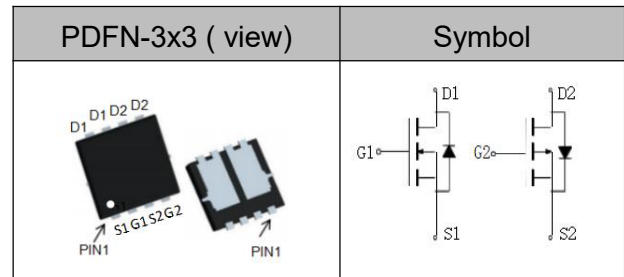


Features

- ◆ NMOS 40V, 20A
 $R_{DS(ON)}=18m\Omega(Typ.)@V_{GS}=10V$
 $R_{DS(ON)}=24m\Omega(Typ.)@V_{GS}=4.5V$
- ◆ PMOS -40V, -15A
 $R_{DS(ON)}=32m\Omega(Typ.)@V_{GS}=-10V$
 $R_{DS(ON)}=40m\Omega(Typ.)@V_{GS}=-4.5V$
- ◆ Reliable and Rugged
- ◆ 100% EAS Guaranteed



Application

- ◆ Motor Drive Applications

Absolute Maximum Ratings $T_A = 25^\circ C$ unless otherwise noted

Symbol	Parameter	Max.N-MOS	Max.P-MOS	Unit
V_{DS}	Drain-Source Voltage	40	-40	V
V_{GS}	Gate-Source Voltage	± 20	± 20	
I_D	Drain Current-Continuous, $T_C = 25^\circ C$	20	-15	A
	Drain Current-Continuous, $T_C = 100^\circ C$	13	-9	
	Drain Current-Continuous, $T_A = 25^\circ C$	8	-7	
	Drain Current-Continuous, $T_A = 70^\circ C$	7	-5	
I_{DM}	Drain Current-Pulsed ^a	80	-60	
E_{AS}	Avalanche Energy, Single pulse ^b	12	16	mJ
I_{AS}	Avalanche Current	7	-9	A
P_D	Total Power Dissipation @ $T_C = 25^\circ C$	16	16	W
	Total Power Dissipation @ $T_C = 100^\circ C$	6	6	
	Total Power Dissipation @ $T_A = 25^\circ C$	2.8	2.8	
	Total Power Dissipation @ $T_A = 70^\circ C$	1.8	1.8	
T_J, T_{STG}	Junction and Storage Temperature Range	-55 to 150		$^\circ C$

Thermal Characteristics

Symbol	Parameter	Max.N-MOS	Max.P-MOS	Unit
$R_{\theta JC}$	Thermal Resistance Junction-Case	7.8	7.8	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ^c	45	45	$^\circ C/W$
$R_{\theta JT}$	Thermal Resistance Junction-Top of package ^c	NA	NA	$^\circ C/W$

Electrical Characteristics $T_J = 25^\circ \text{C}$ unless otherwise noted

■ Off Characteristics

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	N	40	-	-	V
		$V_{GS} = 0V, I_D = -250\mu A$	P	-40	-	-	
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 40V, V_{GS} = 0V$ $T_J = 125^\circ \text{C}$	N	-	-	1	μA
				-	-	30	
		$V_{DS} = -40V, V_{GS} = 0V$ $T_J = 125^\circ \text{C}$	P	-	-	1	
				-	-	30	
I_{GSS}	Forward Gate Body Leakage Current	$V_{DS} = 0V, V_{GS} = \pm 20V$	N	-	-	± 100	nA
		$V_{DS} = 0V, V_{GS} = \pm 20V$	P	-	-	± 100	

■ On Characteristics

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	N	1.0	1.8	2.5	V
		$V_{DS} = V_{GS}, I_D = -250\mu A$	P	1.0	-1.8	2.5	
$R_{DS(on)}$	Static Drain-Source On-Resistance ^d	$V_{GS} = 10V, I_D = 8A$	N	-	18	25	m Ω
		$V_{GS} = 10V, I_D = -8A$	P	-	32	45	
		$V_{GS} = 4.5V, I_D = 6A$	N	-	24	34	
		$V_{GS} = 4.5V, I_D = -6A$	P	-	40	55	

