

P-Channel Enhancement Mode MOSFET

GENERAL DESCRIPTION

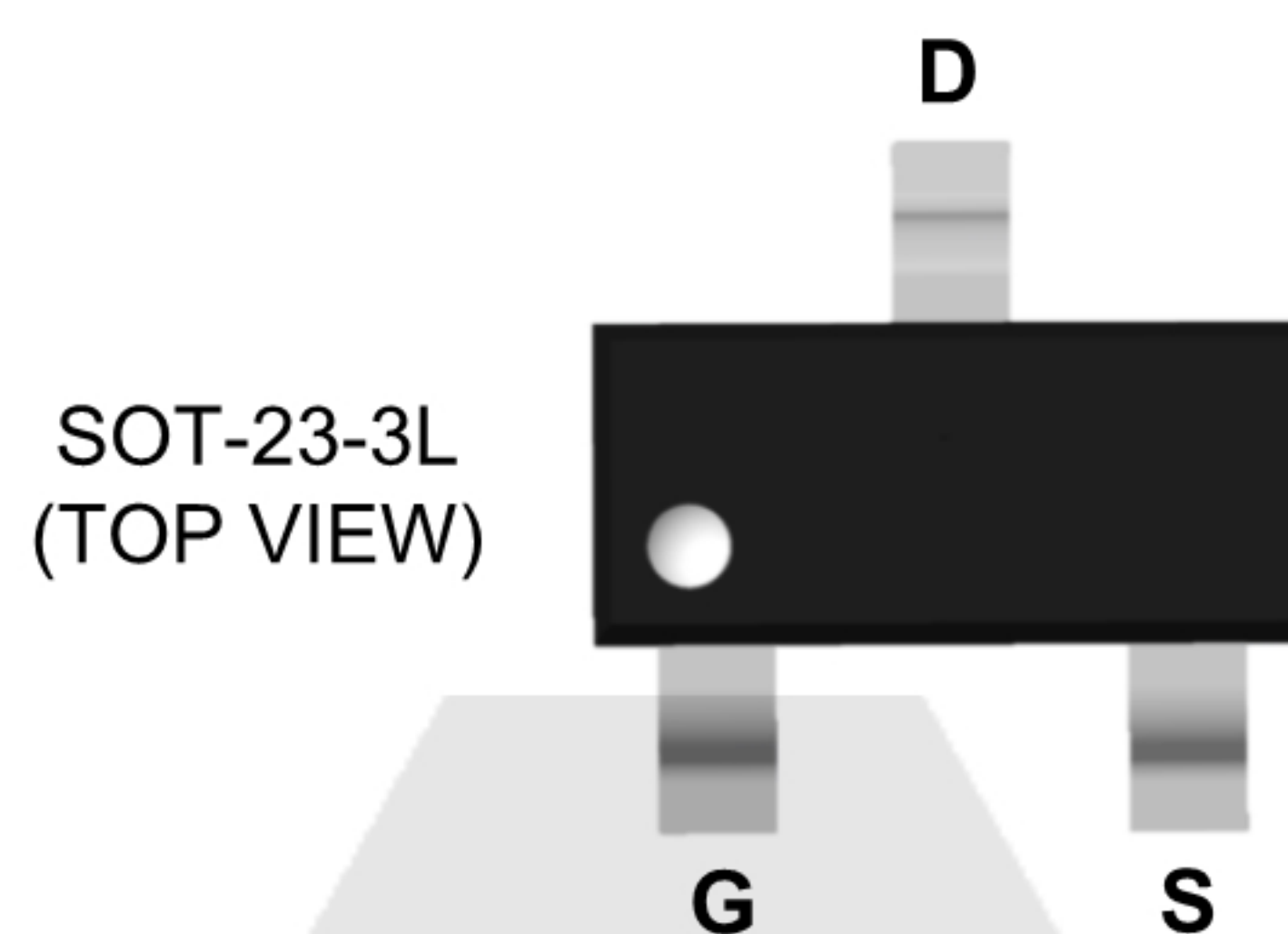
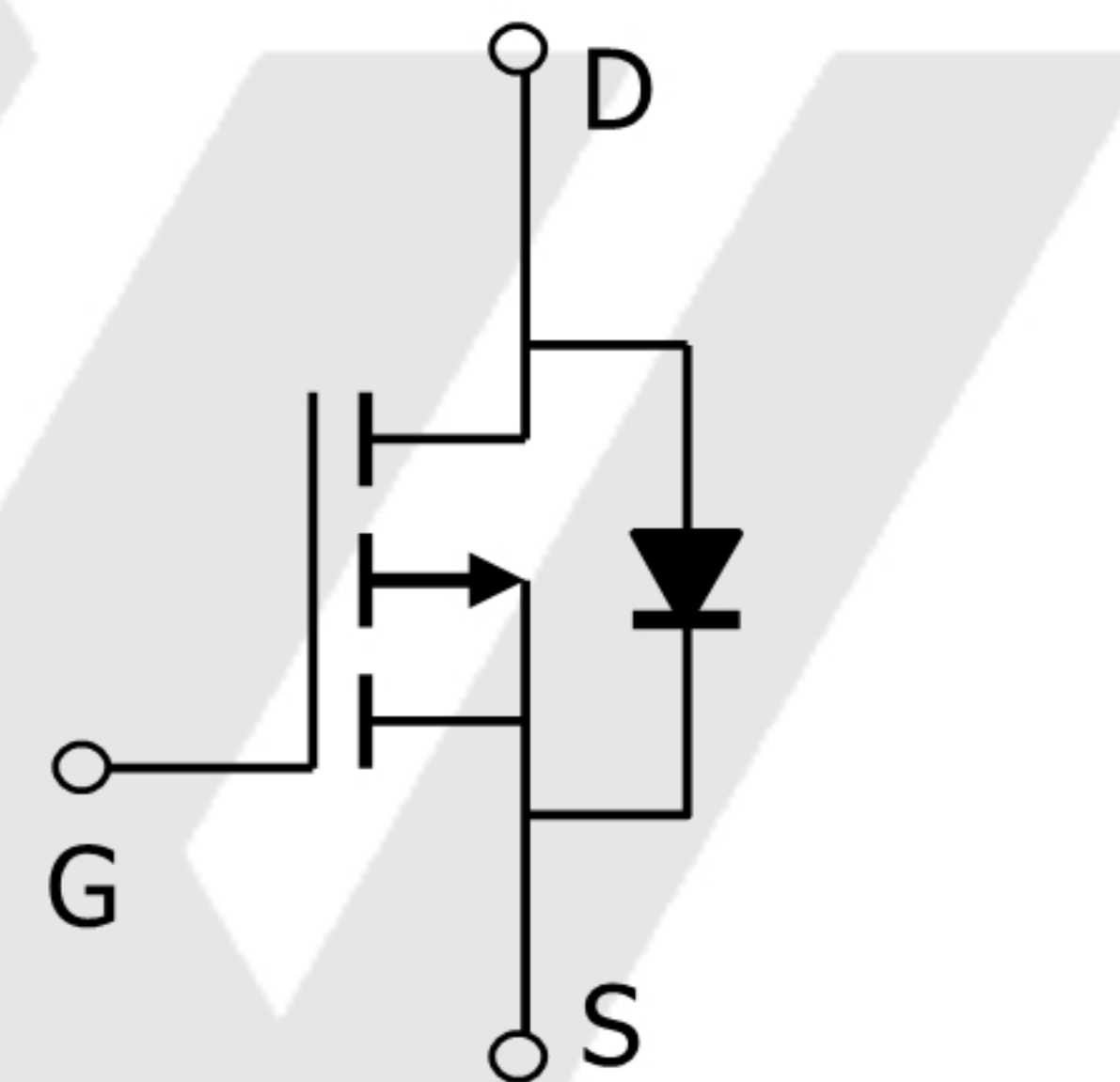
The PW2309 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

