

## P-Channel Enhancement Mode MOSFET

### GENERAL DESCRIPTION

The SI2301 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.

### FEATURES

$V_{DS} = -20V$ ,  $I_D = -2.3A$

$R_{DS(ON)} < 165m\Omega$  @  $V_{GS}=4.5V$

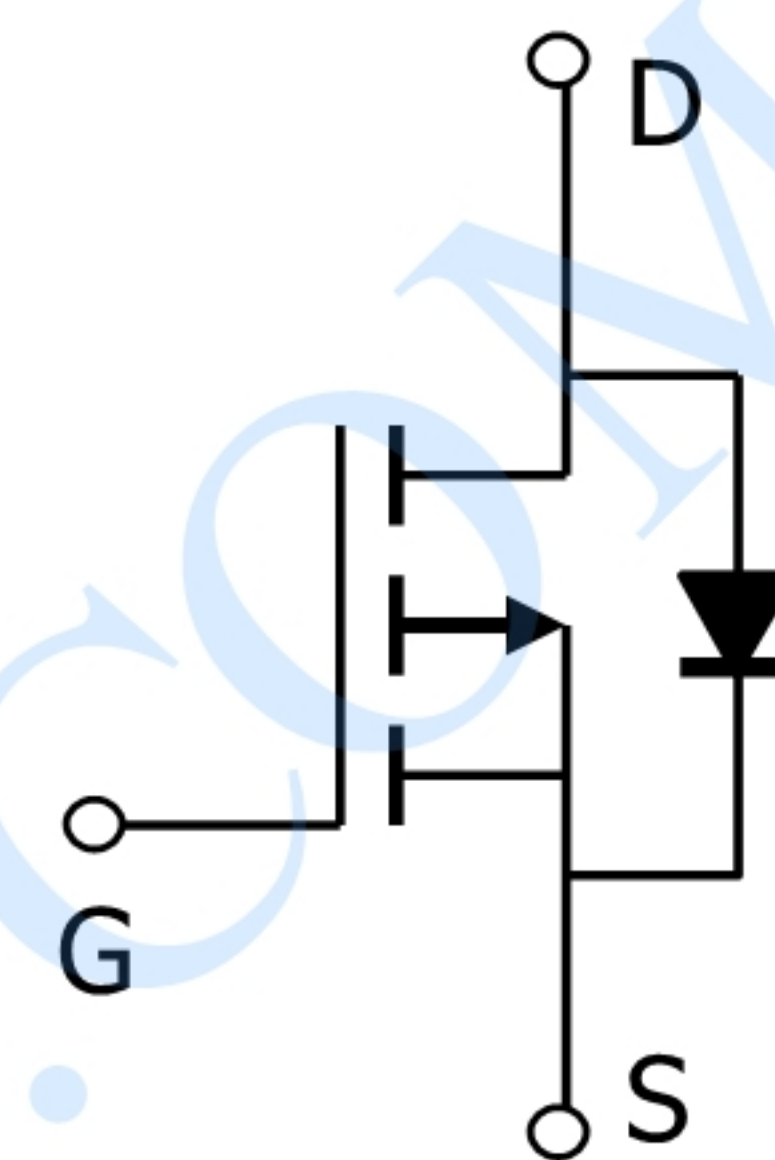
Available in a 3-Pin SOT23-3 Package

### Application

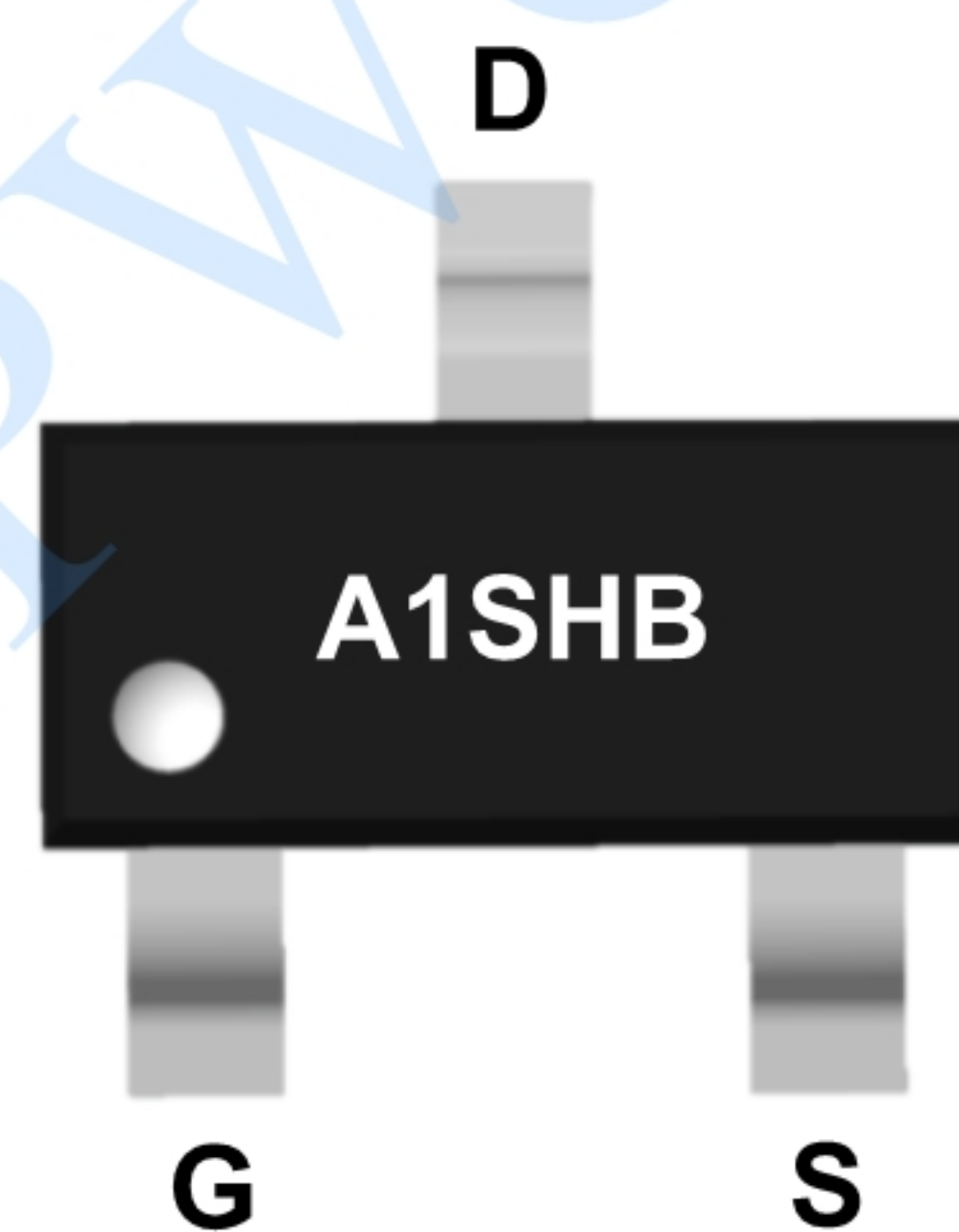
Battery protection

Load switch

Uninterruptible power supply



SOT-23-3L  
(TOP VIEW)



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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Drain Current-Continuous	$I_D$	-2.3	A
Drain Current -Pulsed (Note 1)	$I_{DM}$	-10	A
Maximum Power Dissipation	$P_D$	0.7	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	°C
Thermal Resistance,Junction-to-Ambient (Note 2)	$R_{\theta JA}$	178	°C/W

#### Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.





