



40V N&P-Channel Trench Power MOSFET

General Description

The SJP40NP456A 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 wide variety of applications.

Features

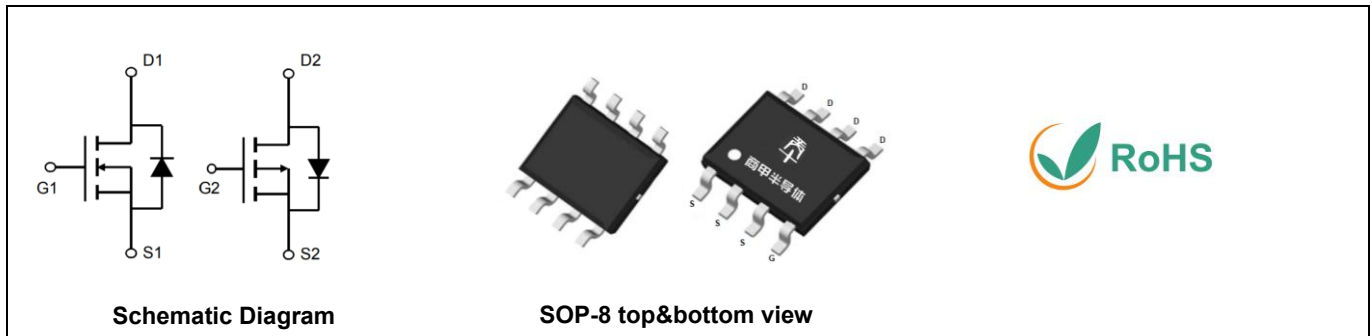
- Low Gate Charge
- High Power and current handing capability
- Lead free product is acquired

Application

- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

Key Performance Parametes

Parameter	Value	Value	Unit
V_{DS}	40	-40	V
$R_{DS(ON_TYP)}$	16.1	32	mΩ
I_D	8.3	-6.8	A
Q_G	9	18	nC



Package Marking and Ordering Information

Device/Ordering Code	Marking	Package	Packing	Reel Size	Tape width	Quantity
SJP40NP456A	SJP40NP456A	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 ($V_{GS}=0\text{V}$)	40	-40	V
V_{GS}	Gate-Source Voltage ($V_{DS}=0\text{V}$)	± 20	± 20	V
I_D	Drain Current-Continuous($T_A=25^{\circ}\text{C}$)	8.3	-6.8	A
	Drain Current-Continuous($T_A=100^{\circ}\text{C}$)	5.3	-4.3	A
$I_{DM}(\text{pulse})$	Drain Current-Continuous@ Current-Pulsed (Note 1)	33.2	-27.2	A
P_D	Maximum Power Dissipation($T_A=25^{\circ}\text{C}$)	2.4	3.1	W
	Maximum Power Dissipation($T_A=100^{\circ}\text{C}$)	0.9	1.3	W
E_{AS}	Avalanche energy (Note 2)	36	49	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	53	40	$^{\circ}\text{C/W}$



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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	40			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =40V, V _{GS} =0V T _J =25℃			1	μA
		V _{DS} =40V, V _{GS} =0V T _J =125℃			100	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} =±20V, V _{DS} =0V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	1		2.5	V
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =4A		8.7		S
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =10V, I _D =4A T _J =25℃		16.1	20.3	mΩ
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =4.5V, I _D =3A T _J =25℃		23	30.6	mΩ
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =20V, V _{GS} =0V, f=1.0MHz		788		pF
C _{oss}	Output Capacitance			62		pF
C _{rss}	Reverse Transfer Capacitance			50		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1.0MHz		1.2		Ω
Switching Parameters						
t _{d(on)}	Turn-on Delay Time	V _{GS} =10V, V _{DS} =20V, R _L =5Ω, R _{GEN} =3Ω		5		nS
t _r	Turn-on Rise Time			2.5		nS
t _{d(off)}	Turn-Off Delay Time			15		nS
t _f	Turn-Off Fall Time			3.5		nS
Q _g	Total Gate Charge	V _{GS} =10V, V _{DS} =20V, I _D =4A		9		nC
Q _{gs}	Gate-Source Charge			2.5		nC
Q _{gd}	Gate-Drain Charge			1.5		nC
Source-Drain Diode Characteristics						
I _{SD}	Source-Drain Current (Body Diode)				8.3	A
V _{SD}	Forward on Voltage (Note 3)	V _{GS} =0V, I _S =4A			1.2	V
t _{rr}	Reverse Recovery Time	I _F =4A, dI/dt=100A/μs		17		ns
Q _{rr}	Reverse Recovery Charge	I _F =4A, dI/dt=100A/μs		11		nC

