GSR40P15T P-Channel MOSFET

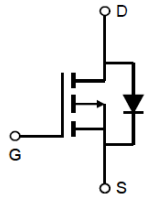
Group-Semi P-Channel MOSFET

Jan 2024

GENERAL DESCRIPTION

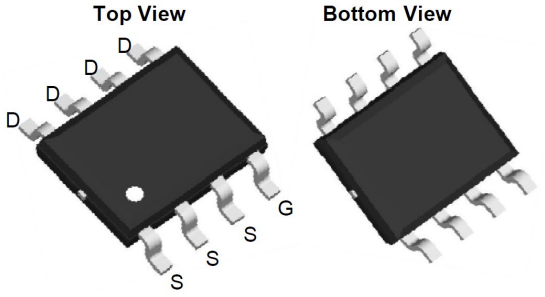
GroupSemiconductor(GS) has series Trench power MOSFET platforms for voltage up 20V to 200 volts, both with design service and manufacturing capability, including cell, termination design and simulation.

The GS 40V 15A P-Channel Power MOSFET is a Low voltage P channel Trench power MOSFET sample with advanced technology to have better characteristics, such as fast switching time, low Ciss and Crss, low on resistance and excellent avalanche characteristics, making it especially suitable for applications which require superior power density and outstanding efficiency.

Package	Pin Configuration (Top View)
SOP-8	

GENERAL FEATURES

- VDS =-40V,ID =-15A
  RDS(ON) <45mΩ @ VGS=-10V
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high EAS
- Excellent package for good heat dissipation
- Special process technology for high ESD capability



Application

- BLDC
- Charger

Electrical Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BVDSS	Drain-Source Breakdown Voltage	VGS = 0V, ID = -250μA, TJ = 25℃	-40	-	-	V
V_{gs}	Gate-Source Voltage		±25			V
I_D	Continuous DrainCurrent	TC=25°C TC=100°C	-15 -10			A
I_{DM}	Pulsed Drain Current [C]		-60			A
I_{AS}	Avalanche Current [C]		25			A
E_{AS}	Avalanche energy L=0.1mH [C]		30			mJ
P_D	Power Dissipation [B]	TC=25°C TC=100°C	83 33			W
P_{DSM}	Power Dissipation [A]	TC=25°C TC=70°C	7.3 4.7			W
T_J, T_{STG}	Junction and Storage Temperature Range		-55 to 150			°C
IDSS	Zero Gate Voltage Drain Current	VDS = -30V, VGS = 0V -TJ = 55℃	-	- -	-1 -5	μA μA
IGSSF	Gate-Body Leakage Current, Forward	VGS = 12V, VDS = 0V	-	-	100	nA
IGSSR	Gate-Body Leakage Current, Reverse	VGS = -12V, VDS = 0V	-	-	-100	nA
Thermal Characteristics						

$R_{\theta JA}$	Maximum Junction-to-Ambient [A]		14			°C/W
	Maximum Junction-to-Ambient [A D]		40			°C/W
$R_{\theta JC}$	Maximum Junction-to-Case		1.1			°C/W
On Characteristics						
VGS(th)	Gate Threshold Voltage	VDS = VGS, ID = 250μA	-1.0		-3.0	V
RDS(on)	Static Drain-Source On-Resistance	VGS = -10V, ID = -10A	-	35	45	mΩ
gFS	Forward Transconductance	VDS = -5V, ID = -10A	-	3	-	S
Rg	Gate resistance	VGS=0V, VDS=0V, f=1MHz	-	3.2	-	Ω
Dynamic Characteristics						
Ciss	Input Capacitance	VDS = -15V, VGS = 0V, f=1MHz	-	1550	-	pF
Coss	Output Capacitance		-	120	-	pF
Crss	Reverse Transfer Capacitance		-	80	-	pF
Switching Characteristics						
td(on)	Turn-On Delay Time	VDS = -20V, RG = 3Ω, ID = -12A , VGS = -10V (Note 5, 6)	-	11	-	ns
tr	Turn-On Rise Time		-	9.4	-	ns
td(off)	Turn-Off Delay Time		-	24	-	ns
tf	Turn-Off Fall Time		-	12	-	ns
Qg(-10V)	Total Gate Charge	VDS = -20V, ID = -12A, VGS =- -10V (Note 5, 6)	-	28	-	nC
Qg-(4.5V)	Total Gate Charge		-	24	-	nC
Qgs	Gate-Source Charge		-	4.6	-	nC
Qgd	Gate-Drain Charge		-	10	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
IS	Maximum Continuous Drain-Source Diode Forward Current		-	-	-	A
ISM	Maximum Pulsed Drain-Source Diode Forward Current		-	-	-25	A
VSD	Drain-Source Diode Forward Voltage	VGS = 0V, IS = -1A	-	-0.7	-1.2	V
trr	Reverse Recovery Time	VGS = 0V, IS =-6A dIF/dt =-100A/μs (Note 5)	-	24	-	ns
Qrr	Reverse Recovery Charge		-	30	-	nC