FEATURES

$V_{DS} = -60V$, $I_D = -3A$
 $R_{DS(ON)} < 180m\Omega$ @ $V_{GS} = -10V$
 Available in a 3-Pin SOT23-3 Package

Application

Battery protection
 Load switch
 Uninterruptible power supply



Absolute Maximum Ratings (TA=25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current, $V_{GS} @ -10V$ (NOTE1)	$I_{D@TA=25^\circ C}$	-3.3	A
	$I_{D@TA=70^\circ C}$	-1.4	A
Pulsed Drain Current (NOTE2)	I_{DM}	-7	A
Total Power Dissipation (NOTE3)	$P_D @ TA=25^\circ C$	1	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ C$
Thermal Resistance Junction-Ambient (NOTE1)	$R_{\theta JA}$	125	$^\circ C/W$
Thermal Resistance Junction-Case (NOTE1)	$R_{\theta JC}$	80	$^\circ C/W$

Note 1.The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.

Note 2.The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$

Note 3.The power dissipation is limited by 150 $^\circ C$ junction temperature

ELECTRICAL CHARACTERISTICS

(TA = 25°C, unless otherwise noted.)

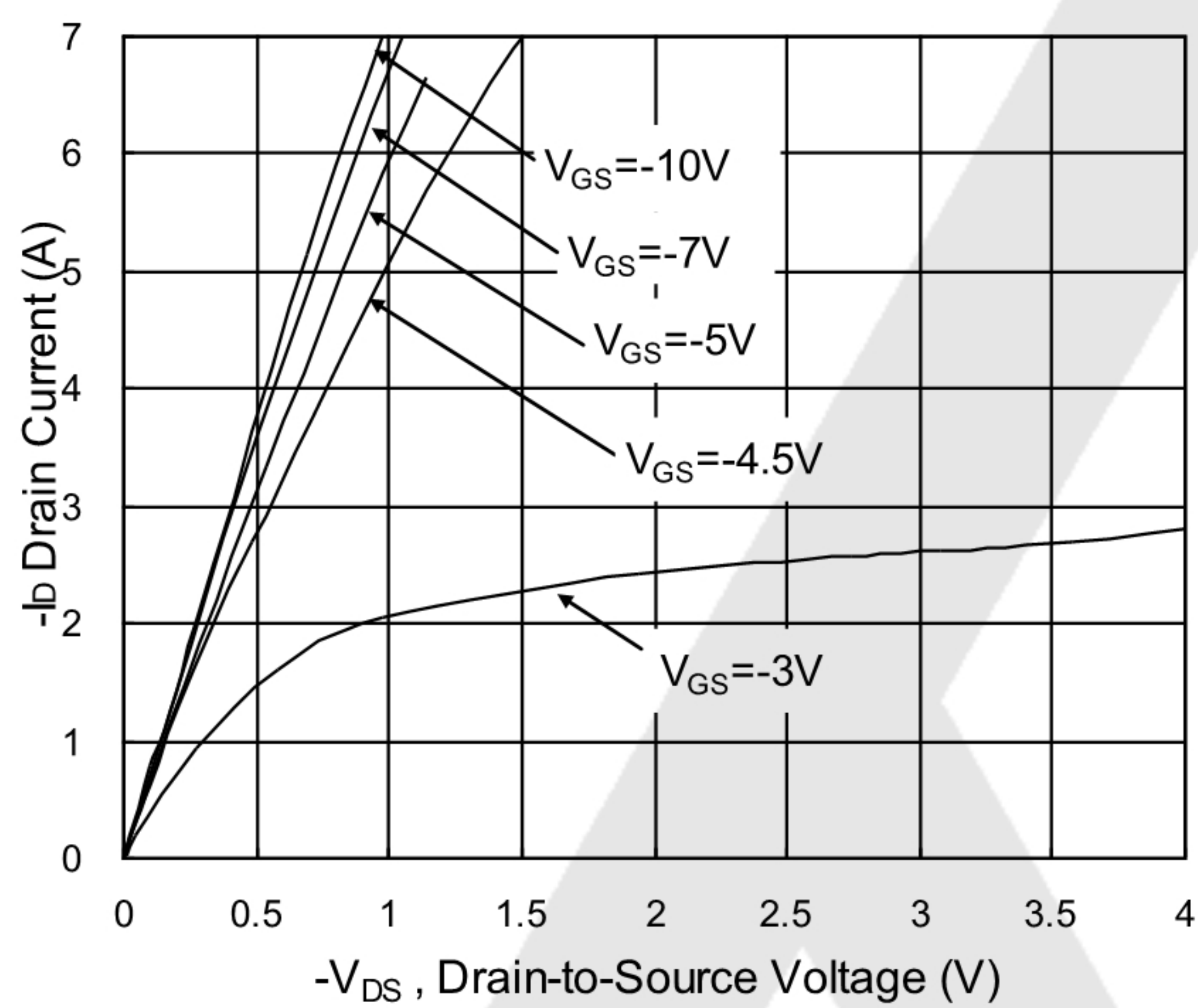
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V , I _D =-250uA	-60			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	BV _{DSS} Temperature Coefficient	Reference to 25°C , I _D =-1mA		-0.021		V/°C
R _{DS(ON)}	Static Drain-Source On-Resistance (NOTE2)	V _{GS} =-10V , I _D =-1.5A		130	185	mΩ
		V _{GS} =-4.5V , I _D =-1A		158	200	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250uA	-1.0		-2.5	V
$\Delta V_{GS(th)}$	V _{GS(th)} Temperature Coefficient			4.08		mV/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =-48V , V _{GS} =0V , T _J =25°C			1	uA
		V _{DS} =-48V , V _{GS} =0V , T _J =55°C			5	uA
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V , V _{DS} =0V			±100	nA
g _{fs}	Forward Transconductance	V _{DS} =-5V , I _D =-1.5A		5.9		S
Q _g	Total Gate Charge (-4.5V)	V _{DS} =-20V , V _{GS} =-4.5V , I _D =-1.5A		4.6		nC
Q _{gs}	Gate-Source Charge			1.4		nC
Q _{gd}	Gate-Drain Charge			1.62		nC
T _{d(on)}	Turn-On Delay Time	V _{DS} =-15V , V _{GS} =-10V , R _G =3.3Ω , I _D =-1A		17.4		ns
T _r	Rise Time			5.4		ns
T _{d(off)}	Turn-Off Delay Time			37.2		ns
T _f	Fall Time			2.4		ns
C _{iss}	Input Capacitance	V _{DS} =-15V , V _{GS} =0V , f=1MHz		531		pF
C _{oss}	Output Capacitance			59		pF
C _{rss}	Reverse Transfer Capacitance			38		pF
I _S	Continuous Source Current(NOTE1, 3)	V _G =V _D =0V , Force Current			-1.7	A
I _{SM}	Pulsed Source Current(NOTE2, 3)				-7	A
V _{SD}	Diode Forward Voltage (NOTE2)	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.

