GSM1012

20V N-Channel Enhancement Mode MOSFET

Product Description

GSM1012, N-Channel enhancement mode MOSFET, uses Advanced Trench Technology to provide excellent $R_{DS(ON)}$, low gate charge.

These devices are particularly suited for low voltage power management, such as smart phone and notebook computer, and low in-line power loss are needed in commercial industrial surface mount applications.

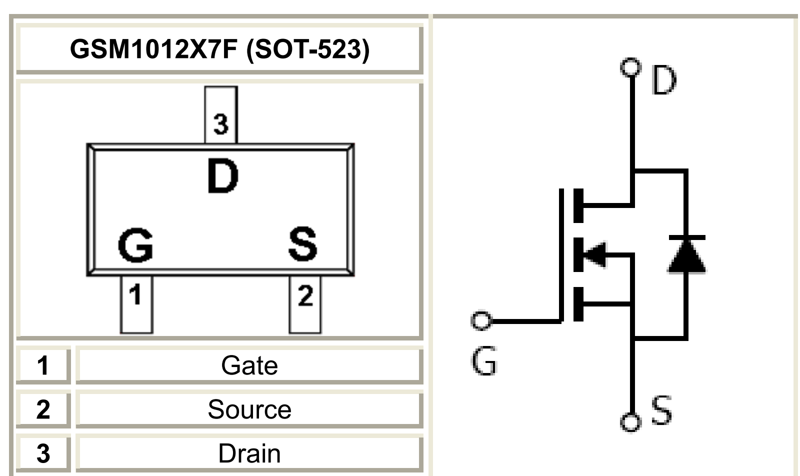
Features

- 20V/0.6A,$R_{DS(ON)}$=360m@V_{GS}=4.5V
- 20V/0.5A,$R_{DS(ON)}$=420m@V_{GS}=2.5V
- 20V/0.4A,$R_{DS(ON)}$=560m@V_{GS}=1.8V
- Low Offset (Error) Voltage
- Low-Voltage Operation
- High-Speed Circuits
- Low Battery Voltage Operation
- SOT-523 package design

Applications

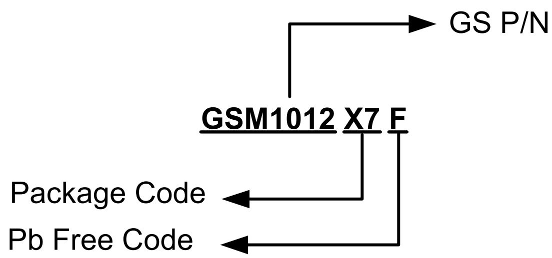
- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories
- Battery Operated Systems
- Power Supply Converter Circuits
- Load/Power Switching Smart Phones, Pagers

Packages & Pin Assignments



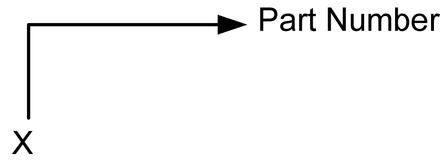
Pin	Function
1	Gate
2	Source
3	Drain

Ordering Information



Part Number	Package	Quantity Reel
GSM1012X7F	SOT-523	3000 PCS

Marking Information



Absolute Maximum Ratings

(T_A=25ºC Unless otherwise noted)

Symbol	Parameter		Typical	Unit
V_{DSS}	Drain-Source Voltage		20	V
V_{GSS}	Gate –Source Voltage		±12	V
I_D	Continuous Drain Current(T_J=150℃)	T_A=25ºC	0.7	A
		T_A=70ºC	0.4	
I_{DM}	Pulsed Drain Current		1.0	A
I_S	Continuous Source Current(Diode Conduction)		0.3	A
P_D	Power Dissipation	T_A=25ºC	0.27	W
		T_A=70ºC	0.16	
T_J	Operating Junction Temperature		-55/150	ºC
T_{STG}	Storage Temperature Range		-55/150	ºC