A: The value of $R_{\theta JA}$ is measured 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 value in any 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 $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.
D. The static characteristics in Figures 1 to 6 are obtained using < 300μs 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.
F. The current rating is based on the t ≤ 10s thermal resistance rating.
G. E_{AR} and I_{AR} ratings are based on low frequency and duty cycles to keep T_j=25C.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

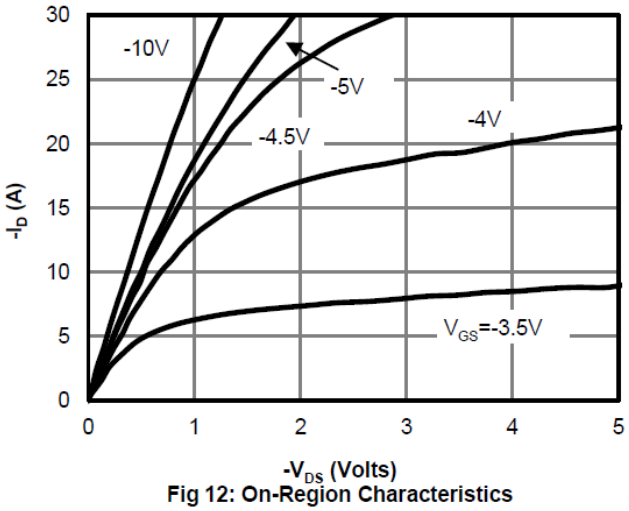


Fig 12: On-Region Characteristics

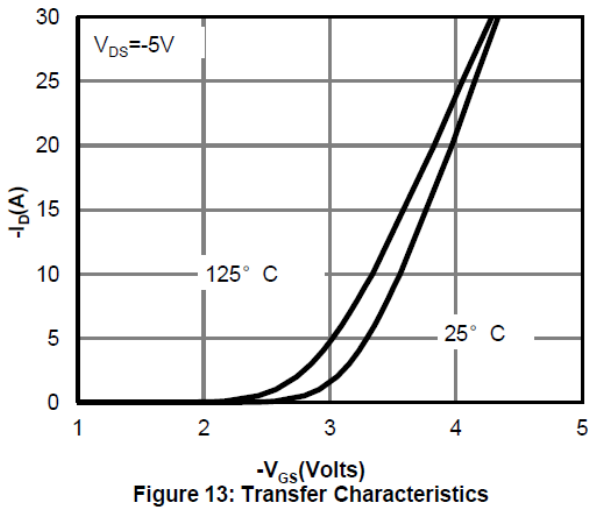


Figure 13: Transfer Characteristics

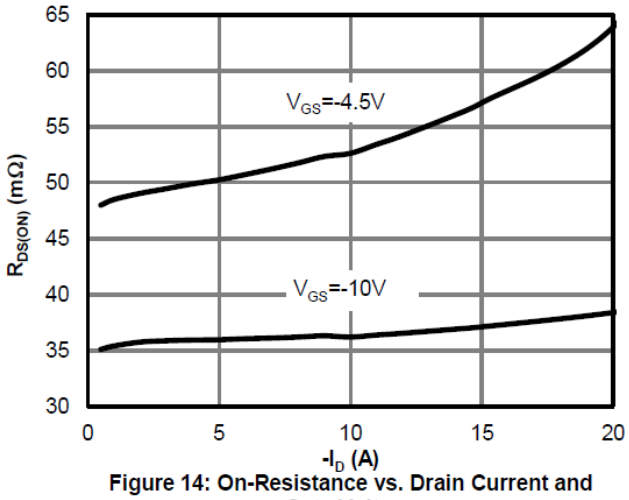


Figure 14: On-Resistance vs. Drain Current and Gate Voltage

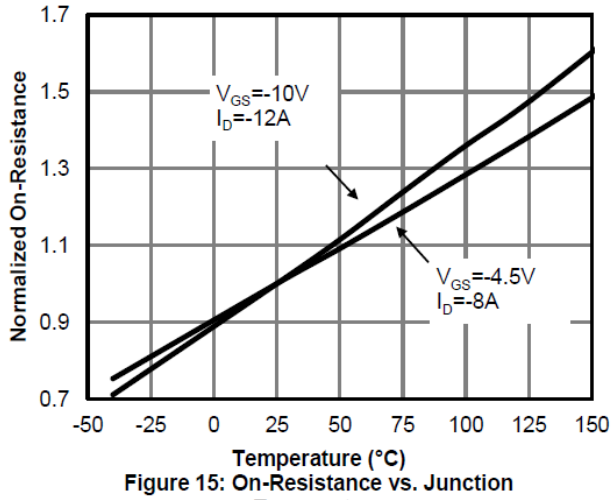


Figure 15: On-Resistance vs. Junction Temperature

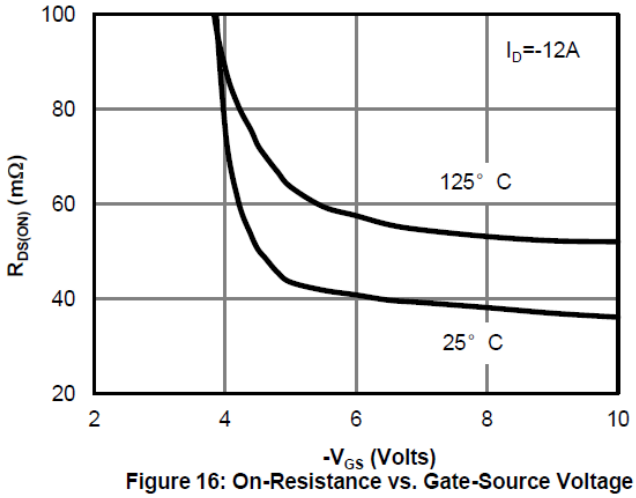


Figure 16: On-Resistance vs. Gate-Source Voltage

