

Description

The SX20G04GD uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

General Features

$V_{DS} = 40V$ $I_D = 20A$

$R_{DS(ON)} < 32m\Omega$ @ $V_{GS}=10V$

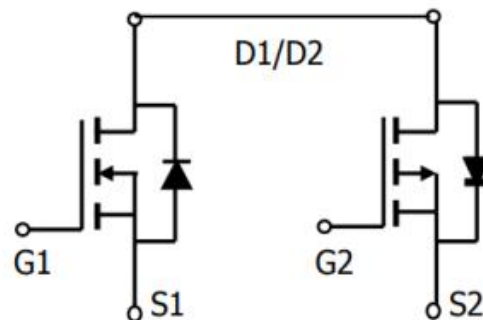
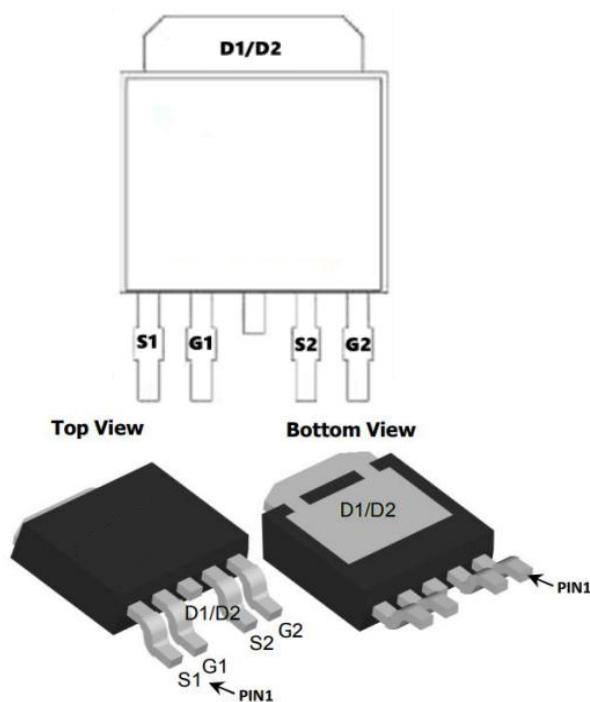
$V_{DS} = -40V$ $I_D = -18A$

$R_{DS(ON)} < 48m\Omega$ @ $V_{GS} = -10V$

Application

Boost driver

Brushless motor



Absolute Maximum Ratings ($T_c=25^\circ C$ unless otherwise noted)

Symbol	Parameter	Rating		Units
		N-Ch	P-Ch	
V_{DS}	Drain-Source Voltage	40	-40	V
V_{GS}	Gate-Source Voltage	± 20	± 20	V
$I_D @ T_c=25^\circ C$	Continuous Drain Current, V_{GS} @ 10V ¹	20	-18	A
$I_D @ T_c=100^\circ C$	Continuous Drain Current, V_{GS} @ 10V ¹	15	-16	A
I_{DM}	Pulsed Drain Current ²	35	-36	A
EAS	Single Pulse Avalanche Energy ³	15	45	mJ
I_{AS}	Avalanche Current	10	-10	A
$P_D @ T_c=25^\circ C$	Total Power Dissipation ⁴	20	25	W
T_{STG}	Storage Temperature Range	-55 to 150	-55 to 150	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150	-55 to 150	$^\circ C$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	62		$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	5		$^\circ C/W$

