GSX6040DT

MOSFET

Metal Oxide Semiconductor Field Effect Transistor

Trench MOSFET

60V Dual N-chanel Normal Power Transistor

GSX6040DT

Data Sheet

Ver 0

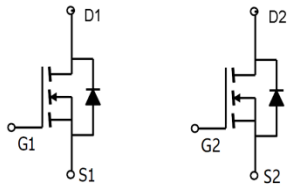
2020-3-20

60V 40A Power MOSFET

■Description

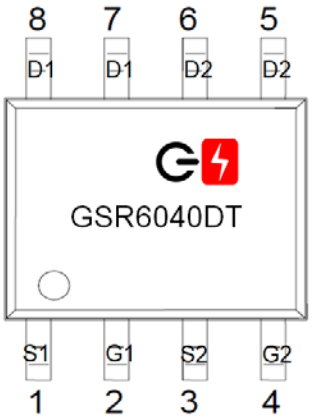
GroupSemiconductor(GS) has series Trench power MOSFET platforms for voltage up 20V to 200 volts, both with design service and manufacturing capability, including cell, termination design and simulation.

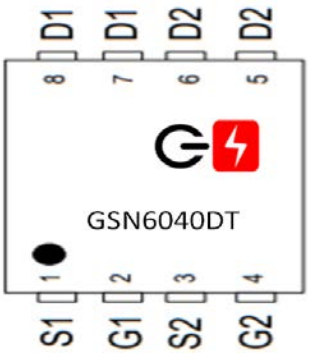
The GS 60V 40A power MOSFET is a Low voltage N channel Trench power MOSFET sample with advanced technology to have better characteristics, such as fast switching time, low Ciss and Crss, low on resistance and excellent avalanche characteristics, making it especially suitable for applications which require superior power density and outstanding efficiency.

Package	Pin Configuration (Top View)
SOP-8/DFN5*6	

■ Features

RDS(ON)=23m Ω @VGS = 10V
VDS = 60V
ID (@ VGS=10V) = 40A





■ PKG

GSR6040DT	GSN6040DT
SOP-8	DFN5*6

■Absolute Maximum Ratings (TC = 25° C, unless otherwise specified)

Symbol	Parameter	Maximum	Units
VDS	Drain-Source Voltage	60	V
VGS	Gate-Source Voltage	±20	V
ID(1)	Continuous Drain Current (TC=25° C)	40	A
	Continuous Drain Current (TC=100° C)	20	
IDM(2)	Pulsed Drain Current	80	A

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EAR(2),(3)	Repetitive avalanche energy	150	mJ
EAS(4)	Single pulsed avalanche energy (1mH)	580	mJ
dv/dt	Peak diode recovery dv/dt	5	V/ns
PD(1)	Power Dissipation (TC=25° C) TO-220	80	W
	Derating above 25° C	1.5	W/ ° C
TJ	Max. operating junction temperature	150	° C
TSTG	Storage temperature	-55 to +150	° C

■Thermal Characteristics

Symbol	Parameter	Value (TO220)	Unit
$R_{\theta JA}$ (6)	Maximum Junction-to-Ambient	82	C/W
$R_{\theta CS}$ (6)	Maximum Case-to-sink	0.6	C/W
$R_{\theta JC}$ (7),(8)	Maximum Junction-to-Case θ	4.1	C/W

1. The power dissipation PD is based on TJ(MAX)=150° C in a TO-251 package, using junction-to-case thermal resistance.
2. Repetitive rating, pulse width limited by junction temperature TJ(MAX)=150° C.
3. L=1mH, Starting TJ=25° C.
4. L = 10mH, starting TJ = 25° C.
5. L=60mH, starting TJ = 25° C.
6. The tests are performed with the device with T A =25° C.
7. The R □ JA is the sum of the thermal impedance from junction to case R □ JC and case to ambient.
8. These curves are based on the junction-to-case thermal impedance, assuming a maximum junction temperature of TJ(MAX)=150° C.