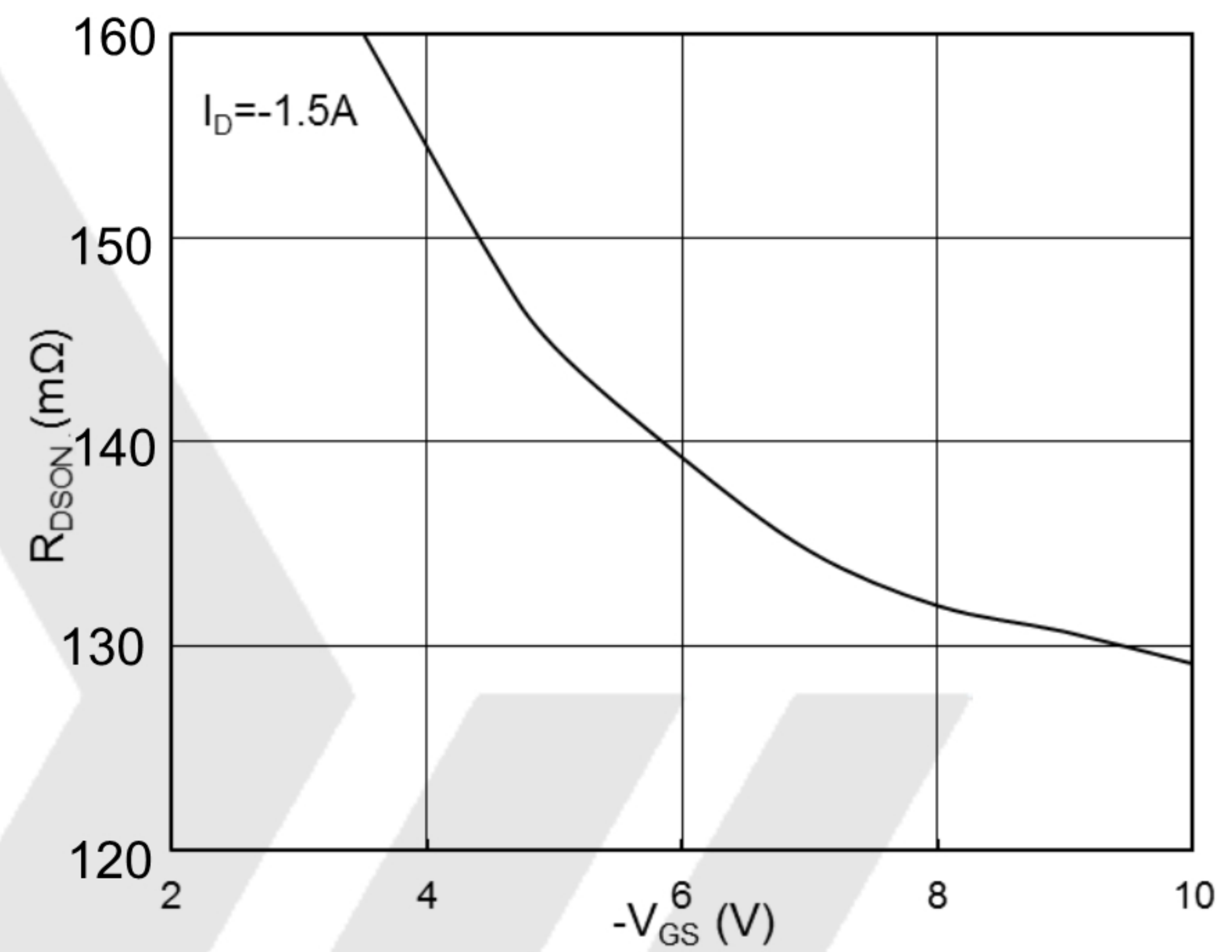
Note 2.The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%