Electrical Characteristics (T_c=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BVDSS	Drain-Source Breakdown Voltage	V _{GS} =0V , I _D =250uA	40	44	---	V
ΔBVDSS/ΔT _J	BVDSS Temperature Coefficient	Reference to 25°C , I _D =1mA	---	0.032	---	V/°C
RDS(ON)	Static Drain-Source On-Resistance ²	V _{GS} =10V , I _D =4A	---	24	32	mΩ
		V _{GS} =4.5V , I _D =3A	---	38	48	
VGS(th)	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250uA	1.0	1.5	2.5	V
ΔVGS(th)	VGS(th) Temperature Coefficient		---	-4.5	---	mV/°C
IDSS	Drain-Source Leakage Current	V _{DS} =32V , V _{GS} =0V , T _J =25°C	---	---	1	uA
		V _{DS} =32V , V _{GS} =0V , T _J =55°C	---	---	5	
IGSS	Gate-Source Leakage Current	V _{GS} =±20V , V _{DS} =0V	---	---	±100	nA
gfs	Forward Transconductance	V _{DS} =5V , I _D =4A	---	8	---	S
R _g	Gate Resistance	V _{DS} =0V , V _{GS} =0V , f=1MHz	---	2.4	4.8	Ω
Q _g	Total Gate Charge (4.5V)	V _{DS} =15V , V _{GS} =4.5V , I _D =3A	---	5	---	nC
Q _{gs}	Gate-Source Charge		---	1.54	---	
Q _{gd}	Gate-Drain Charge		---	1.84	---	
Td(on)	Turn-On Delay Time	V _{DD} =15V , V _{GS} =10V , R _G =3.3Ω I _D =1A	---	7.8	---	ns
T _r	Rise Time		---	2.1	---	
Td(off)	Turn-Off Delay Time		---	29	---	
T _f	Fall Time		---	2.1	---	
Ciss	Input Capacitance	V _{DS} =15V , V _{GS} =0V , f=1MHz	---	452	---	pF
Coss	Output Capacitance		---	51	---	
Crss	Reverse Transfer Capacitance		---	38	---	
IS	Continuous Source Current ^{1,4}	V _G =V _D =0V , Force Current	---	---	4.5	A
ISM	Pulsed Source Current ^{2,4}		---	---	14	A
VSD	Diode Forward Voltage ²	V _{GS} =0V , I _S =1A , T _J =25°C	---	---	1.2	V

Note :

- 1 、 The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- 2 、 The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3 、 The EAS data shows Max. rating . The test condition is V_{DD}=25V,V_{GS}=10V,L=0.1mH,I_{AS}=10A
- 4 、 The power dissipation is limited by 150°C junction temperature
- 5 、 The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

Electrical Characteristics (T_c=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BVDSS	Drain-Source Breakdown Voltage	V _{GS} =0V , I _D =-250uA	-40	---	---	V
ΔBVDSS/ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C , I _D =-1mA	---	-0.02	---	V/°C
RDS(ON)	Static Drain-Source On-Resistance ²	V _{GS} =-10V , I _D =-5A	---	42	48	mΩ
		V _{GS} =-4.5V , I _D =-3A	---	48	60	
VGS(th)	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250uA	-1.0	-1.6	-2.5	V
ΔVGS(th)	V _{GS(th)} Temperature Coefficient		---	3.72	---	mV/°C
IDSS	Drain-Source Leakage Current	V _{DS} =-32V , V _{GS} =0V , T _J =25°C	---	---	1	uA
		V _{DS} =-32V , V _{GS} =0V , T _J =55°C	---	---	5	
IGSS	Gate-Source Leakage Current	V _{GS} =±20V , V _{DS} =0V	---	---	±100	nA
Q _g	Total Gate Charge (-4.5V)	V _{DS} =-20V , V _{GS} =-4.5V , I _D =-6A	---	15.8	---	nC
Q _{gs}	Gate-Source Charge		---	3.5	---	
Q _{gd}	Gate-Drain Charge		---	3.2	---	
Td(on)	Turn-On Delay Time	V _{DD} =-15V , V _{GS} =-10V , R _G =3.3Ω, I _D =-1A	---	5.2	---	ns
T _r	Rise Time		---	7	---	
Td(off)	Turn-Off Delay Time		---	23	---	
T _f	Fall Time		---	8	---	
C _{iss}	Input Capacitance	V _{DS} =-15V , V _{GS} =0V , f=1MHz	---	1000	---	pF
C _{oss}	Output Capacitance		---	160	---	
Crss	Reverse Transfer Capacitance		---	100	---	
I _s	Continuous Source Current ^{1,5}	V _G =V _D =0V , Force Current	---	---	-5.7	A
VSD	Diode Forward Voltage ²	V _{GS} =0V , I _s =-1A , T _J =25°C	---	---	-1.2	V

Note :

- 1、 The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper.
- 2、 The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3、 The EAS data shows Max. rating . The test condition is VDD=-25V,VGS=-10V,L=0.1mH,IAS=-15A
- 4、 The power dissipation is limited by 150°C junction temperature
- 5 、 The data is theoretically the same as ID and IDM , in real applications , should be limited by total power dissipation.

