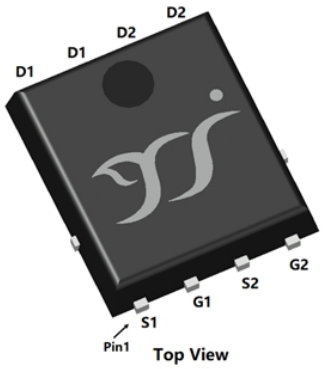
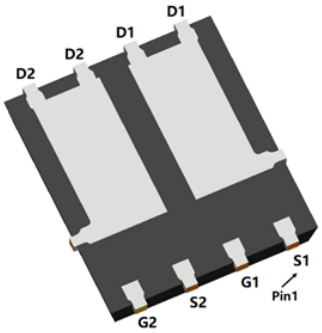
N-Channel and P-Channel Complementary MOSFET

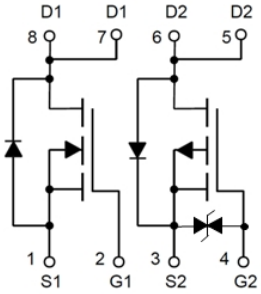


Top View



Bottom View

PDFN5060-8L



Product Summary

NMOS

- V_{DS} 40V
- I_D 39A
- $R_{DS(ON)}$(at V_{GS}=10V) ＜13mΩ
- $R_{DS(ON)}$(at V_{GS}=4.5V) ＜21mΩ

PMOS

- V_{DS} -40V
- I_D -45A
- $R_{DS(ON)}$(at V_{GS}=-10V) ＜13mΩ
- $R_{DS(ON)}$(at V_{GS}=-4.5V) ＜20mΩ
- 100% EAS Tested
- 100% ▽V_{DS} Tested
- ESD Level(HBM) H1C

General Description

- Excellent package for heat dissipation
- High density cell design for low $R_{DS(ON)}$
- High Speed switching
- Moisture Sensitivity Level 1
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free
- Part no. with suffix “Q” means AEC-Q101 qualified

Applications

- BMS
- Reverse polarity protection
- BLDC Motor driver
- Load switch

■ Limiting Values

Parameter	Conditions			Symbol	NMOS		PMOS		Unit
					Min	Max	Min	Max	
Drain-source Voltage				V_{DS}	-	40	-	-40	V
Gate-source Voltage (Note 1)				V_{GS}	-20	20	-20	20	
Continuous Drain Current (Note 2,3)	Steady-State	T_A=25℃	NMOS:V_{GS}=10V，PMOS:V_{GS}=-10V	I_D	-	9	-	-9.8	A
		T_A=100℃			-	5.7	-	-6.2	
Continuous Drain Current (Note 2,4)	Steady-State	T_C=25℃	NMOS:V_{GS}=10V，PMOS:V_{GS}=-10V, Chip limitation		-	39	-	-45	
		T_C=100℃			-	24.6	-	-28.4	
Pulsed Drain Current	T_C=25℃,t_p≤10μs			I_{DM}	-	156	-	-180	
Maximum Body-Diode Continuous Current	T_C=25℃			I_S	-	32	-	-37	
Avalanche Energy (non-repetitive)	NMOS:T_J=25℃,V_G=10V,R_G=25Ω,L=0.5mH,I_{AS}=14A			EAS	-	49	-	110.2	mJ
	PMOS:T_J=25℃,V_G=-10V,R_G=25Ω,L=0.5mH,I_{AS}=-21A								
Total Power Dissipation (Note 2,3)	Steady-State	T_A=25℃		P_D	-	2.01	-	2.08	W
		T_A=100℃			-	0.8	-	0.83	
Total Power Dissipation (Note 2,4)	Steady-State	T_C=25℃			-	37.8	-	44.6	
		T_C=100℃			-	15.1	-	17.8	
Junction and Storage Temperature Range				T_J ,T_{STG}	-55	150	-55	150	℃

■Thermal Resistance

Parameter		Symbol	NMOS		PMOS		Units
			Typ	Max	Typ	Max	
Thermal Resistance Junction-to-Ambient (Note 3)	Steady-State	$R_{\theta JA}$	-	62	-	60	℃/W
Thermal Resistance Junction-to-Case	Steady-State	$R_{\theta JC}$	-	3.3	-	2.8	

■ NMOS Electrical Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Static Parameter						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V,I_D=250μA,Tj=25℃	40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=40V,V_{GS}=0V,Tj=25℃	-	-	1	μA
		V_{DS}=40V,V_{GS}=0V,Tj=125℃	-	-	100	
Gate-Source Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V,Tj=25℃	-	-	±100	nA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA,Tj=25℃	1	1.5	2	V
Static Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS}=10V,I_D=20A,Tj=25℃	-	10.5	13	mΩ
		V_{GS}=4.5V,I_D=10A,Tj=25℃	-	14	21	
Diode Forward Voltage	V_{SD}	I_S=20A,V_{GS}=0V,Tj=25℃	-	0.89	1.2	V
Gate Resistance	R_G	f=1MHz,Tj=25℃	-	2.6	-	Ω
Dynamic Parameters						
Input Capacitance	C_{iss}	V_{DS}=20V,V_{GS}=0V,f=1MHz,Tj=25℃	-	1012	1518	pF
Output Capacitance	C_{oss}		-	126	-	
Reverse Transfer Capacitance	C_{rss}		-	98	-	
Switching Parameters						
Total Gate Charge	Q_g	V_{GS}=10V,V_{DS}=20V,I_D=20A,Tj=25℃	-	21.5	-	nC
Gate-Source Charge	Q_{gs}		-	3.3	-	
Gate-Drain Charge	Q_{gd}		-	4.9	-	
Reverse Recovery Charge	Q_{rr}	I_F=20A,di/dt=100A/μs,V_{GS}=0V,V_R=20V, Tj=25℃	-	7	-	nC
Reverse Recovery Time	t_{rr}		-	13	-	ns
Turn-on Delay Time	$t_{D(on)}$	V_{GS}=10V,V_{DS}=20V,I_D=20A,R_{GEN}=3Ω, Tj=25℃	-	7.6	-	ns
Turn-on Rise Time	t_r		-	3.8	-	
Turn-off Delay Time	$t_{D(off)}$		-	25.6	-	
Turn-off Fall Time	t_f		-	5.9	-	

