GOOD-ARK SEMICONDUCTOR

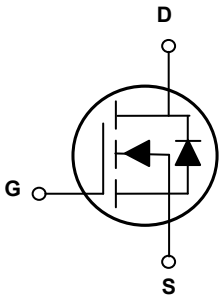
GSGG6504

650V N-Channel MOSFET

Main Product Characteristics

V_{DS}	650V
$R_{DS(ON)}$	950mΩ
I_D	4A

TO-251



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

Description

The GSGG6504 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 supply and a wide variety of other applications.

Absolute Maximum Ratings (T_C=25°C unless otherwise specified)

Parameter	Symbol	Max.	Unit
Drain-Source Voltage (V_{GS}=0V)	V_{DS}	650	V
Gate-Source Voltage (V_{DS}=0V) , AC (f>1 Hz)	V_{GS}	±30	V
Drain Current-Continuous (T_C=25°C)	I_D	4	A
Drain Current-Continuous (T_C=100°C)	I_D	2.5	A
Drain Current-Pulsed[1]	I_{DM}	16	A
Maximum Power Dissipation (Tc=25°C)	P_D	41	W
Power Dissipation-Derate above 25°C		0.328	W/°C
Single Pulse Avalanche Energy[2]	E_{AS}	27	mJ
Avalanche Current[1]	I_{AR}	0.7	A
Repetitive Avalanche energy, t_{AR} limited by T_{jmax}[1]	E_{AR}	0.1	mJ
Drain Source Voltage Slope, V_{DS} ≤480 V	dv/dt	50	V/ns
Reverse Diode dv/dt, V_{DS} ≤480 V, I_{SD}<I_D	dv/dt	15	V/ns
Operating Junction Range	T_J	-55 To +150	°C
Storage Temperature Range	T_{STG}	-55 To +150	°C
Thermal Resistance, Junction-to-Case (Maximum)	R_{thJC}	3.0	°C/W
Thermal Resistance, Junction-to-Ambient (Maximum)	R_{thJA}	62	°C/W

Electrical Characteristics (T_A=25°C unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
On/Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=250μA	650	-	-	V
Zero Gate Voltage Drain Current (Tc=25°C)	I_{DSS}	V_{DS}=650V, V_{GS}=0V	-	-	1	μA
Zero Gate Voltage Drain Current (Tc=125°C)	I_{DSS}	V_{DS}=650V, V_{GS}=0V	-	-	50	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V, V_{DS}=0V	-	-	±100	nA
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}=V_{DS}, I_D=250μA	3	-	4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=2A	-	950	1100	mΩ
Dynamic and Switching Characteristics						
Input Capacitance	C_{lss}	V_{DS}=50V, F=1.0MHz V_{GS}=0V	-	304	-	pF
Output Capacitance	C_{oss}		-	18	-	pF
Reverse Transfer Capacitance	C_{rss}		-	0.6	-	pF
Total Gate Charge	Q_g	V_{DS}=480V,I_D=4A, V_{GS}=10V	-	8.8	12	nC
Gate-Source Charge	Q_{gs}		-	2.3	-	nC
Gate-Drain Charge	Q_{gd}		-	4	-	nC
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=380V,I_D=2.5A, R_G=5Ω,V_{GS}=10V	-	8	-	nS
Turn-on Rise Time	t_r		-	4	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	52	70	nS
Turn-Off Fall Time	t_f		-	9	18	nS
Source-Drain Diode Characteristics and Maximum Ratings						
Source-drain Current	I_S	T_C=25°C	-	-	4	A
Pulsed Source-drain Current	I_{SDM}		-	-	16	A
Forward On Voltage	V_{SD}	T_J=25°C, I_{SD}=4A, V_{GS}=0V	-	0.9	1.2	V
Reverse Recovery Time	t_{rr}	T_J=25°C,I_F=2A, di/dt=100A/μs	-	200	-	nS
Reverse Recovery Charge	Q_{rr}		-	0.6	-	uC
Peak Reverse Recovery Current	I_{rrm}		-	6	-	A