Electrical Characteristics

(T_A=25ºC Unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS}=0V,I_D=250uA	20			V
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS},I_D=250uA	0.4		1.0	V
I_{GSS}	Gate Leakage Current	V_{DS}=0V,V_{GS}=±12V			±100	nA
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}= 20V,V_{GS}=0V			1	uA
		V_{DS}= 20V, V_{GS}=0V , T_J=85ºC			5	
$I_{D(on)}$	On-State Drain Current	V_{DS}≥5V,V_{GS} =4.5V	0.7			A
$R_{DS(on)}$	Drain-Source On-Resistance	V_{GS}=4.5V,I_D=0.6A		240	360	mΩ
		V_{GS}=2.5V,I_D=0.5A		300	420	
		V_{GS}=1.8V,I_D=0.4A		420	560	
g_{fs}	Forward Transconductance	V_{DS}=10V,I_D=0.4A		1.0		S
V_{SD}	Diode Forward Voltage	I_S=0.15A,V_{GS}=0V		0.65	1.2	V
Dynamic						
C_{iss}	Input Capacitance	V_{DS}=10V, V_{GS}=0V,f=1MHz		70		pF
C_{oss}	Output Capacitance			20		
C_{rss}	Reverse Transfer Capacitance			8		
Q_g	Total Gate Charge	V_{DS}=10V, V_{GS}=4.5V, I_D=0.6A		1.06	1.38	nC
Q_{gs}	Gate-Source Charge			0.18		
Q_{gd}	Gate-Drain Charge			0.32		
$t_{d(on)}$	Turn-On Time	V_{DD}=10V, R_L=20Ω ,I_D=0.5A V_{GEN}=4.5V,R_G=1Ω		18	26	ns
t_r				20	28	
$t_{d(off)}$	Turn-Off Time			70	110	
t_f				25	40	

Typical Performance Characteristics

I_D - Drain Current (A)

V_{GS} = 5 V thru 2 V

V_{GS} = 1.5 V

V_{GS} = 1.0 V

V_{DS} - Drain-to-Source Voltage (V)

Output Characteristics

I_D - Drain Current (A)

T_J = 25 °C

T_J = 125 °C

T_J = - 55 °C

V_{GS} - Gate-to-Source Voltage (V)

Transfer Characteristics

$R_{DS(on)}$ - D to S On-Resistance (Ω)

V_{GS} = 1.8 V

V_{GS} = 2.5 V

V_{GS} = 4.5 V

I_D - Drain Current (A)

On-Resistance vs. Drain Current

C - Capacitance (pF)

C_{iss}

C_{oss}

C_{rss}

V_{DS} - Drain-to-Source Voltage (V)

Capacitance

V_{GS} - Gate-to-Source Voltage (V)

I_D = 0.606 A

V_{DS} = 10 V

V_{DS} = 16 V

Q_g - Total Gate Charge (nC)

Gate Charge

$R_{DS(on)}$ - On-Resistance (Normalized)

V_{GS} = 4.5 V, I_D = 0.606 A
V_{GS} = 2.5 V, I_D = 0.505 A

V_{GS} = 1.8 V, I_D = 0.15 A

T_J - Junction Temperature (°C)

On-Resistance vs. Junction Temperature

Typical Performance Characteristics(continue)

I_S - Source Current (A)

T_J = 150 °C

T_J = 25 °C

V_{SD} - Source-to-Drain Voltage (V)

Source-Drain Diode Forward Voltage

$R_{DS(on)}$ - On-Resistance (Ω)

I_D = 0.606 A

T_A = 125 °C

T_A = 25 °C

V_{GS} - Gate-to-Source Voltage (V)

$R_{DS(on)}$ vs. V_{GS} vs Temperature

$V_{GS(th)}$ (V)

I_D = 250 µA

T_J - Temperature (°C)

Threshold Voltage

I_D - Drain Current (A)

Limited by $R_{DS(on)}$*

1 ms

10 ms

100 ms

1 s

10 s

DC

T_A = 25 °C
Single Pulse

V_{DS} - Drain-to-Source Voltage (V)

* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

Normalized Effective Transient Thermal Impedance

Duty Cycle = 0.5

0.2

0.1

0.05

0.02

Single Pulse

Notes:

P_{DM}

t_1

t_2

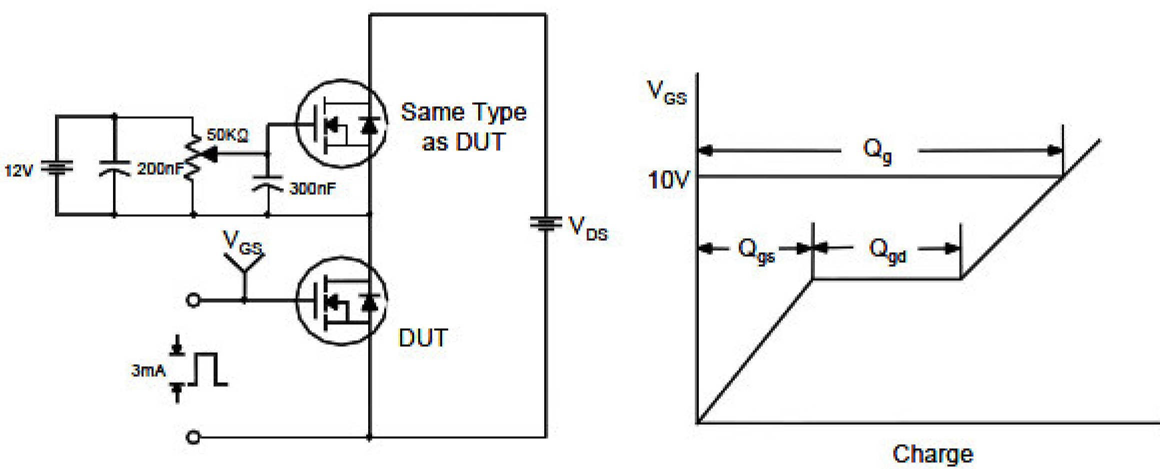
1. Duty Cycle, D = $\frac{t_1}{t_2}$
2. Per Unit Base = R_{thJA} = 540 °C/W
3. $T_{JM} - T_A = P_{DM}Z_{thJA}(t)$
4. Surface Mounted

Square Wave Pulse Duration (s)

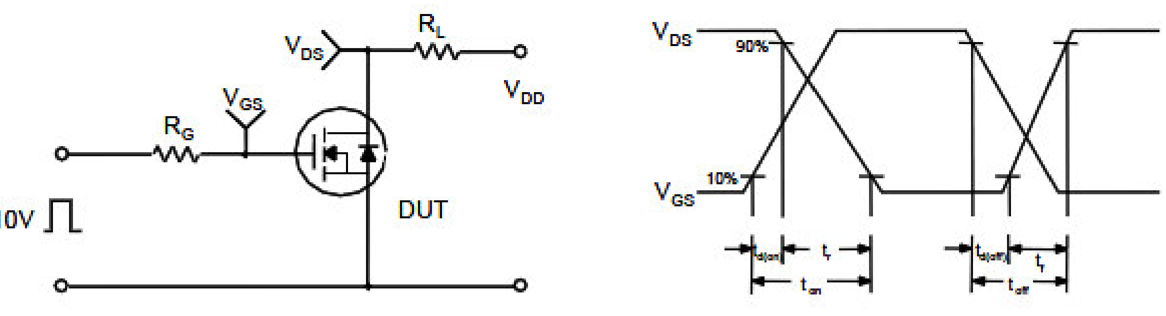
Normalized Thermal Transient Impedance, Junction-to-Ambient