■ PMOS Electrical Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Static Parameter						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V,I_D=-250μA,Tj=25℃	-40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=-40V,V_{GS}=0V,Tj=25℃	-	-	-1	μA
		V_{DS}=-40V,V_{GS}=0V,Tj=125℃	-	-	-100	
Gate-Source Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V,Tj=25℃	-	-	±10	μA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=-250μA,Tj=25℃	-1.2	-1.7	-2.2	V
Static Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS}=-10V,I_D=-20A,Tj=25℃	-	9.8	13	mΩ
		V_{GS}=-4.5V,I_D=-10A,Tj=25℃	-	13.4	20	
Diode Forward Voltage	V_{SD}	I_S=-20A,V_{GS}=0V,Tj=25℃	-	-0.9	-1.2	V
Gate Resistance	R_G	f=1MHz,Tj=25℃	-	6.5	-	Ω
Dynamic Parameters						
Input Capacitance	C_{iss}	V_{DS}=-20V,V_{GS}=0V,f=1MHz,Tj=25℃	-	3006	4509	pF
Output Capacitance	C_{oss}		-	324	-	
Reverse Transfer Capacitance	C_{rss}		-	268	-	
Switching Parameters						
Total Gate Charge	Q_g	V_{GS}=-10V,V_{DS}=-20V,I_D=-20A,Tj=25℃	-	55.4	-	nC
Gate-Source Charge	Q_{gs}		-	10.2	-	
Gate-Drain Charge	Q_{gd}		-	9.8	-	
Reverse Recovery Charge	Q_{rr}	I_F=-20A,di/dt=100A/us,V_{GS}=0V, V_R=-20V,Tj=25℃	-	24.7	-	nC
Reverse Recovery Time	t_{rr}		-	24.7	-	ns
Turn-on Delay Time	$t_{D(on)}$	V_{GS}=-10V,V_{DS}=-20V,I_D=-20A, R_{GEN}=3Ω,Tj=25℃	-	10.6	-	ns
Turn-on Rise Time	t_r		-	63.9	-	
Turn-off Delay Time	$t_{D(off)}$		-	95.1	-	
Turn-off Fall Time	t_f		-	66.5	-	

Note：

1. PMOS:V_{GS}=-20V/+10V according AEC-Q101 at Tj=150℃.
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
3. The value of $R_{\theta JA}$ is measured with the device mounted on the 40mm*40mm*1.1mm single layer FR-4 PCB board with 1 in^2 pad of 2oz. Copper, in the still air environment with T_A=25℃.The maximum allowed junction temperature of 150℃. The value in any given application depends on the user's specific board design.
4. Thermal resistance from junction to soldering point (on the exposed drain pad).

