



40V N&P-Channel Trench Power MOSFET

General Description

The SJP40NP456 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

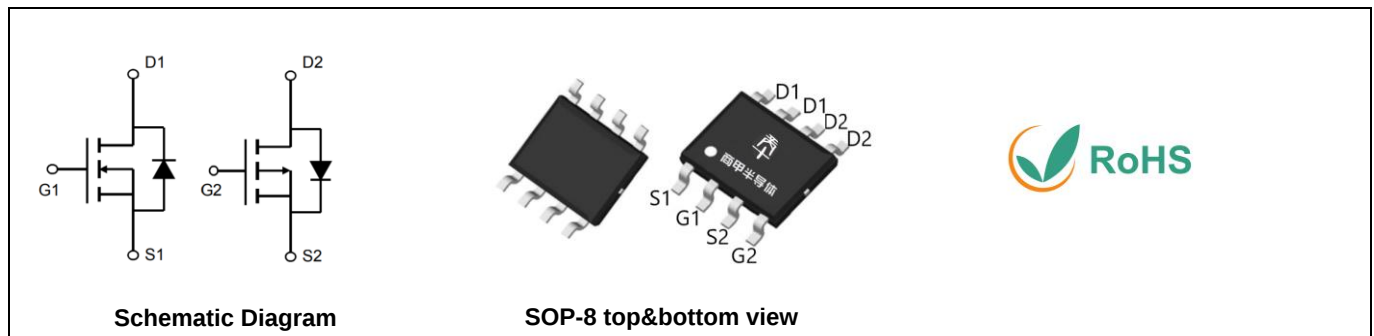
- Low Gate Charge
- High Power and current handling capability
- Lead free product is acquired

Application

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

Key Performance Parameters

Parameter	Value	Value	Unit
V_{DS}	40	-40	V
$R_{DS(ON_TYP)}$	16.8	33.5	mΩ
I_D	8	-6.4	A
Q_G	9	18	nC



Package Marking and Ordering Information

Device/Ordering Code	Marking	Package	Packing	Reel Size	Tape width	Quantity
SJP40NP456	SJP40NP456	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 ($V_{GS}=0V$)	40	-40	V
V_{GS}	Gate-Source Voltage ($V_{DS}=0V$)	± 20	± 20	V
I_D	Drain Current-Continuous($T_A=25^\circ\text{C}$)	8	-6.4	A
	Drain Current-Continuous($T_A=100^\circ\text{C}$)	5.1	-4.1	A
I_{DM} (pulse)	Drain Current-Continuous@ Current-Pulsed (Note 1)	32	-25.6	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		9		S
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =10V, I _D =4A T _J =25℃		16.8	21.8	mΩ
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =4.5V, I _D =3A T _J =25℃		22.8	30.3	mΩ
Dynamic Characteristics						
C _{iSS}	Input Capacitance	V _{DS} =20V, V _{GS} =0V, f=1.0MHz		771		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		0.9		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	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