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■ Electrical Characteristics (TJ=25° C unless otherwise specified)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BVDSS	Drain-Source Breakdown Voltage	ID=250uA, VGS=0V, TJ=25° C	60			V
BVDSS /ΔTJ	Zero Gate Voltage Drain Current	ID=250uA, VGS=0V		0.72		V/° C
IDSS	Zero Gate Voltage Drain Current	VDS=60V, VGS=0V			1	uA
		VDS=60V, TJ=125° C	10			
IGSS	Gate-Body leakage current	VDS=0V, VGS=20V			100	nA
		VDS=0V, VGS=-20V	-100			
On Characteristics						
VGS(th)	Gate Threshold Voltage	VDS=Vgs, ID=250uA	1		2	V
RDS(ON)	Static Drain-Source On-Resistance	VGS=10V, ID=10A		18	23	mΩ
gFS	Forward Transconductance	VDS = 10 V, ID = 10A		20		S
Source Drain Diode Characteristics						
VSD	Diode Forward Voltage	IS=10A,VGS=0V		0.82	1.2	V
ISD	Continuous source-drain Current			80		A
trr	Reverse Recovery Time	IF=30A,dI/dt=100A/us		32		ns
Qrr	Reverse Recovery Charge	IF=30A,dI/dt=100A/us		56		nC
Dynamic Characteristics						
Ciss	Input Capacitance	VGS=0V, VDS=15V, f=1MHz		1890		pF
Coss	Output Capacitance	VGS=0V, VDS=15V, f=1MHz		540		pF
Crss	Reverse Transfer Capacitance	VGS=0V, VDS=15V, f=1MHz		40		pF
Qg	Total Gate Charge	VDS=10V, ID=30A		39		nC
Qgs	Gate Source Charge	VDS=10V, ID=30A		8		nC
Qgd	Gate Drain Charge	VDS=10V, ID=30A		11		nC
Switching Characteristics						
t_d(on)	Turn-On DelayTime	VGS=10V, VDS=10V, ID=30A, RG=2.5 Ω		14		ns
tr	Turn-On Rise Time			9		ns
t_d(off)	Turn-Off DelayTime			40		ns
tf	Turn-Off Fall Time			12		ns