■ NMOS Typical Electrical and Thermal Characteristics Diagrams

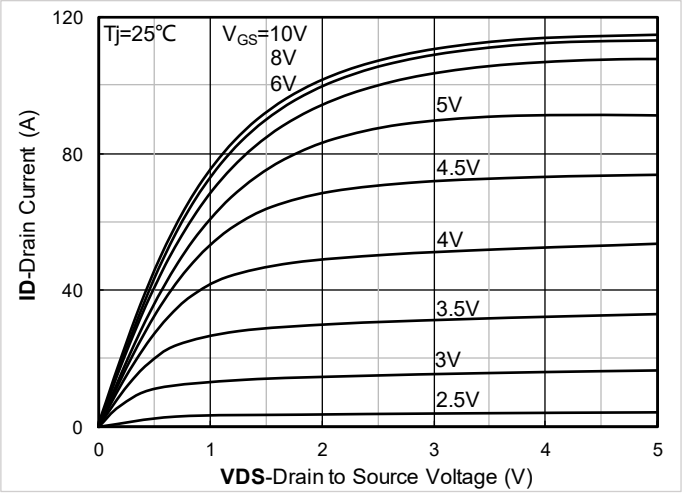


Figure 1. Output Characteristics; typical values

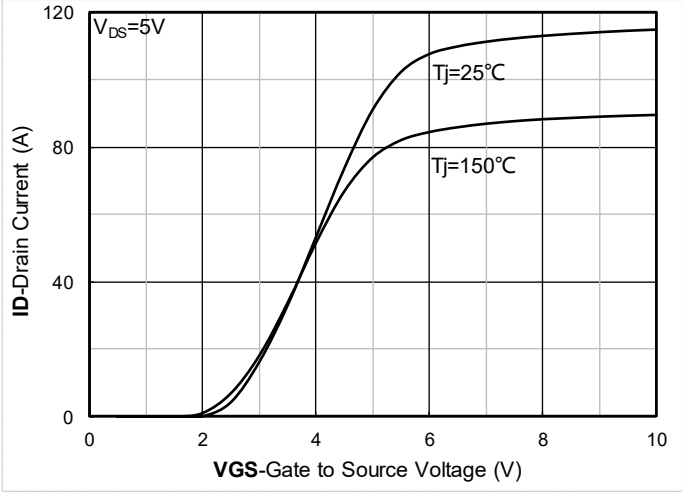


Figure 2. Transfer Characteristics; typical values

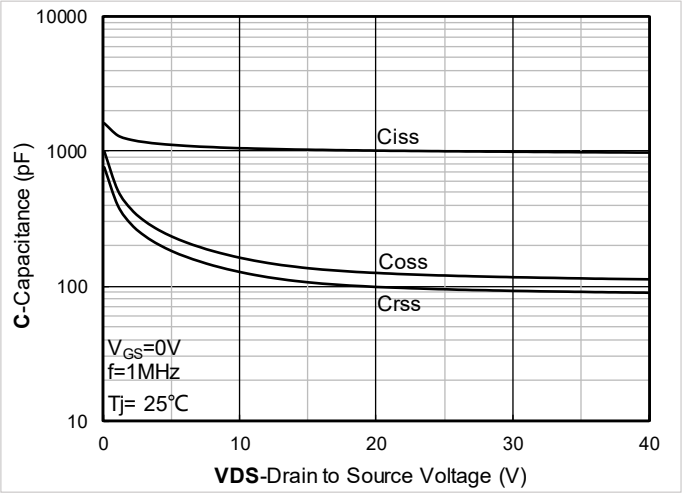


Figure 3. Capacitance Characteristics; typical values

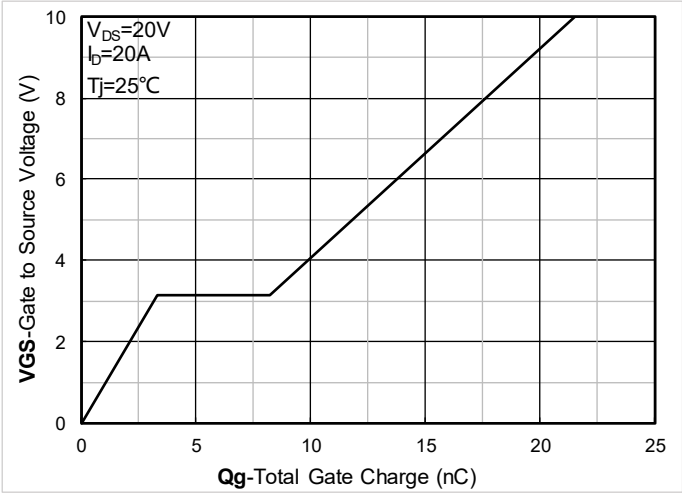


Figure 4. Gate Charge; typical values

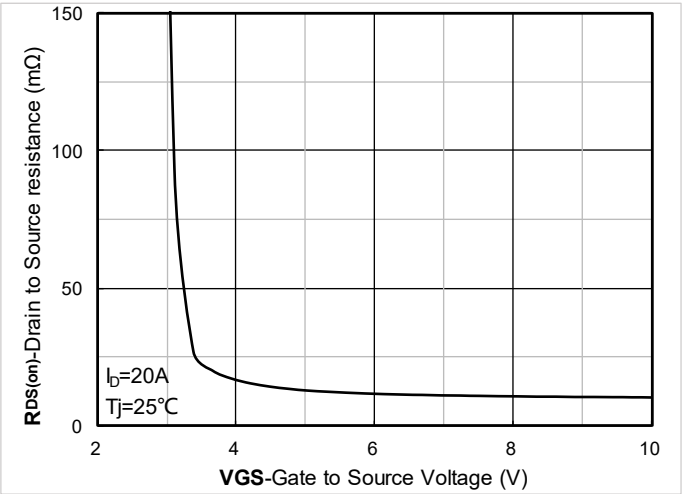


Figure 5. On-Resistance vs. Gate to Source Voltage; typical values

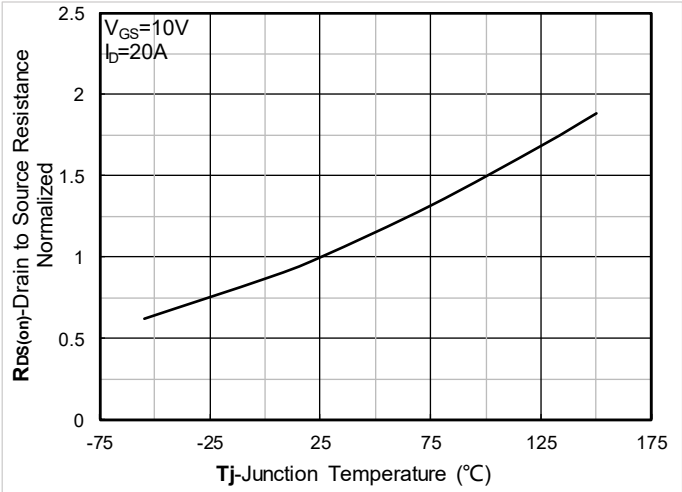


Figure 6. Normalized On-Resistance

