



20V NP-Channel Trench Power MOSFET

General Description

The SJP20NP400 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 wide variety of applications.

Features

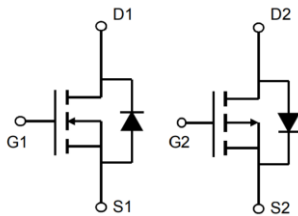
- Low Gate Charge
- High Power and current handing capability
- Lead free product is acquired

Application

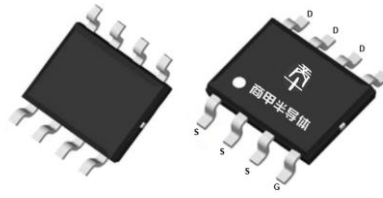
- PWM Applications
- Load Switch
- Power Management

Key Performance Parametes

Parameter	Value	Value	Unit
V_{DS}	20	-20	V
$R_{DS(ON_TYP)}$	11.8	26.3	mΩ
I_D	7.9	-5.3	A
Q_G	8.5	8	nC



Schematic Diagram



SOP-8 top&bottom view



Package Marking and Ordering Information

Device/Ordering Code	Marking	Package	Packing	Reel Size	Tape width	Quantity
SJP20NP400	SJP20NP400	SOP-8	Tape	\	\	4000 Pcs

Table 1. Absolute Maximum Ratings ($T_A=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	N Limit	P Limit	Unit
V_{DS}	Drain-Source Voltage ($V_{GS}=0V$)	20	-20	V
V_{GS}	Gate-Source Voltage ($V_{DS}=0V$)	± 12	± 12	V
I_D	Drain Current-Continuous($T_A=25^\circ\text{C}$)	7.9	-5.3	A
	Drain Current-Continuous($T_A=100^\circ\text{C}$)	5	-3.3	A
$I_{DM} \text{ (pluse)}$	Drain Current-Continuous@ Current-Pulsed (Note 1)	31.6	-21.2	A
P_D	Maximum Power Dissipation($T_A=25^\circ\text{C}$)	1.3	1.3	W
	Maximum Power Dissipation($T_A=100^\circ\text{C}$)	0.5	0.5	W
E_{AS}	Avalanche energy (Note 2)	30	25	mJ
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 To 150		$^\circ\text{C}$

Table 2. Thermal Characteristic

Symbol	Parameter	N Limit	P Limit	Unit
$R_{\theta JA}$	Thermal Resistance, Junction-to- Ambient	94	94	$^\circ\text{C/W}$



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Table 3. N-Channel Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
On/Off States						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V I _D =250μA	20			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =20V, V _{GS} =0V T _J =25℃			1	μA
		V _{DS} =20V, V _{GS} =0V T _J =125℃			100	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} =±12V, V _{DS} =0V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	0.4		1	V
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =3A		13		S
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =4.5V, I _D =3A T _J =25℃		11.8	14.8	mΩ
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =2.5V, I _D =2A T _J =25℃		14.8	19.7	mΩ
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =10V,V _{GS} =0V, f=1.0MHz		805		pF
C _{oss}	Output Capacitance			88		pF
C _{rss}	Reverse Transfer Capacitance			75		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1.0MHz		1.4		Ω
Switching Parameters						
t _{d(on)}	Turn-on Delay Time	V _{GS} =4.5V, V _{DS} =10V, R _L =3.3Ω, R _{GEN} =3Ω		6		nS
t _r	Turn-on Rise Time			20		nS
t _{d(off)}	Turn-Off Delay Time			28		nS
t _f	Turn-Off Fall Time			9		nS
Q _g	Total Gate Charge	V _{GS} =4.5V, V _{DS} =10V, I _D =3A		8.5		nC
Q _{gs}	Gate-Source Charge			1.4		nC
Q _{gd}	Gate-Drain Charge			1.5		nC
Source-Drain Diode Characteristics						
I _{SD}	Source-Drain Current (Body Diode)				7.9	A
V _{SD}	Forward on Voltage (Note 3)	V _{GS} =0V, I _S =3A			1.2	V
t _{rr}	Reverse Recovery Time	I _F =3A, dI/dt=100A/μs		4.3		ns
Q _{rr}	Reverse Recovery Charge	I _F =3A, dI/dt=100A/μs		0.6		nC

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature.