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

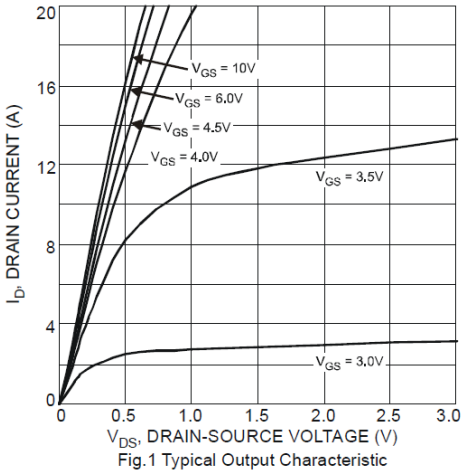

Fig.1 Typical Output Characteristic

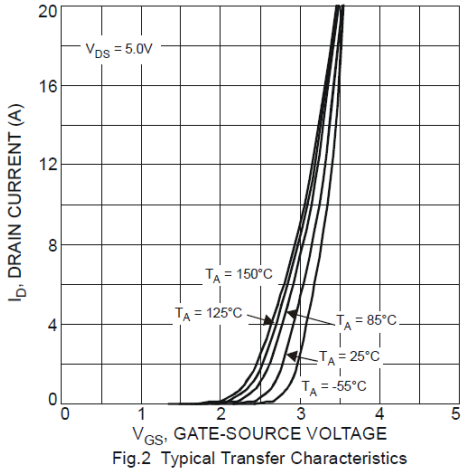

Fig.2 Typical Transfer Characteristics

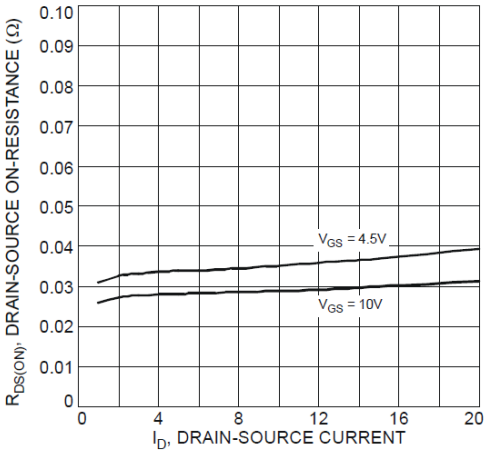

Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

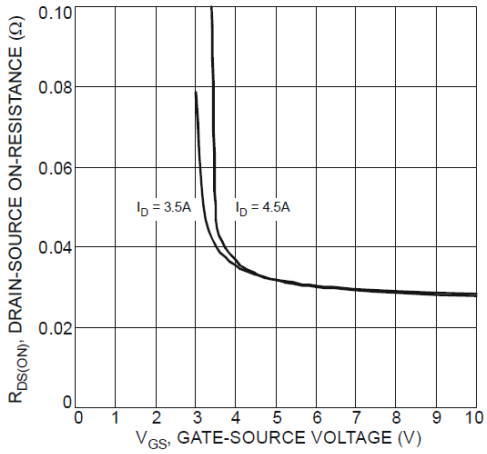

Fig. 4 Typical On-Resistance vs. Drain Current and Gate Voltage

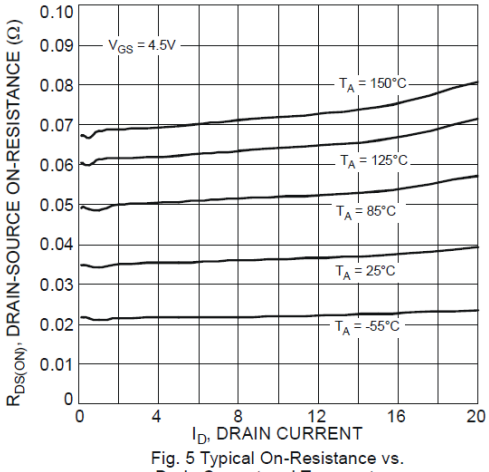

Fig. 5 Typical On-Resistance vs. Drain Current and Temperature

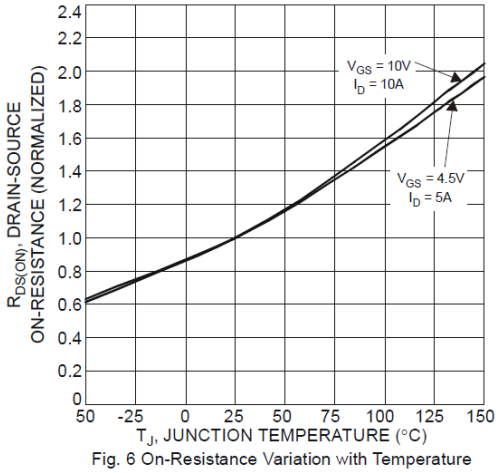

Fig. 6 On-Resistance Variation with Temperature