Note:

1. Repetitive rating: Pulsed width limited by maximum junction temperature.
2. T_J=25°C,V_{DD}=50V,V_G=10V, R_G=25Ω.

Typical Electrical and Thermal Characteristic Curves

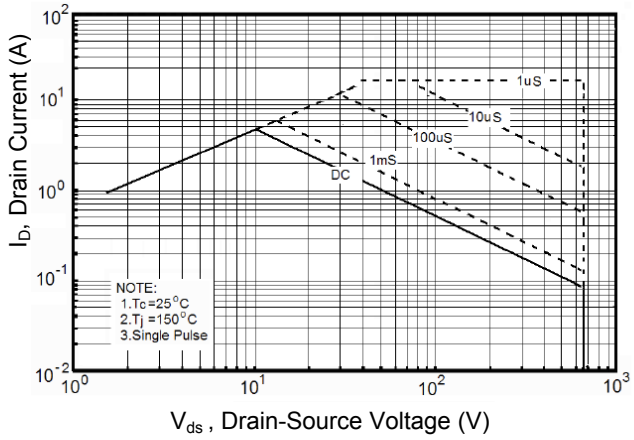


Figure 1. Safe Operating Area

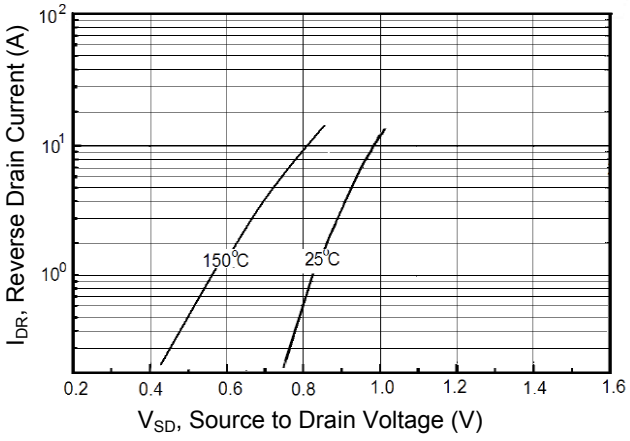


Figure 2. Source-Drain Diode Forward Voltage