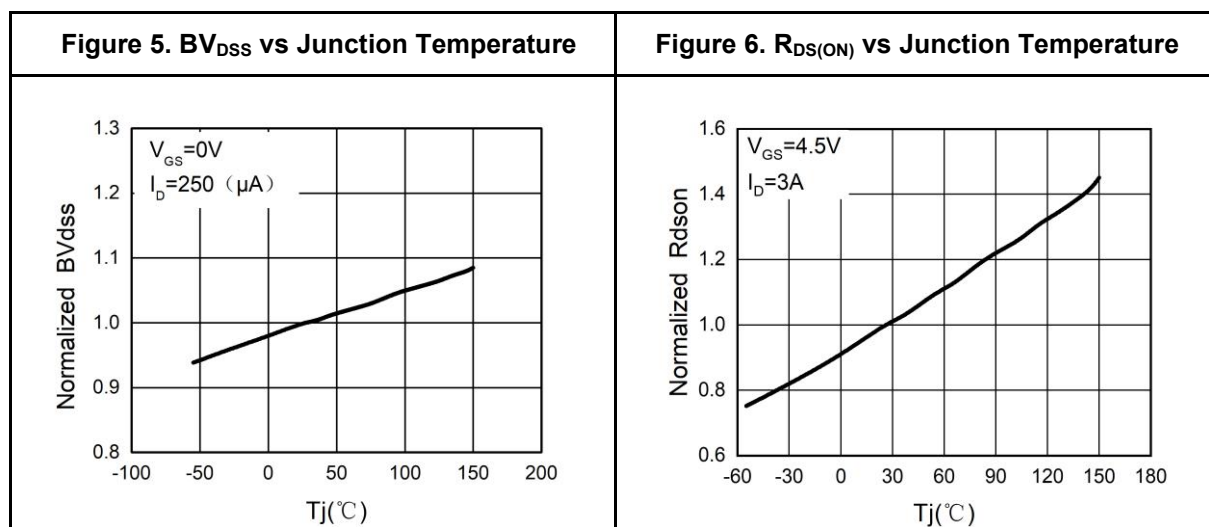
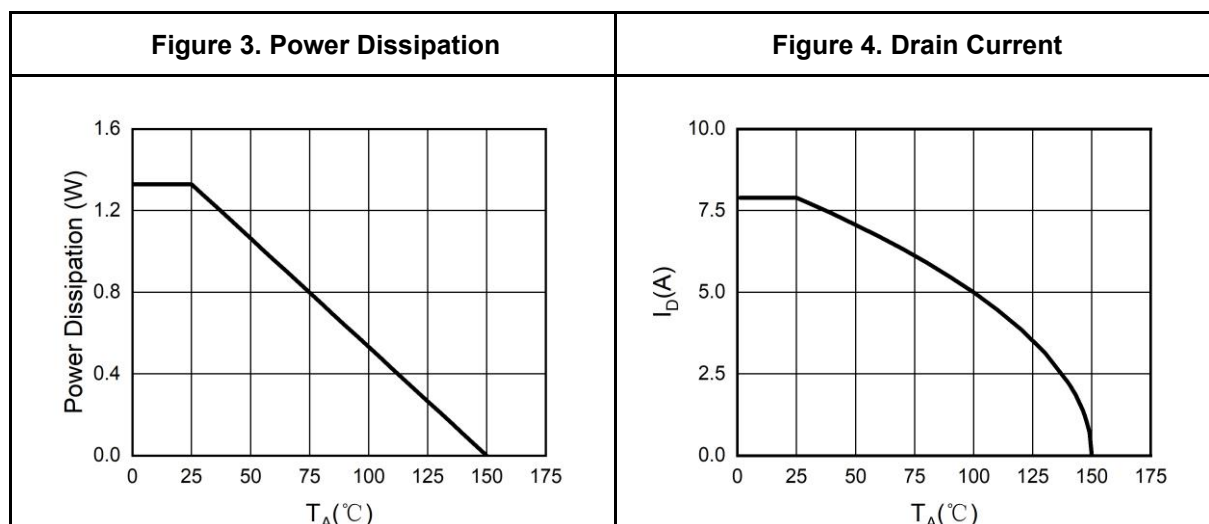
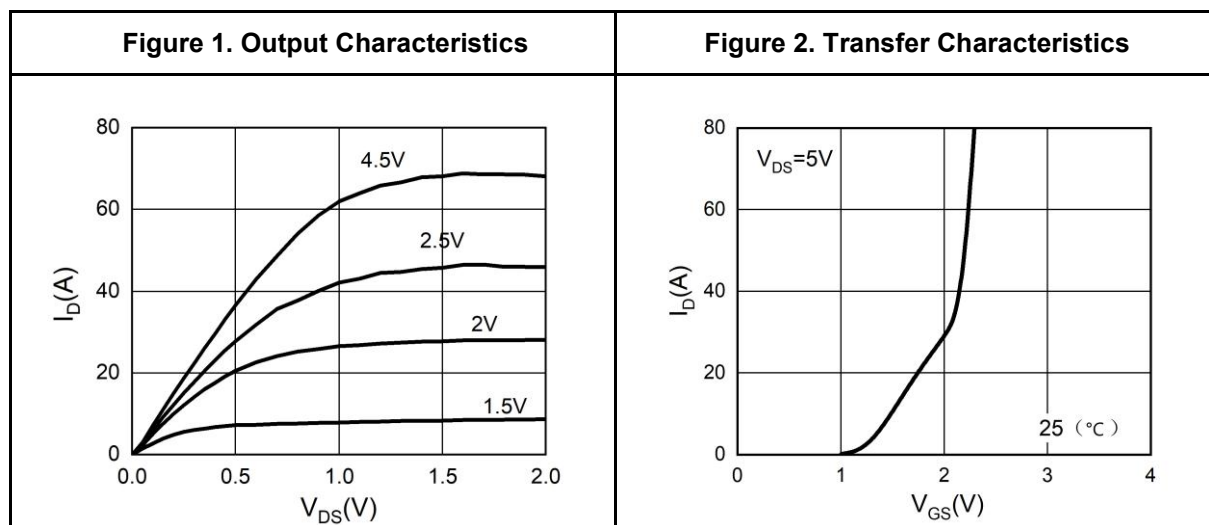
Notes 2.EAS condition: $T_J=25^{\circ}\text{C}, V_{DD}=20V, V_G=10V, R_g=25\Omega, L=0.5\text{mH}$.