N-Typical Characteristics

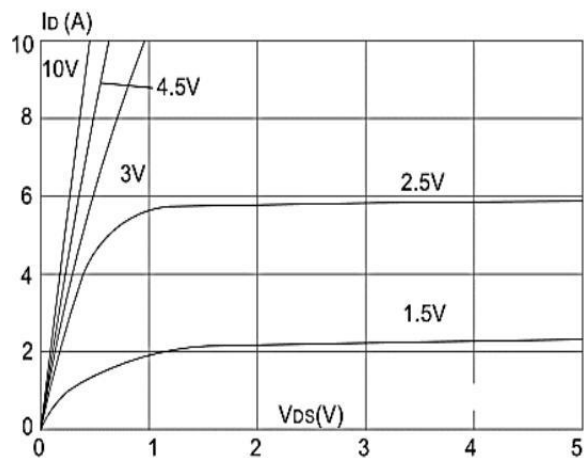


Figure1: Output Characteristics

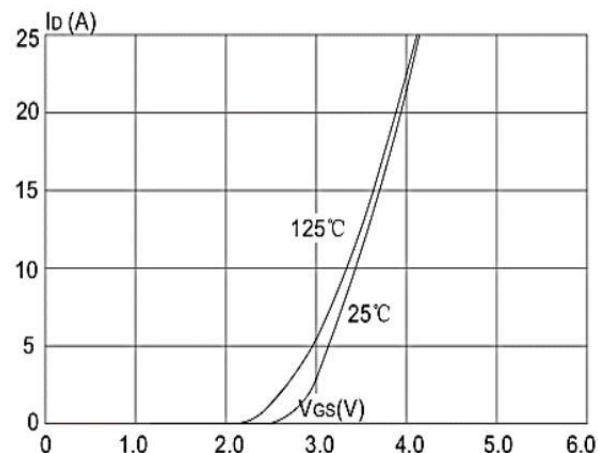


Figure 2: Typical Transfer Characteristics

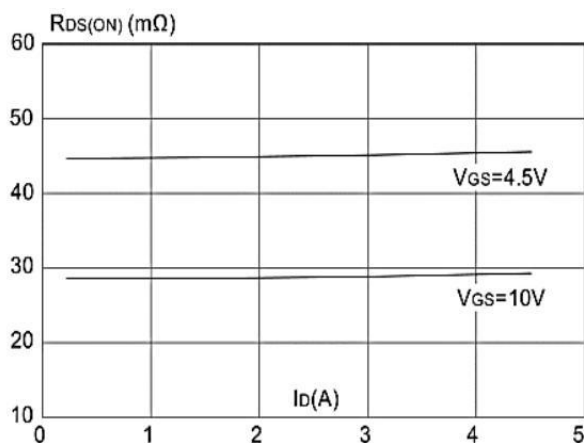


Figure 3: On-resistance vs. Drain Current

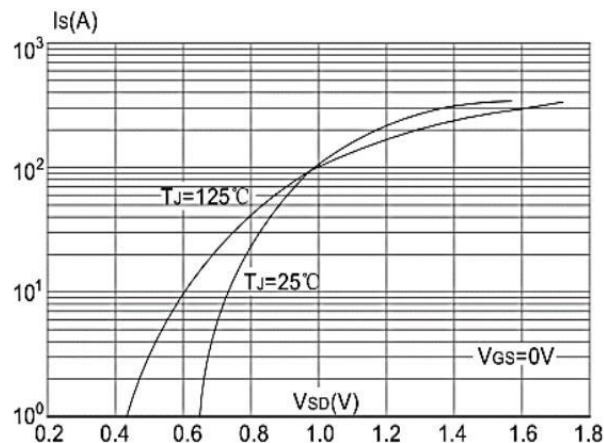


Figure 4: Body Diode Characteristics

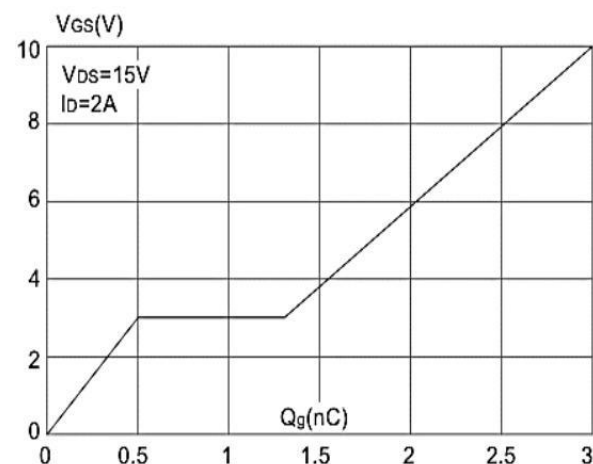