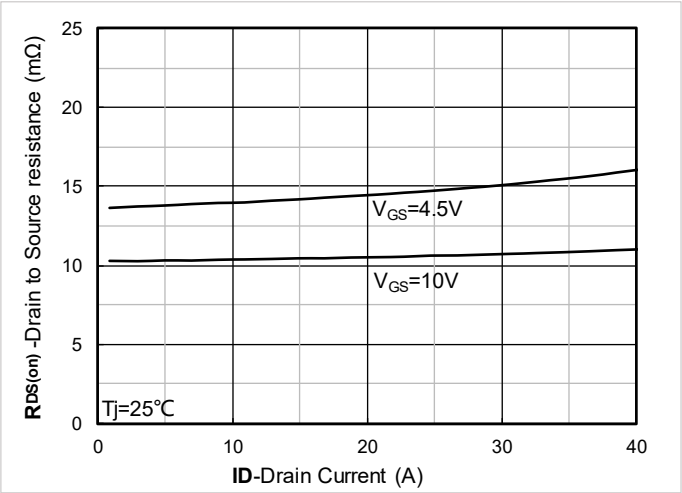


Figure 7. $R_{DS(on)}$ vs. Drain Current; typical values

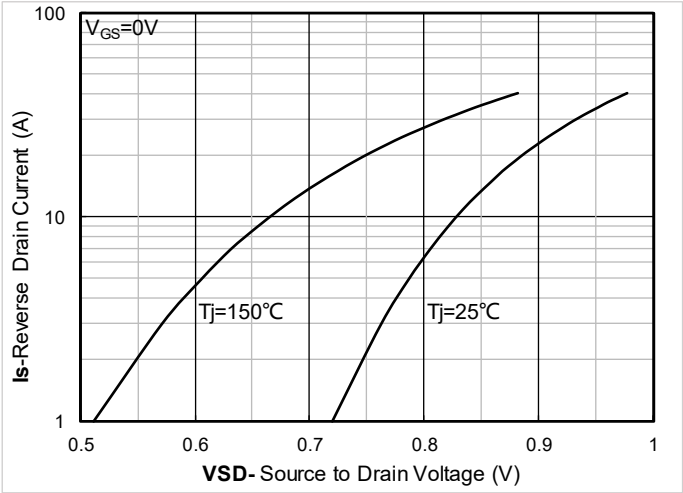


Figure 8. Forward characteristics of reverse diode; typical values

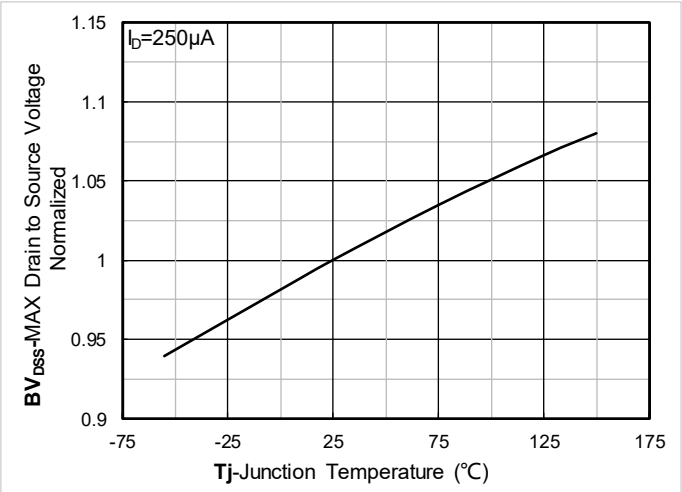


Figure 9. Normalized breakdown voltage

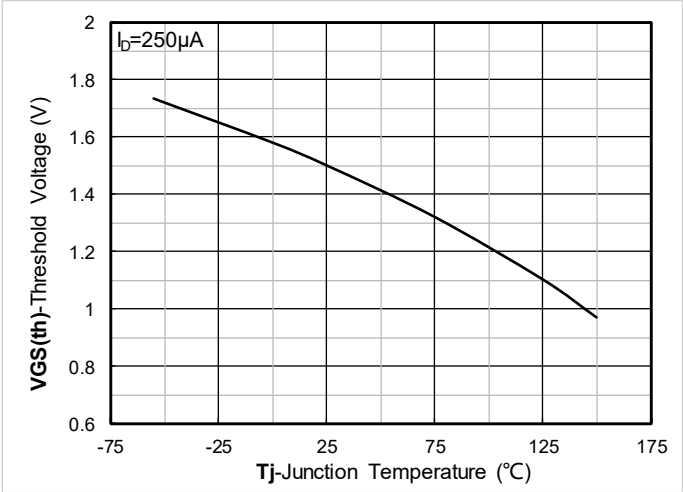


Figure 10. Gate Threshold voltage; typical values

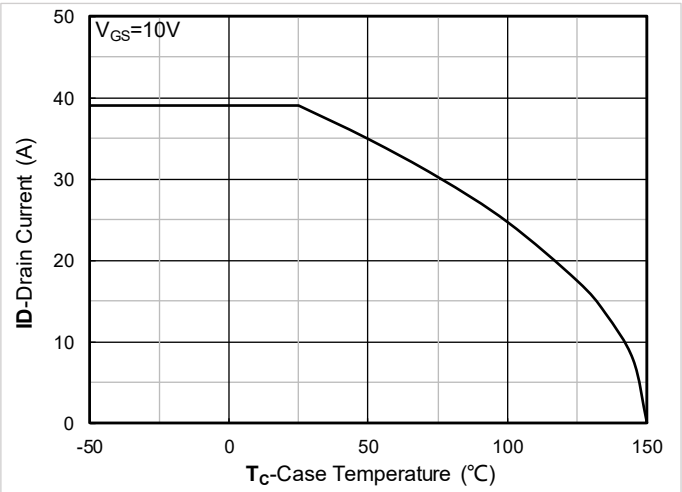


Figure 11. Current dissipation

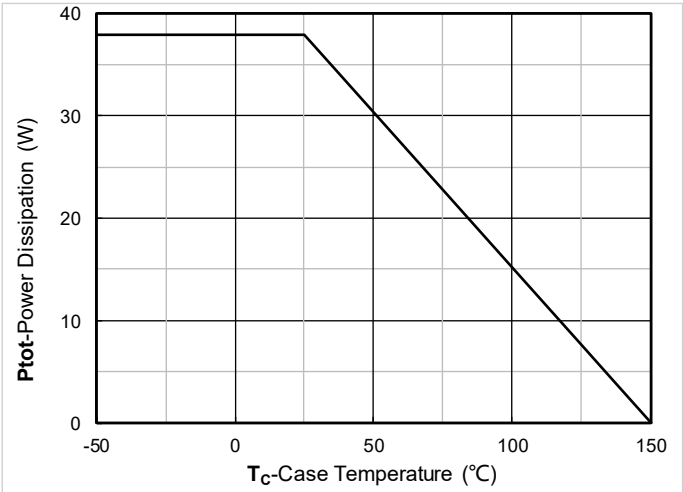


Figure 12. Power dissipation

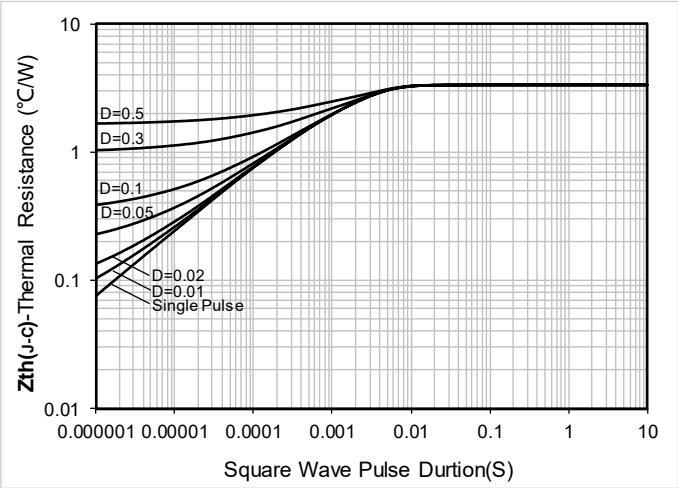