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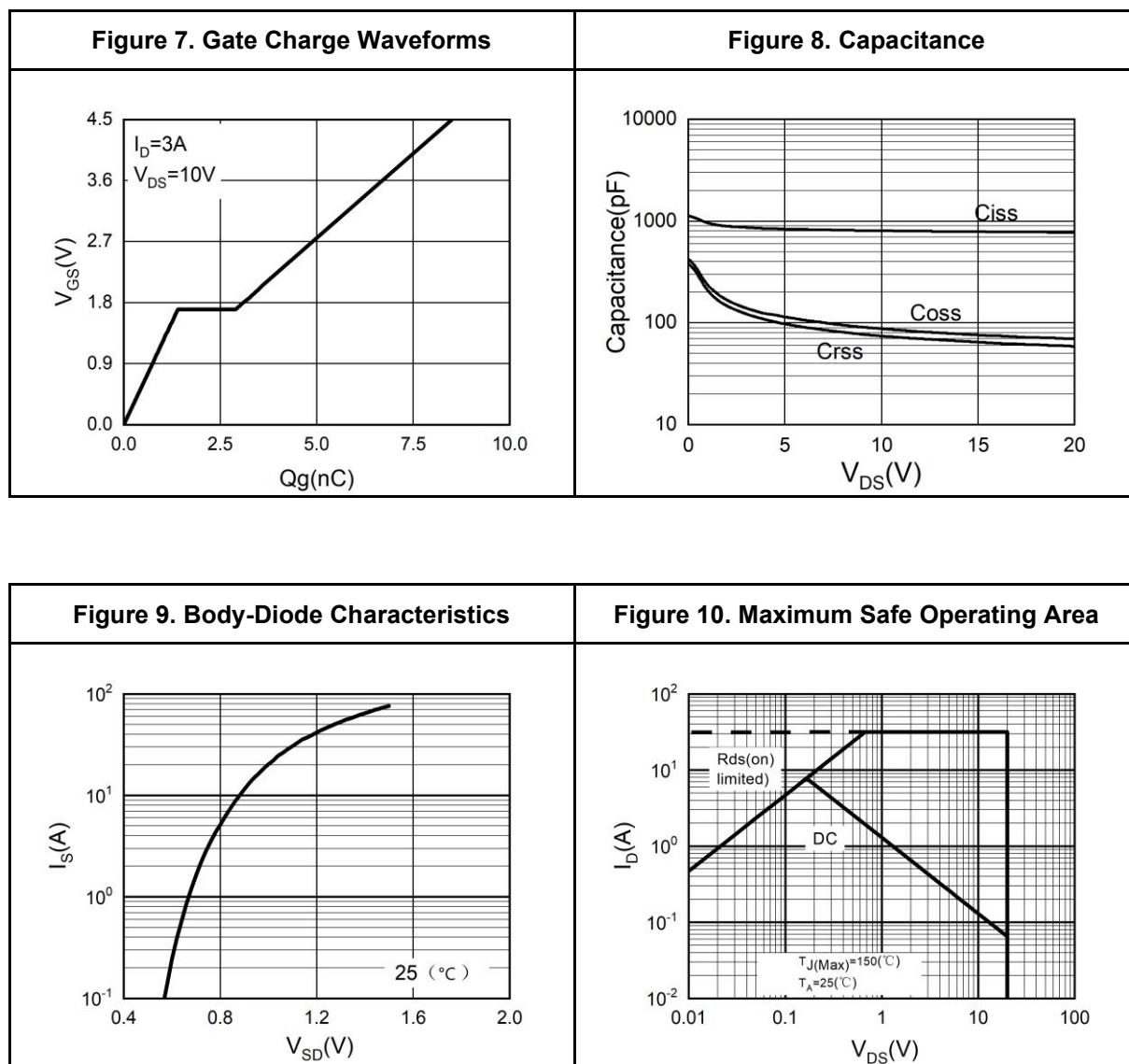
N-Channel Typical Electrical And Thermal Characteristics (Curves)





