

Features

- N-Channel
40V/45A,
 $R_{DS(ON)} = 6.7m\Omega$ (Typ.) @ $V_{GS} = 10V$
- P-Channel
-40V/-31A,
 $R_{DS(ON)} = 14m\Omega$ (Typ.) @ $V_{GS} = -10V$
 $R_{DS(ON)} = 17m\Omega$ (Typ.) @ $V_{GS} = -4.5V$
- Excellent $Q_G \times R_{DS(on)}$ product(FOM)
- SGT Technology
- 100% avalanche tested

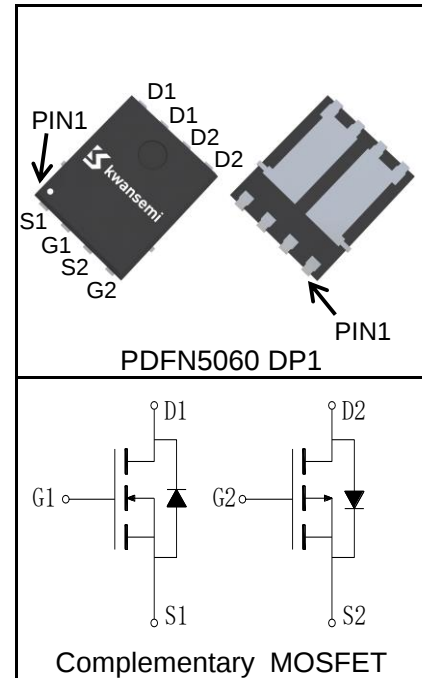
Applications

- Motor Drive Applications



Halogen-Free

Pin Description



Absolute Maximum Ratings

Symbol	Parameter		N-Channel	P-Channel	Unit
Common Ratings ($T_A = 25^\circ\text{C}$ Unless Otherwise Noted)					
V_{DSS}	Drain-Source Voltage		40	-40	V
V_{GSS}	Gate-Source Voltage		± 20	± 20	
T_J	Maximum Junction Temperature		150	150	$^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to 150	-55 to 150	$^\circ\text{C}$
I_S	Diode Continuous Forward Current	$T_C = 25^\circ\text{C}$	45	-31	A
Mounted on Large Heat Sink					
$I_{DP}^{(1)}$	Pulse Drain Current	$T_C = 25^\circ\text{C}$	180	-124	A
$I_D^{(2)}$	Continuous Drain Current @ T_C ($V_{GS} = \pm 10V$)	$T_C = 25^\circ\text{C}$	45	-31	A
		$T_C = 100^\circ\text{C}$	28	-19	
	Continuous Drain Current @ T_A ($V_{GS} = \pm 10V$) ⁽³⁾	$T_A = 25^\circ\text{C}$	14	-9	
		$T_A = 70^\circ\text{C}$	11	-7	
P_D	Maximum Power Dissipation @ T_C	$T_C = 25^\circ\text{C}$	26	27	W
		$T_C = 100^\circ\text{C}$	10	11	
	Maximum Power Dissipation @ T_A ⁽³⁾	$T_A = 25^\circ\text{C}$	2.8	2.8	
		$T_A = 70^\circ\text{C}$	1.8	1.8	
$R_{\theta JC}$	Thermal Resistance-Junction to Case		4.8	4.5	$^\circ\text{C/W}$
$R_{\theta JA}^{(3)}$	Thermal Resistance-Junction to Ambient		40	40	$^\circ\text{C/W}$
Drain-Source Avalanche Ratings					
$E_{AS}^{(4)}$	Avalanche Energy, Single Pulsed		100	144	mJ

Electrical Characteristics ($T_A=25^{\circ}\text{C}$ Unless Otherwise Noted)

Symbol	Parameter	Test Condition	Rating			Unit	
			Min.	Typ.	Max.		
Static Characteristics							
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250μA	N	40			V
		V _{GS} =0V, I _{DS} =-250μA	P	-40			
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =40V, V _{GS} =0V	N			1	μA
				T _J =125°C			
		V _{DS} =-40V, V _{GS} =0V	P			-1	
				T _J =125°C			
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250μA	N	2	3	4	V
		V _{DS} =V _{GS} , I _{DS} =-250μA	P	-1.2	-1.6	-2.3	
I _{GSS}	Gate Leakage Current	V _{GS} =±20V, V _{DS} =0V	N			±100	nA
		V _{GS} =±20V, V _{DS} =0V	P			±100	
R _{DS(ON)} ⑤	Drain-Source On-state Resistance	V _{GS} =10V, I _{DS} =10A	N		6.7	8.2	mΩ
		V _{GS} =-10V, I _{DS} =-10A	P		14	18	
		V _{GS} =6V, I _{DS} =5A	N		8.5	11	
		V _{GS} =-4.5V, I _{DS} =-5A	P		17	24	
Diode Characteristics							
V _{SD} ⑤	Diode Forward Voltage	I _{SD} =10A, V _{GS} =0V	N		0.84	1.2	V
		I _{SD} =-10A, V _{GS} =0V	P		-0.84	-1.2	
t _{rr}	Reverse Recovery Time	N-Channel I _{SD} =10A, dI _{SD} /dt=100A/μs	N		16		ns
			P		66		
Q _{rr}	Reverse Recovery Charge	P-Channel I _{SD} =-10A, dI _{SD} /dt=-100A/μs	N		30		nC
			P		54		
Dynamic Characteristics ⑥							
R _G	Gate Resistance	V _{GS} =0V,V _{DS} =0V,F=1MHz	N		5.4		Ω
			P		16		
C _{iss}	Input Capacitance	N-Channel V _{GS} =0V,V _{DS} =20V, Frequency=200KHz	N		1025		pF
			P		2360		
C _{oss}	Output Capacitance		N		420		
			P		200		
C _{rss}	Reverse Transfer Capacitance	P-Channel V _{GS} =0V,V _{DS} =-20V, Frequency=200KHz	N		9		
			P		145		