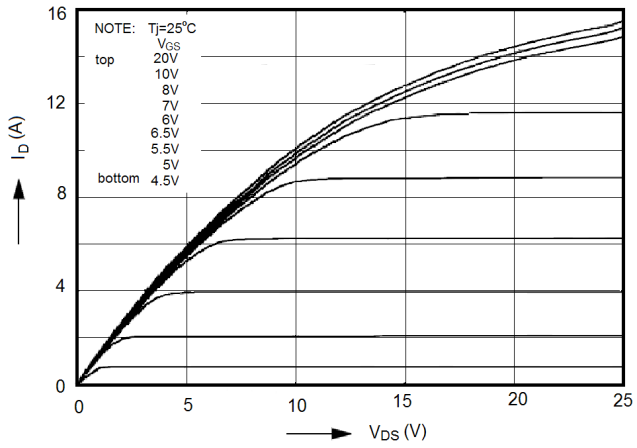


Figure 3. Output Characteristics

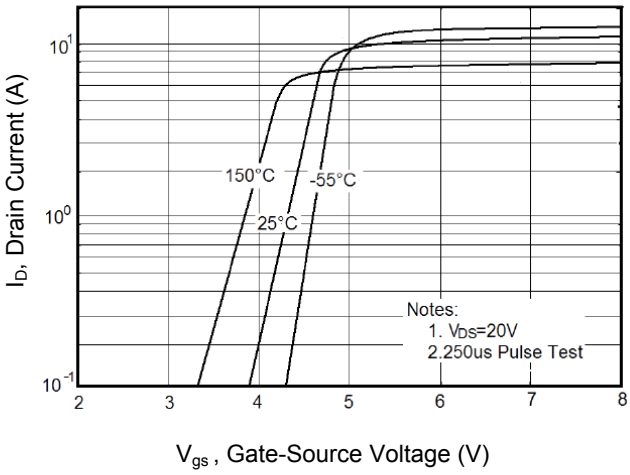


Figure 4. Transfer Characteristics

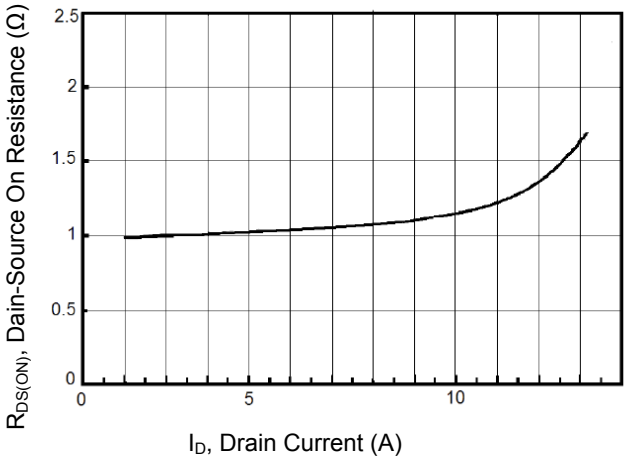


Figure 5. Static Drain-source on Resistance

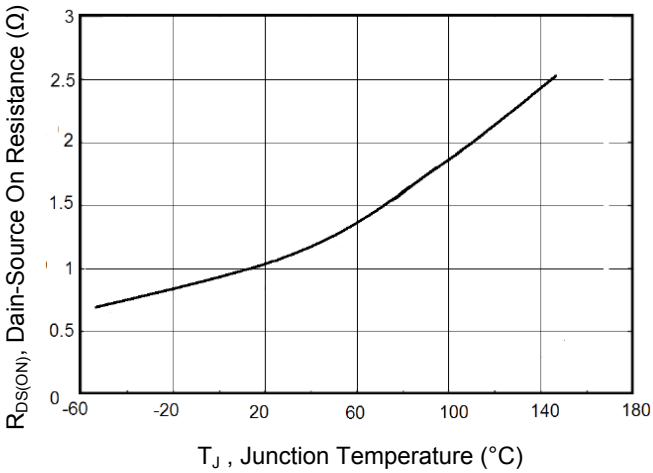


Figure 6. R_{DSON} vs Junction Temperature