Figure 5: Gate Charge Characteristics

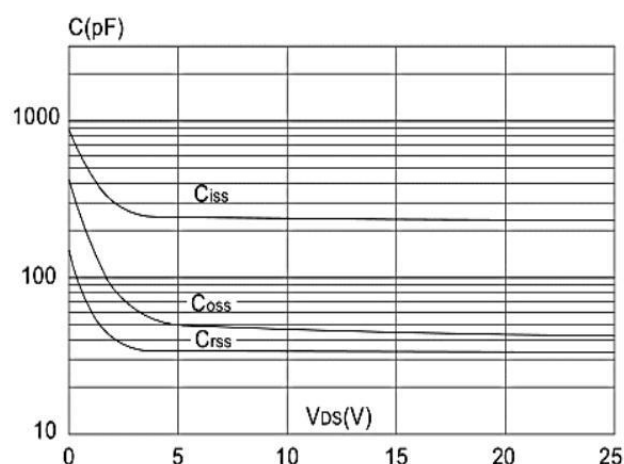


Figure 6: Capacitance Characteristics

N-Typical Characteristics

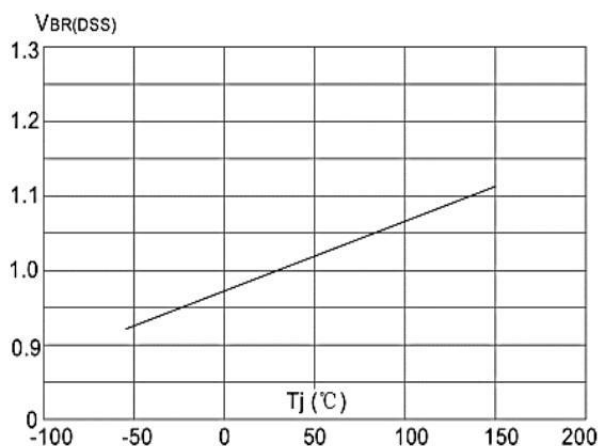


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

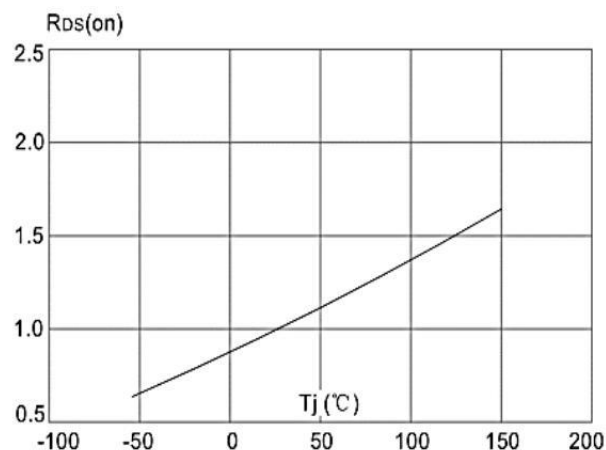


Figure 8: Normalized on Resistance vs. Junction Temperature

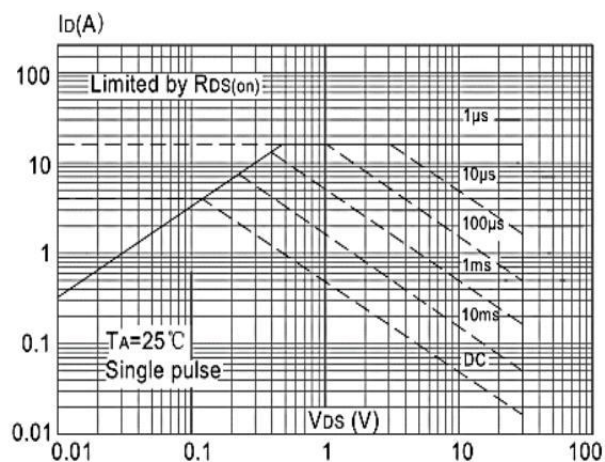


Figure 9: Maximum Safe Operating Area vs. Case Temperature