Electrical Characteristics ($T_A=25^{\circ}\text{C}$ Unless Otherwise Noted)

Symbol	Parameter	Test Condition	Rating			Unit
			Min.	Typ.	Max.	
Dynamic Characteristics ^⑥						
t _{d(ON)}	Turn-on Delay Time	N-Channel V _{DD} =20V, I _{DS} =10A, V _{GEN} =10V, R _G =3Ω	N		12	ns
			P		27	
t _r	Turn-on Rise Time		N		11	
			P		25	
t _{d(OFF)}	Turn-off Delay Time	P-Channel V _{DD} =-20V, I _{DS} =-10A, V _{GEN} = -10V, R _G =3Ω	N		16	
			P		73	
t _f	Turn-off Fall Time		N		9	
			P		19	
Gate Charge Characteristics ^⑥						
Q _g	Total Gate Charge	N-Channel V _{DS} =20V, V _{GS} =10V, I _{DS} =10A	N		15	nC
			P		46	
Q _{gs}	Gate-Source Charge	P-Channel V _{DS} =-20V, V _{GS} = -10V, I _{DS} =-10A	N		4.3	
			P		8.2	
Q _{gd}	Gate-Drain Charge		N		2.8	
			P		13	

- Notes:
- ① Pulse width limited by safe operating area.
 - ② Calculated continuous current based on maximum allowable junction temperature.
 - ③ When mounted on 1 inch square copper board, $t \leq 10\text{sec}$. The value in any given application depends on the user's specific board design.
 - ④ Limited by T_{Jmax} . Starting $T_J = 25^{\circ}\text{C}$, N Channel: $I_{ASmax} = 20\text{A}$, $L=0.5\text{mH}$, $V_{DD} = 24\text{V}$, $R_G = 25\Omega$, $V_{GS}=10\text{V}$, Part not recommended for use above this value. 100% Final Test at $I_{AS}=10\text{A}$, $L=0.5\text{mH}$. P-Channel: $I_{ASmax} = -24\text{A}$, $L=0.5\text{mH}$, $V_{DD} = -24\text{V}$, $R_G = 25\Omega$, $V_{GS}=-10\text{V}$, Part not recommended for use above this value. 100% Final Test at $I_{AS}=-12\text{A}$, $L=0.5\text{mH}$.
 - ⑤ Pulse test; Pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$.
 - ⑥ Guaranteed by design, not subject to production testing.