Typical Characteristics

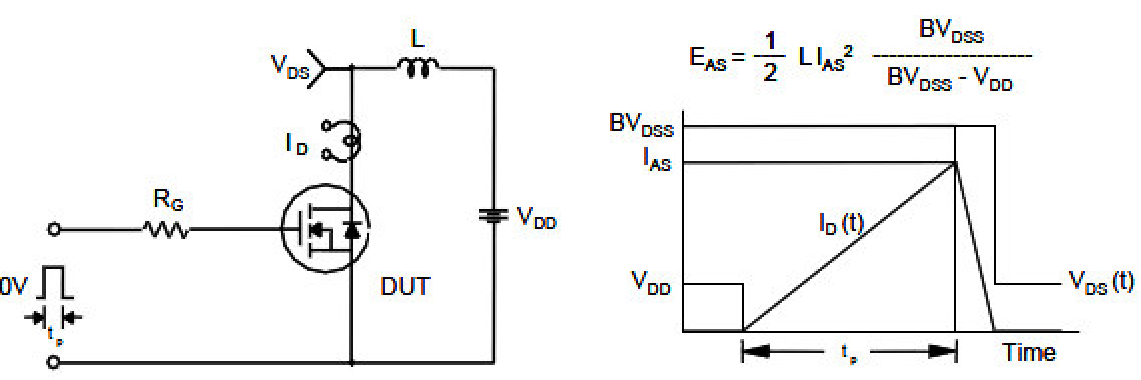
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



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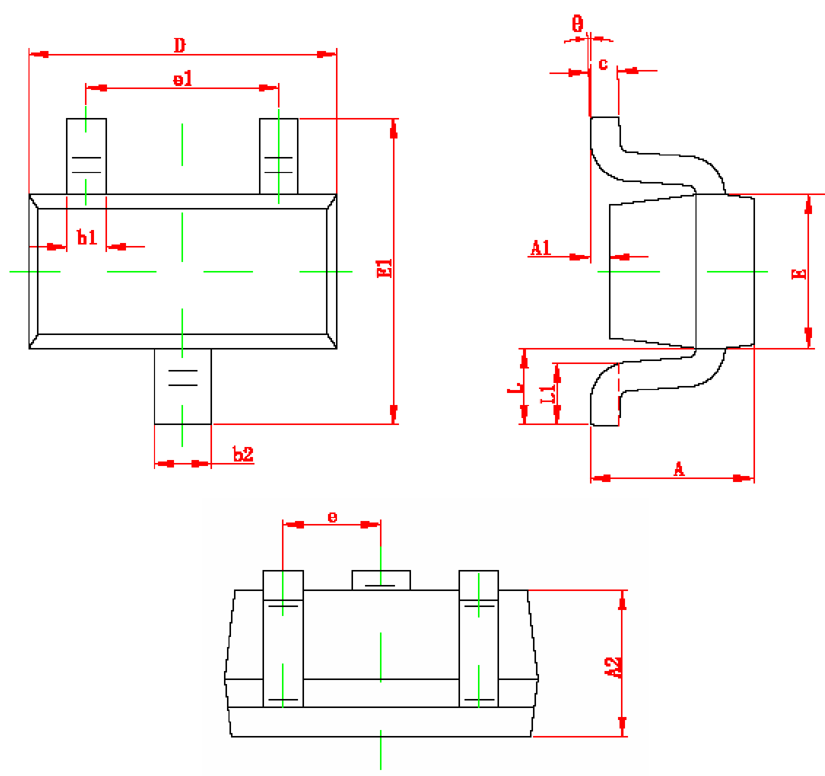
Package Dimension

SOT-523



Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	0.700	0.900	0.028	0.035
A1	0.000	0.100	0.000	0.004
A2	0.700	0.800	0.028	0.031
b1	0.150	0.250	0.006	0.010
b2	0.250	0.325	0.010	0.013
c	0.100	0.200	0.004	0.008
D	1.500	1.700	0.059	0.067
E	0.750	0.850	0.030	0.033
E1	1.450	1.750	0.057	0.069
e	0.500(TYP)		0.020(TYP)	
e1	0.900	1.100	0.035	0.043
L	0.550(REF)		0.022(REF)	
L1	0.280	0.440	0.011	0.017
θ	0°	4°	0°	4°

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