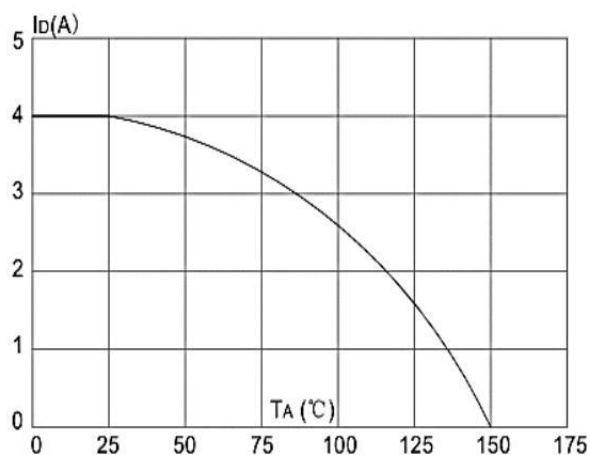


Figure 10: Maximum Continuous Drain Current

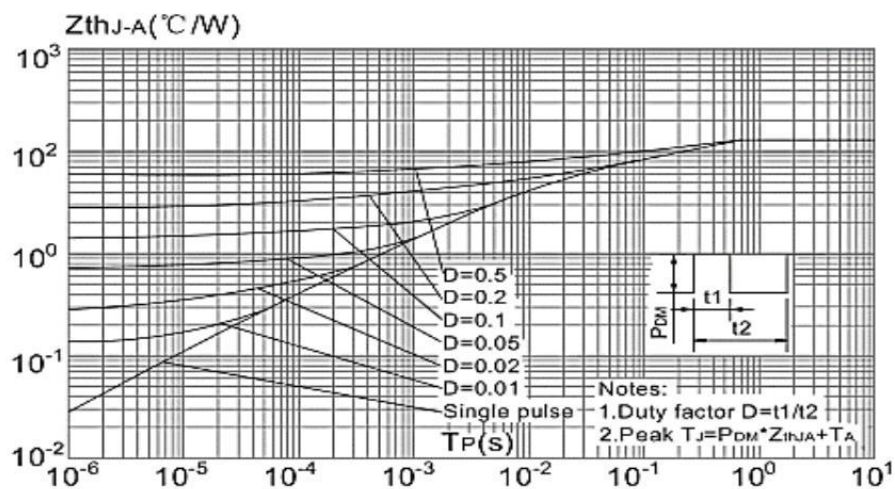


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case

P-Typical Characteristics

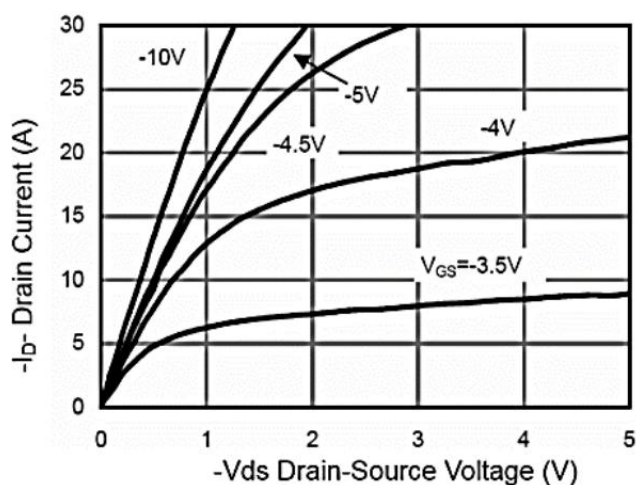


Figure 1 Output Characteristics

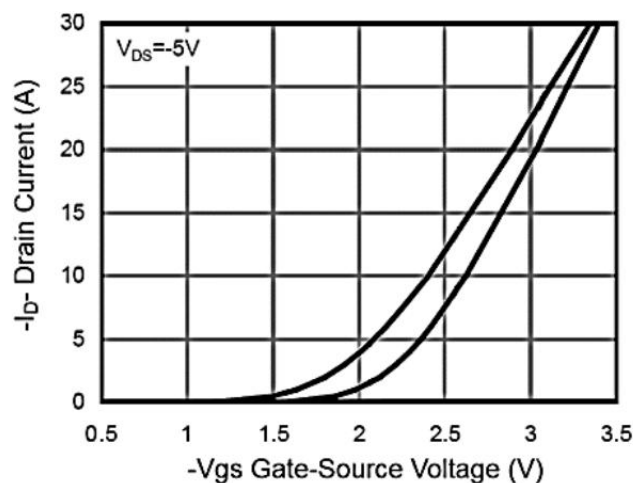


Figure 2 Transfer Characteristics

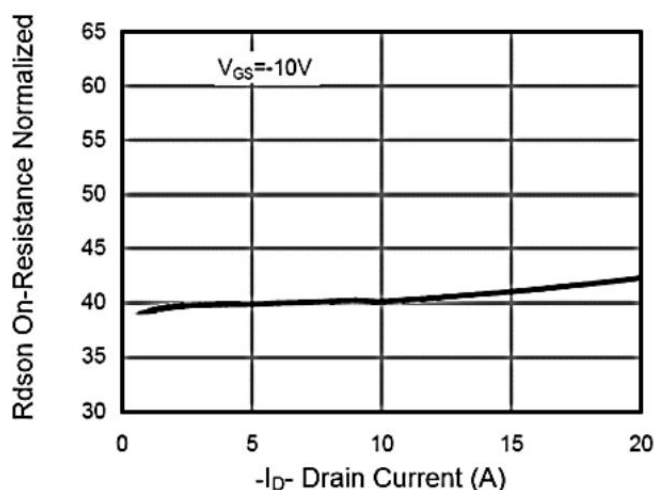