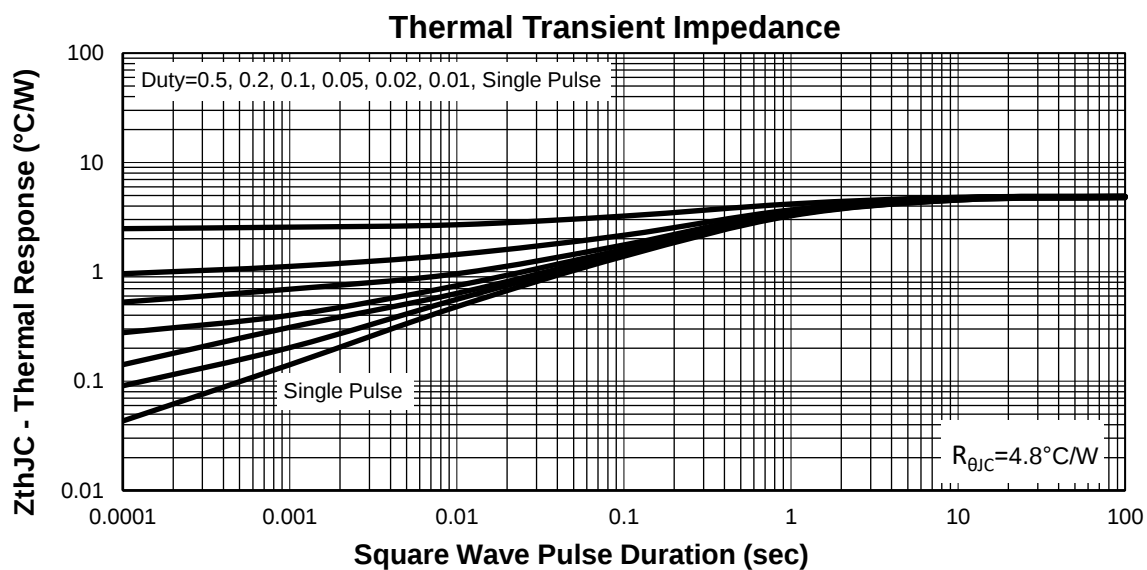
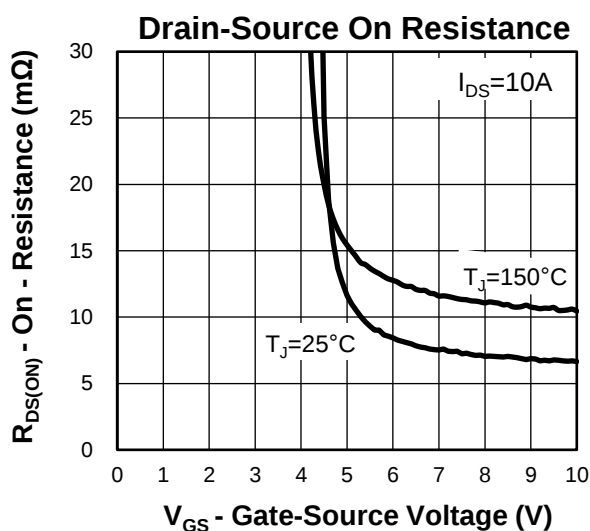
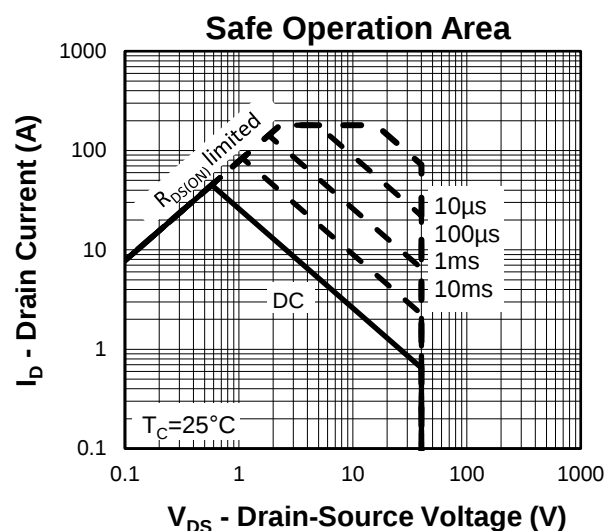
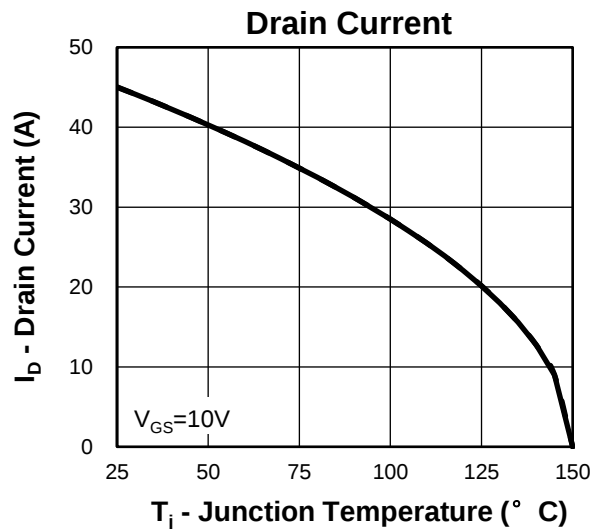
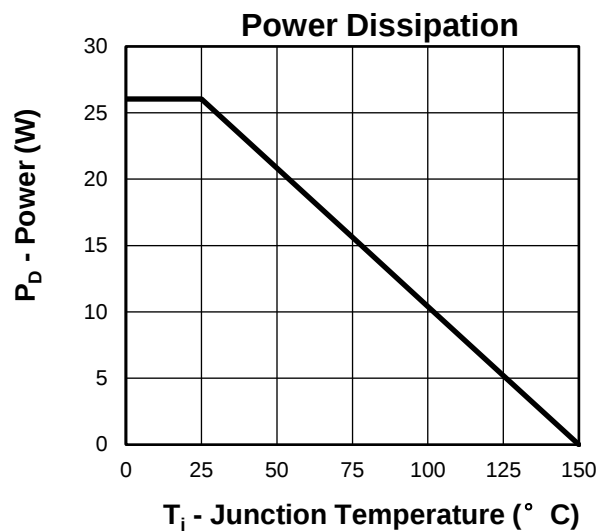
Ordering and Marking Information

Device	Package	Packaging	Quantity	Reel Size	Tape width
KS4613NAT	PDFN5060 DP1	Tape&Reel	5000	13"	12mm