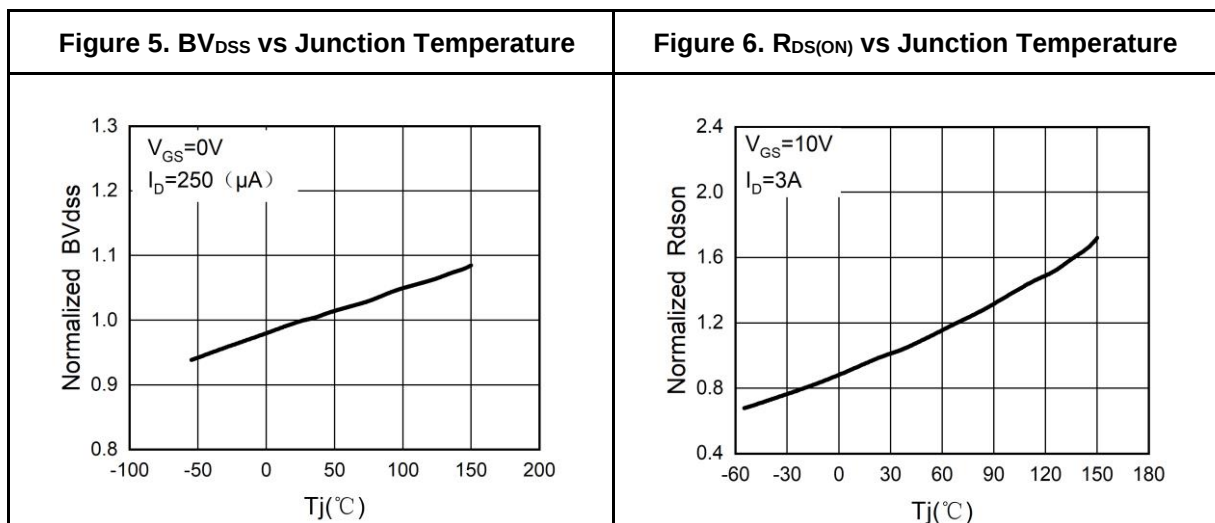
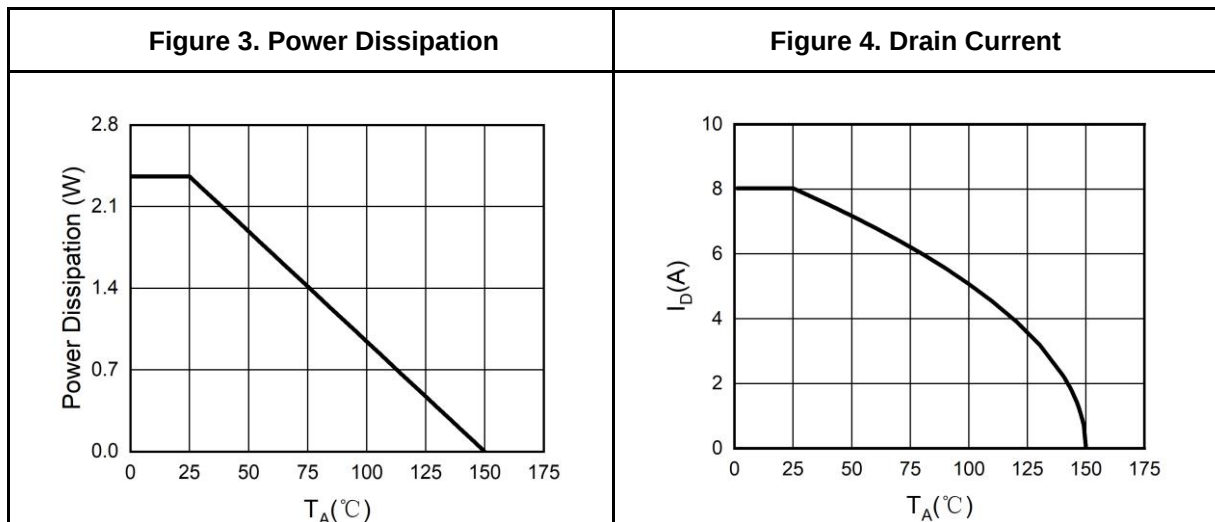
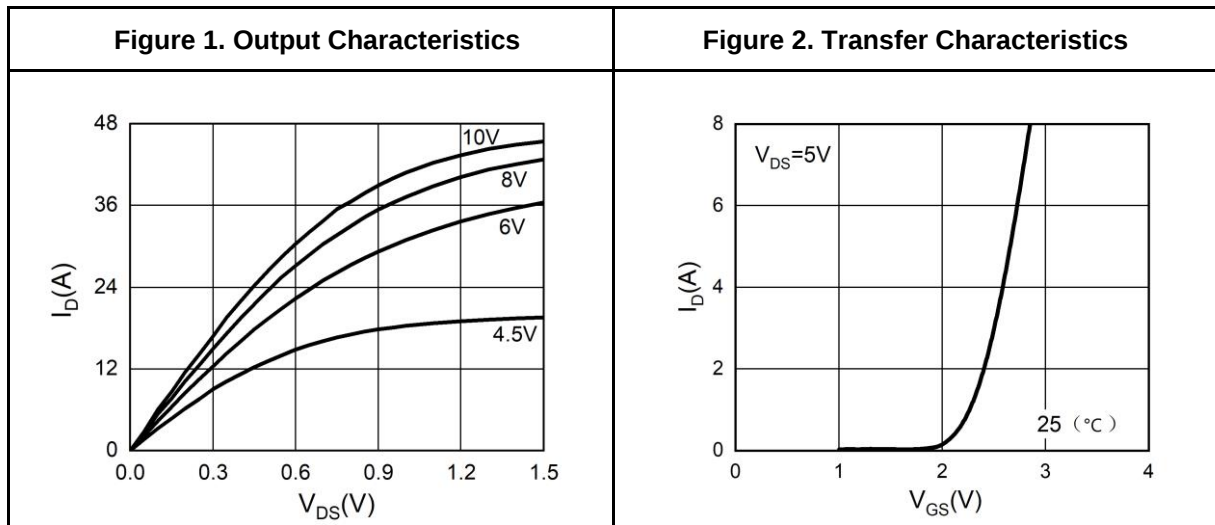
Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature.