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N-Channel Typical Electrical And Thermal Characteristics (Curves)





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Table 4. P-Channel Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
On/Off States						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V I _D =-250μA	-20			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-20V, V _{GS} =0V T _J =25℃			-1	μA
		V _{DS} =-20V, V _{GS} =0V T _J =125℃			-100	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} =±12V, V _{DS} =0V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =-250μA	-0.5		-1	V
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-3A		11		S
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =-4.5V, I _D =-3A T _J =25℃		26.3	32.9	mΩ
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =-2.5V, I _D =-2A T _J =25℃		35	46.6	mΩ
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =-10V, V _{GS} =0V, f=1.0MHz		872		pF
C _{oss}	Output Capacitance			103		pF
C _{rss}	Reverse Transfer Capacitance			87		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1.0MHz		6		Ω
Switching Parameters						
t _{d(on)}	Turn-on Delay Time	V _{GS} =-4.5V, V _{DS} =-10V, R _L =3.3Ω, R _{GEN} =3Ω		26		nS
t _r	Turn-on Rise Time			45		nS
t _{d(off)}	Turn-Off Delay Time			70		nS
t _f	Turn-Off Fall Time			58		nS
Q _g	Total Gate Charge	V _{GS} =-4.5V, V _{DS} =-1V, I _D =-3A		8		nC
Q _{gs}	Gate-Source Charge			1.4		nC
Q _{gd}	Gate-Drain Charge			1.6		nC
Source-Drain Diode Characteristics						
I _{SD}	Source-Drain Current (Body Diode)				-5.3	A
V _{SD}	Forward on Voltage (Note 3)	V _{GS} =0V, I _S =-3A			-1.2	V
t _{rr}	Reverse Recovery Time	I _F =-3A, dI/dt=100A/μs		17		ns
Q _{rr}	Reverse Recovery Charge	I _F =-3A, dI/dt=100A/μs		7		nC

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature.