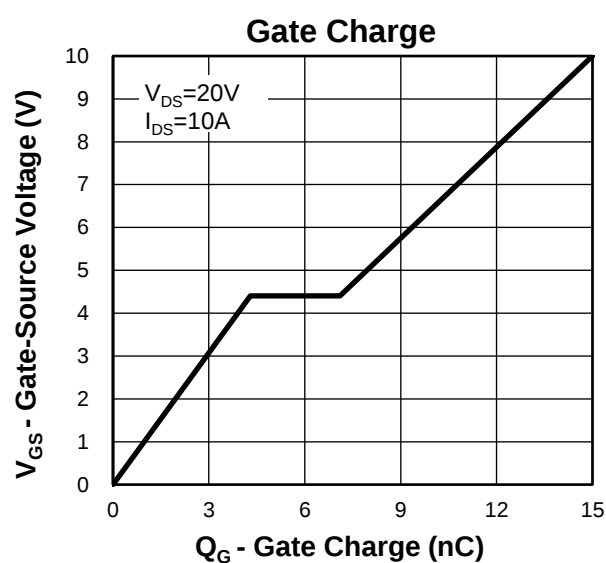
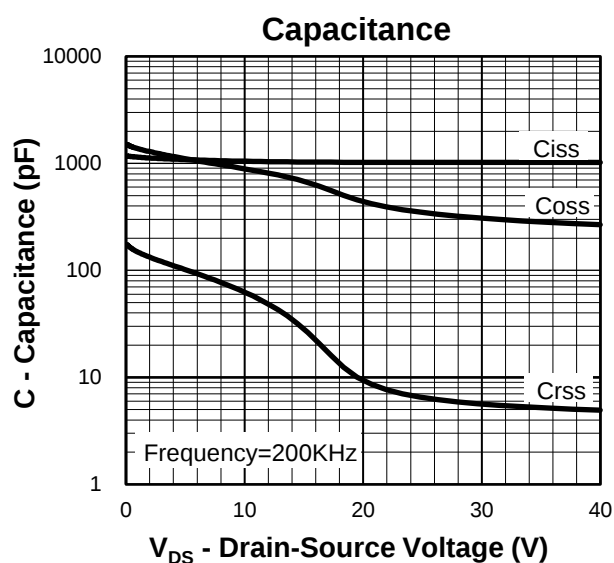
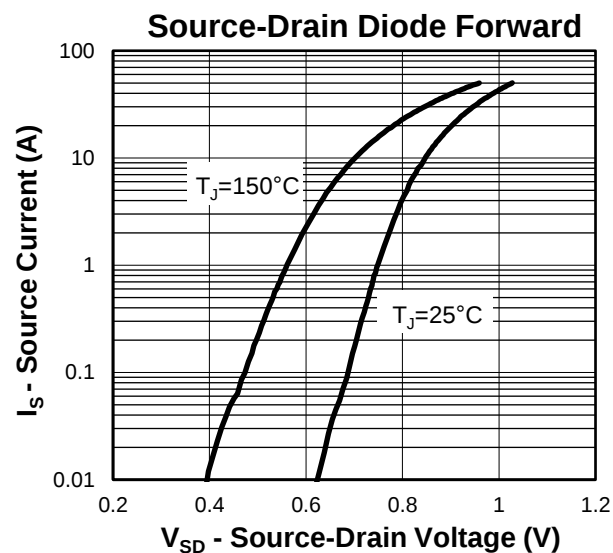
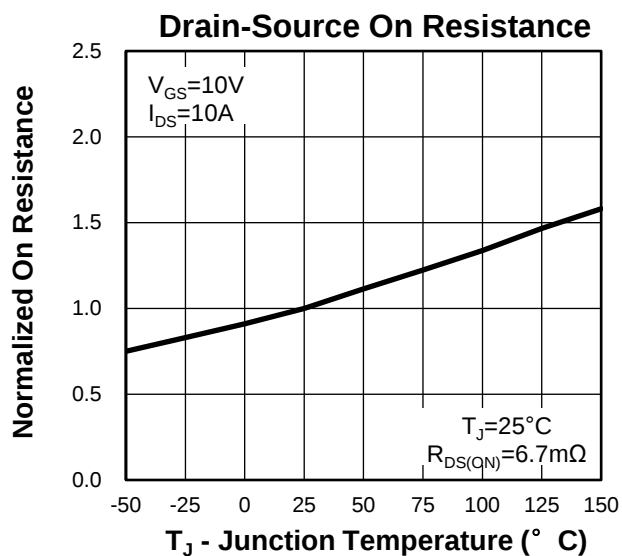
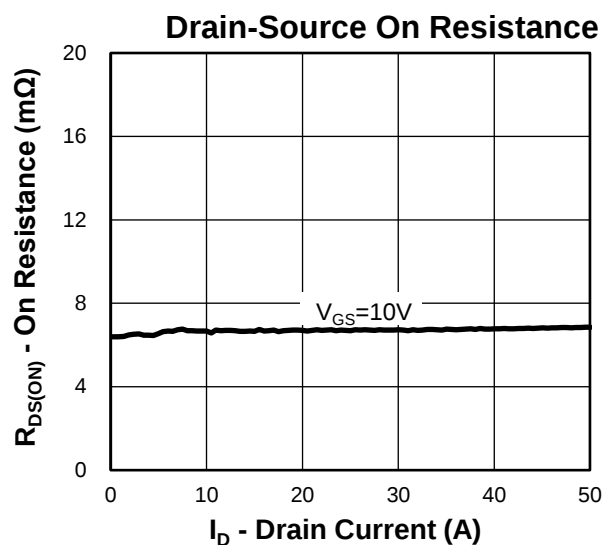
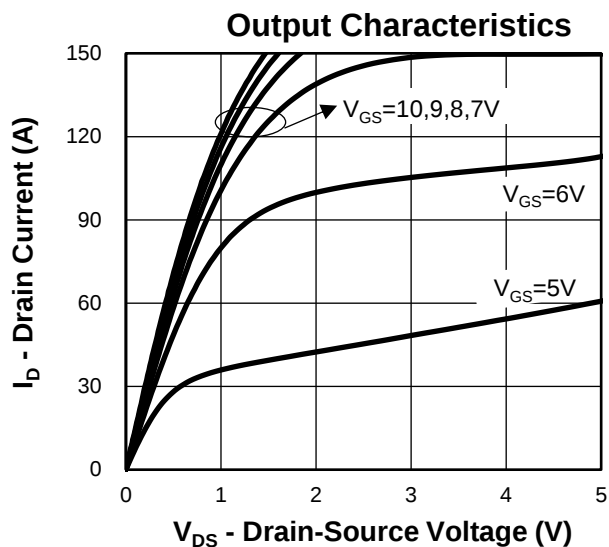


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2nd Line: Part Number(4613T)
3rd Line: Lot Number(YWWXXX)