Typical Electrical and Thermal Characteristic Curves

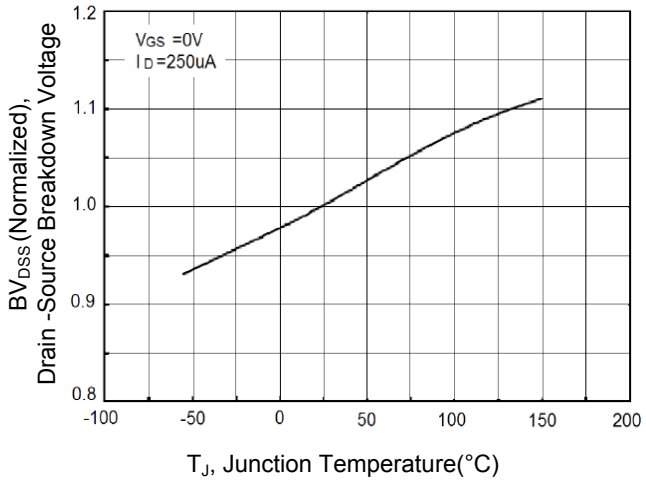


Figure 7. BV_{DSS} vs. Junction Temperature

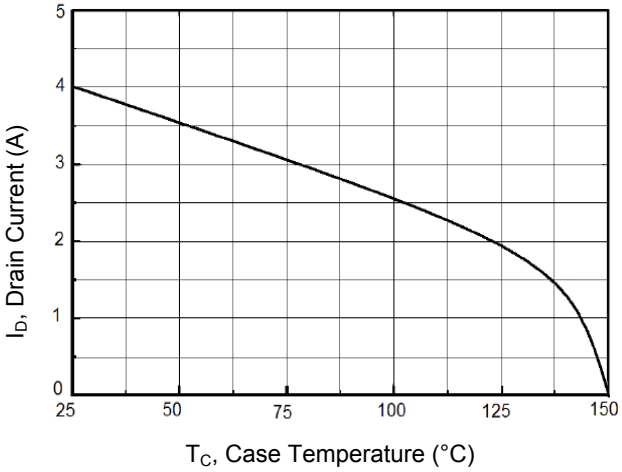


Figure 8. Maximum I_D vs Junction Temperature

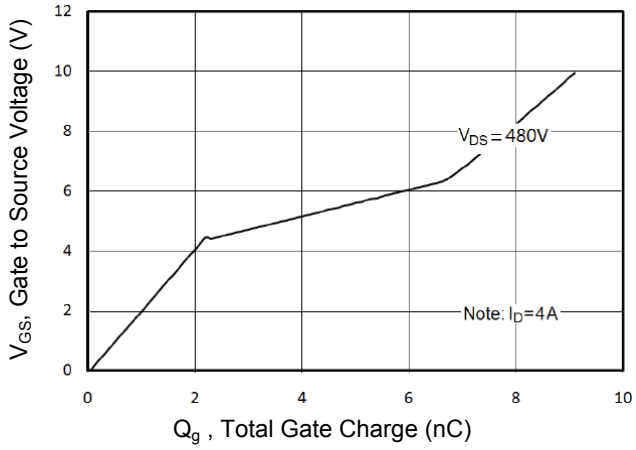


Figure 9. Gate Charge Waveforms

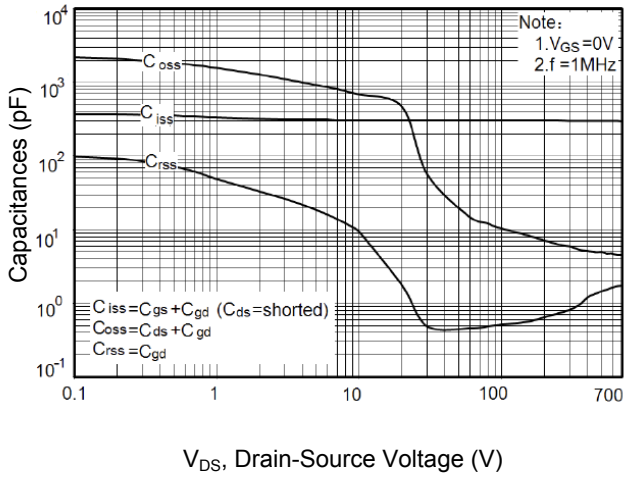