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.



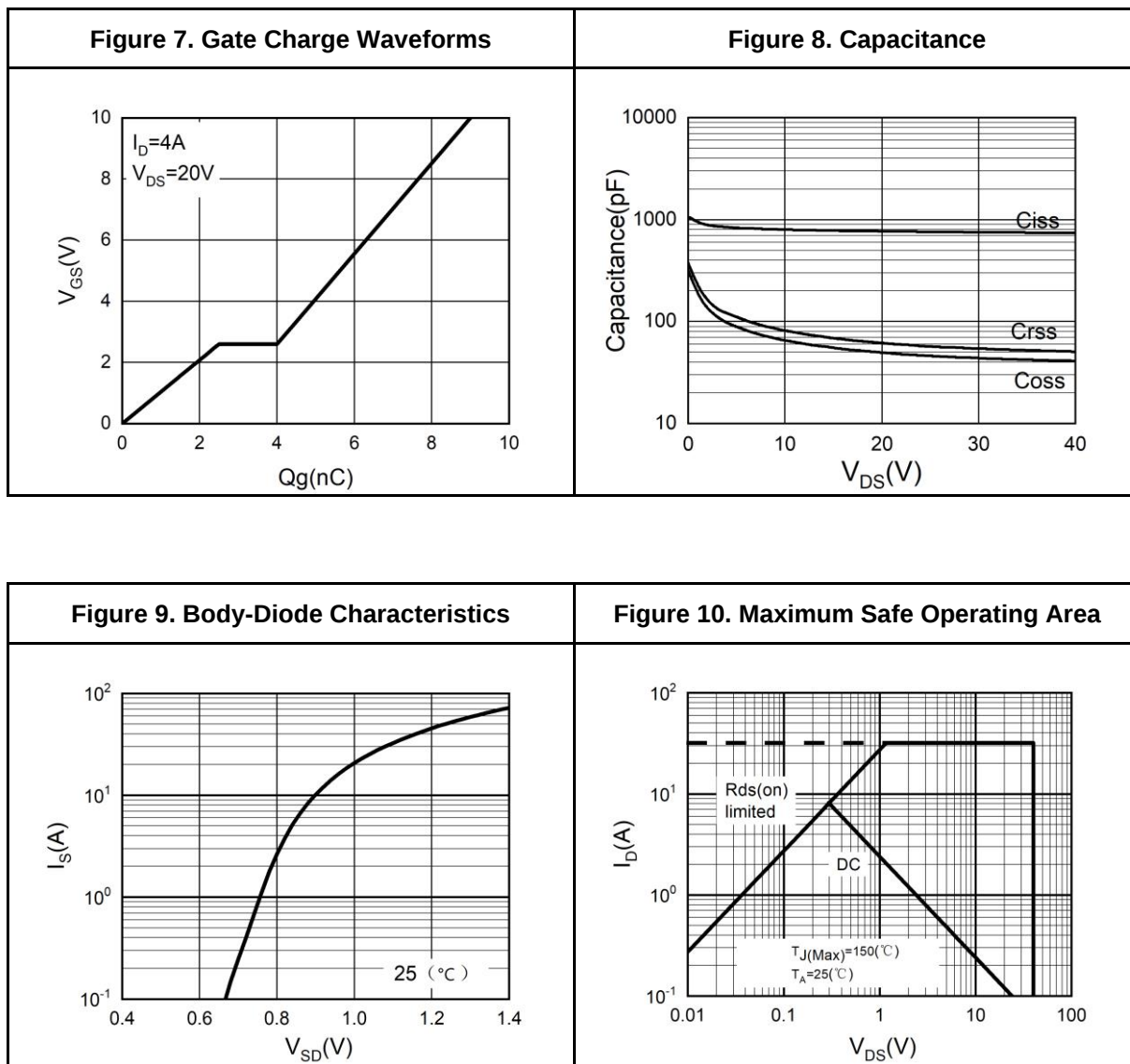
N-Channel Typical Electrical And Thermal Characteristics (Curves)