ELECTRICAL CHARACTERISTICS

(TA = 25°C, unless otherwise noted.)

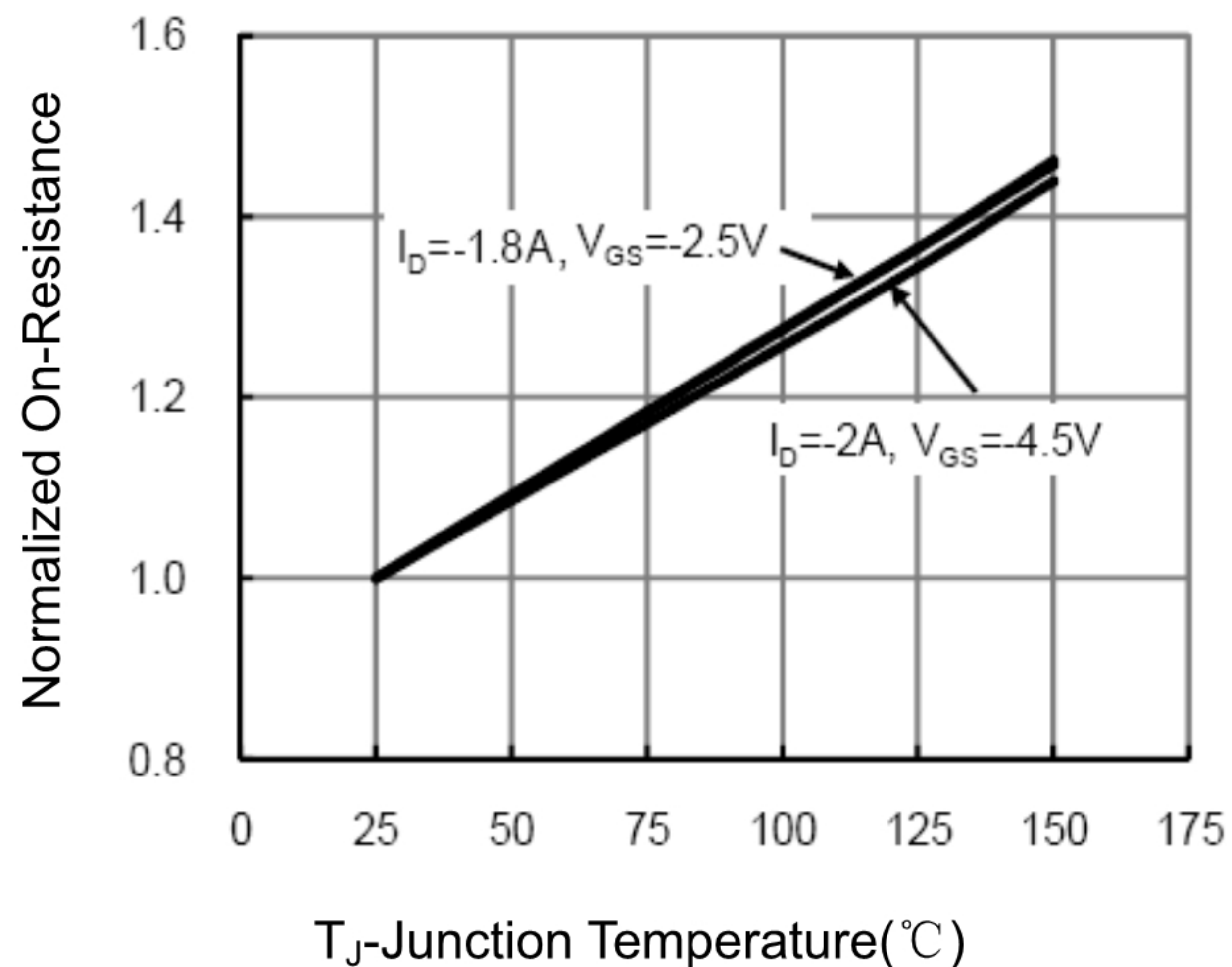
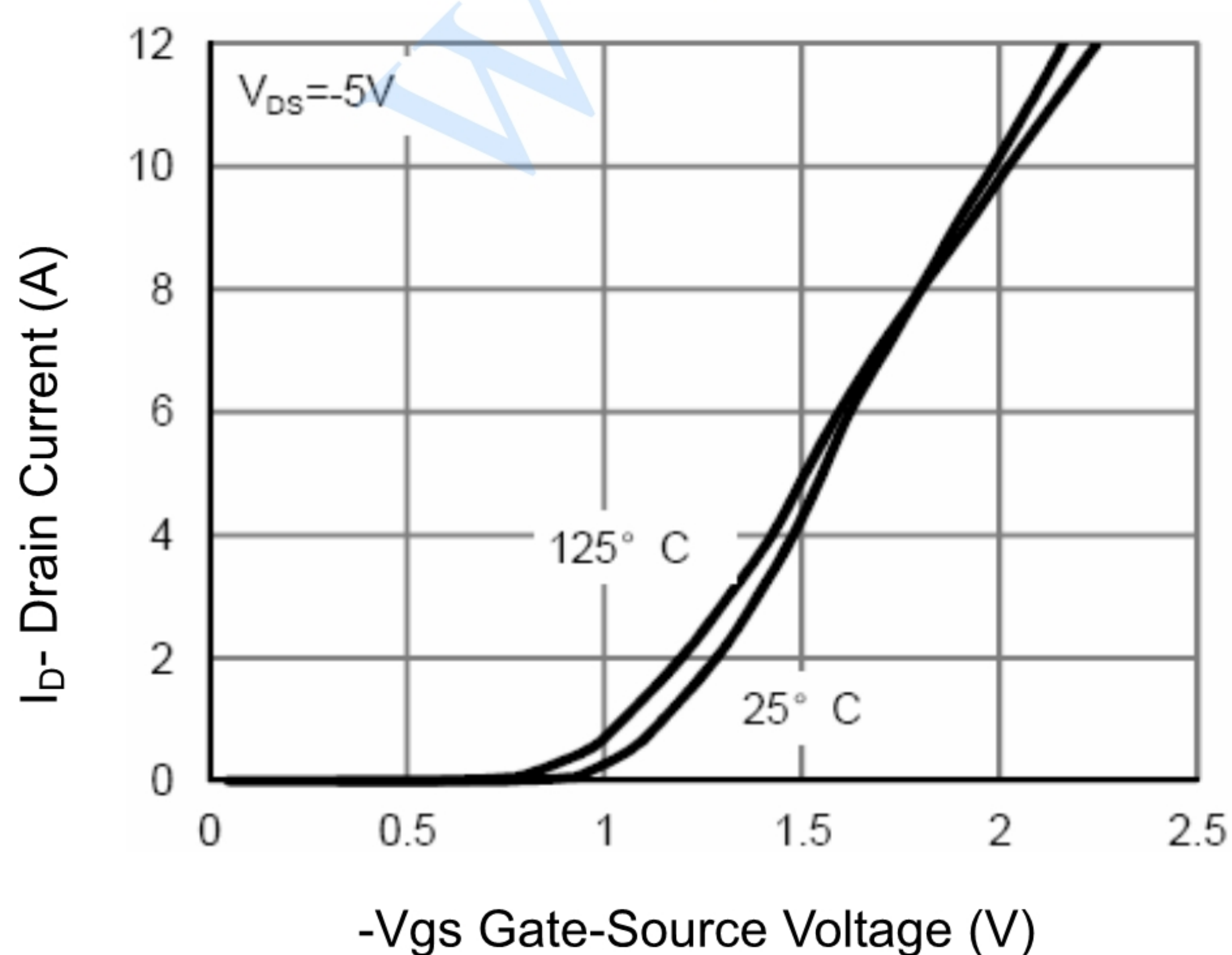
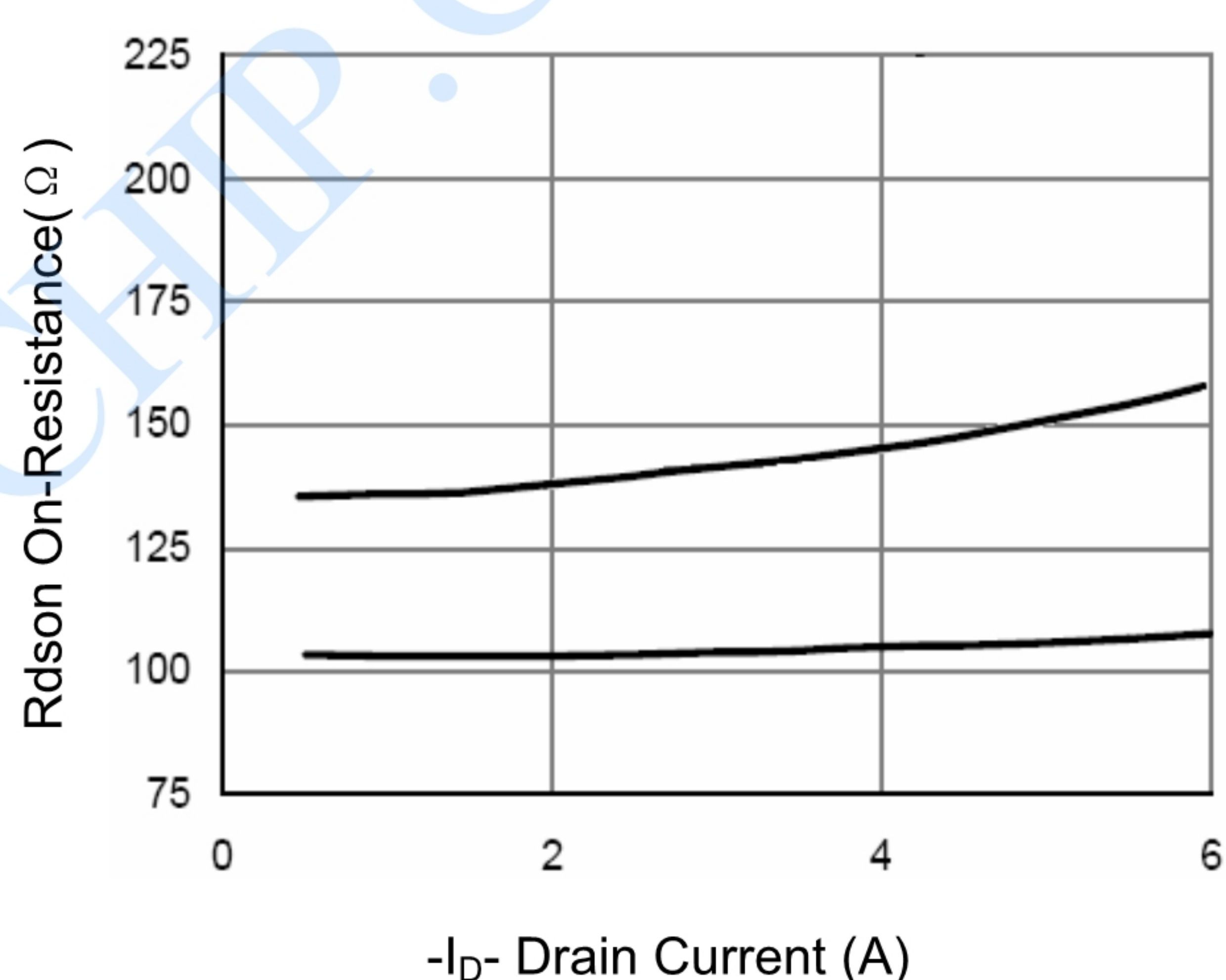
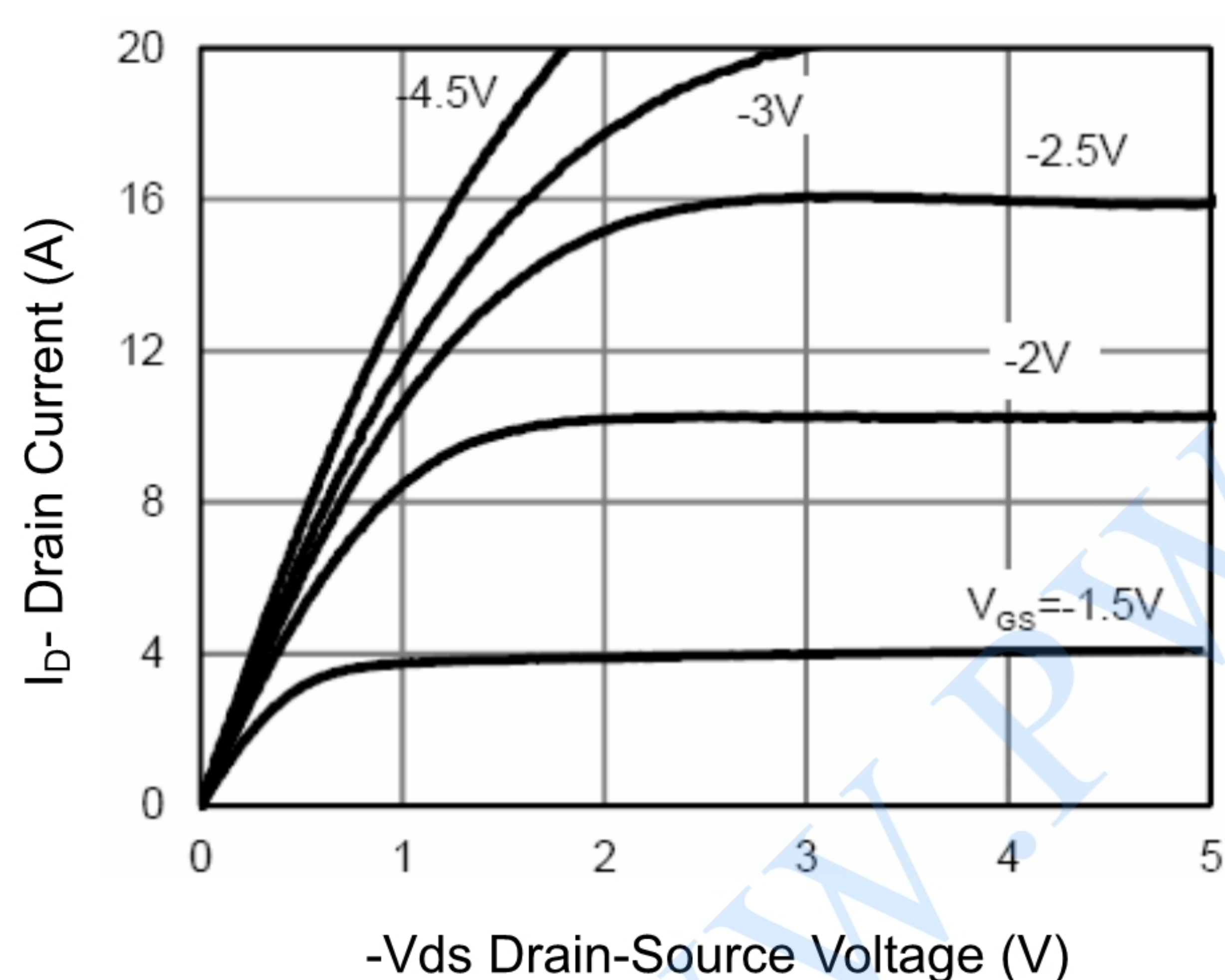
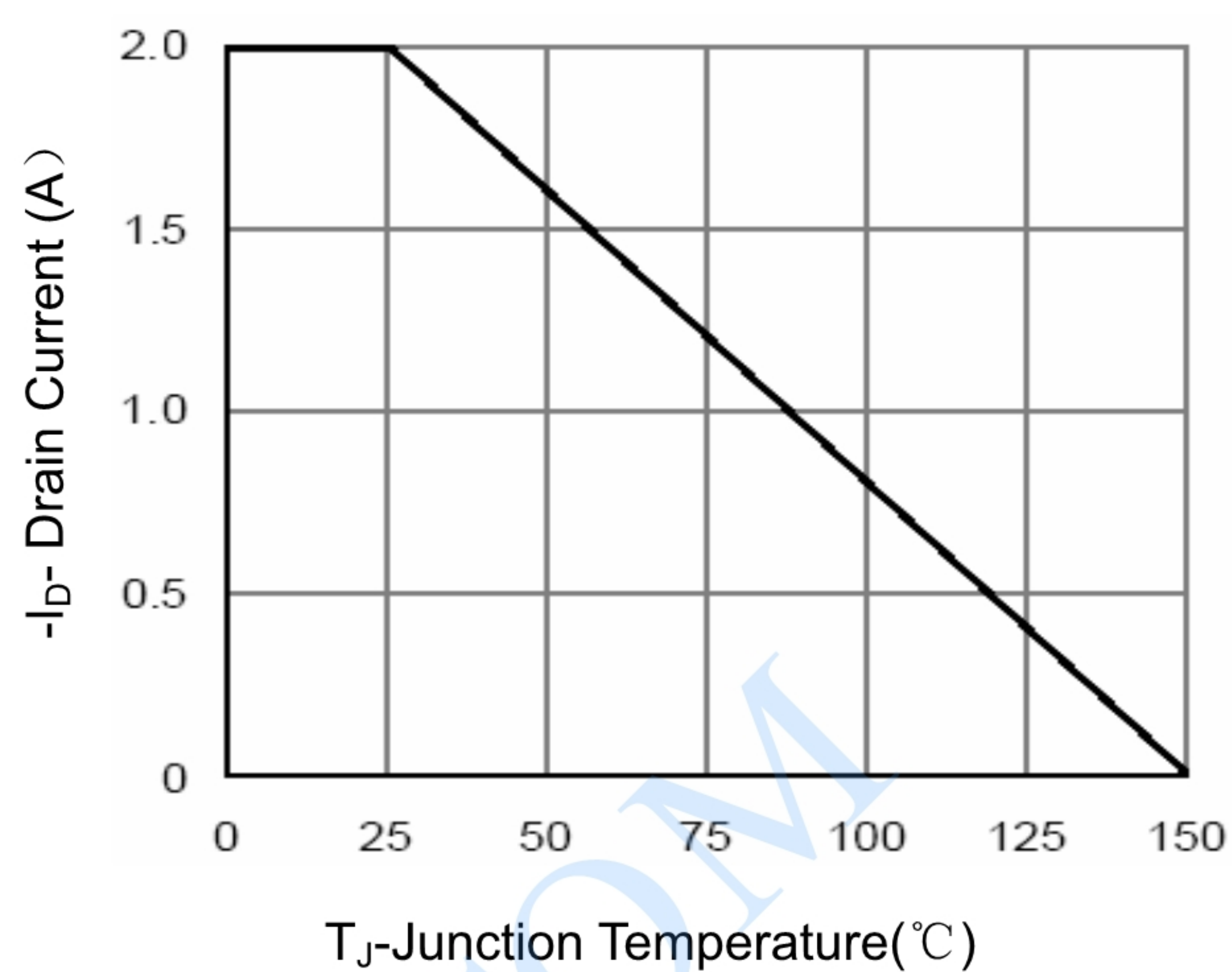
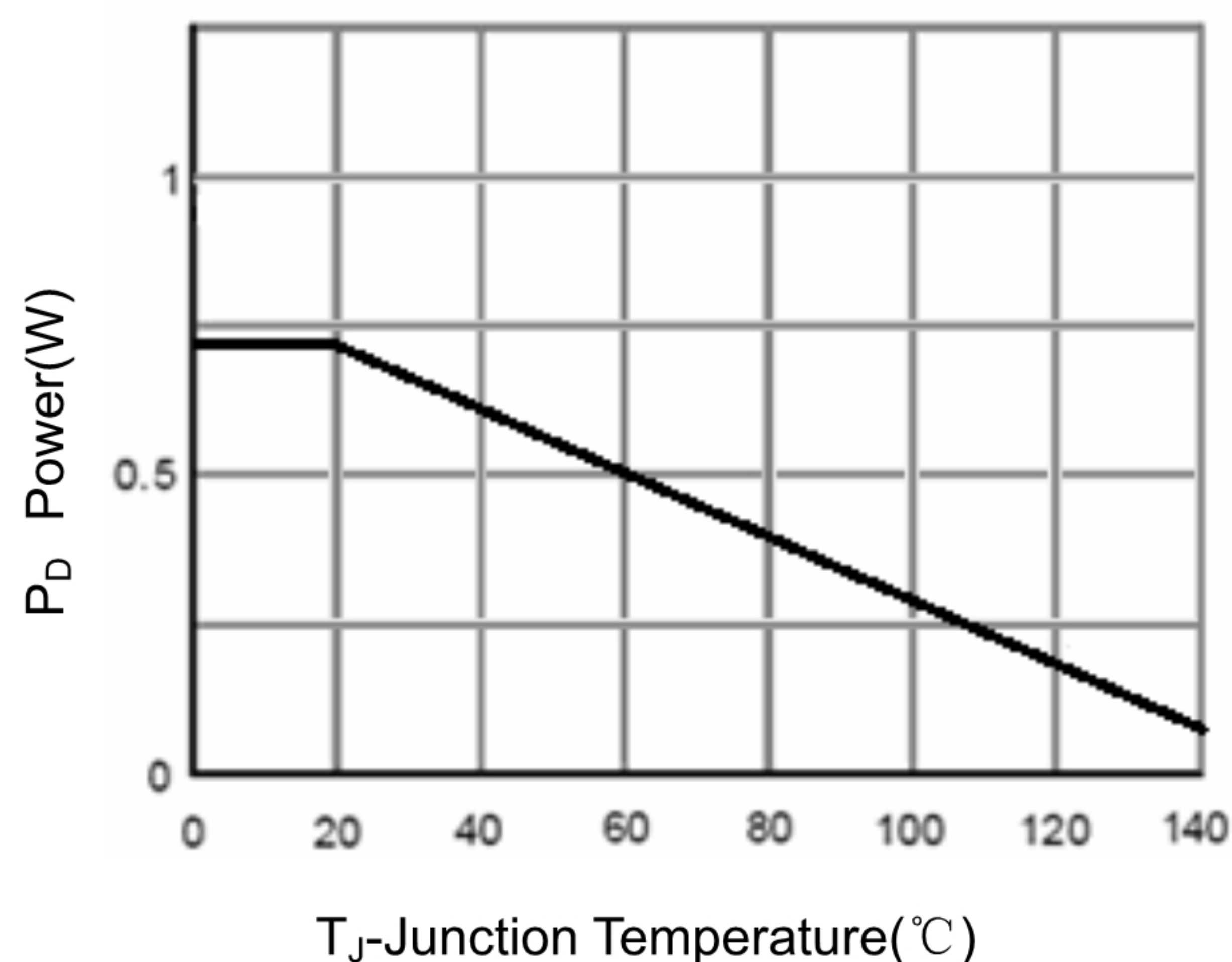
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> = -250μA	-20		-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = -20V,V <sub>GS</sub> =0V	-	-	-1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±12V,V <sub>DS</sub> =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> = -250μA	-0.4	-0.7	-1	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -2A	-	135	165	mΩ
		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -1.8A		150	185	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = -5V,I <sub>D</sub> = -2A	4	-	-	S
Dynamic Characteristics (Note2)						
Input Capacitance	C <sub>Iss</sub>	V <sub>DS</sub> = -10V,V <sub>GS</sub> =0V, F=1.0MHz	-	290	-	PF
Output Capacitance	C <sub>Oss</sub>		-	60	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	34	-	PF
Switching Characteristics (Note 2)						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = -10V, R <sub>L</sub> =5Ω V <sub>GS</sub> = -4.5V,R <sub>GEN</sub> =3Ω	-	10	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	5.0	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	21	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	7	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = -10V,I <sub>D</sub> = -2A, V <sub>GS</sub> = -4.5V	-	3.3	12	nC
Gate-Source Charge	Q <sub>gs</sub>		-	0.7	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	1.3	-	nC
Diode Forward Voltage (Note 1)	V <sub>SD</sub>	V <sub>GS</sub> =0V,I <sub>S</sub> =2A	-	-	-1.2	V