Figure 10. Capacitance

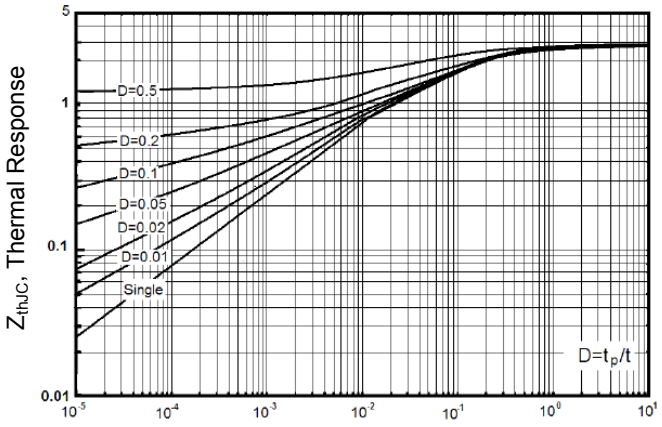


Figure 11. Transient Thermal Impedance

Typical Electrical and Thermal Characteristic Curves

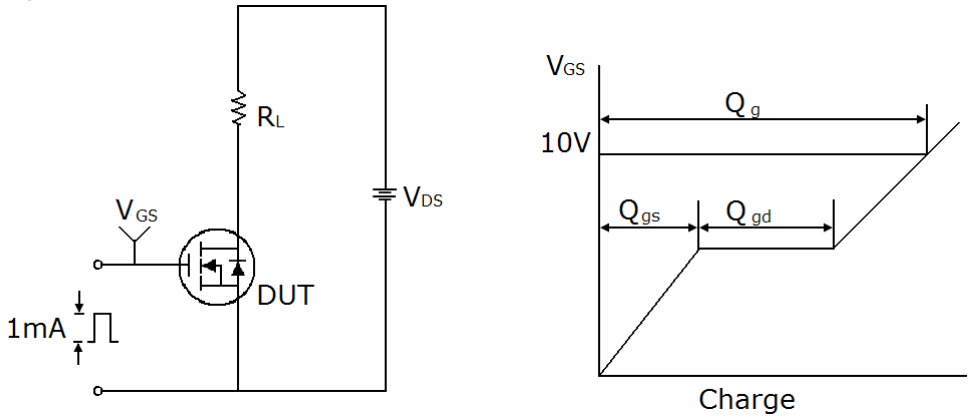


Figure 12. Gate Charge Test Circuit & Waveform

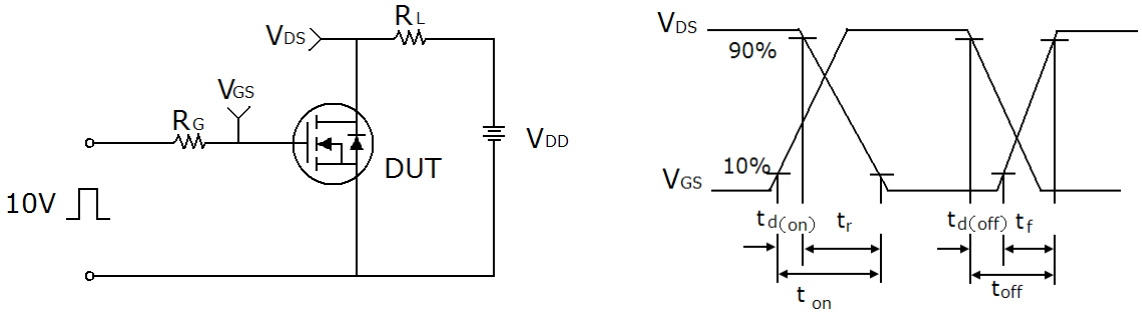


Figure 13. Switch Time Test Circuit:

