-	350	510	pF
Output Capacitance	$C_{oss}$		-	65	95	
Reverse Transfer Capacitance	$C_{rss}$		-	50	75	
<b>Source-Drain Ratings and Characteristics</b>						
Continuous Source Current	$I_S$	$V_G=V_D=0V, \text{Force Current}$	-	-	-2.5	A
Pulsed Source Current	$I_{SM}$		-	-	-5	A
Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=-1A, T_J=25^\circ\text{C}$	-	-	-1	V

Notes::

1. Repetitive rating: Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed, pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .
3. Essentially independent of operating temperature.

## N-Channel Typical Characteristic Curves

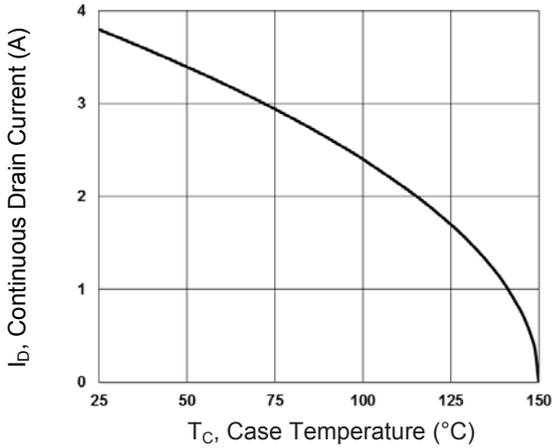


Figure 1. Continuous Drain Current vs.  $T_c$

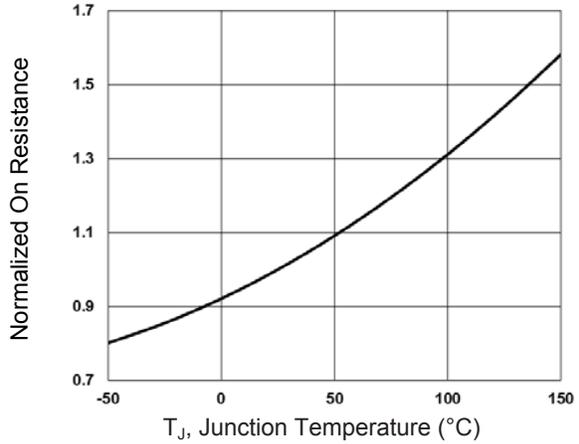