Figure 13. Maximum Transient Thermal Impedance

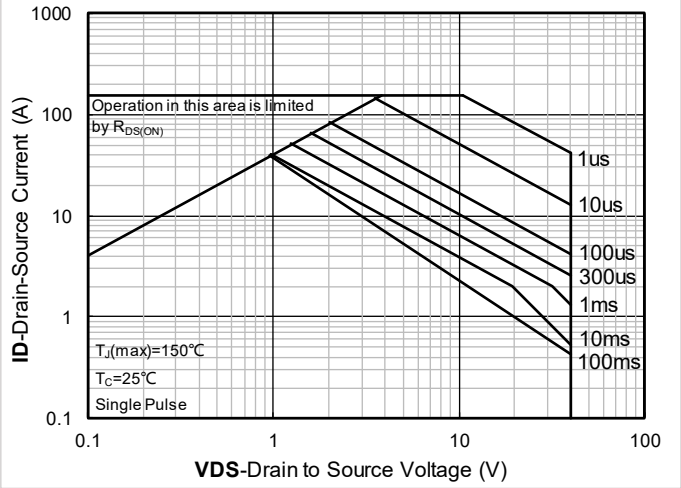


Figure 14. Safe Operation Area

■ PMOS Typical Electrical and Thermal Characteristics Diagrams

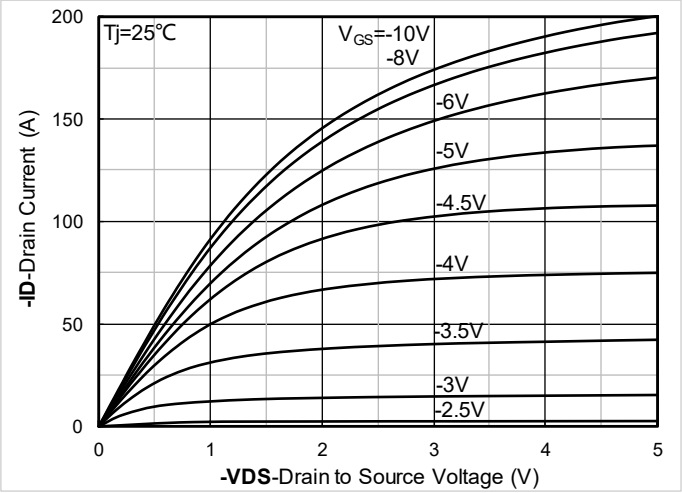


Figure 1. Output Characteristics; typical values

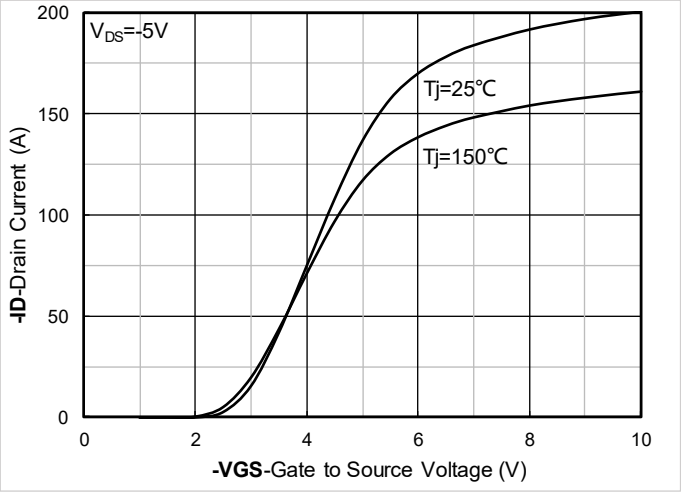


Figure 2. Transfer Characteristics; typical values

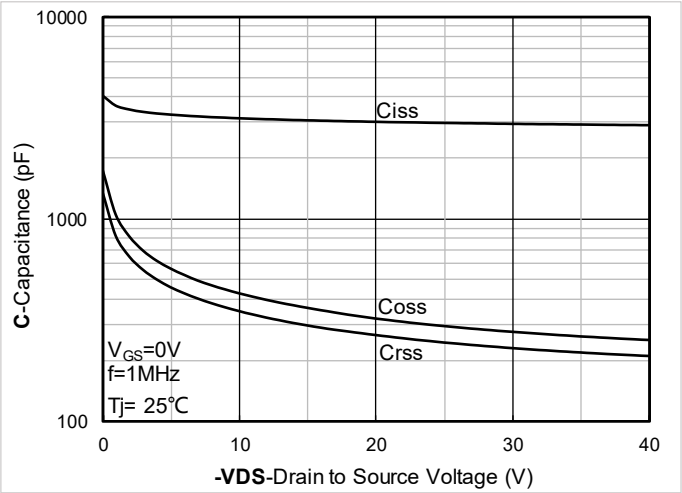


Figure 3. Capacitance Characteristics; typical values

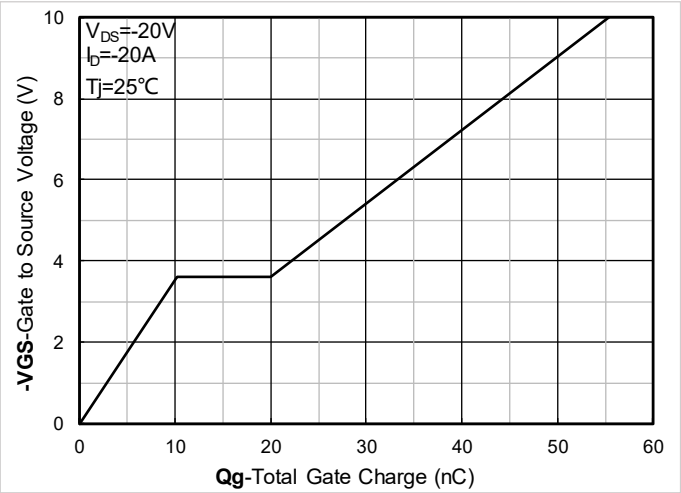


Figure 4. Gate Charge; typical values

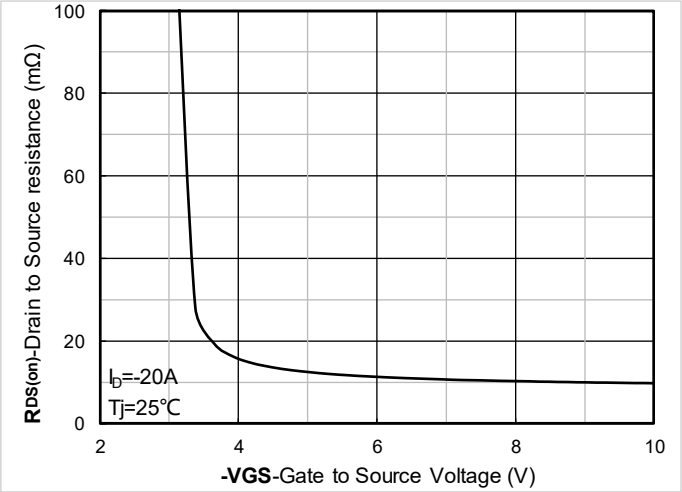