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

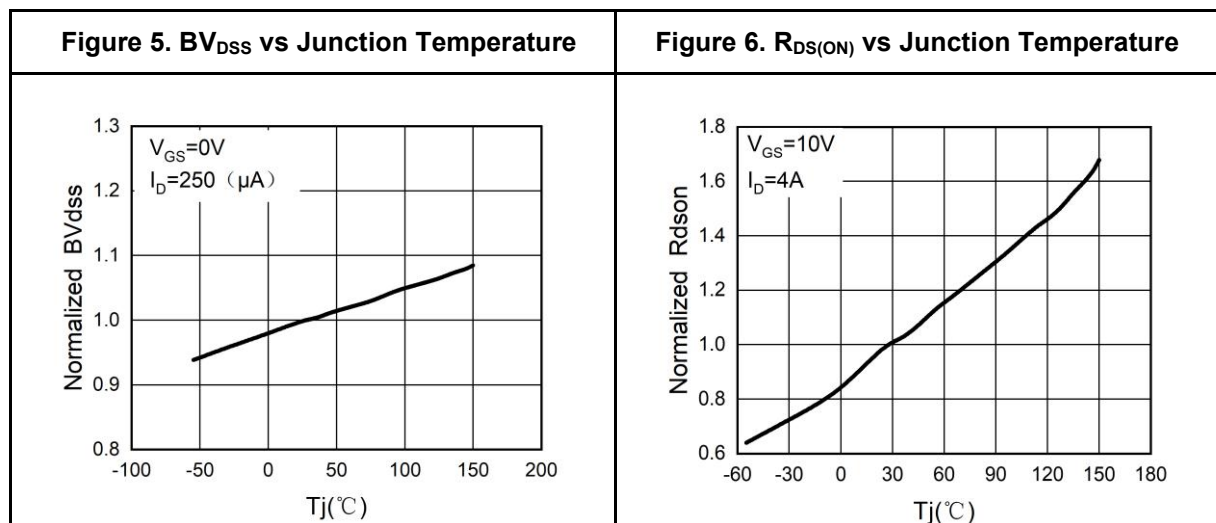
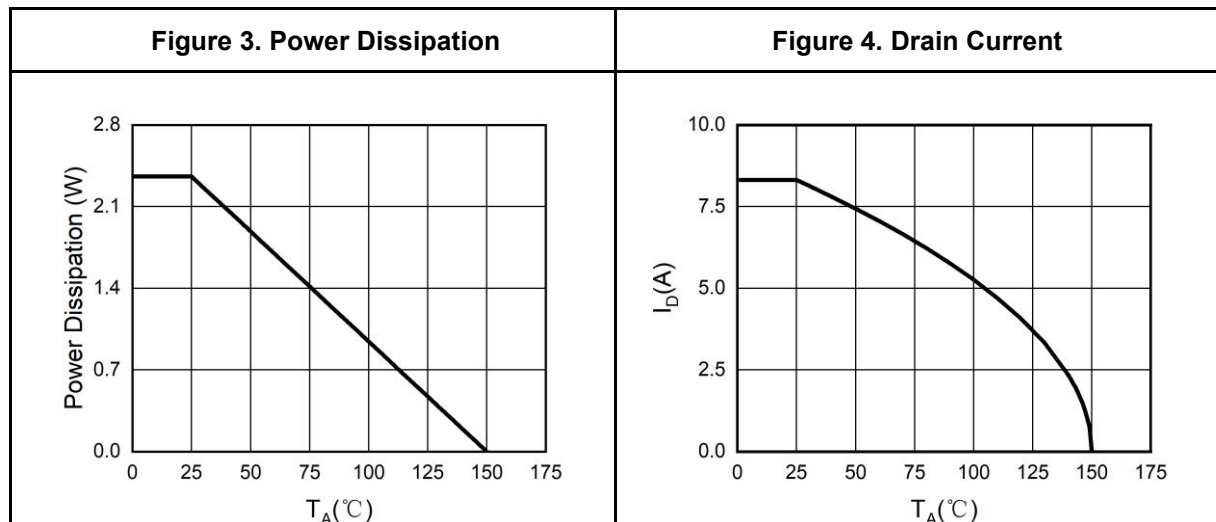