■ Dynamic Characteristics

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
R _g	Gate Resistance	V _{GS} = 0V, V _{DS} = 0V f = 1.0MHz	N	-	NA	-	Ω
			P	-	NA	-	
C _{iss}	Input Capacitance	N-MOS V _{DS} = 20V, V _{GS} = 0V, f = 1.0MHz P-MOS V _{DS} = -20V, V _{GS} = 0V, f = 1.0MHz	N	-	1117	-	pF
			P	-	1244	-	
C _{oss}	Output Capacitance		N	-	89	-	
			P	-	97	-	
C _{rss}	Reverse Transfer Capacitance		N	-	74	-	
			P	-	80	-	

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-On Delay Time	N-MOS $V_{DD} = 20V, I_D = 8A,$ $R_G = 3\Omega, V_{GS} = 10V$ P-MOS $V_{DS} = -20V, I_D = -8A,$ $R_G = 3\Omega, V_{GS} = -10V$	N	-	7	-	ns
			P	-	8	-	
t_r	Turn-On Rise Time		N	-	9	-	
			P	-	12	-	
$t_{d(off)}$	Turn-Off Delay Time		N	-	16	-	
			P	-	30	-	
t_f	Turn-Off Fall Time	N-MOS $V_{DS} = 20V, I_D = 5A,$ $V_{GS} = 10V$ P-MOS $V_{DS} = -20V, I_D = -5A,$ $V_{GS} = -10V$	N	-	22	-	nC
Q_g	Total Gate Charge		P	-	23	-	
Q_{gs}	Gate-Source Charge		N	-	4.0	-	
			P	-	4.0	-	
Q_{gd}	Gate-Drain Charge		N	-	4.0	-	
			P	-	4.0	-	