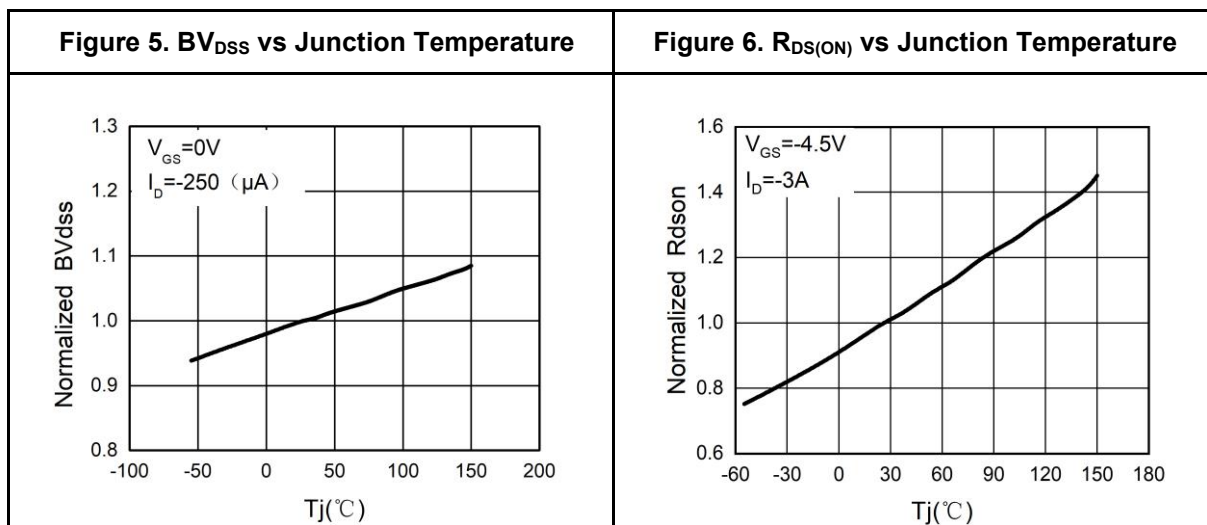
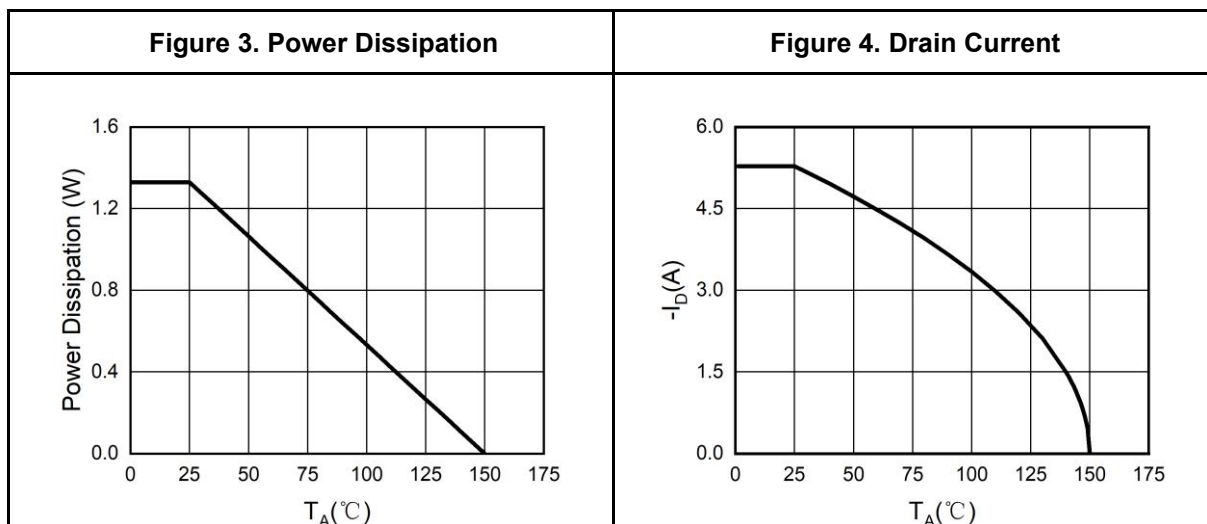
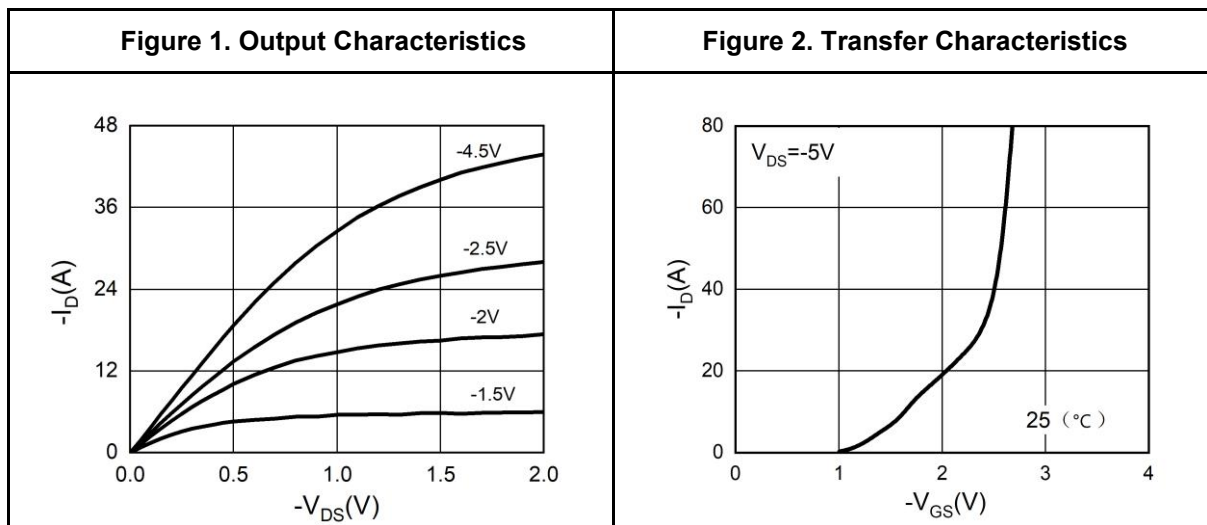
Notes 2.EAS condition: $T_J=25^{\circ}\text{C}, V_{DD}=-20V, V_G=-10V, R_g=25\Omega, L=0.5\text{mH}$.

Notes 3.Repetitive Rating: Pulse width limited by maximum junction temperature.