Figure 5. On-Resistance vs. Gate to Source Voltage; typical values

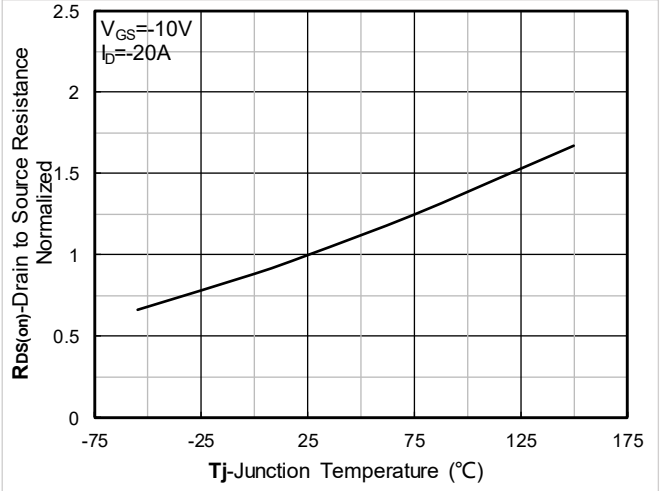


Figure 6. Normalized On-Resistance

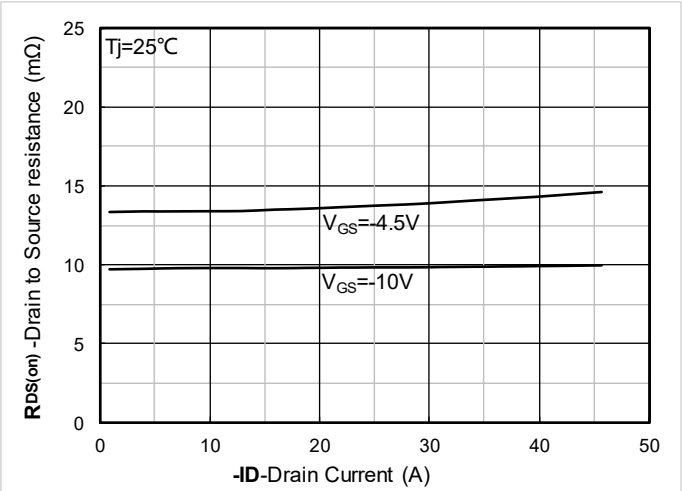


Figure 7. $R_{DS(on)}$ vs. Drain Current; typical values

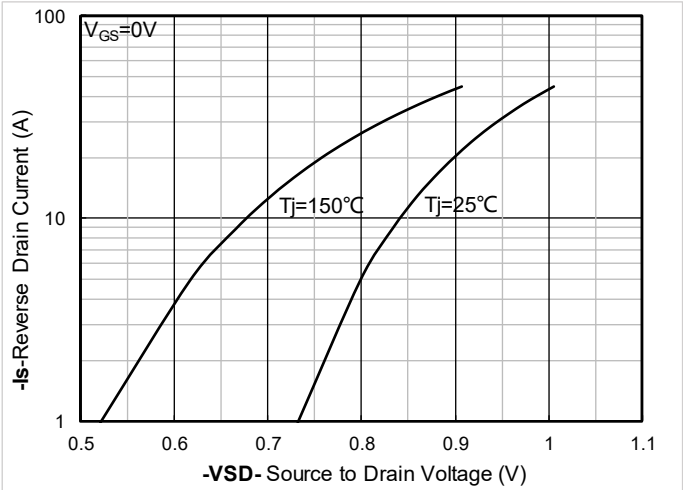


Figure 8. Forward characteristics of reverse diode; typical values

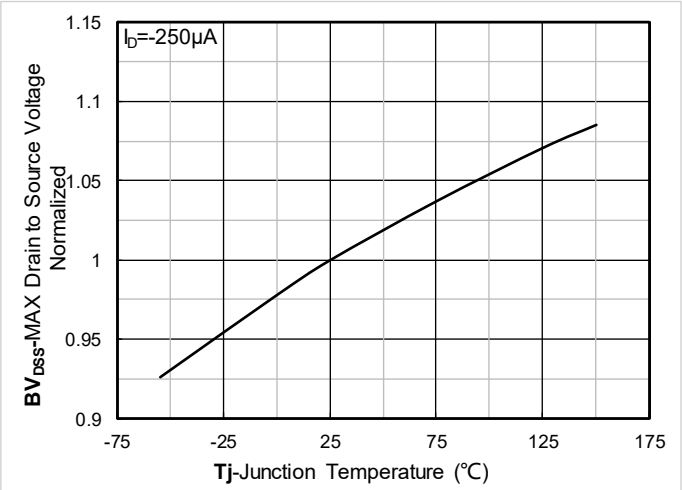


Figure 9. Normalized breakdown voltage

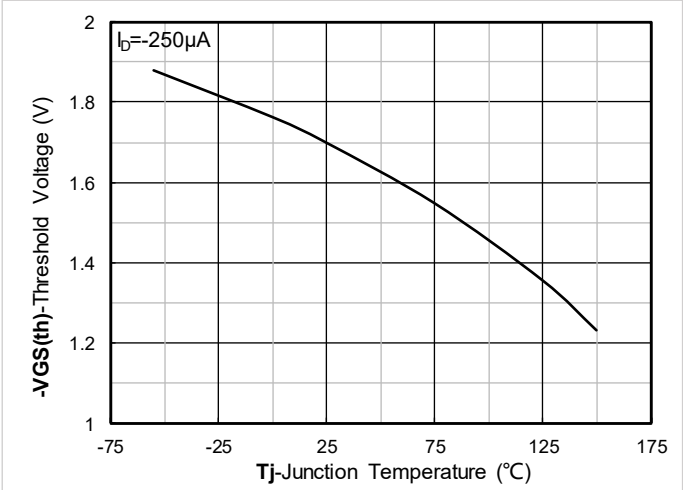


Figure 10. Gate Threshold voltage; typical values

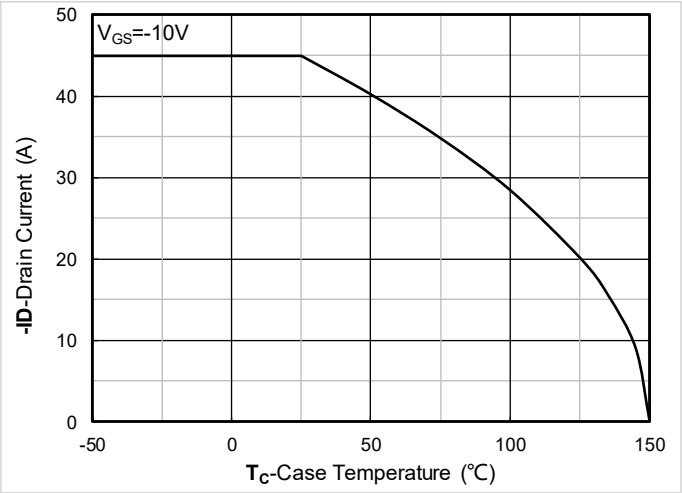


Figure 11. Current dissipation

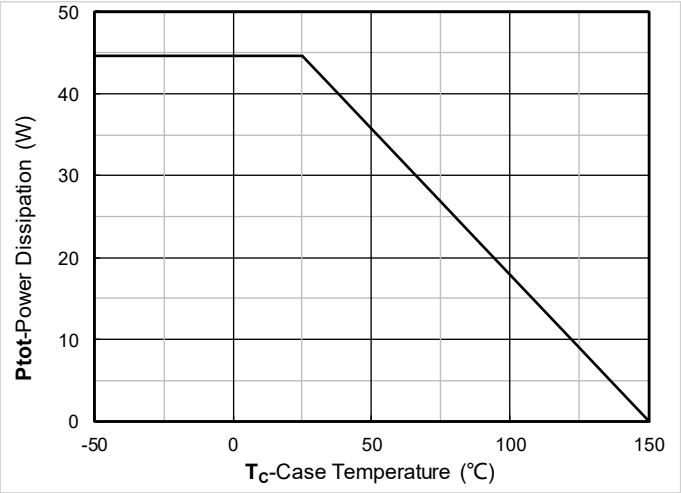