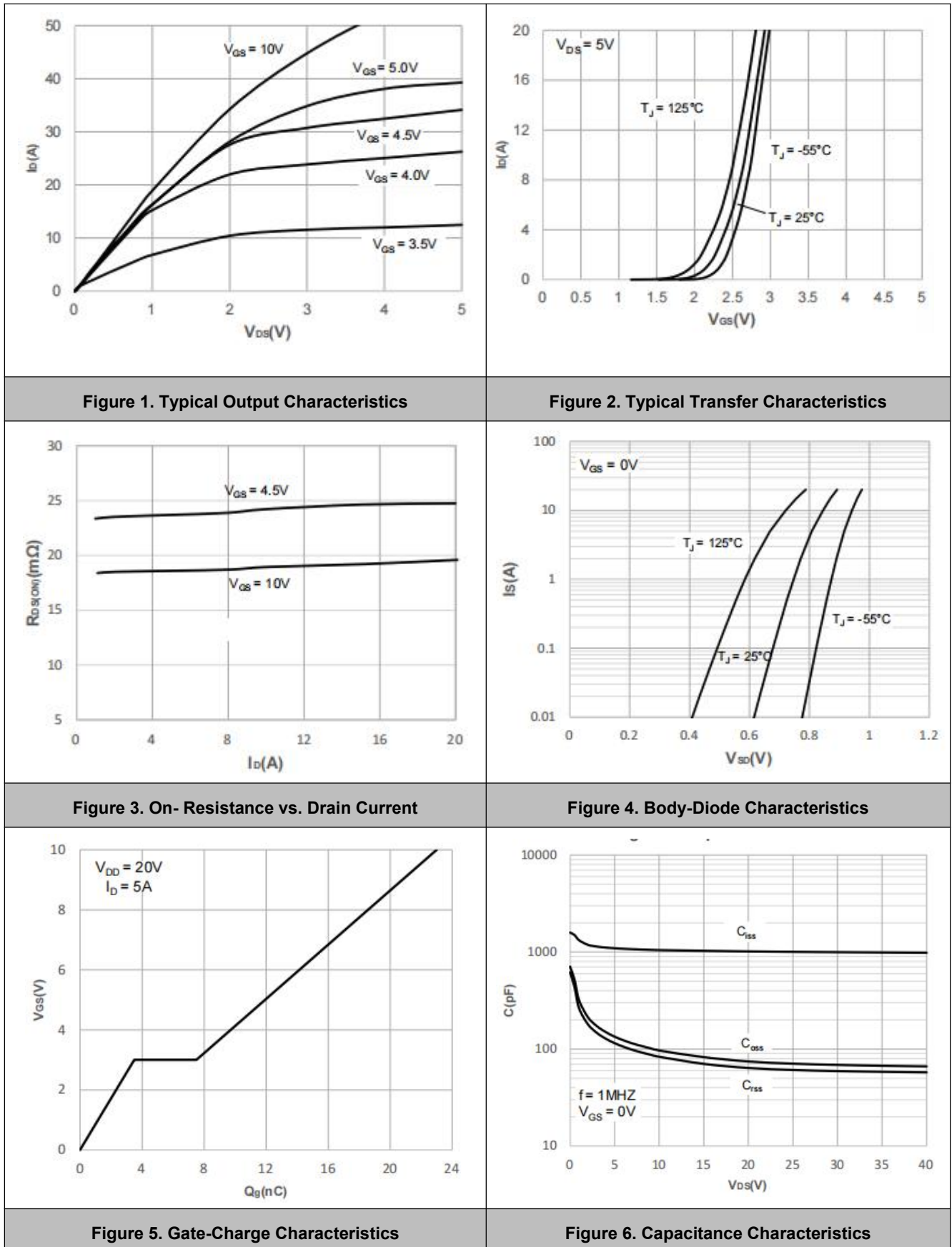
■ Drain-Source Diode Characteristics

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
I_S	Continuous Source Current	$V_G = V_D = 0V,$ Force Current	N	-	-	20	A
			P	-	-	-15	
I_{SM}	Pulse Source Current		N	-	-	80	
			P	-	-	-60	
V_{SD}	Drain-Source Diode Forward Voltage ^d	$V_{GS} = 0V, I_{SD} = 1A$	N	-	0.75	1.3	V