Note 3.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation

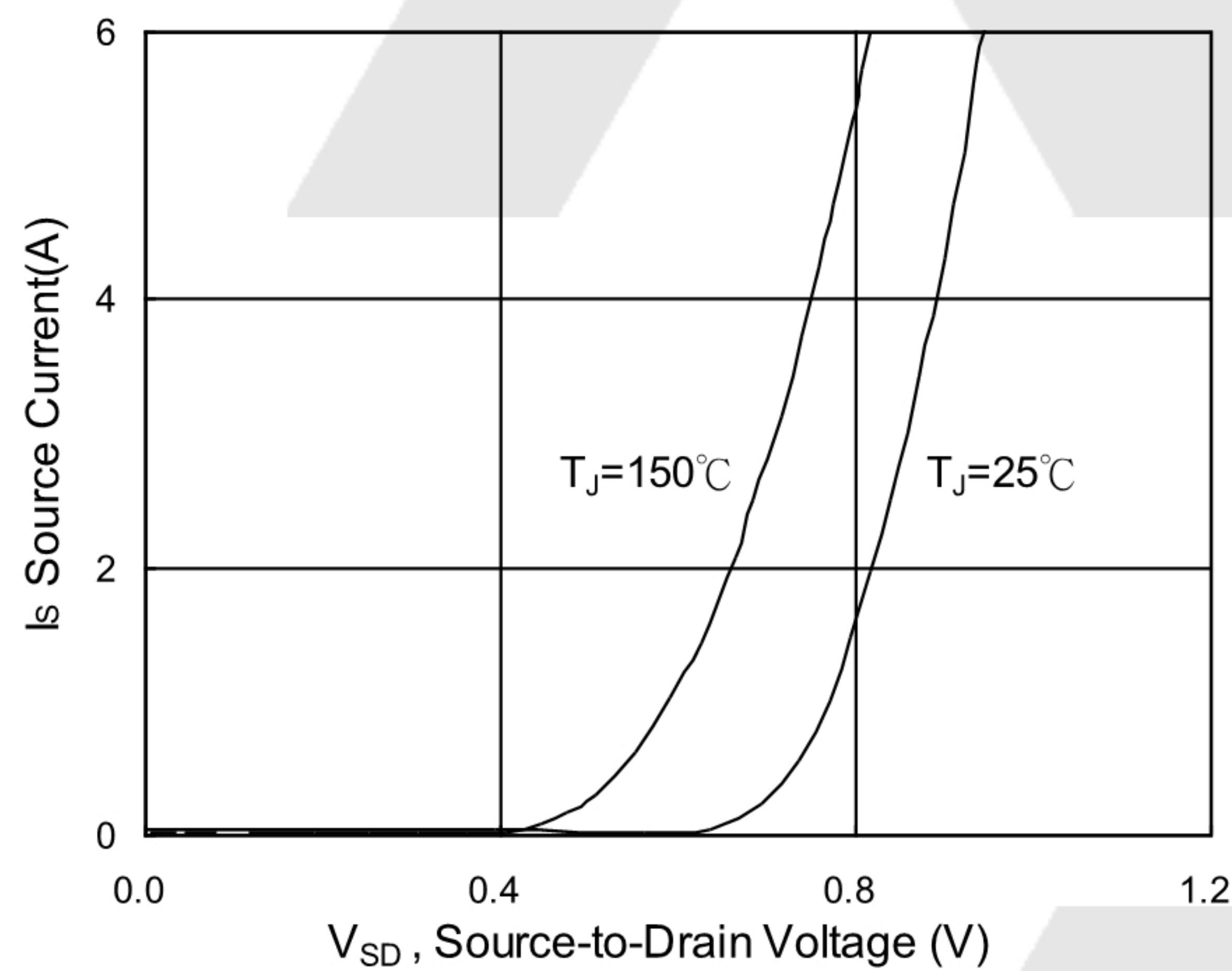
Thermal Characteristics



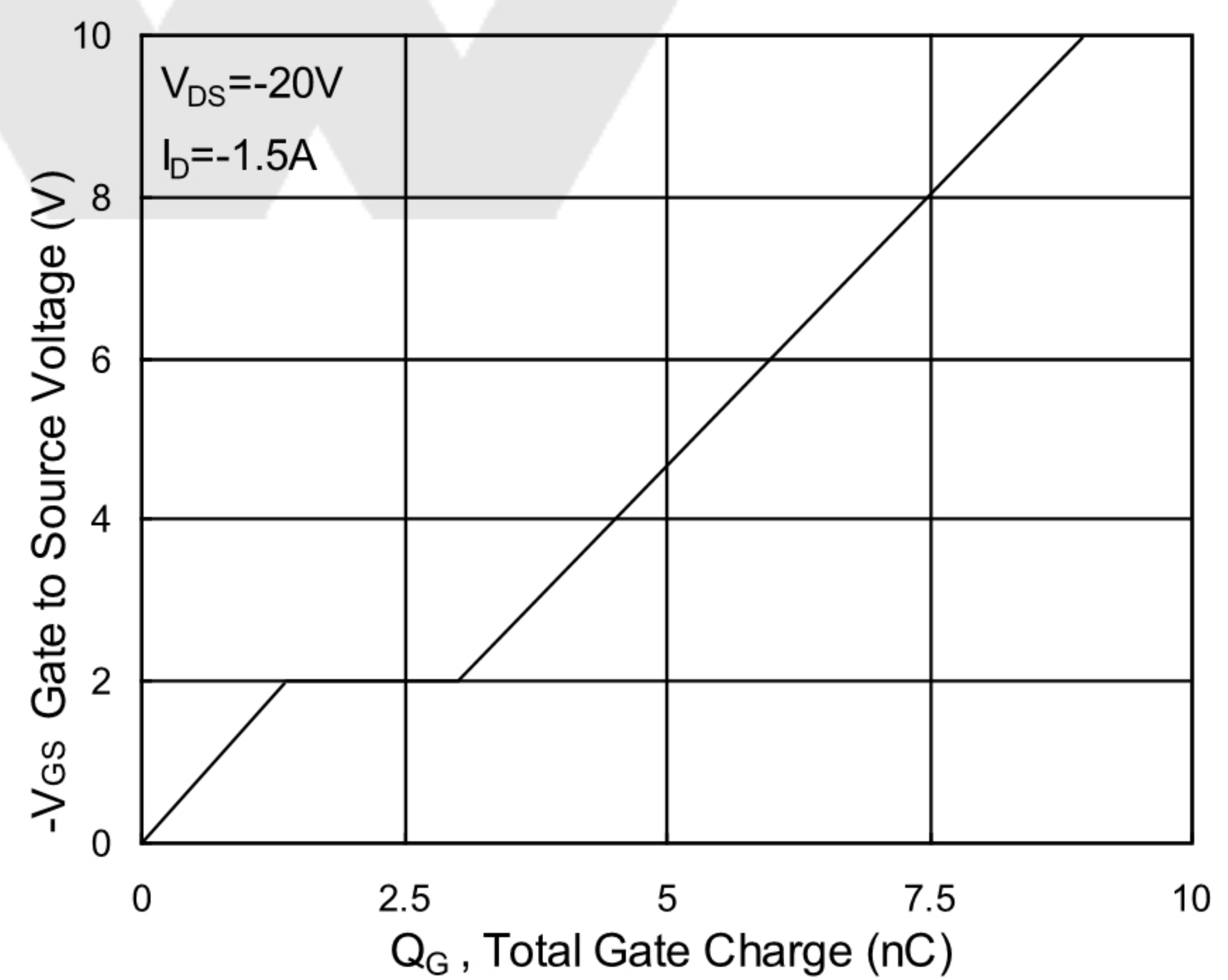
Typical Output Characteristics



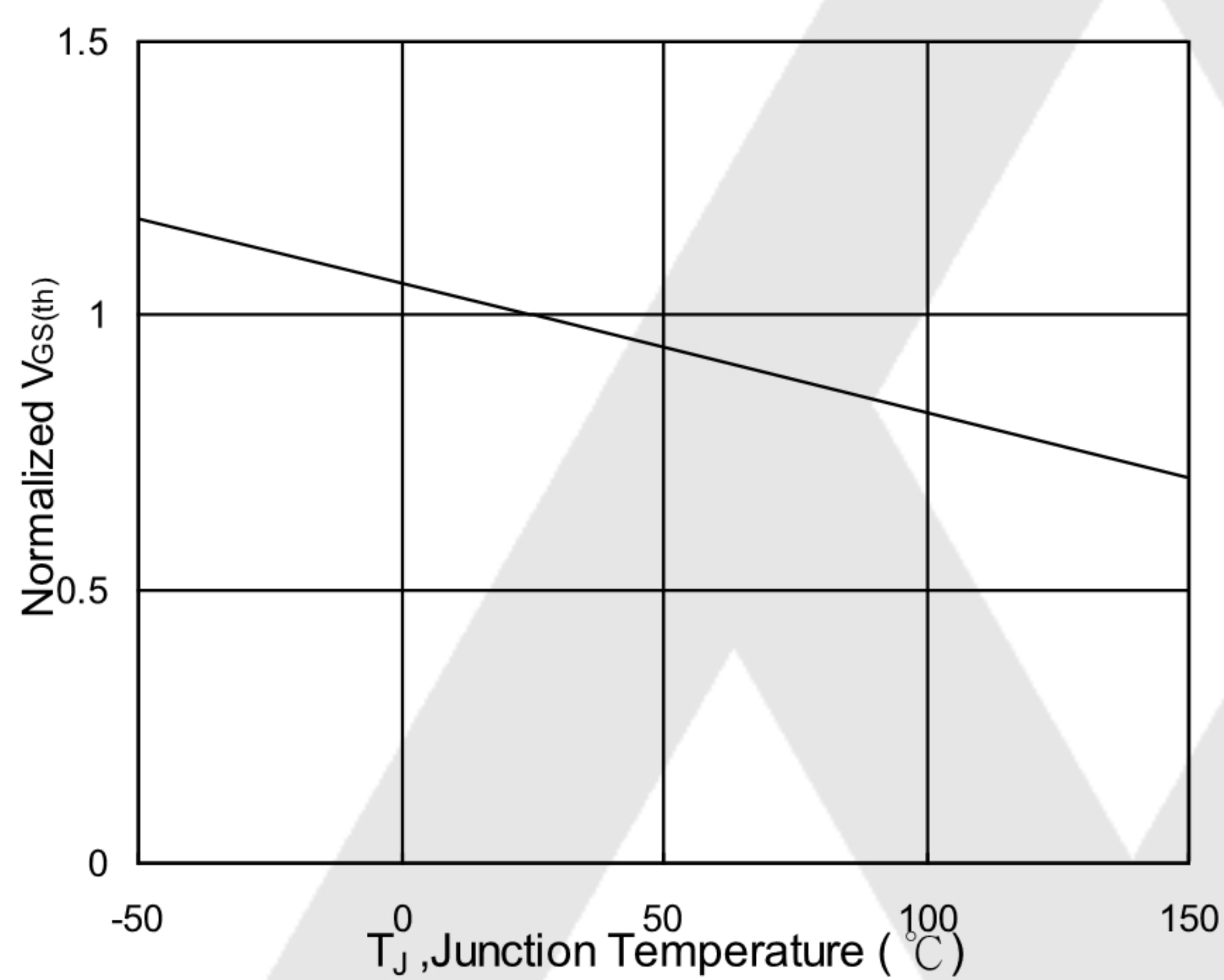