Figure 2. Normalized  $R_{DS(ON)}$  vs.  $T_j$

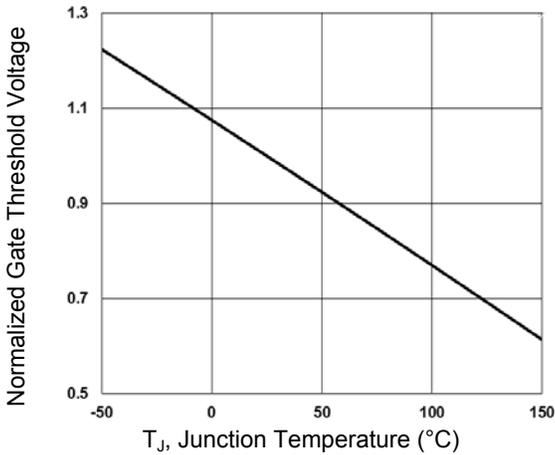


Figure 3. Normalized  $V_{th}$  vs.  $T_j$

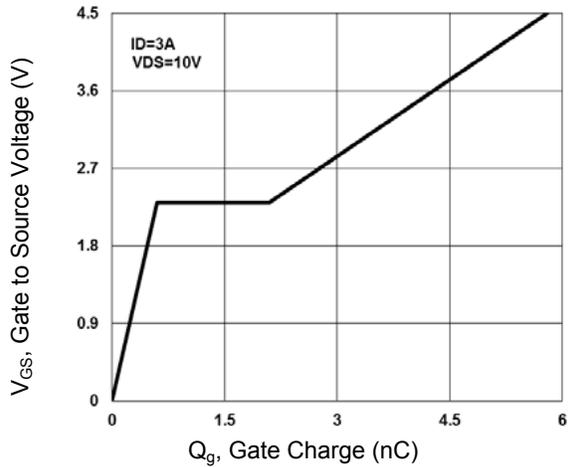


Figure 4. Gate Charge Waveform

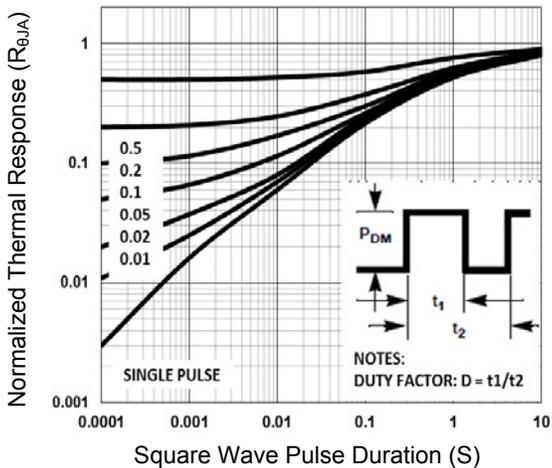


Figure 5. Normalized Transient Impedance

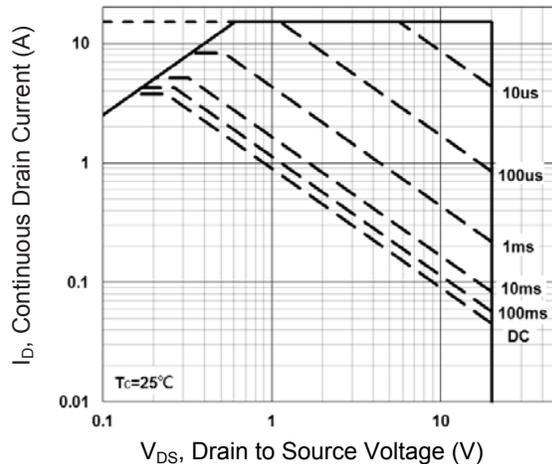


Figure 6. Maximum Safe Operation Area

## P-Channel Typical Characteristic Curves

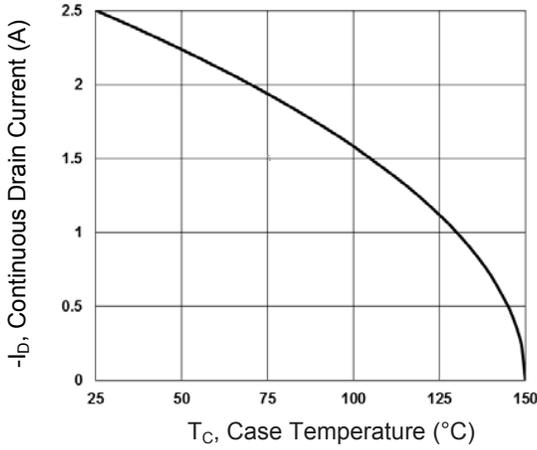


Figure 1. Continuous Drain Current vs.  $T_c$

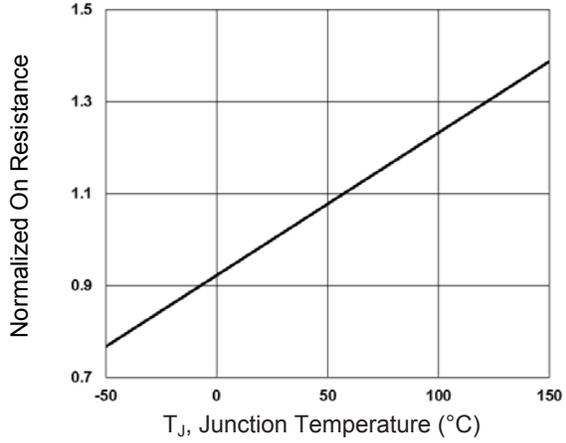


Figure 2. Normalized  $R_{DS(ON)}$  vs.  $T_j$

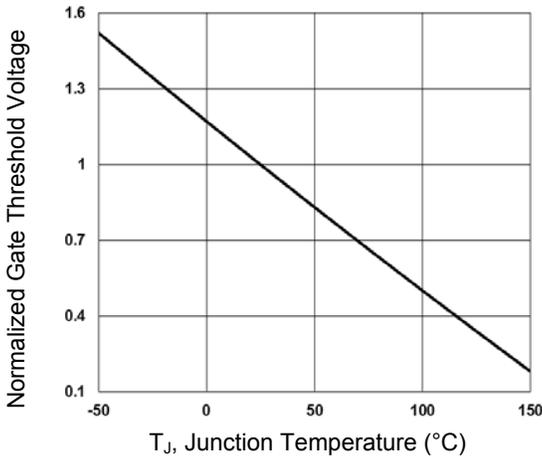


Figure 3. Normalized  $V_{th}$  vs.  $T_j$

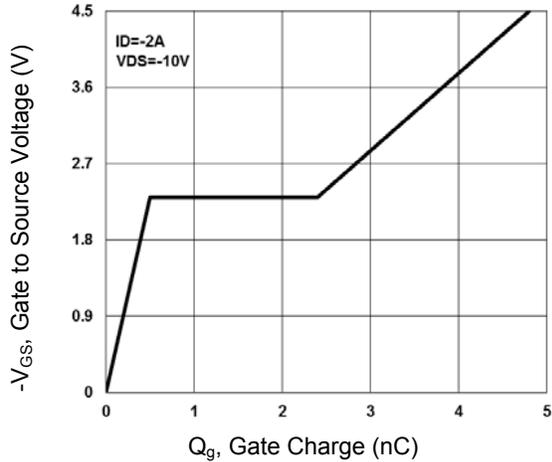


Figure 4. Gate Charge Waveform