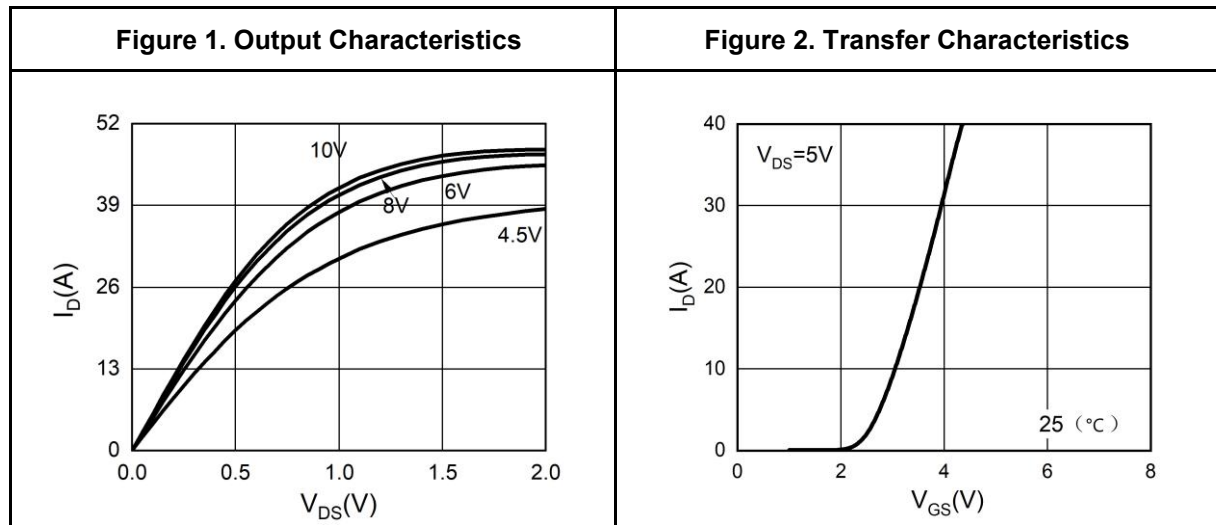
Notes 2.EAS condition: $T_J=25^{\circ}\text{C}, V_{DD}=30V, V_G=10V, R_g=25\Omega, L=0.5\text{mH}$.