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

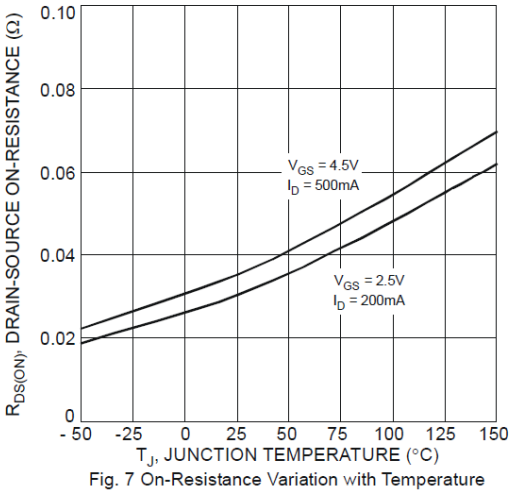


Fig. 7 On-Resistance Variation with Temperature

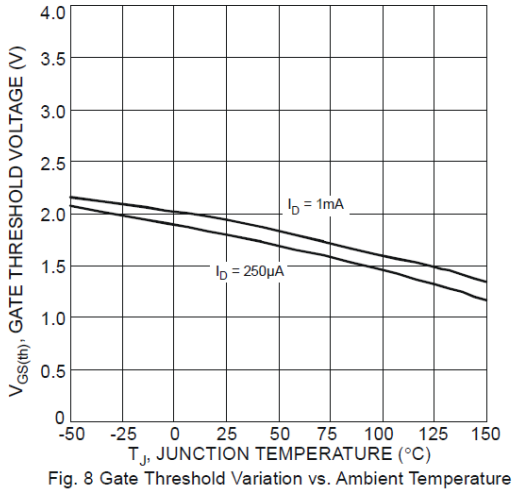


Fig. 8 Gate Threshold Variation vs. Ambient Temperature

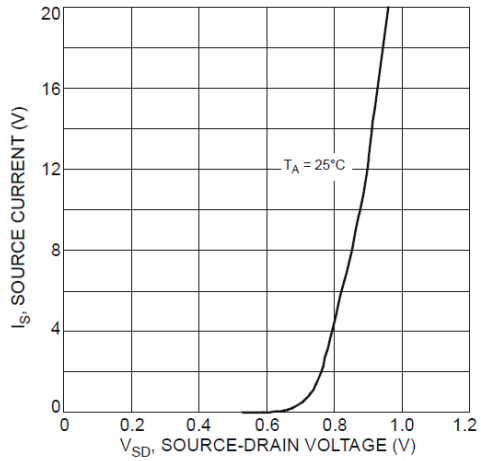


Fig.9 Diode Forward Voltage vs. Current

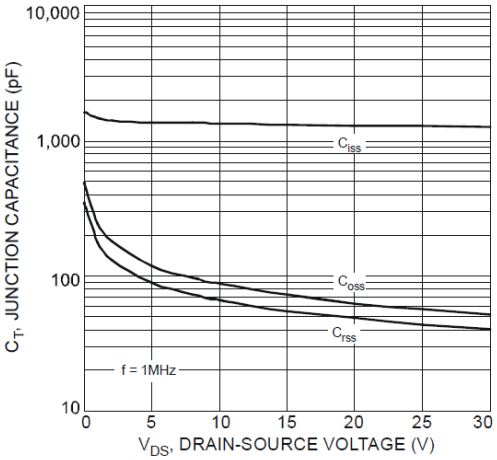


Fig. 10 Typical Junction Capacitance

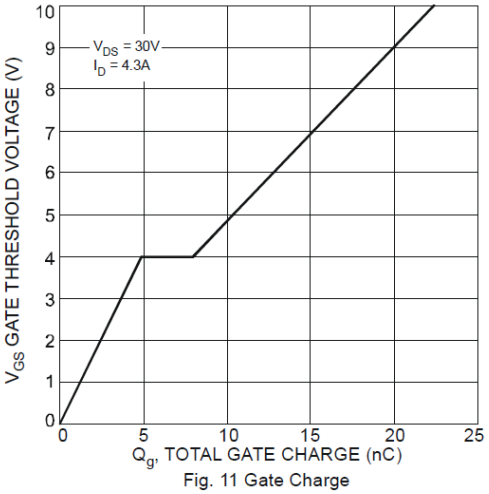


Fig. 11 Gate Charge

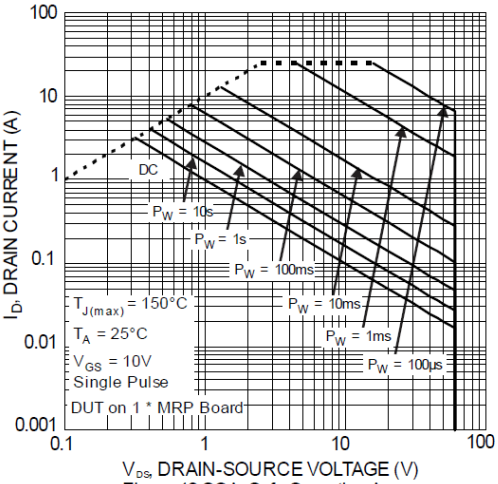


Figure 12 SOA, Safe Operation Area

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

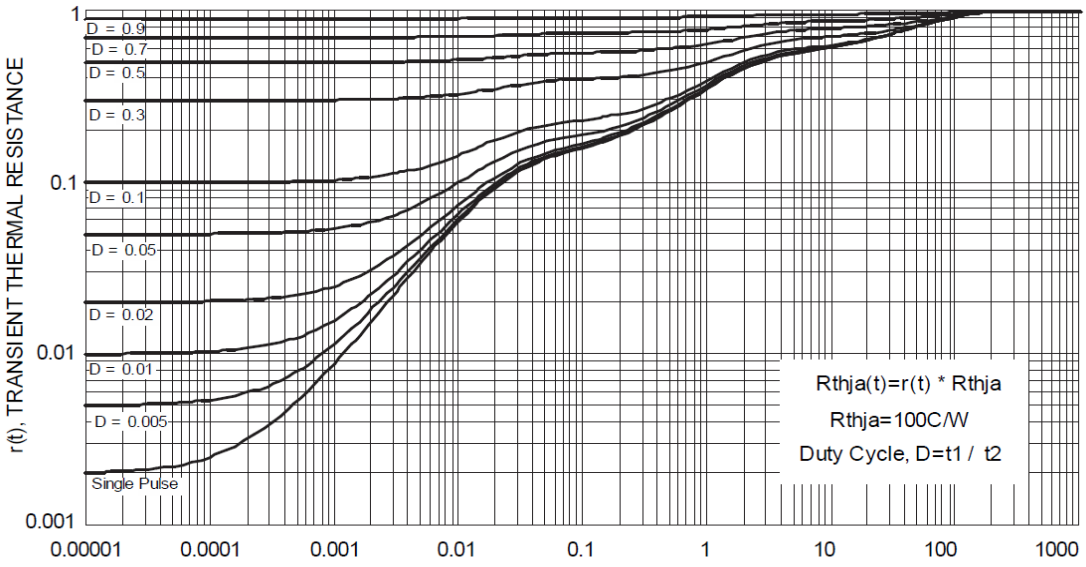