NOTES:

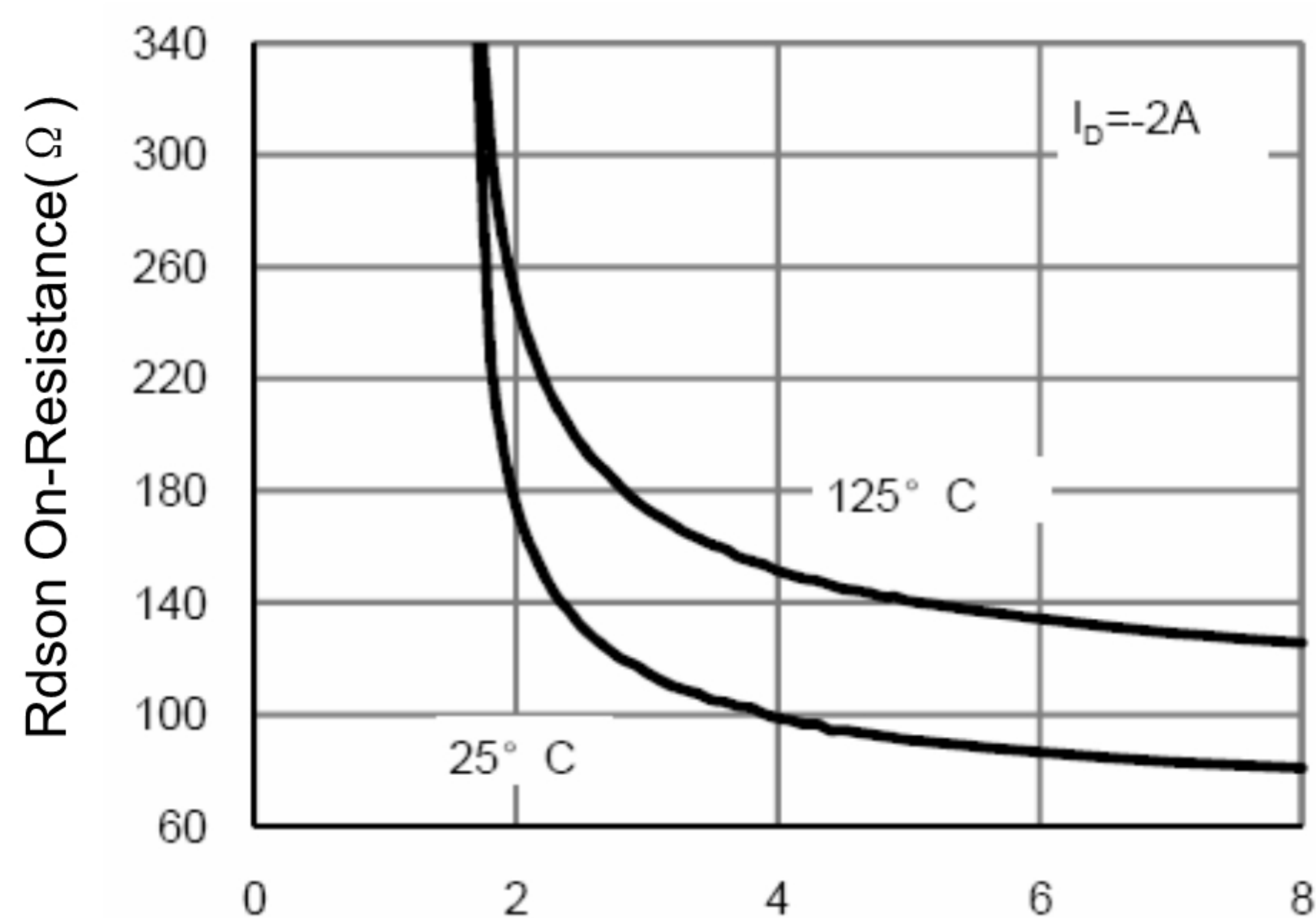
1. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
2. Guaranteed by design, not subject to production