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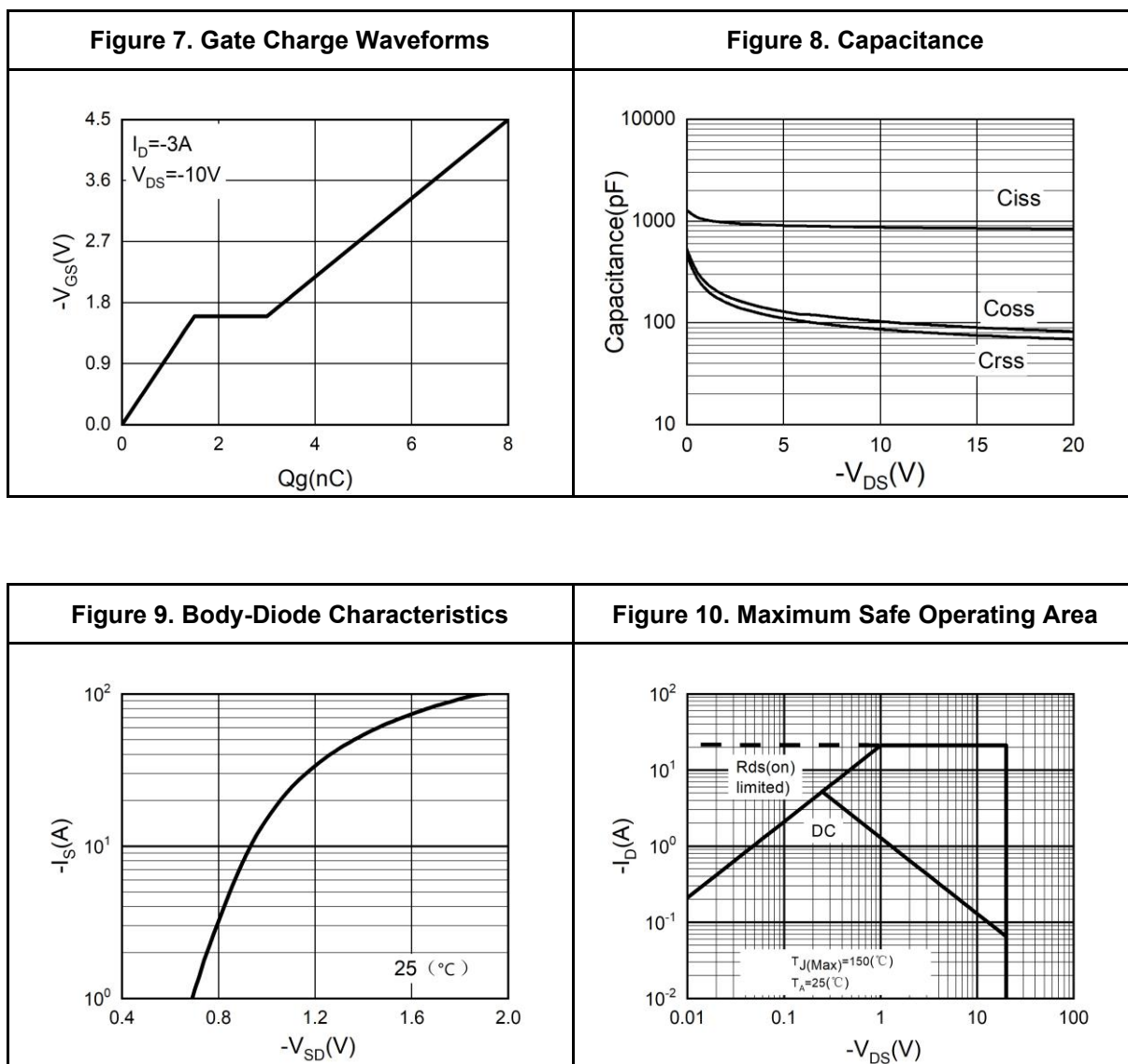
P-Channel Typical Electrical And Thermal Characteristics (Curves)