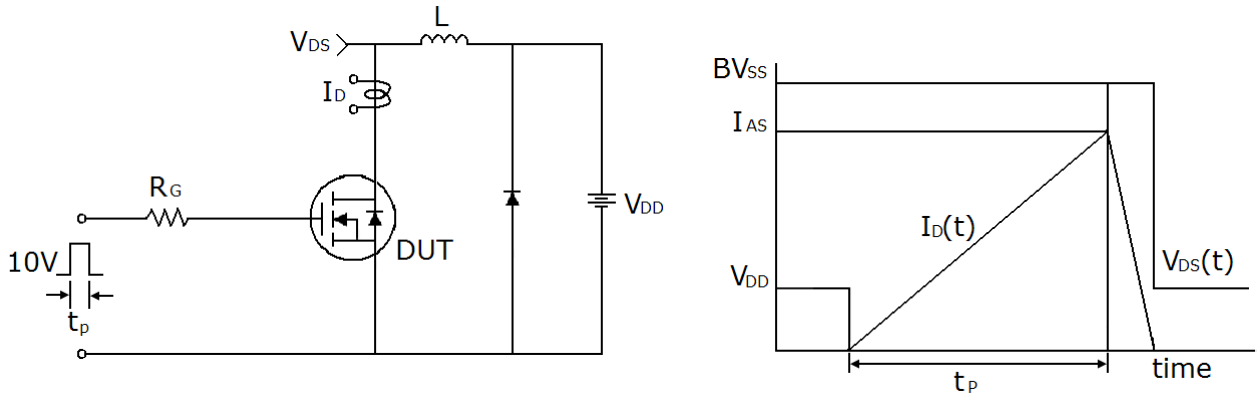
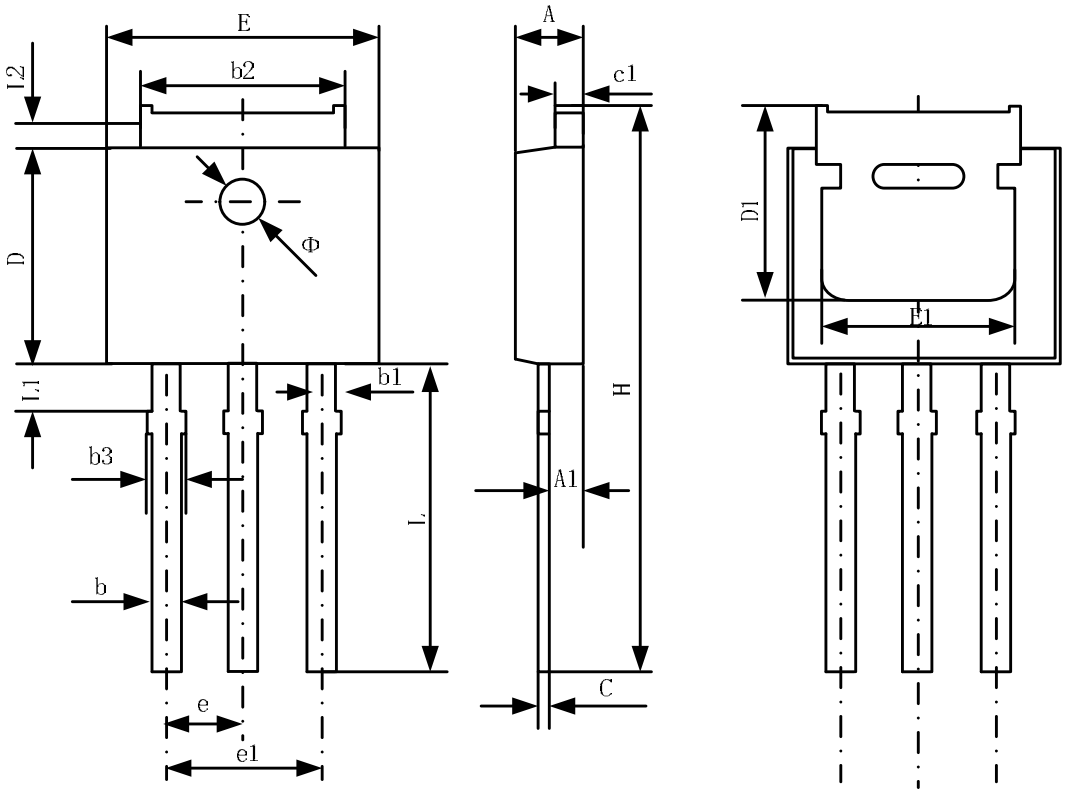


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

Package Outline Dimensions (TO-251)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.20	2.35	0.087	0.093
A1	0.90	1.10	0.035	0.043
b	0.56	0.69	0.022	0.027
b1	0.77	0.90	0.030	0.035
b2	5.23	5.43	0.206	0.214
b3	-	1.05	0.000	0.041
C	0.46	0.59	0.018	0.023
c1	0.46	0.59	0.018	0.023
D	6.00	6.20	0.236	0.244
D1	5.20	-	0.205	-
E	6.50	6.70	0.256	0.264
E1	4.60	5.00	0.181	-
e	2.24	2.34	0.088	0.092
e1	4.47	4.67	0.176	0.184
H	16.18	16.78	0.637	0.661
L	9.00	9.60	0.354	0.378
L1	0.95	1.35	0.037	0.053
L2	0.90	1.25	0.035	0.049