Figure 13 Transient Thermal Resistance

Table 20 Switching times test circuit and waveform for inductive load

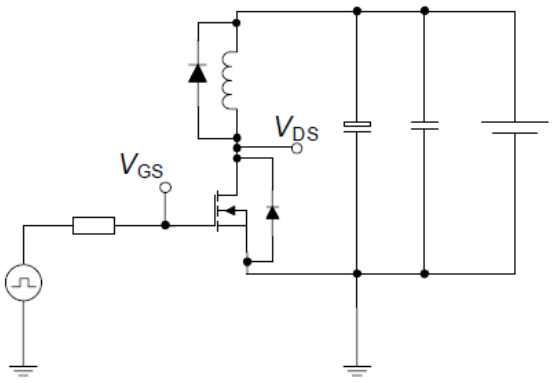
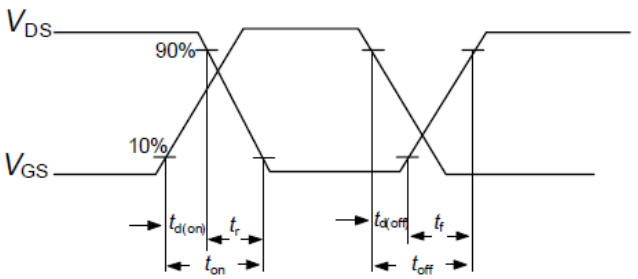
Switching times test circuit for inductive load	Switching time waveform
	

Table 21 Unclamped inductive load test circuit and waveform

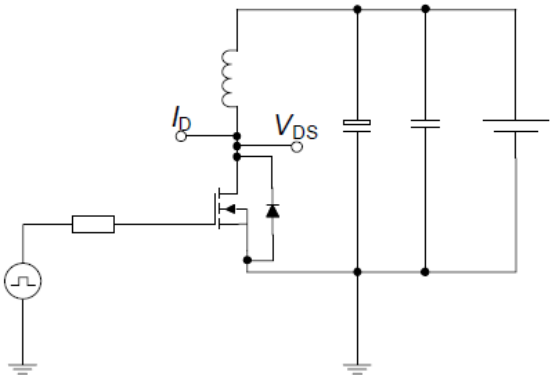
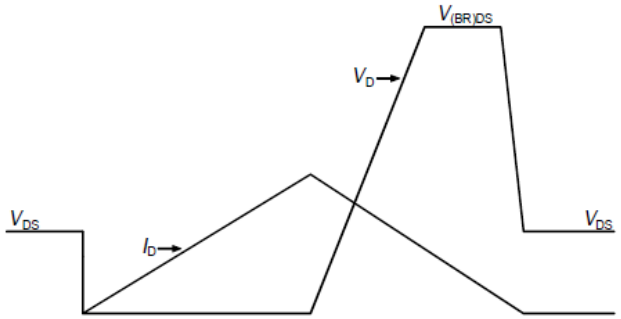
Unclamped inductive load test circuit	Unclamped inductive waveform
	

Table 22 Test circuit and waveform for diode characteristics

Test circuit for diode characteristics	Diode recovery waveform