Figure 12. Power dissipation

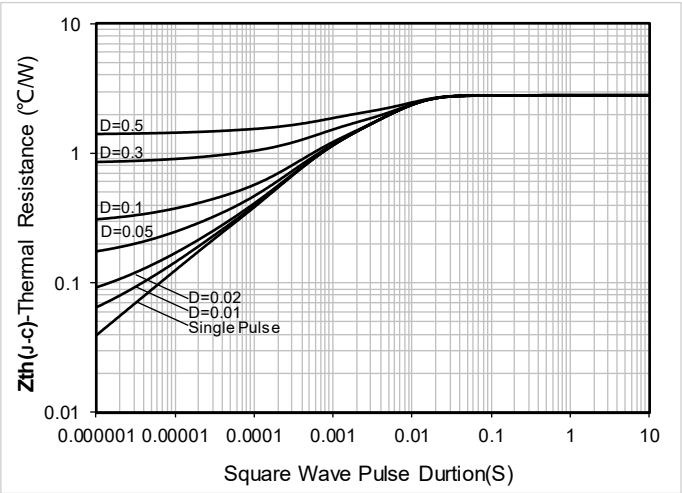


Figure 13. Maximum Transient Thermal Impedance

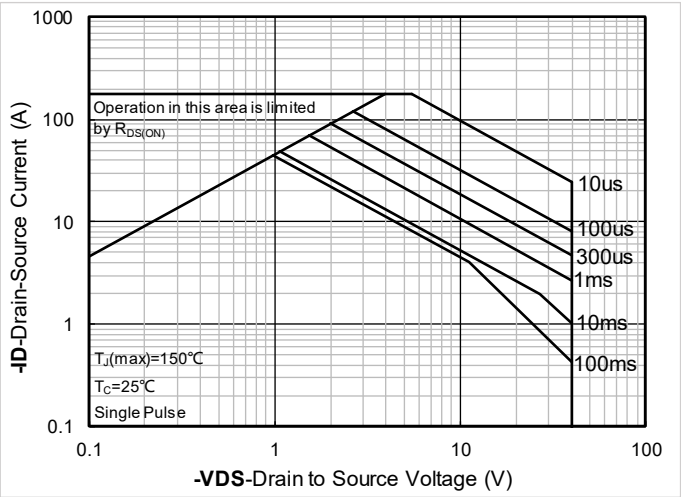
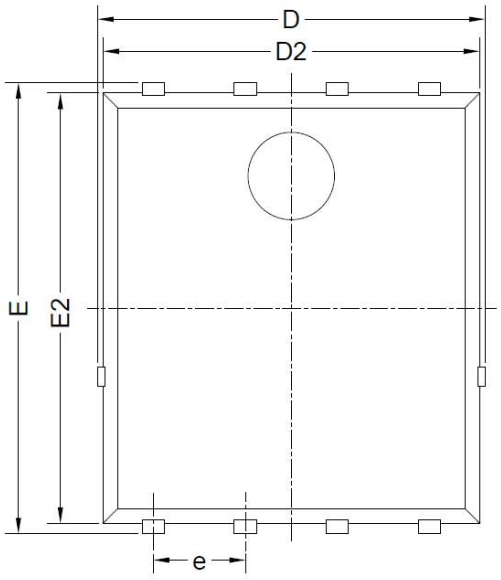
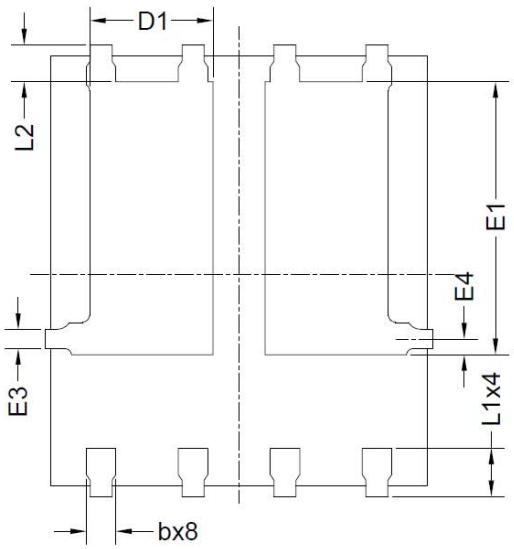


Figure 14. Safe Operation Area

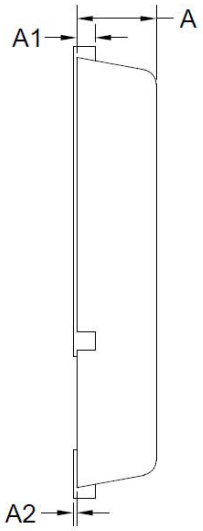
■ PDFN5060-8L-E-1.1MM Package information



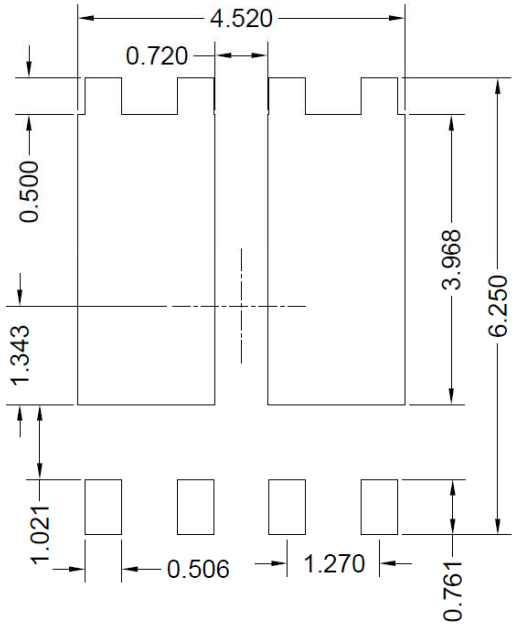
Top View
正面视图



Bottom View
背面视图



Side View
侧面视图

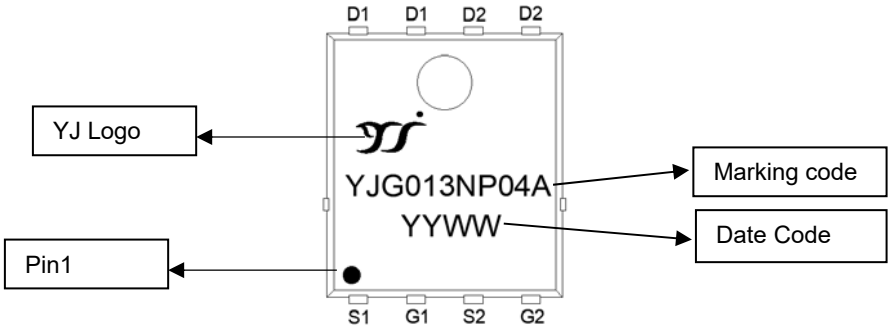


Suggested Solder Pad Layout
Top View

SYMBOL	MILLIMETER		
	MIN	NOM	MAX
D	5.15	5.35	5.55
E	5.95	6.15	6.35
A	1.00	1.10	1.20
A1		0.254 BSC	
A2			0.10
D1	1.50	1.70	1.90
E1	3.52	3.72	3.92
D2	5.00	5.20	5.40
E2	5.66	5.86	6.06
E3		0.254REF	
E4		0.21REF	
L1	0.56	0.66	0.76
L2		0.50 BSC	
b	0.31	0.41	0.51
e		1.27 BSC	

Note:
1.Controlling dimension:in millimeters.
2.General tolerance:±0.10mm.
3.The pad layout is for reference purposes only.

■ Marking Information



Note：
1. All marking is at middle of the product body
2. All marking is in laser printing
3. YJG013NP04A is part no., YYWW is date code, “YY” is year, “WW” is week
4. Body color: Black

Disclaimer

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