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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	-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℃		33.5	43.6	mΩ
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =-4.5V, I _D =-5A T _J =25℃		44	59.1	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)				-6.4	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.

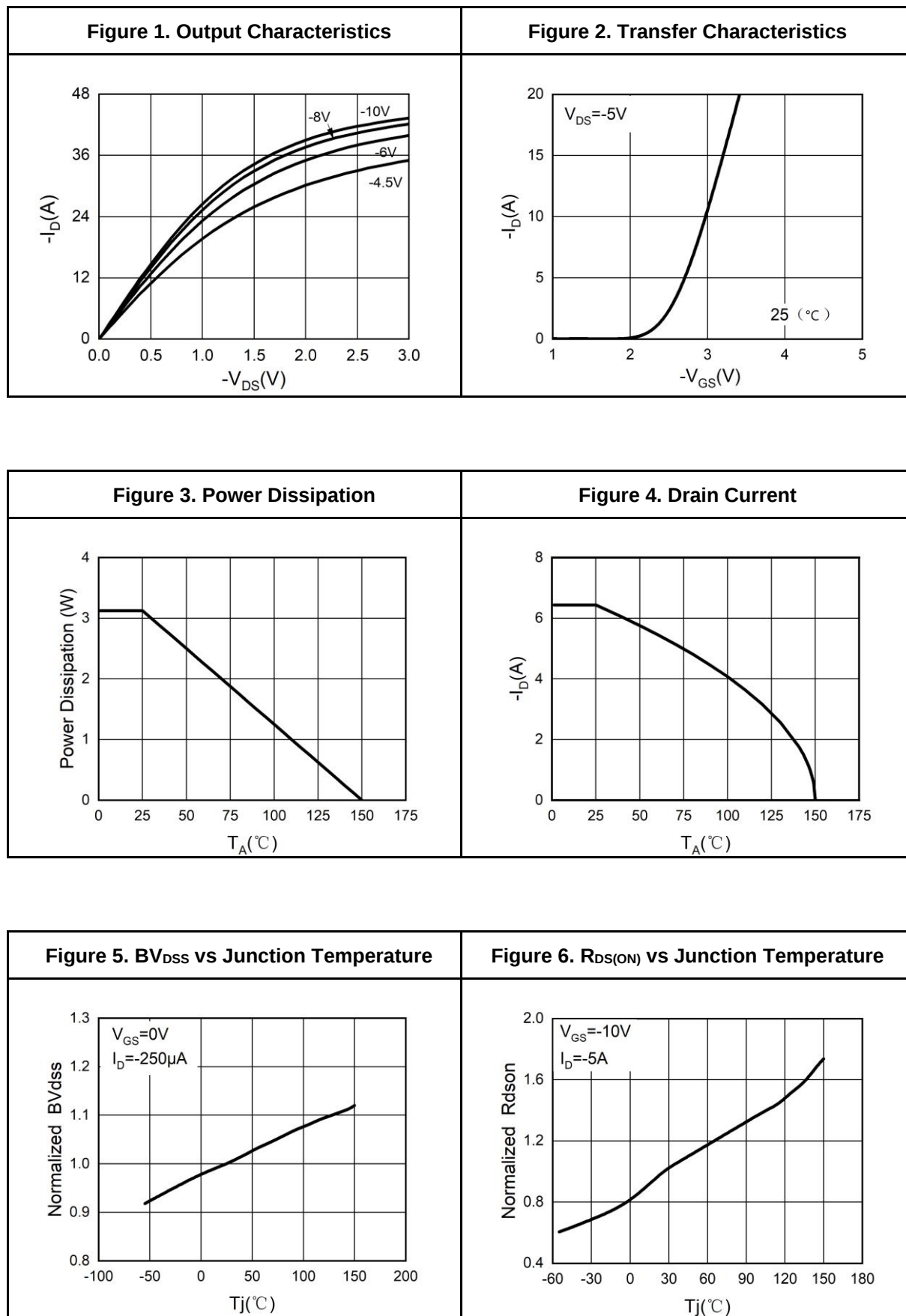
Notes 2.EAS condition: $T_J=25^{\circ}\text{C}, V_{DD}=-40V, V_G=-10V, R_g=25\Omega, L=0.5\text{mH}$.