		$V_{GS} = 0V, I_{SD} = -1A$	P	-	-0.75	1.3	
t_{rr}	Reverse Recovery Time	N-MOS $I_F = 8A, di/dt = 100A/\mu s$	N	-	16	-	ns
			P	-	22	-	
Q_{rr}	Reverse Recovery Charge	P-MOS $I_F = -8A, di/dt = 100A/\mu s$	N	-	29	-	nC
			P	-	34	-	

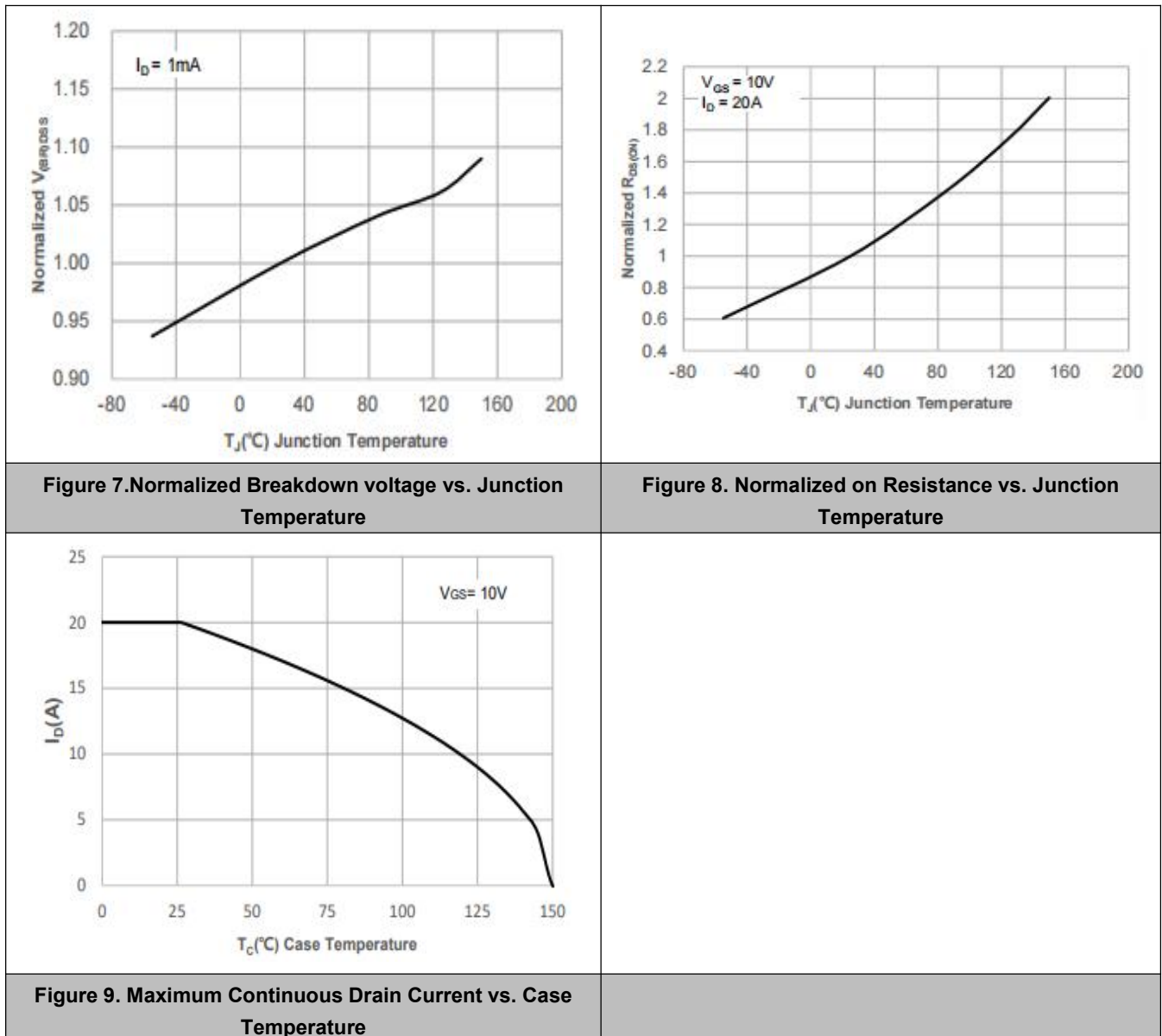
Notes:

- a: Max. current is limited by junction temperature.
- b: The EAS data shows Max. Rating. The test condition:
N-MOS: $V_{DD} = 25V, V_{GS} = 10V, L = 0.5mH, I_{AS} = 7A.$
P-MOS: $V_{DD} = -25V, V_{GS} = -10V, L = 0.5mH, I_{AS} = -8A.$
- c: Surface Mounted on 1in2 FR-4 board with 1oz.
- d: Pulse test (pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$).
- e: Guaranteed by design, not subject to production testing.

■ Typical Characteristics(N-Channel)



■ Typical Characteristics(N-Channel)



■ Typical Characteristics(P-Channel)

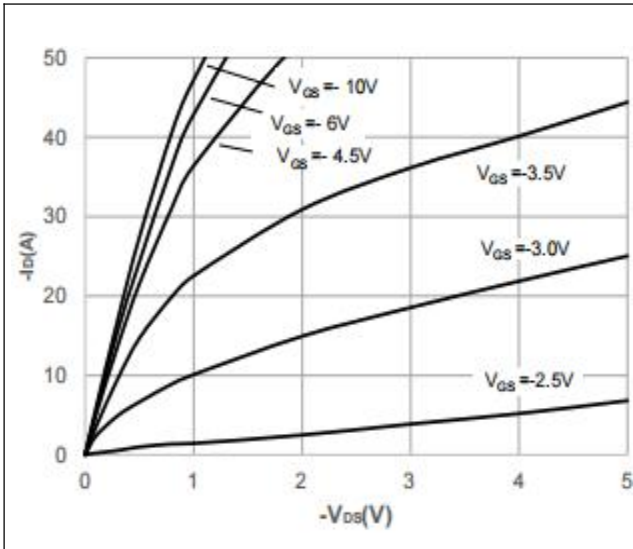


Figure 1. Typical Output Characteristics

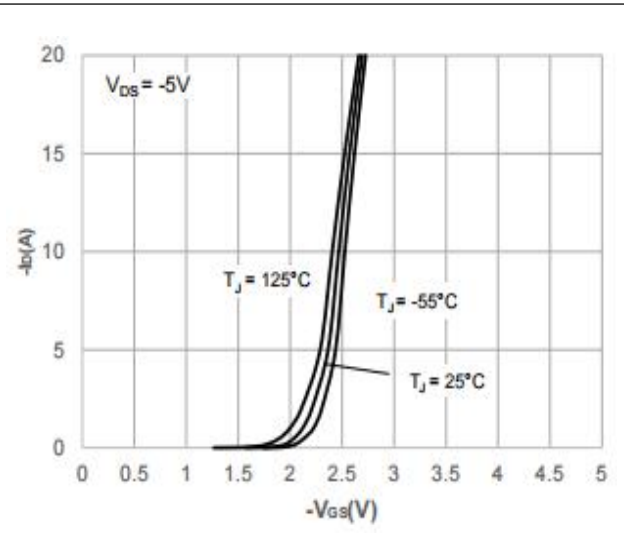


Figure 2. Typical Transfer Characteristics

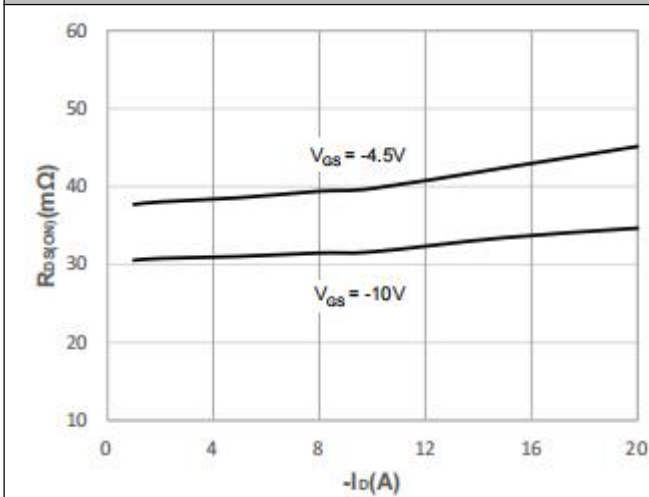


Figure 3. On- Resistance vs. Drain Current

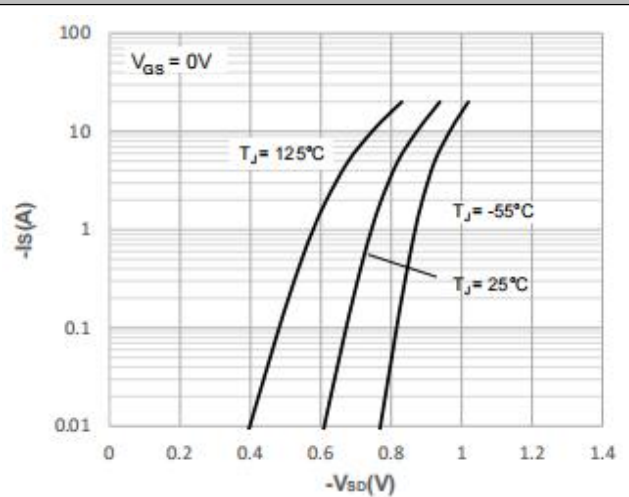


Figure 4. Body-Diode Characteristics

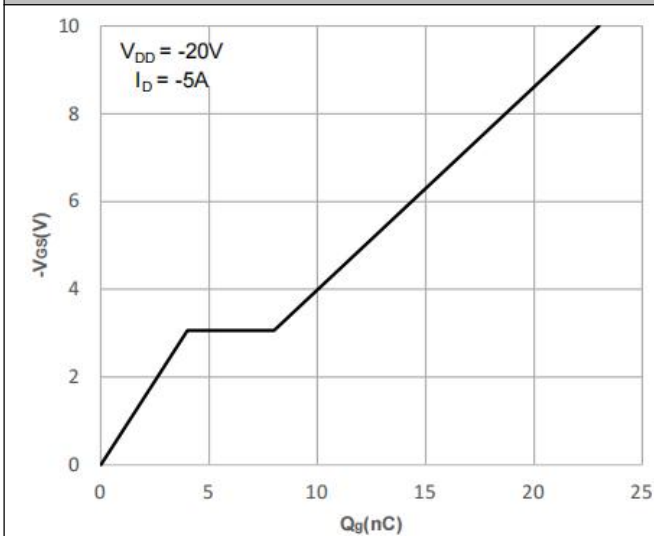