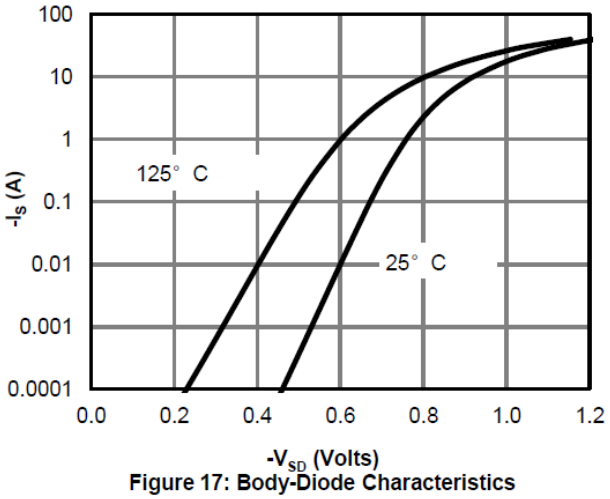


Figure 17: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

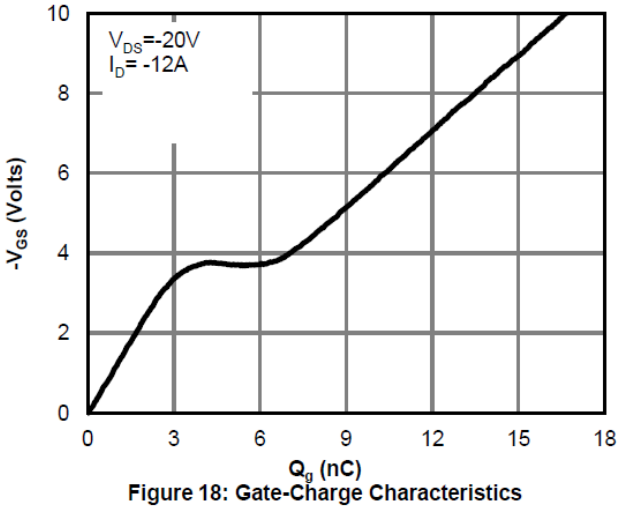


Figure 18: Gate-Charge Characteristics

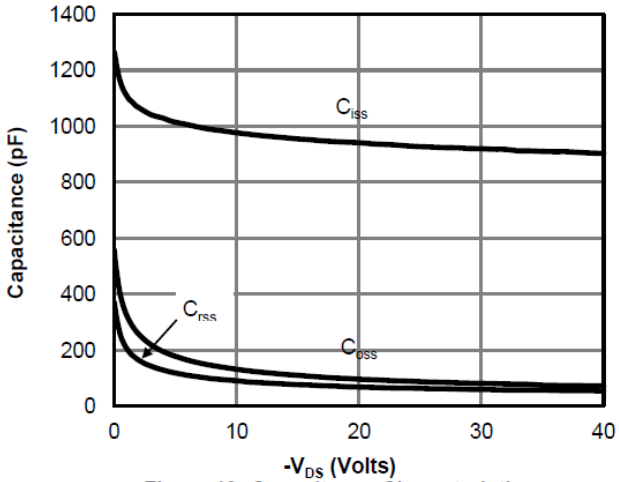


Figure 19: Capacitance Characteristics

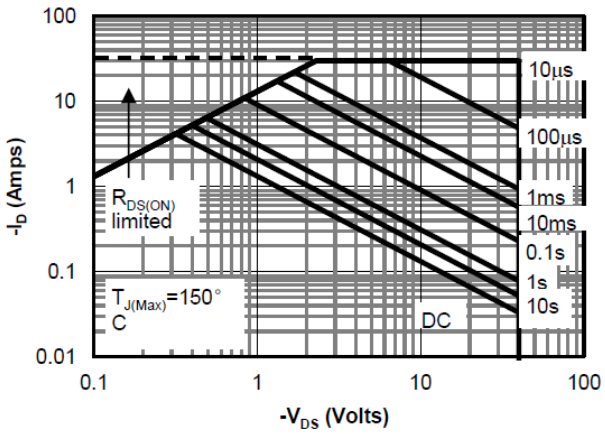


Figure 20: Maximum Forward Biased Safe Operating Area (Note E)

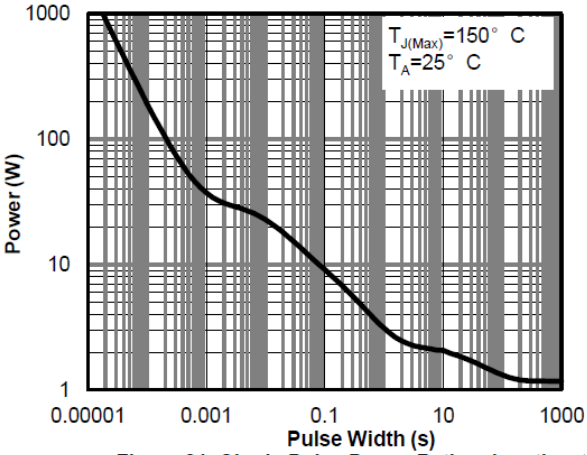


Figure 21: Single Pulse Power Rating Junction-to-Ambient (Note E)