Figure 3 Rdson- Drain Current

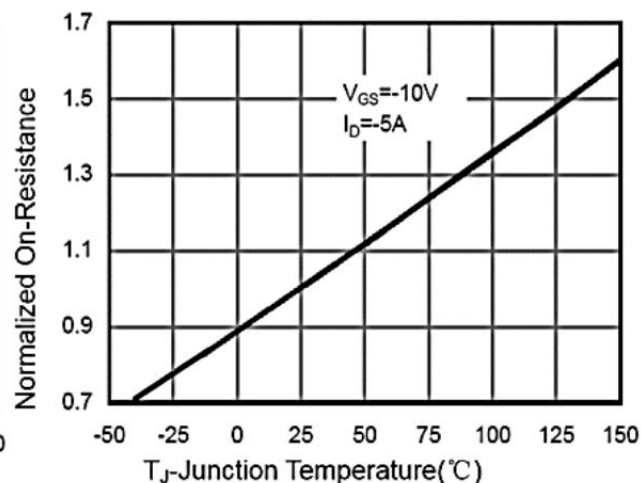


Figure 4 Rdson-Junction Temperature

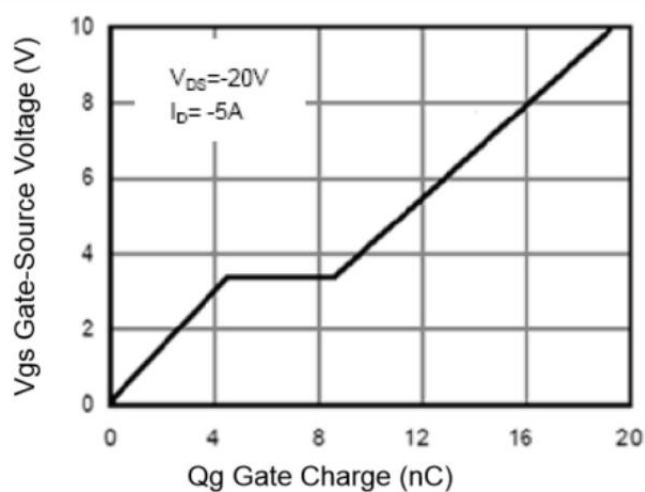


Figure 5 Gate Charge

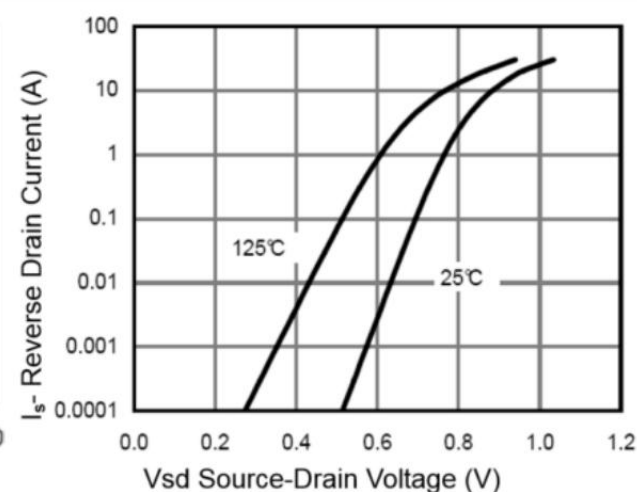


Figure 6 Source- Drain Diode Forward

P-Typical Characteristics

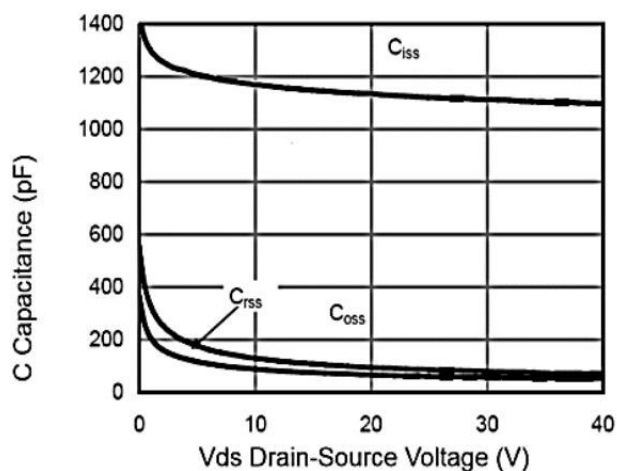


Figure 7 Capacitance vs Vds

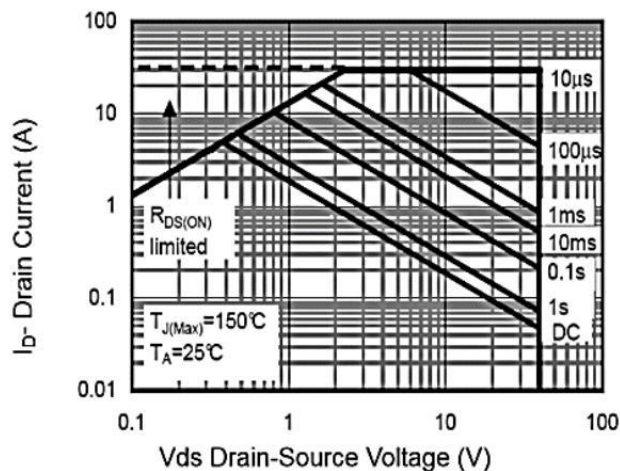