## Typical Electrical and Thermal Characteristics

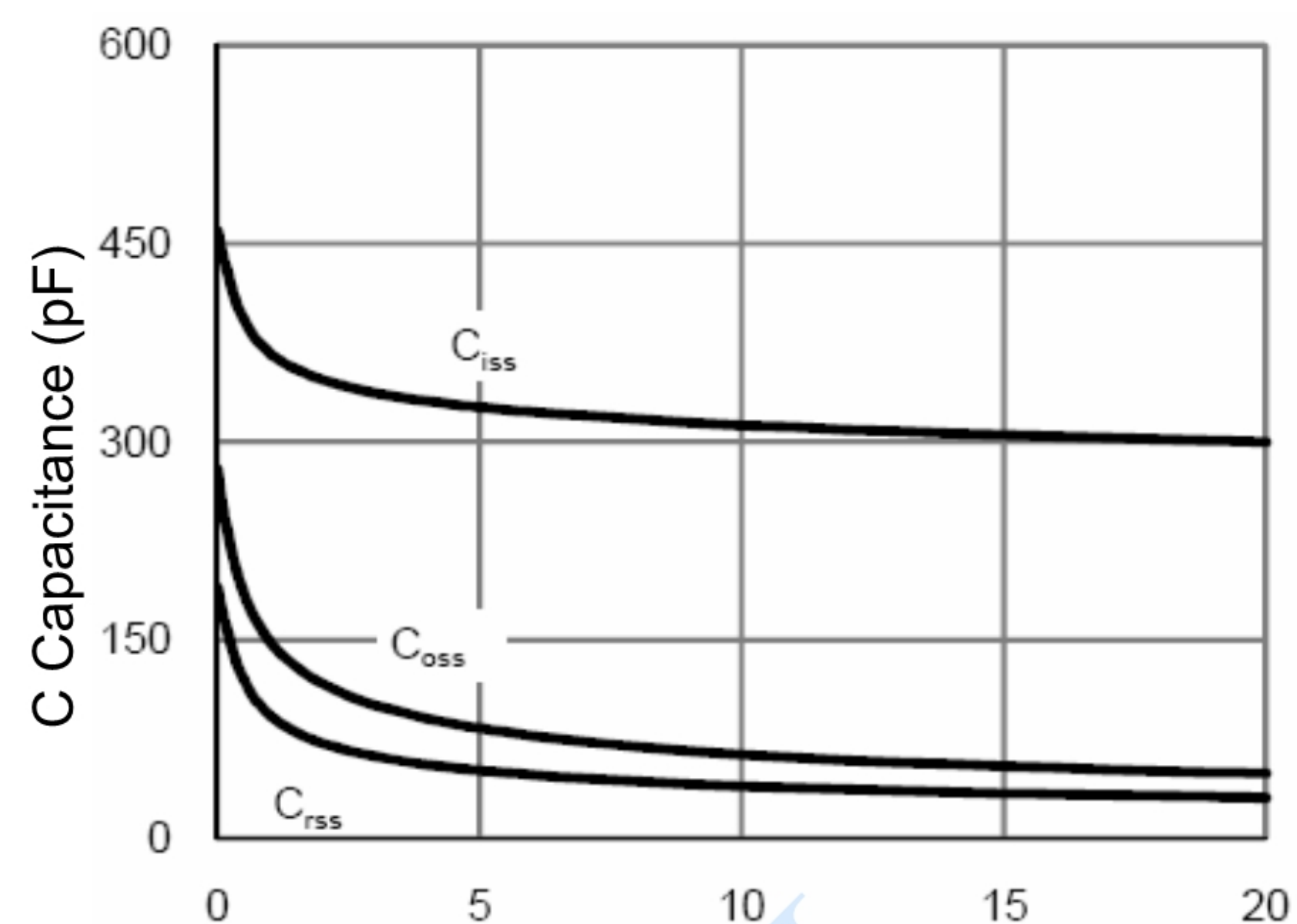






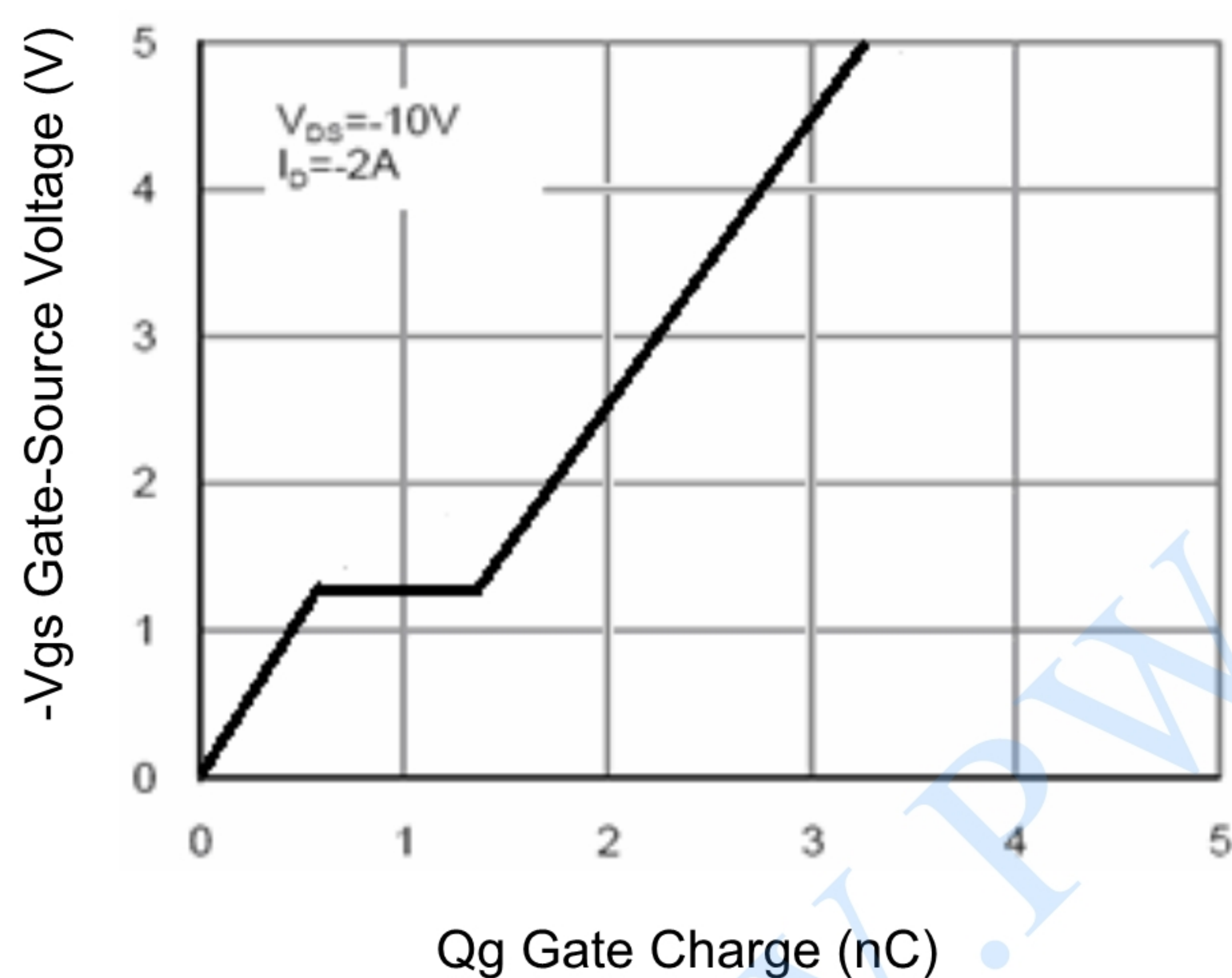
- Vgs Gate-Source Voltage (V)

Figure 7 Rdson vs Vgs