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



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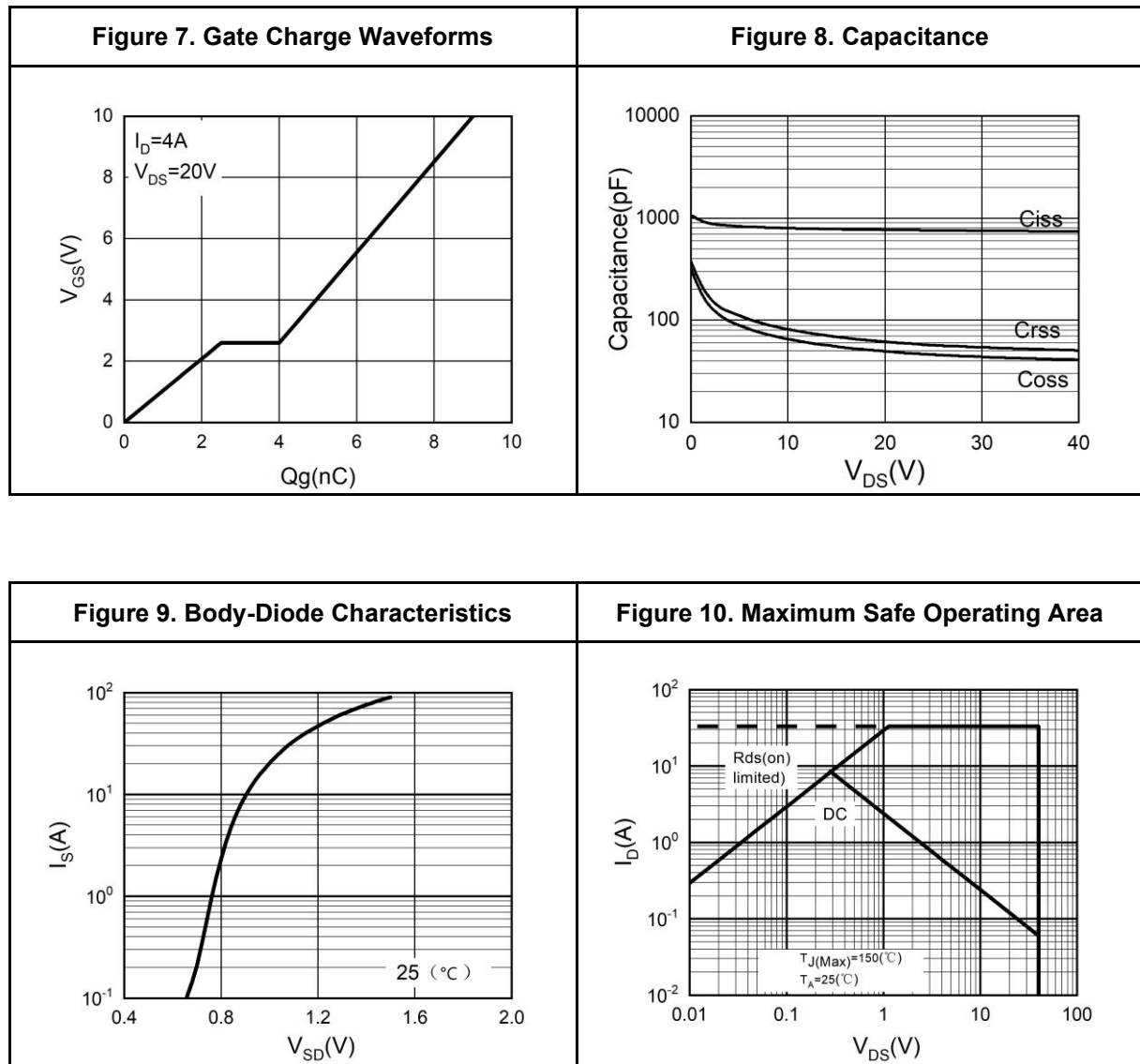
N-Channel Typical Electrical And Thermal Characteristics (Curves)





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N-Channel Typical Electrical And Thermal Characteristics (Curves)





40V N&P-Channel Trench Power MOSFET

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	-40			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-40V, V _{GS} =0V T _J =25℃			-1	μA
		V _{DS} =-40V, V _{GS} =0V T _J =125℃			-100	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} =±20V, V _{DS} =0V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =-250μA	-1		-2.5	V
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-10A		15		S
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =-10V, I _D =-10A T _J =25℃		32	40	mΩ
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =-4.5V, I _D =-5A T _J =25℃		43	7.2	mΩ
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =-20V, V _{GS} =0V, f=1.0MHz		949		pF
C _{oss}	Output Capacitance			85		pF
C _{rss}	Reverse Transfer Capacitance			72		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1.0MHz		5.1		Ω
Switching Parameters						
t _{d(on)}	Turn-on Delay Time	V _{GS} =-10V, V _{DS} =-20V, R _L =2Ω, R _{GEN} =3Ω		6		nS
t _r	Turn-on Rise Time			8.5		nS
t _{d(off)}	Turn-Off Delay Time			44		nS
t _f	Turn-Off Fall Time			15.2		nS
Q _g	Total Gate Charge	V _{GS} =-10V, V _{DS} =-20V, I _D =-10A		18		nC
Q _{gs}	Gate-Source Charge			3.5		nC
Q _{gd}	Gate-Drain Charge			3.2		nC
Source-Drain Diode Characteristics						
I _{SD}	Source-Drain Current (Body Diode)				-6.8	A
V _{SD}	Forward on Voltage (Note 3)	V _{GS} =0V, I _S =-10A			-1.2	V
t _{rr}	Reverse Recovery Time	I _F =-10A, dI/dt=-100A/μs		17.3		ns
Q _{rr}	Reverse Recovery Charge	I _F =-10A, dI/dt=-100A/μs		9.5		nC

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

Notes 2.EAS condition: $T_J=25^{\circ}\text{C}, V_{DD}=-40V, V_G=-10V, R_g=25\Omega, L=0.5\text{mH}$.