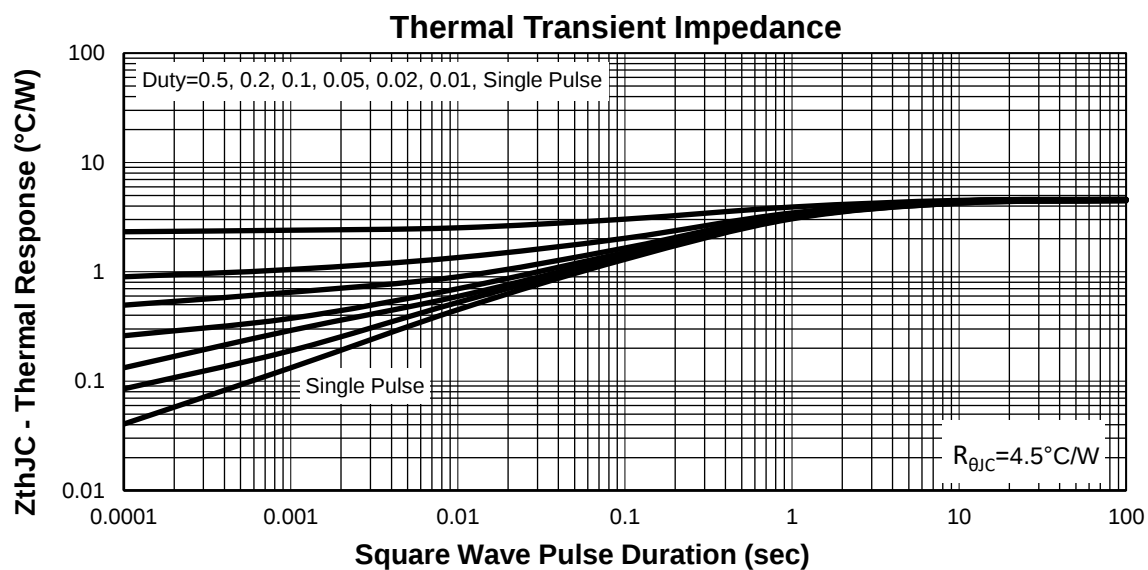
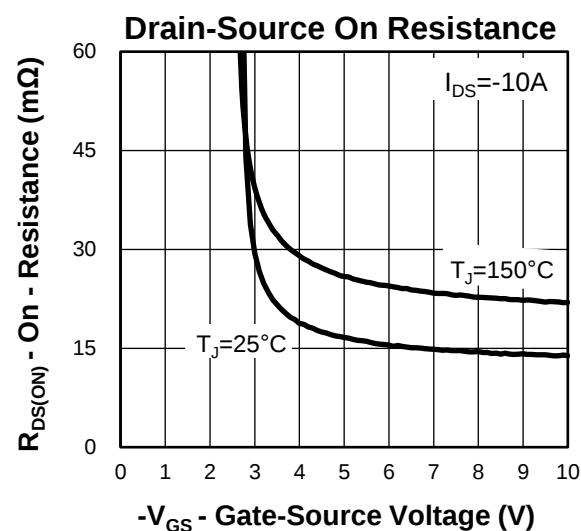
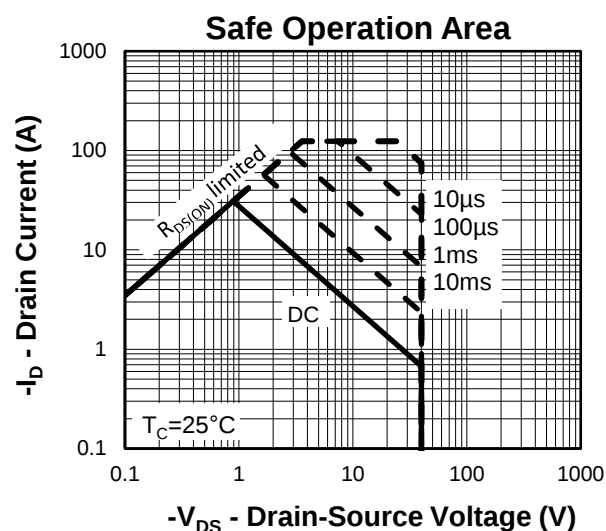
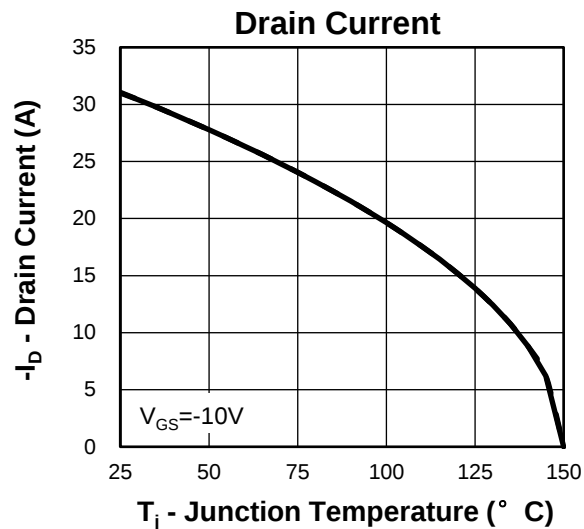
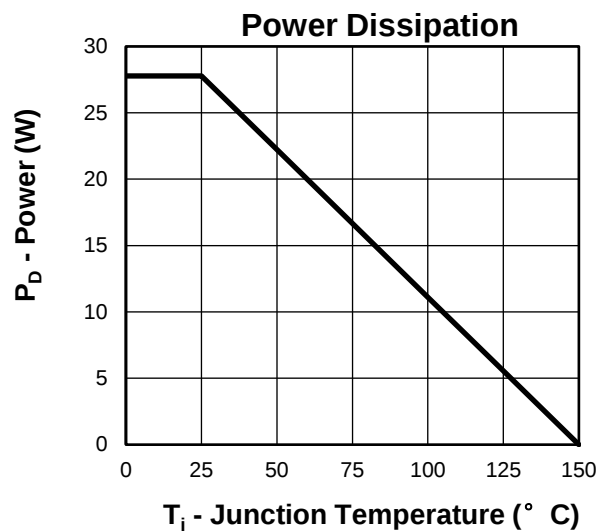
Typical Characteristics(N-Channel)