On-Resistance v.s Gate-Source



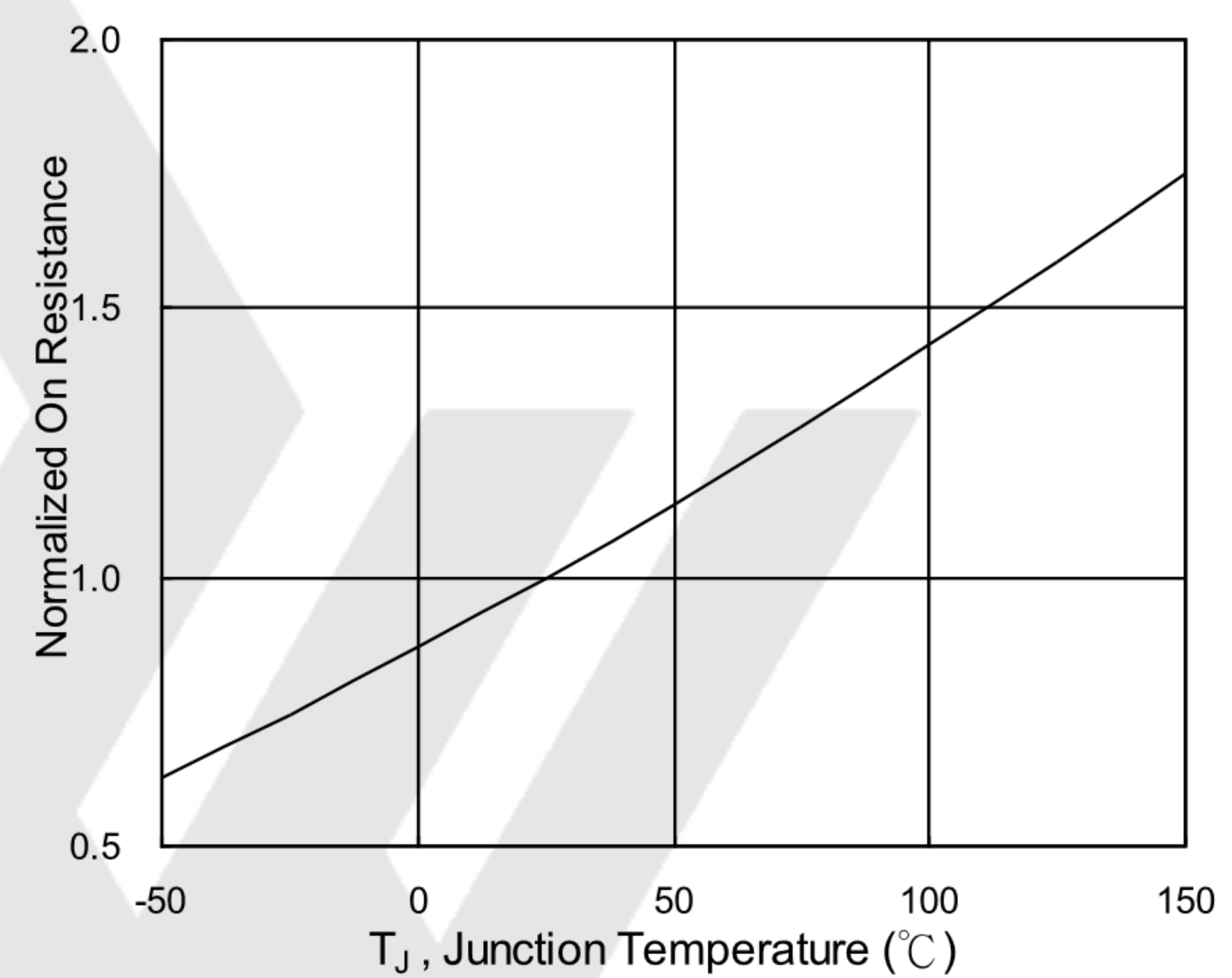
Forward Characteristics Of Reverse



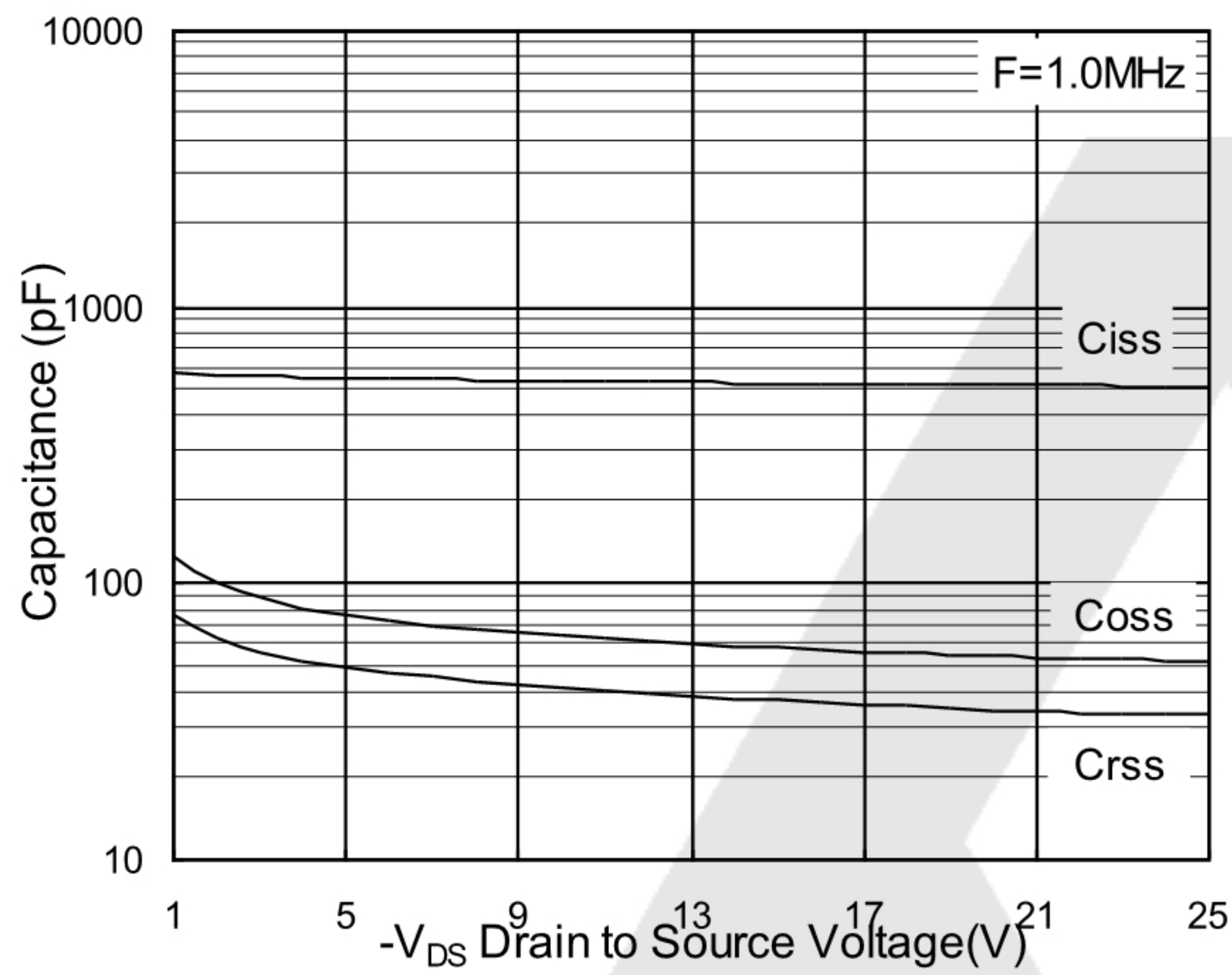
Gate-Charge Characteristics



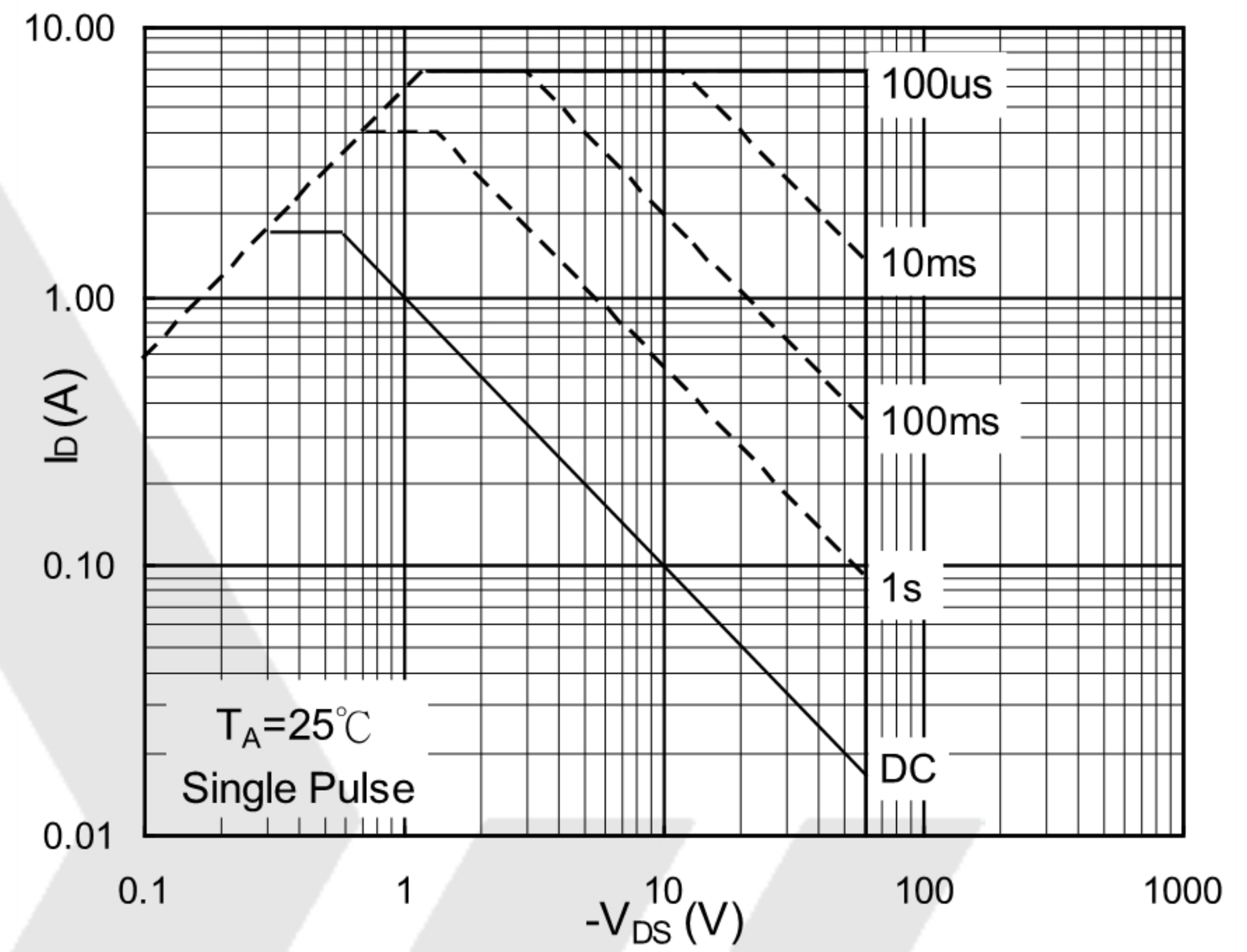
Normalized $V_{GS(th)}$ v.s T_J