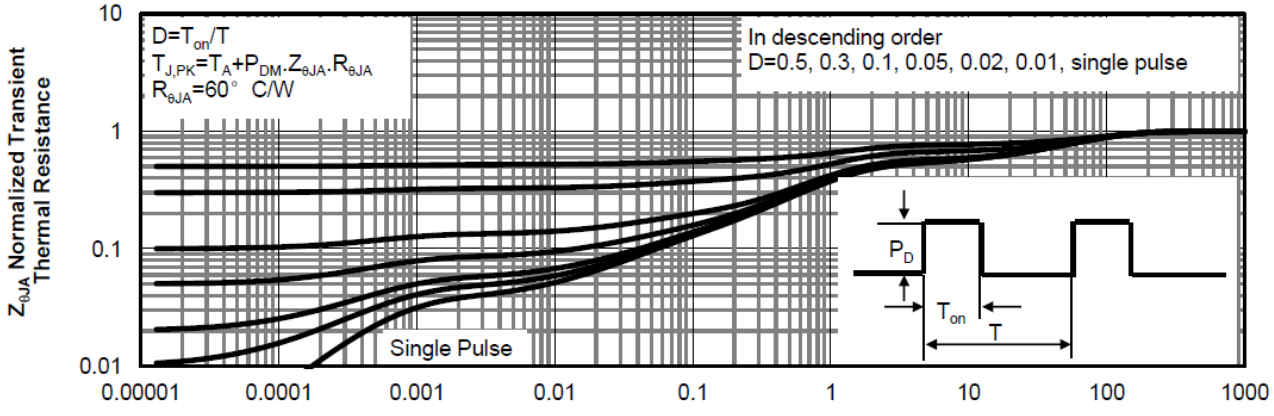
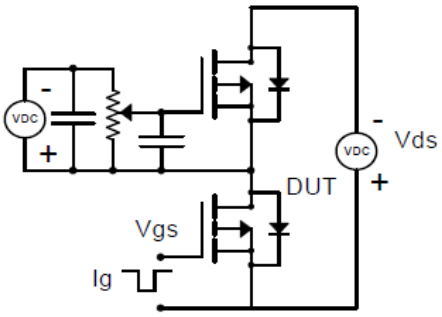
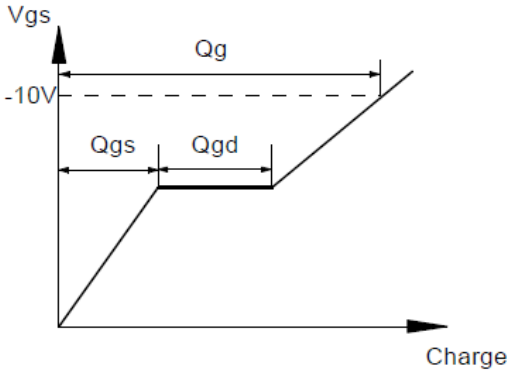


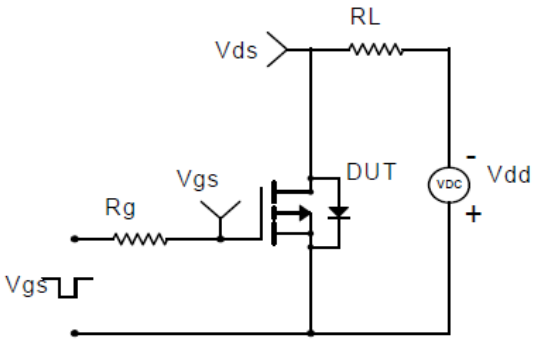
Figure 22: Normalized Maximum Transient Thermal Impedance

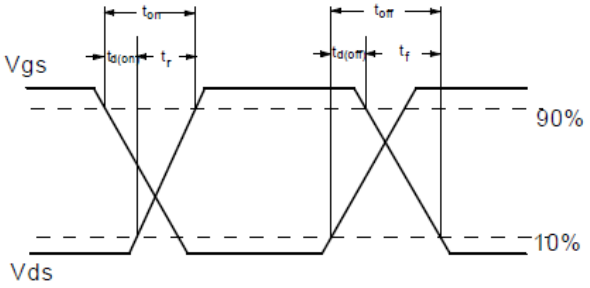
Gate Charge Test Circuit & Waveform





Resistive Switching Test Circuit & Waveforms





Diode Recovery Test Circuit & Waveforms