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



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P-Channel Typical Electrical And Thermal Characteristics (Curves)

Figure 1. Output Characteristics

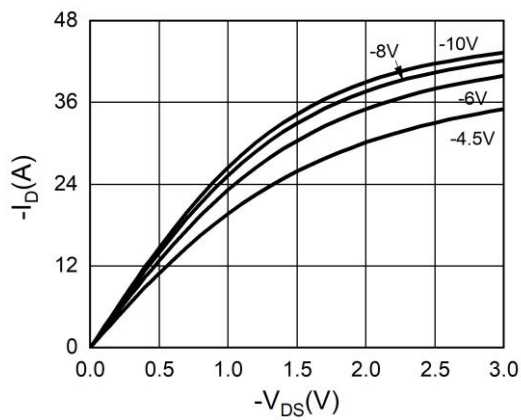


Figure 2. Transfer Characteristics

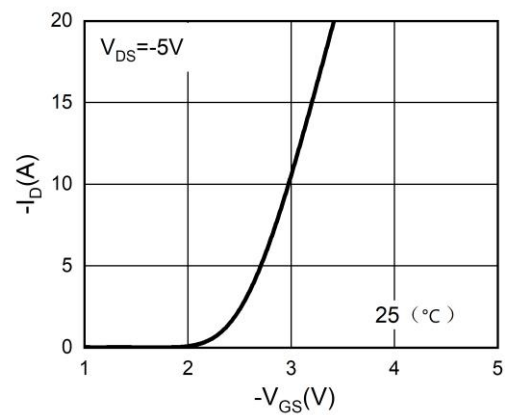


Figure 3. Power Dissipation

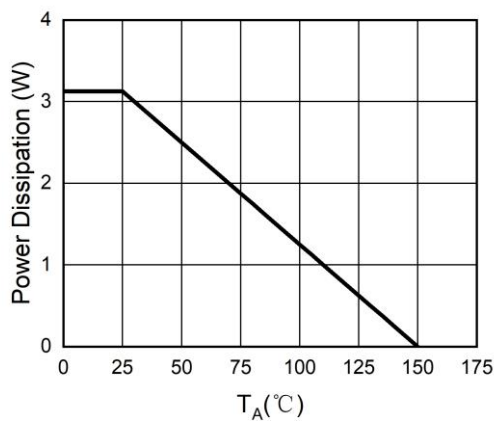


Figure 4. Drain Current

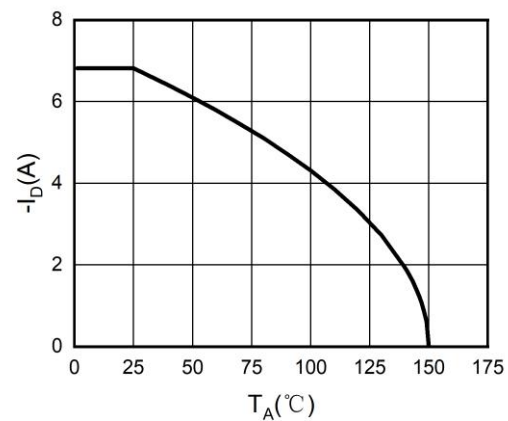


Figure 5. BV_{DSS} vs Junction Temperature

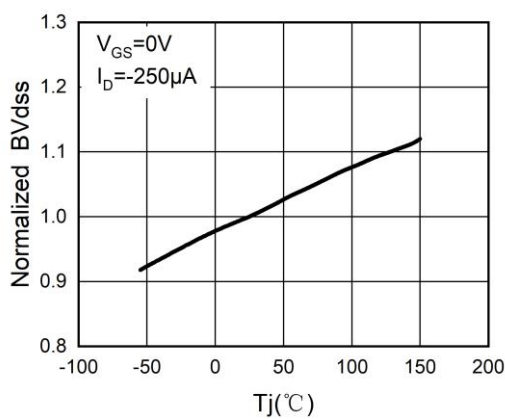
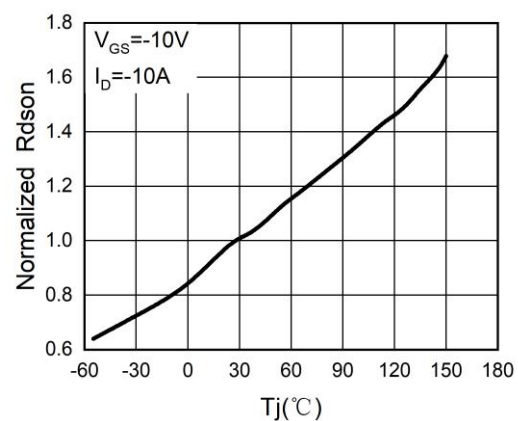