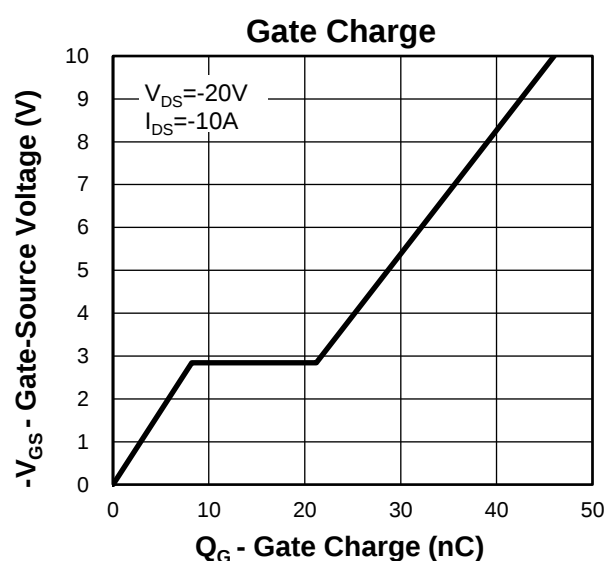
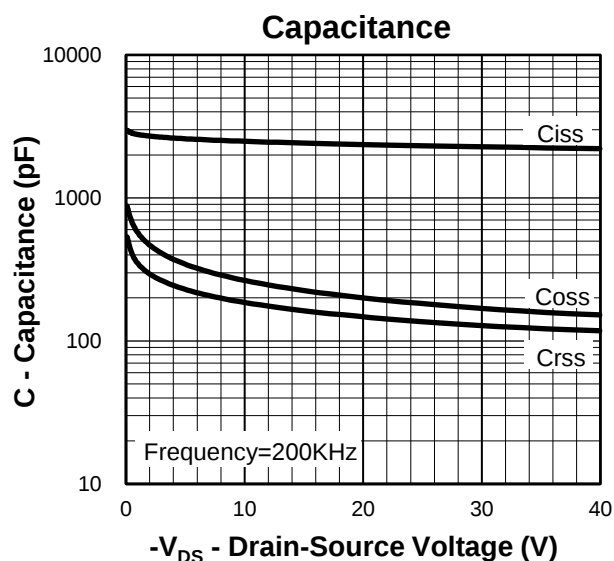
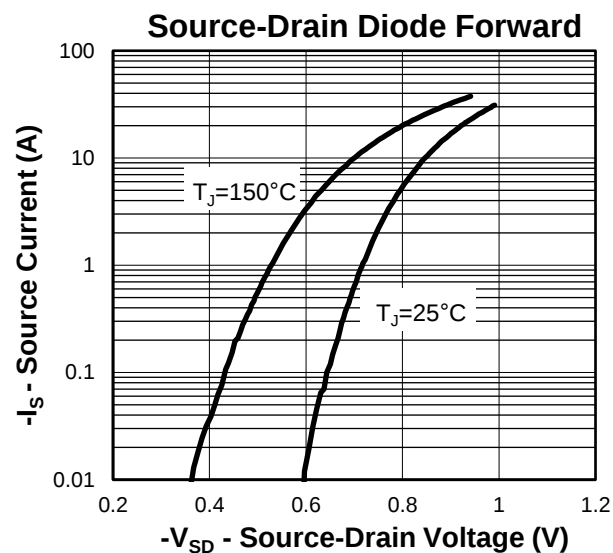
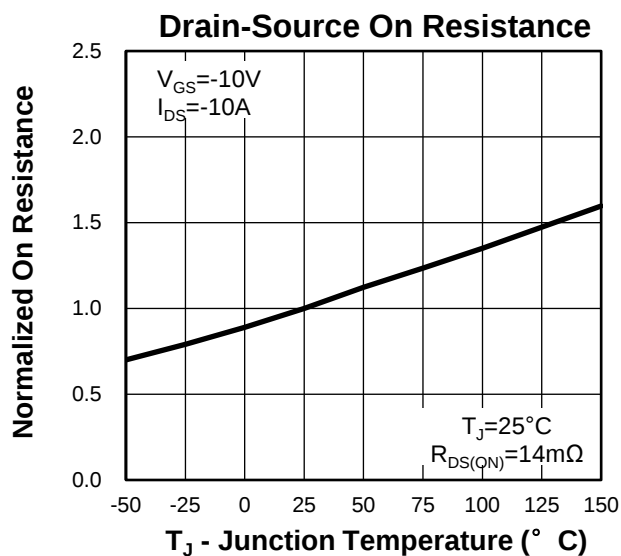
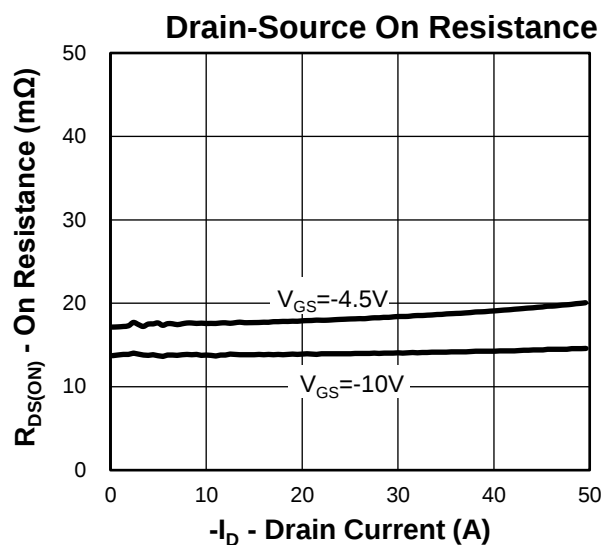
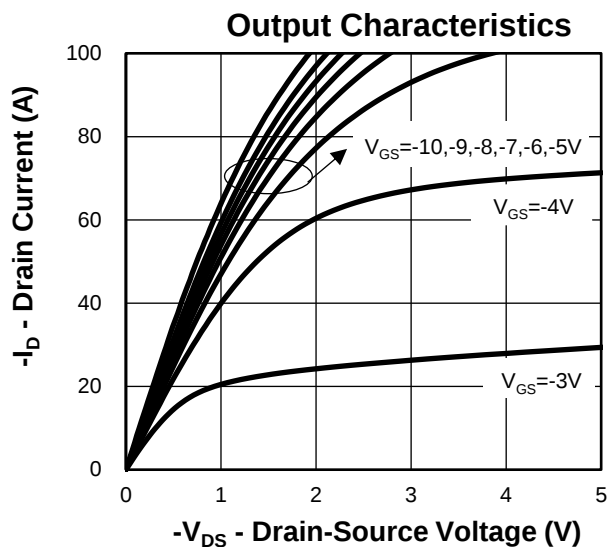
Typical Characteristics(N-Channel)