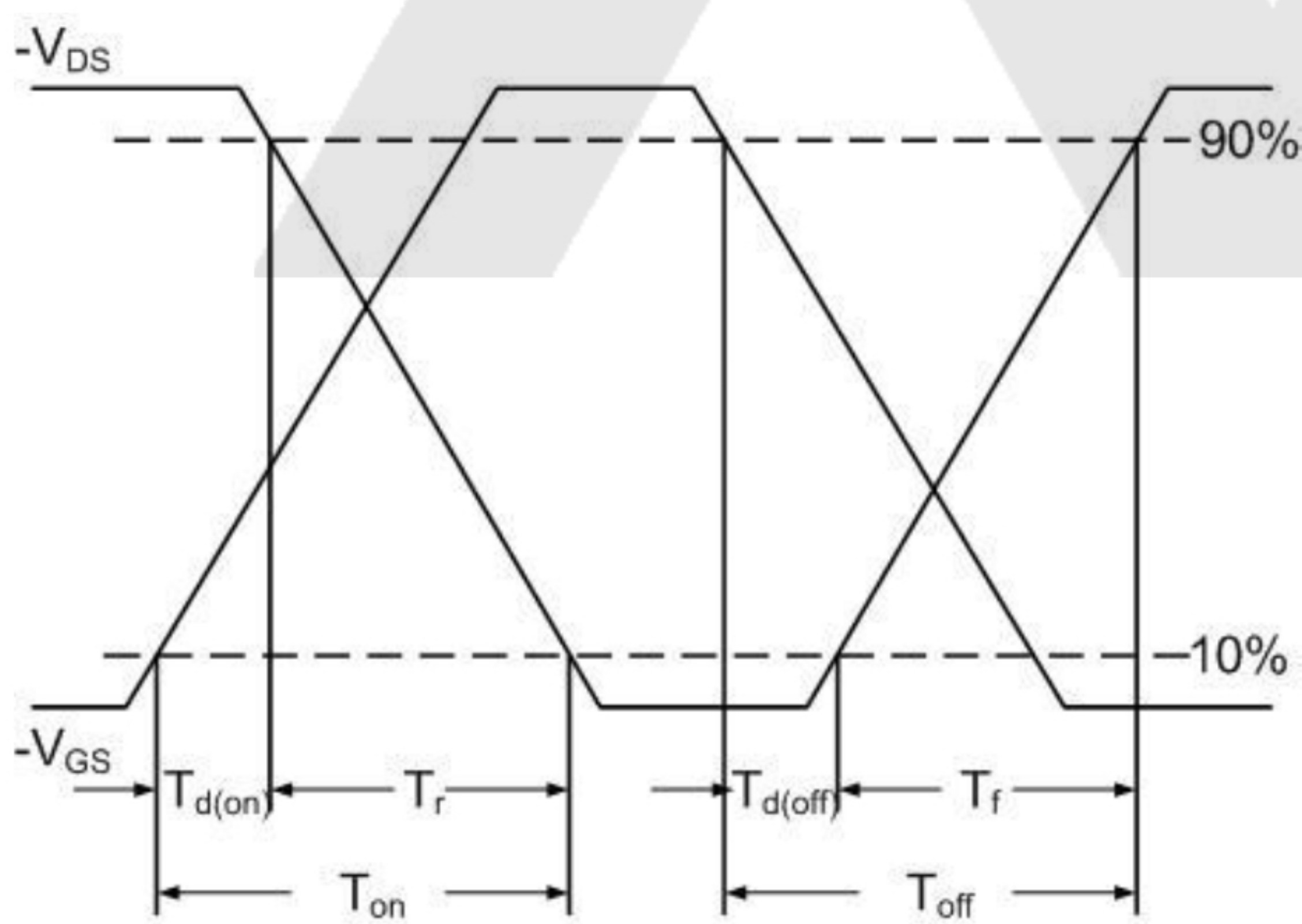
Normalized R_{DSON} v.s T_J



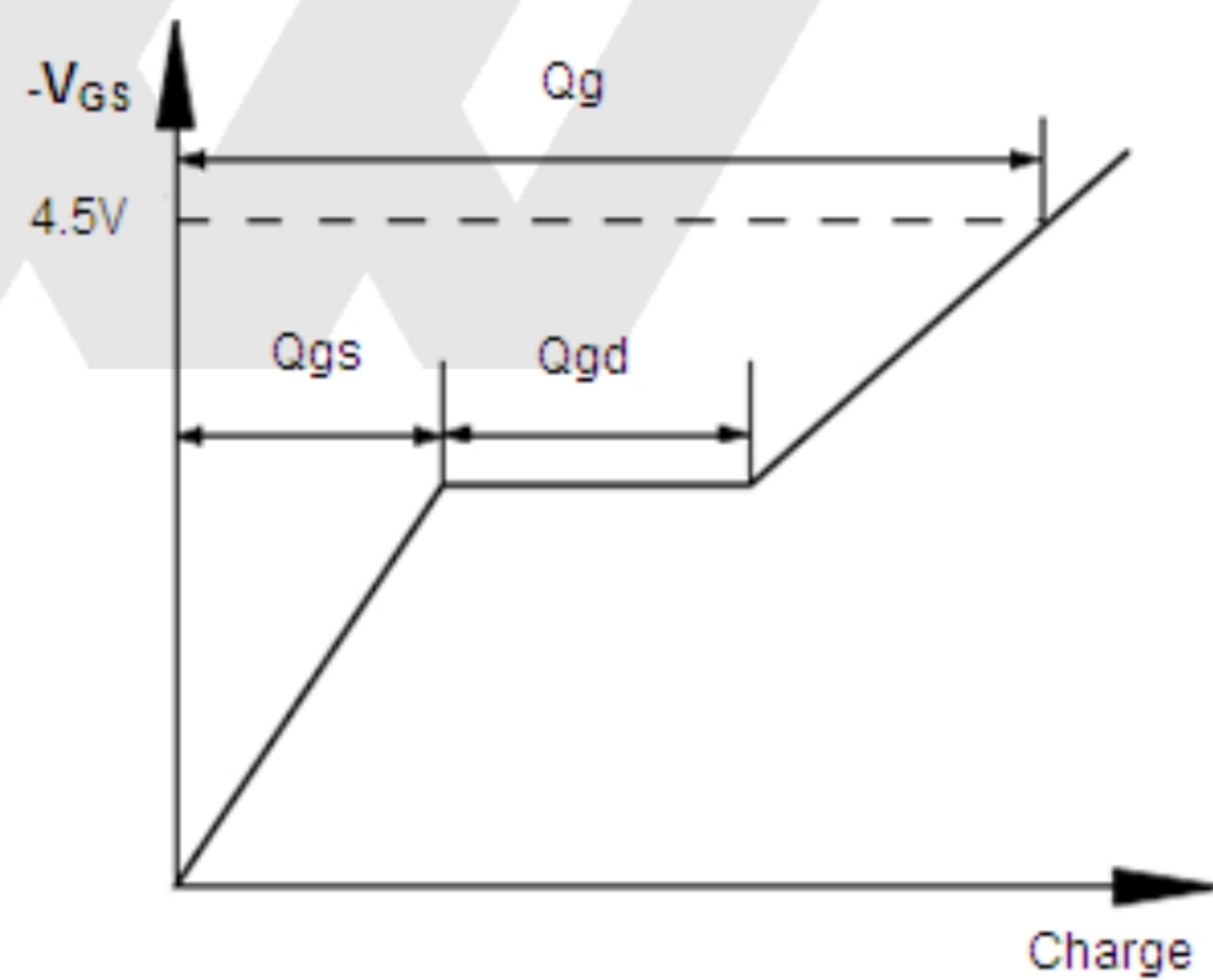
Capacitance



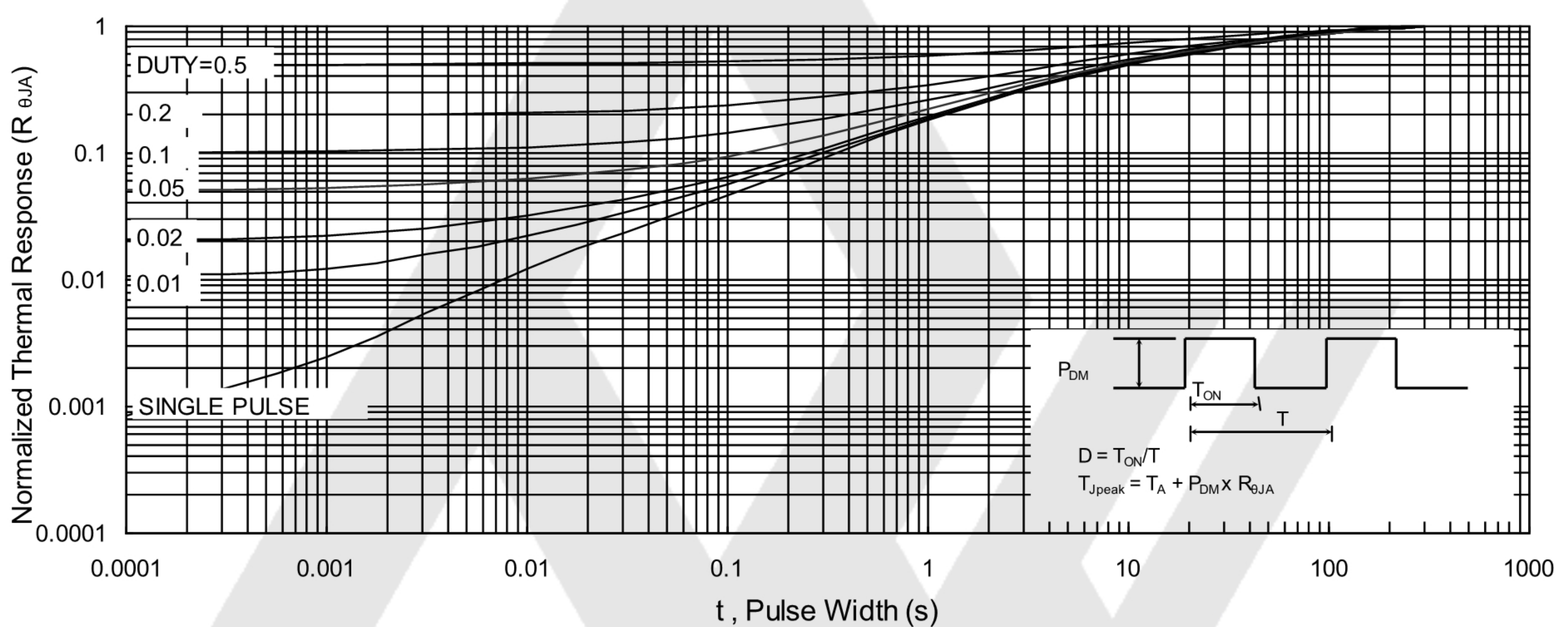
Safe Operating Area



Switching time waveform



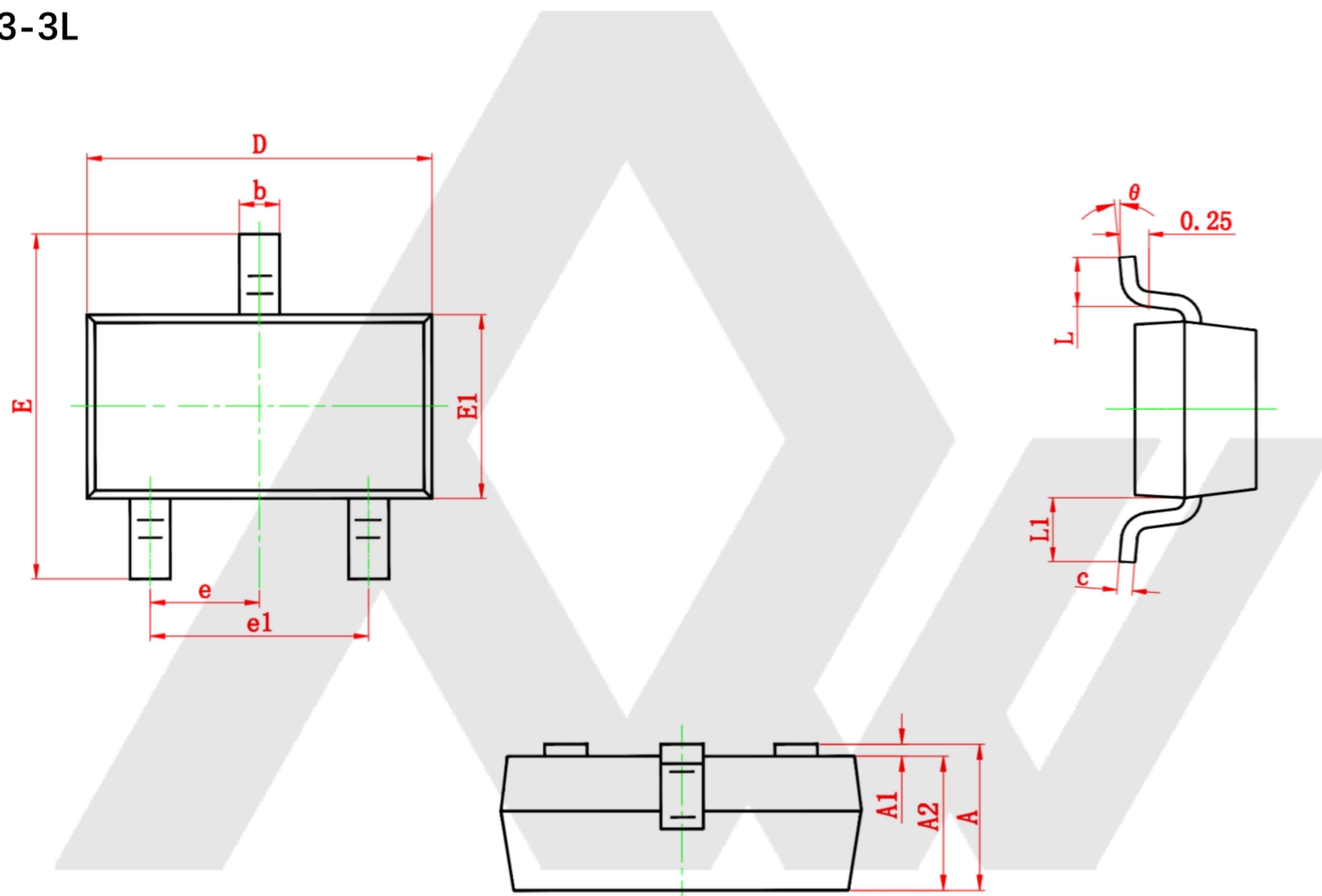
Gate Charge waveform



Normalized Maximum Transient Thermal Impedance

PACKAGE DESCRIPTION

SOT23-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	2.250	2.550	0.089	0.100
E1	1.200	1.400	0.047	0.055
e	0.950 TYP.		0.037 TYP.	
e1	1.800	2.000	0.071	0.079
L	0.300	0.500	0.012	0.020
L1	0.550 REF.		0.022 REF.	
θ	0°	8°	0°	8°

Notes

1. All dimensions are in millimeters.
2. Tolerance $\pm 0.10\text{mm}$ (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

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