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



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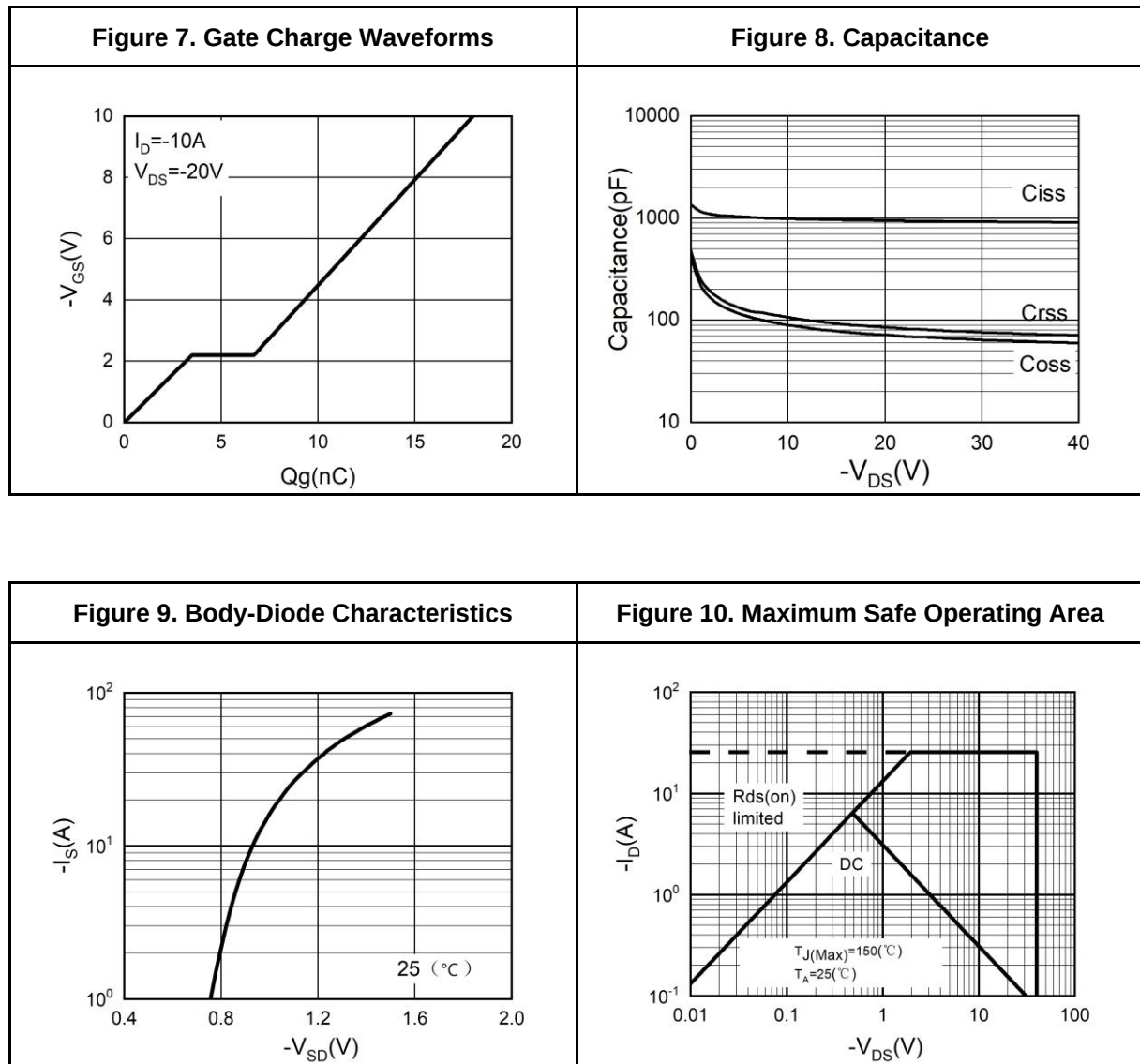
P-Channel Typical Electrical And Thermal Characteristics (Curves)