Figure 8 Safe Operation Area

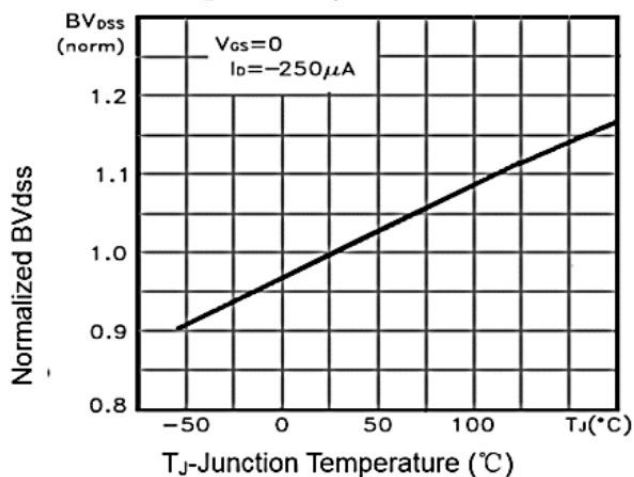


Figure 9 BV_{DSS} vs Junction Temperature

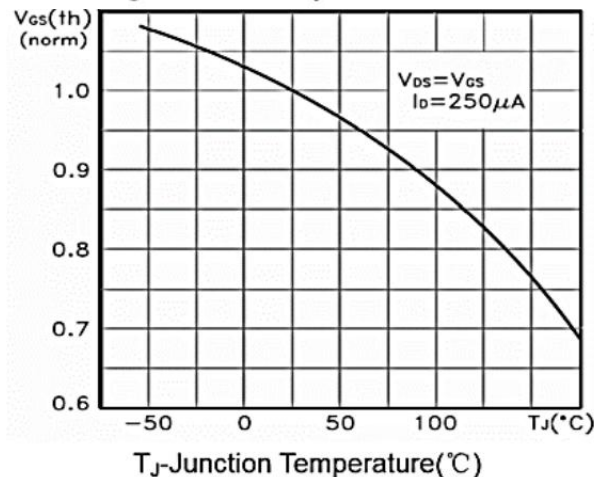


Figure 10 V_{GS(th)} vs Junction Temperature

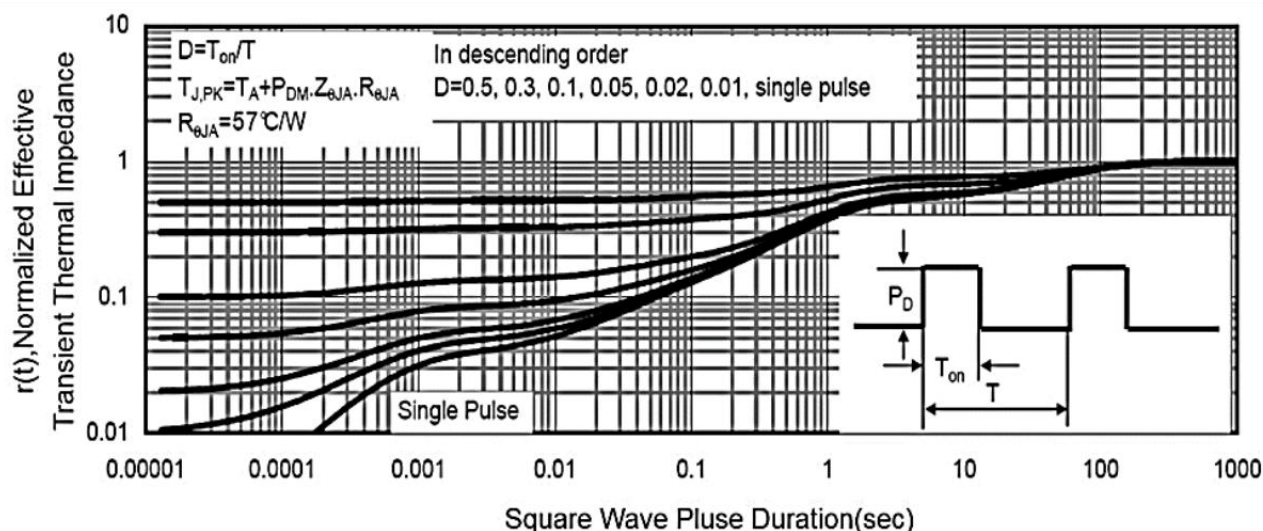
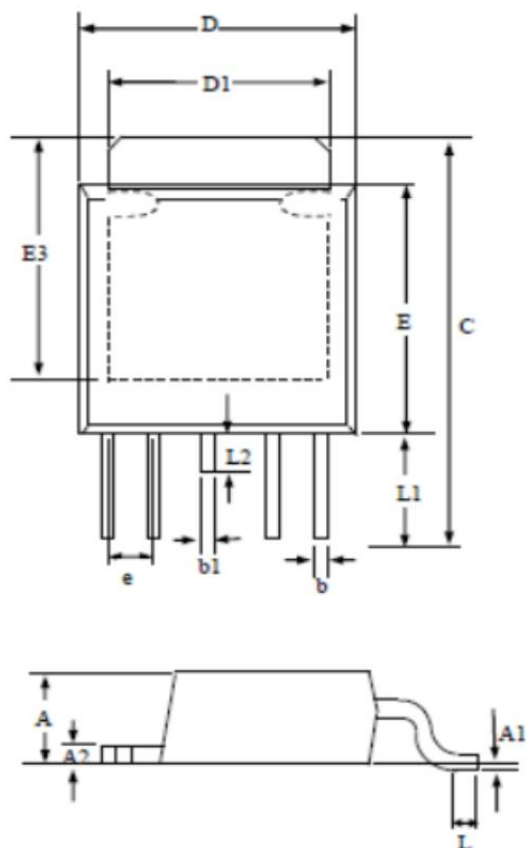


Figure 11 Normalized Maximum Transient Thermal Impedance

Package Mechanical Data:TO-252-4L



SYMBOLS	Millimeters		
	MIN	NOM	MAX
D	6.30	6.55	6.80
D1	4.80	5.35	5.90
C	9.30	9.75	10.20
E	5.30	5.80	6.30
E3	4.50	5.15	5.80
L	0.90	1.35	1.80
L1	2.00	2.53	3.05
L2	0.50	0.85	1.20
b	0.30	0.50	0.70
b1	0.40	0.60	0.80
A	2.10	2.30	2.50
A2	0.40	0.53	0.65
A1	0.00	0.10	0.20
e	1.20	1.30	1.40

1.All Dimensions Are in Millimeters.

2.Dimension Does Not Include Mold Protrusions.

Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
TAPING	TO-252-4L		2500