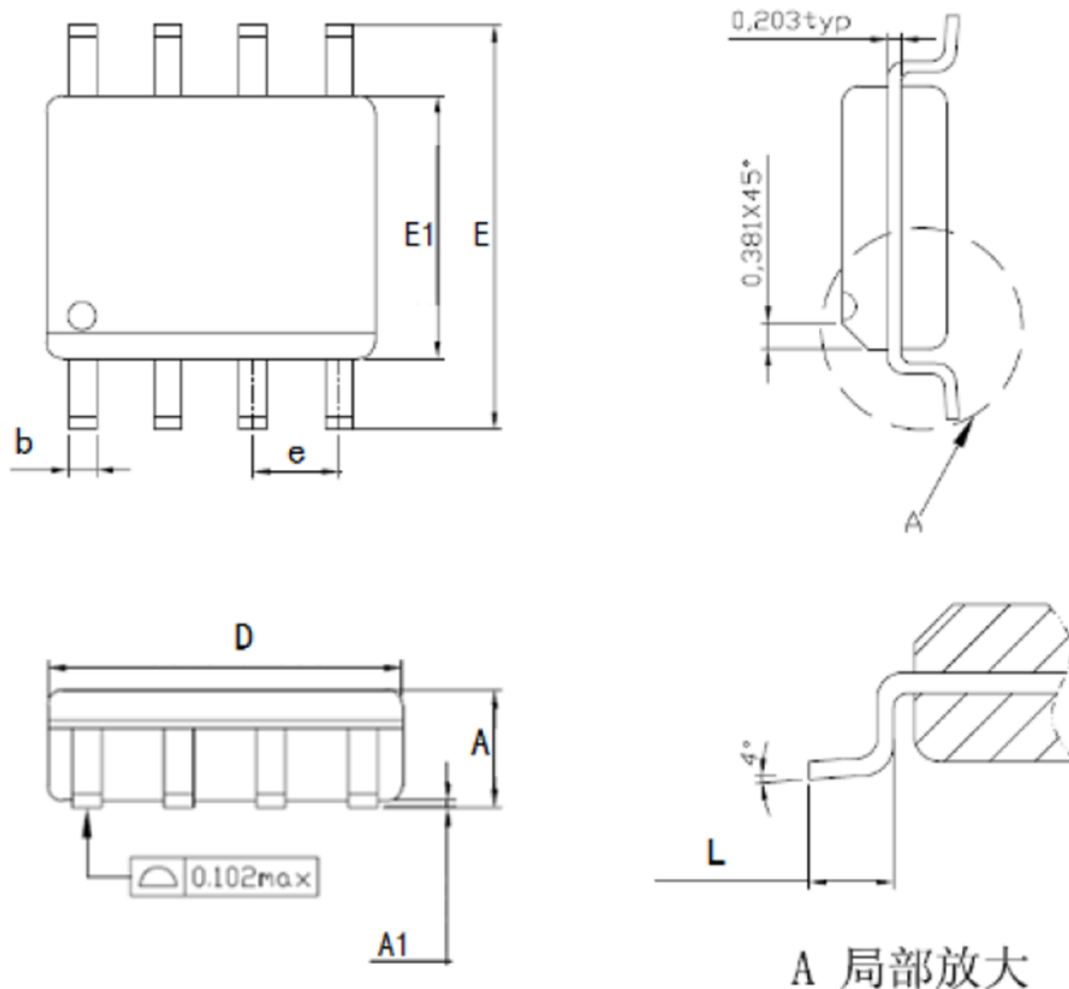
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SOP-8 Package Information



Symbol	Dimensions In Millimeters		
	Min.	Nom.	Max
A	1.35	1.55	1.75
A1	0.1	0.15	0.2
b	0.346	0.406	0.466
D	4.8	4.89	4.98
E	5.75	6.00	6.25
E1	3.81	3.90	3.99
e	1.27TYP		
L	0.406	0.838	1.27



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