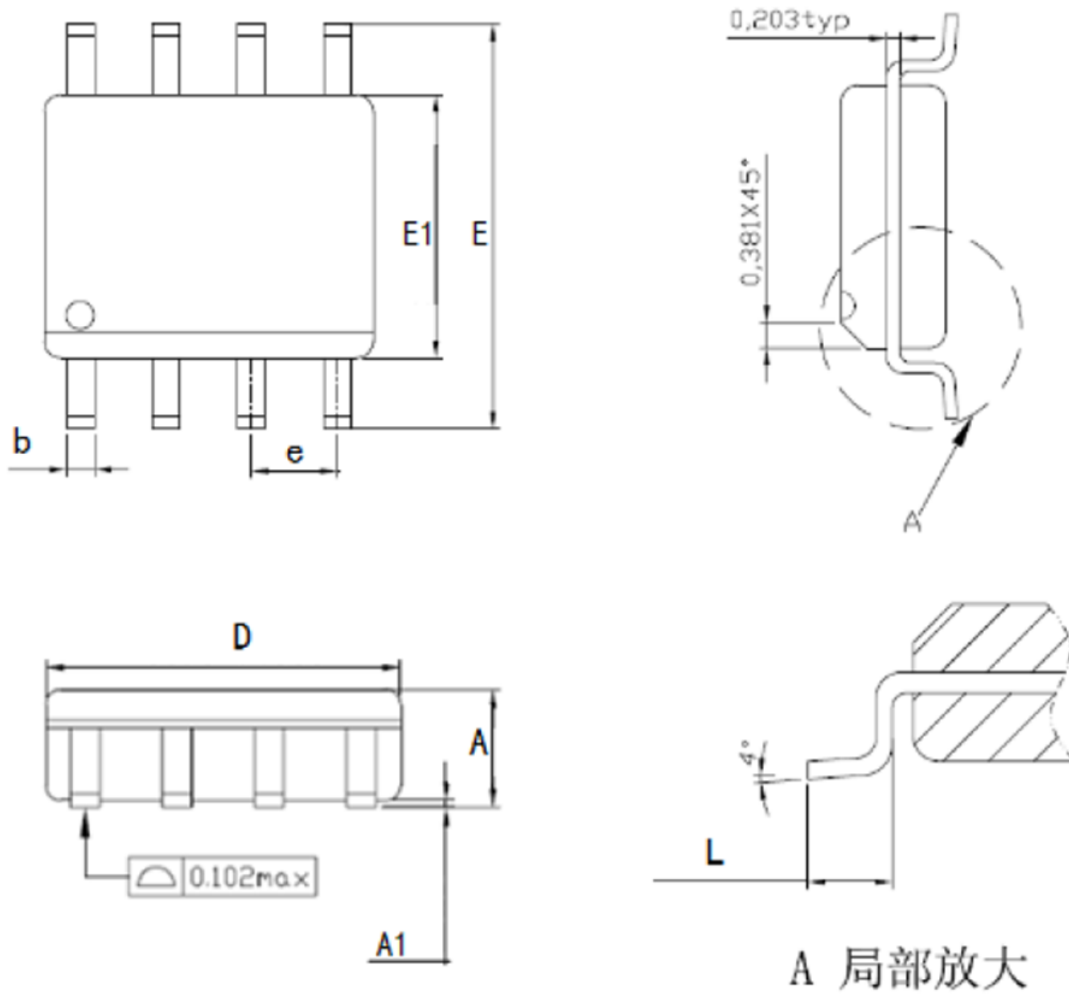
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P-Channel Typical Electrical And Thermal Characteristics (Curves)





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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