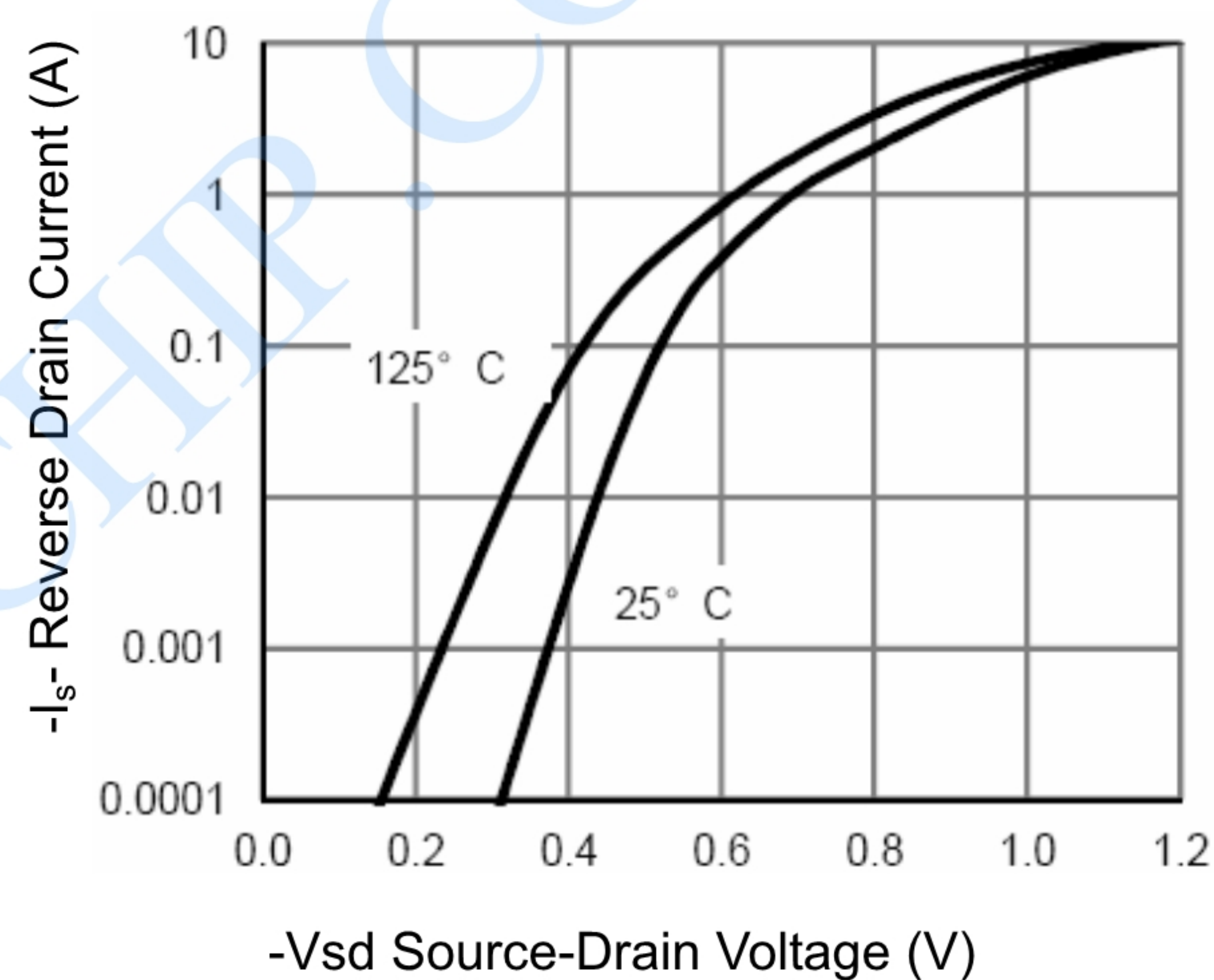
- Vds Drain-Source Voltage (V)

Figure 8 Capacitance vs Vds



Qg Gate Charge (nC)

Figure 9 Gate Charge



- Vsd Source-Drain Voltage (V)