Figure 5. Gate-Charge Characteristics

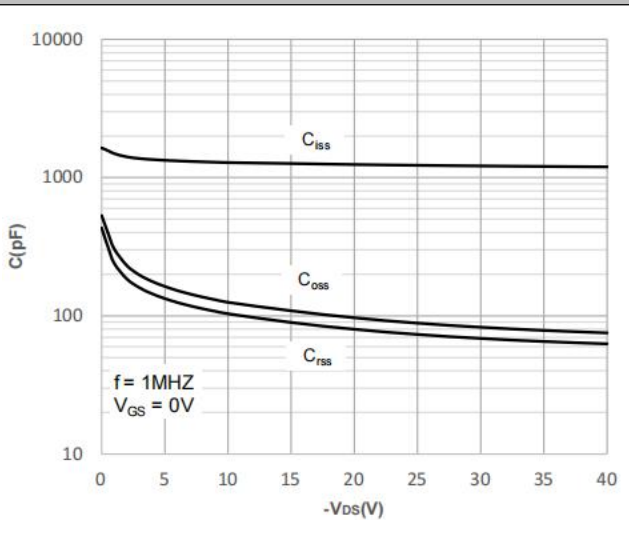
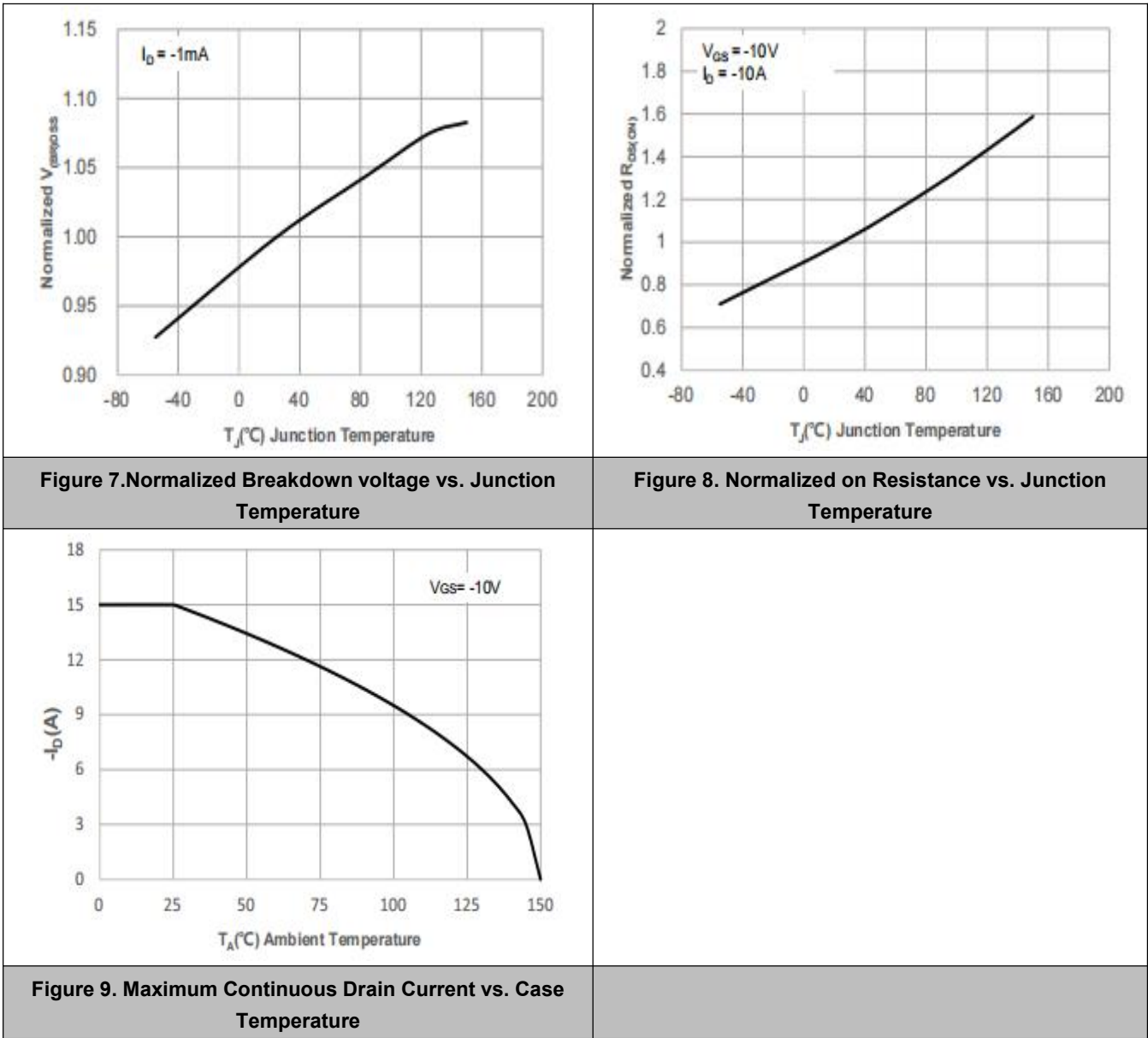
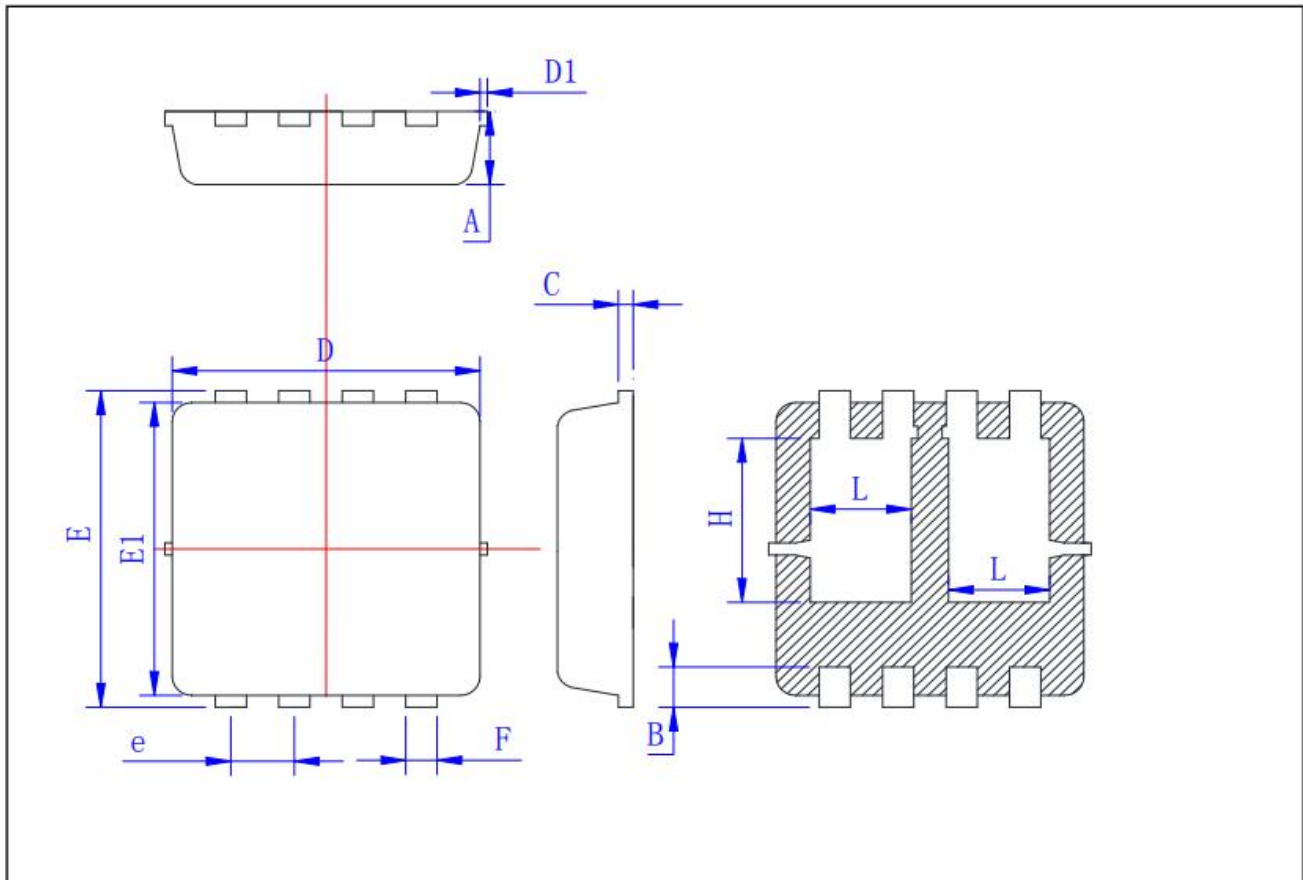


Figure 6. Capacitance Characteristics

■ Typical Characteristics(P-Channel)



■ Package Information



Symbol	Min. (mm)	Typ. (mm)	Max.(mm)
A	0.725	0.775	0.825
B	0.28	0.38	0.48
C	0.13	0.15	0.20
D	3.05	3.15	3.25
D1			0.10
E	3.25	3.35	3.45
E1	3.0	3.1	3.2
e	0.60	0.65	0.70
F	0.25	0.30	0.35
H	1.63	1.73	1.83
L	0.93	1.03	1.13