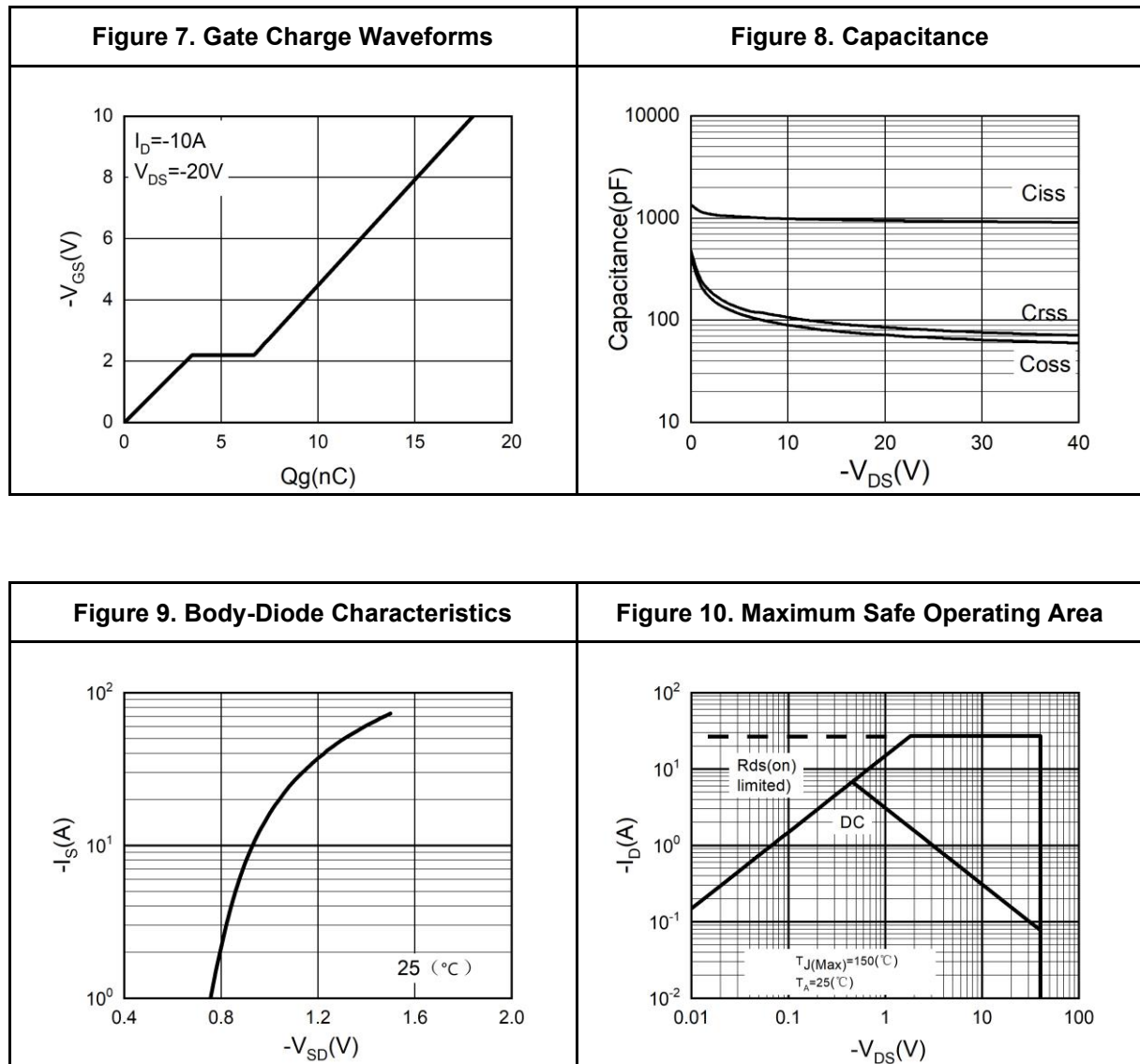
Figure 6. $R_{DS(ON)}$ vs Junction Temperature