Figure 10 Source- Drain Diode Forward

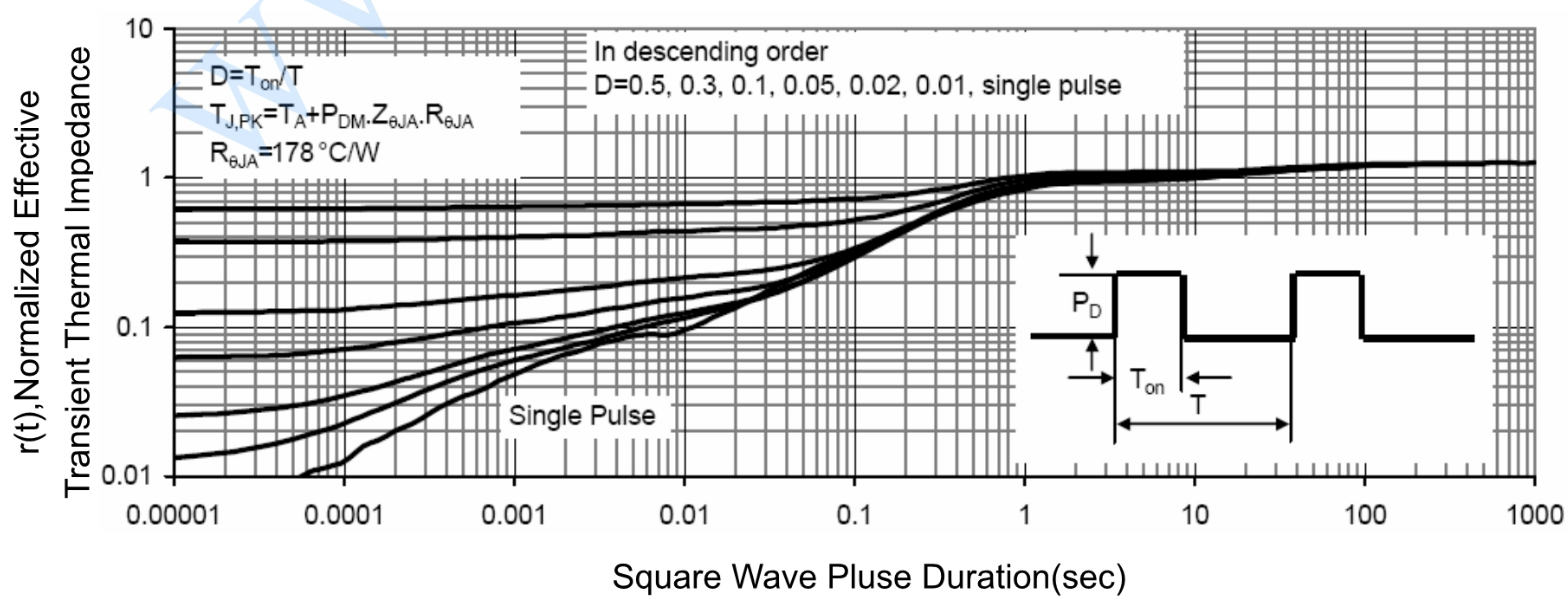
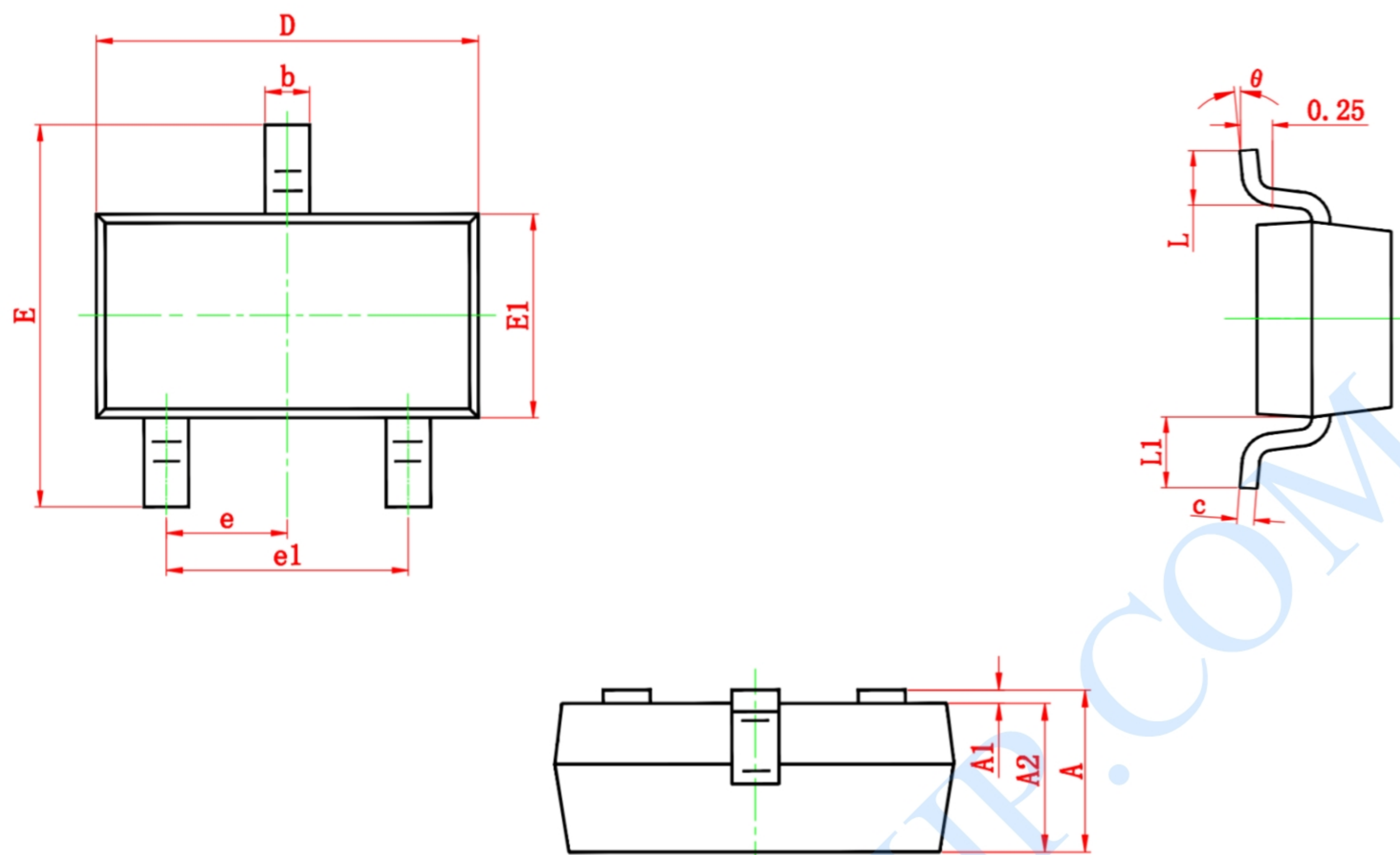


Figure 11 Normalized Maximum Transient Thermal Impedance



## PACKAGE DESCRIPTION



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.	
$\theta$	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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