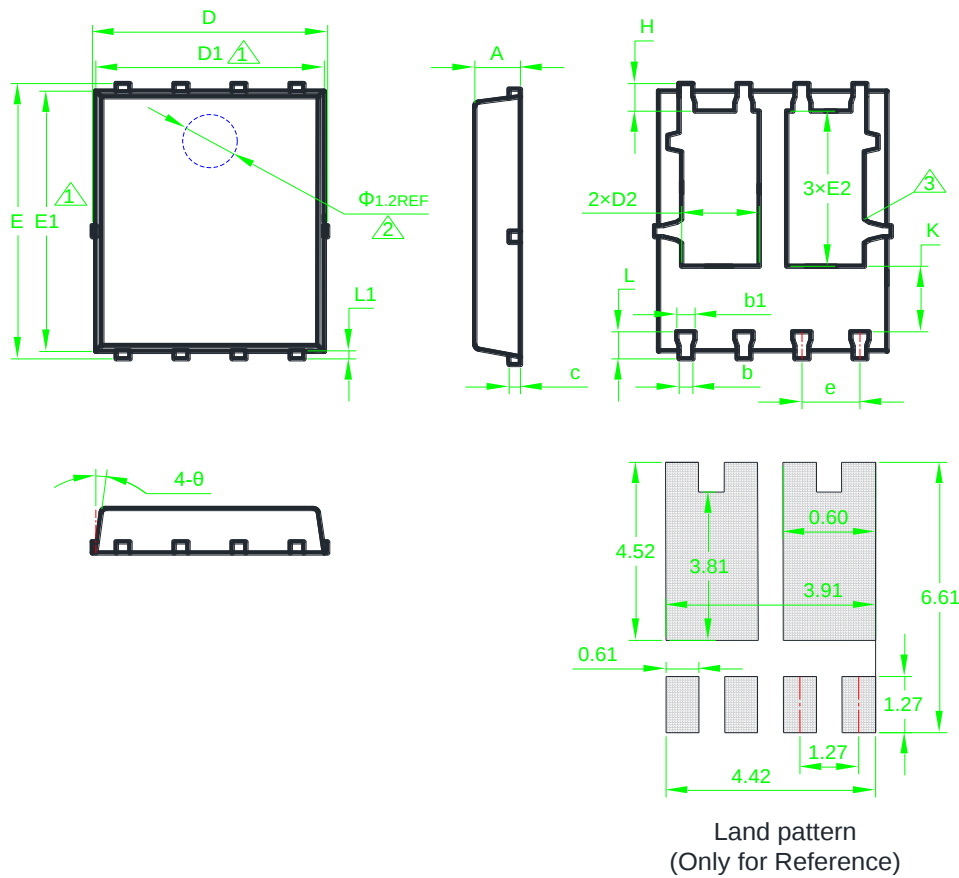


Typical Characteristics(P-Channel)



Typical Characteristics(P-Channel)