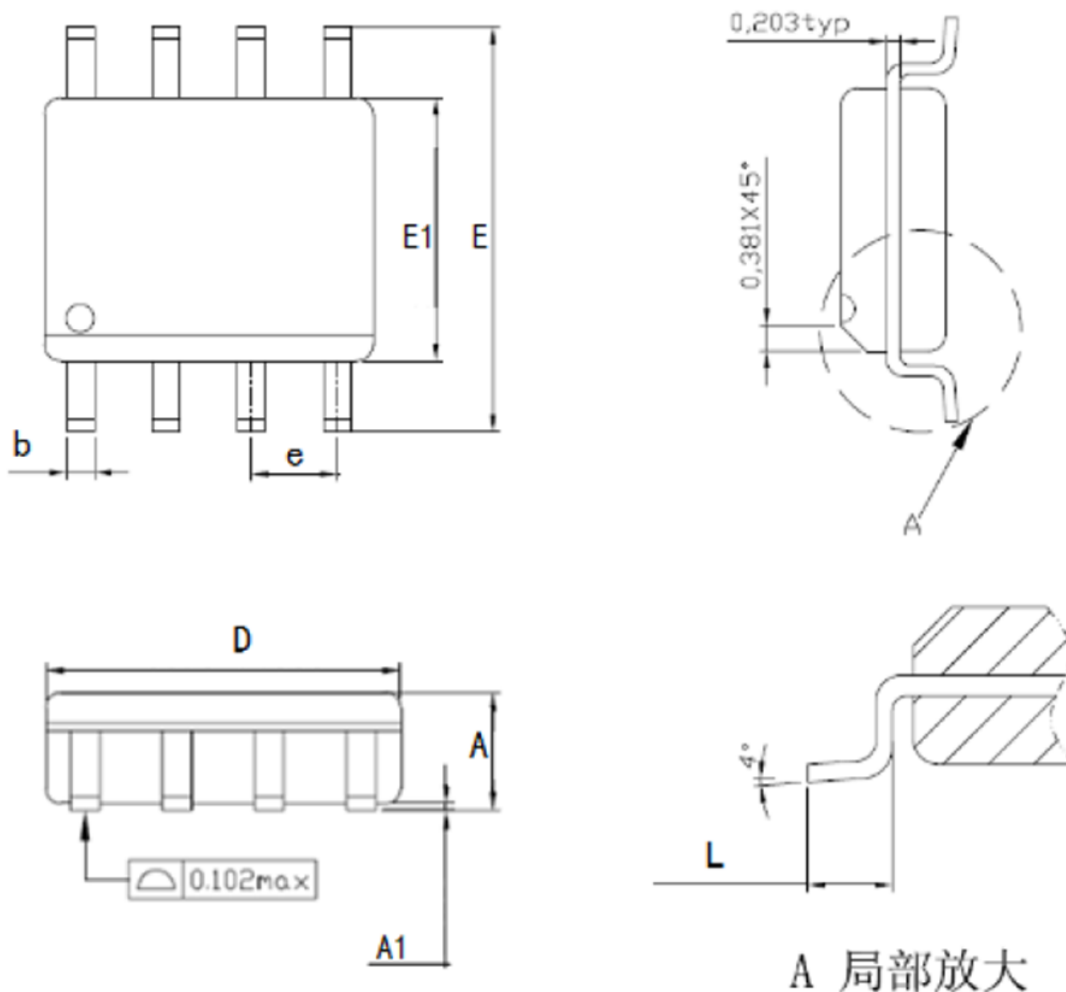
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P-Channel Typical Electrical And Thermal Characteristics (Curves)





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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Attention

This product described in this document can not be used in life support devices or systems, aircraft's control systems, and other applications whose failure can be reasonably expected to result in serious physical and/or material damage, apart from that when an application agreement is signed between customer and Wuxi Shangjia Semiconductor.

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