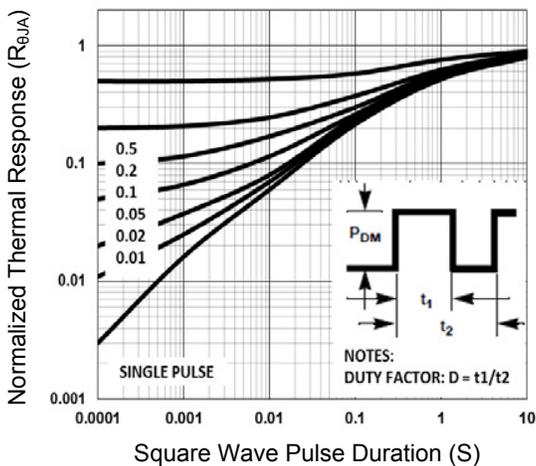


Figure 5. Normalized Transient Impedance

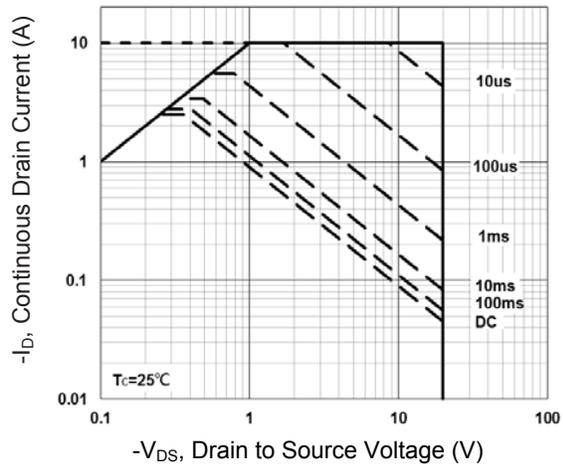
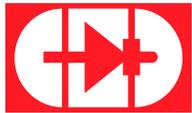
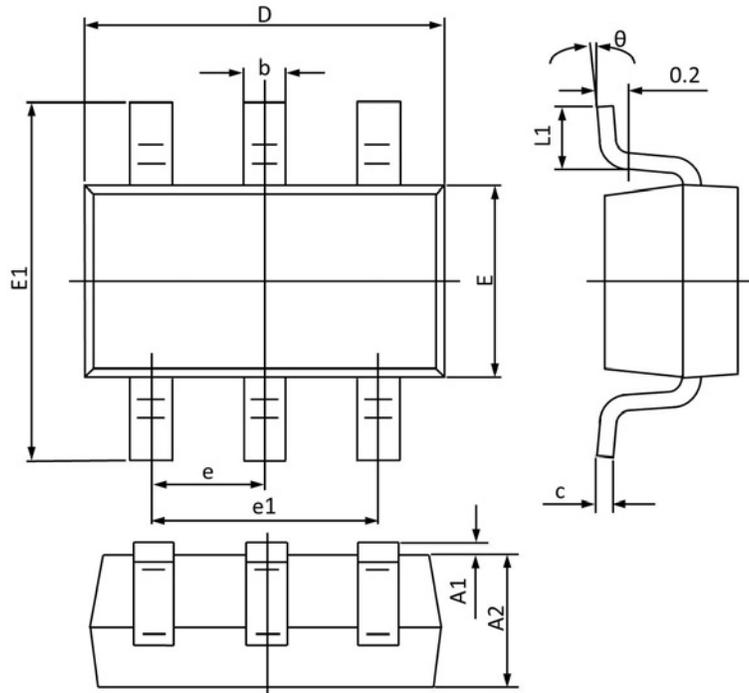


Figure 6. Maximum Safe Operation Area



## Package Outline Dimensions (SOT-23-6L)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A1	0.000	0.100	0.000	0.004
A2	1.000	1.200	0.040	0.047
b	0.300	0.500	0.012	0.019
c	0.047	0.207	0.002	0.008
D	2.800	3.000	0.110	0.118
E1	2.600	3.000	0.103	0.118
E	1.500	1.800	0.059	0.071
e	0.95 TYP		0.037 TYP	
e1	1.90 TYP		0.075 TYP	
L1	0.250	0.550	0.010	0.021
$\theta$	0°	8°	0°	8°

## Order information

Device	Package	Marking	Carrier	Quantity
GSFR2116AU	SOT-23-6L	R2116AU	Tape & Reel	3,000 pcs / Reel