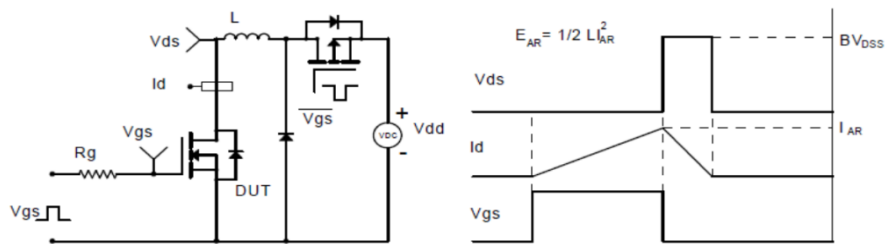


Package Information
PDFN5060 DP1


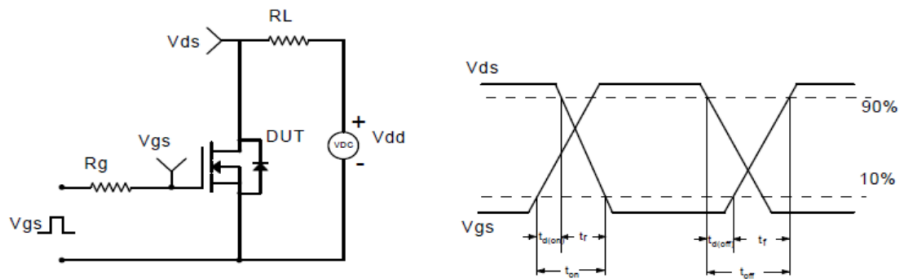
SYMBOL	MM			INCH			SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX		MIN	NOM	MAX	MIN	NOM	MAX
A	0.90	1.00	1.20	0.035	0.039	0.047	E1	5.45	*	5.95	0.215	*	0.234
b	0.25	0.30	0.35	0.010	0.012	0.014	E2	3.35	3.50	3.80	0.132	0.138	0.150
b1	0.30	0.40	0.50	0.012	0.016	0.020	e	1.27BSC			0.050BSC		
c	0.20	0.25	0.30	0.008	0.010	0.012	H	0.41	0.51	0.71	0.016	0.020	0.028
D	5.15BSC			0.203BSC			K	1.10	*	1.50	0.043	*	0.059
D1	4.80	*	5.30	0.189	*	0.209	L	0.51	0.61	0.71	0.020	0.024	0.028
D2	1.50	1.70	1.90	0.059	0.067	0.075	L1	0.06	0.13	0.20	0.002	0.005	0.008
E	5.90	6.05	6.25	0.232	0.238	0.246	θ	0°	*	12°	0°	*	12°

- ① Dimensions D1 and E1 do not include mold flash protrusions or gate burrs.
- ② The existence and size of demolding hole are variable depending on mold.
- ③ The size and shape of exposed pad are variable depending on mold.

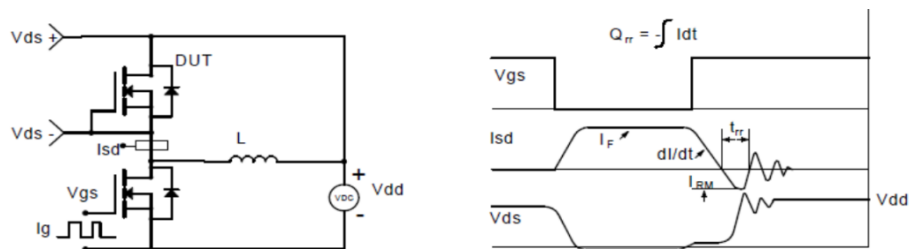
Avalanche Test Circuit and Waveforms(N-Channel)



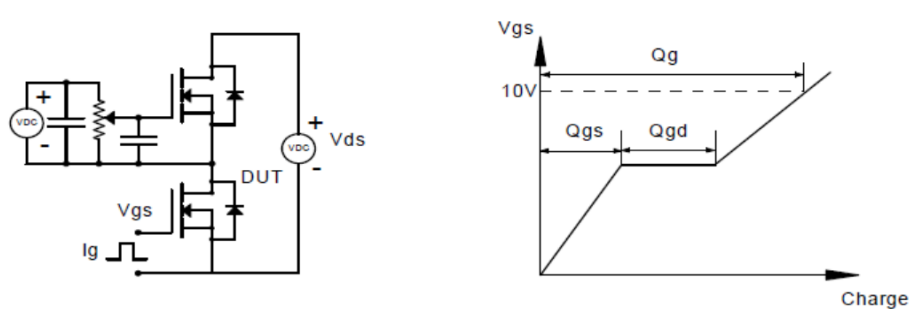
Switching Time Test Circuit and Waveforms(N-Channel)



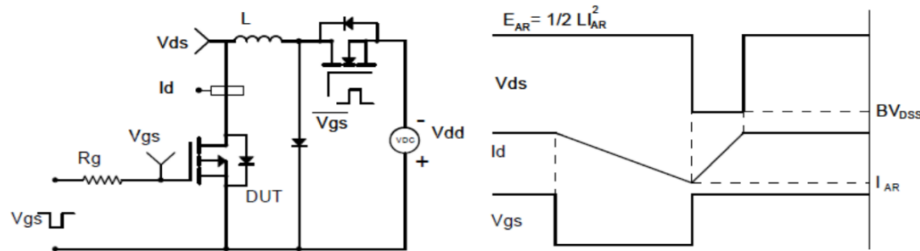
Diode Recovery Test Circuit and Waveforms(N-Channel)



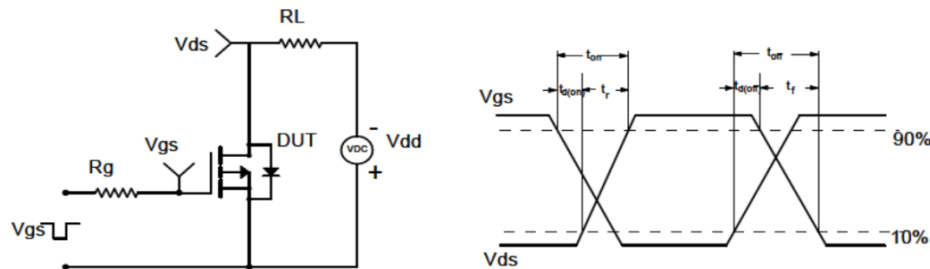
Gate Charge Test Circuit and Waveform(N-Channel)



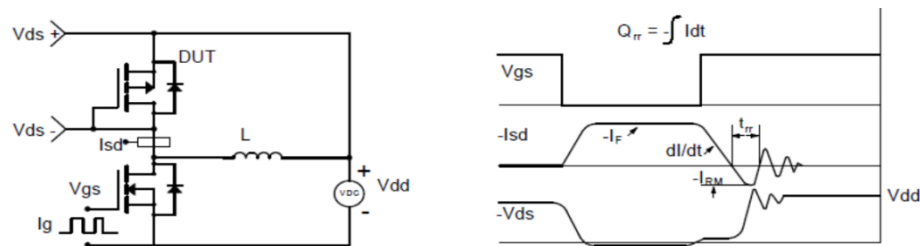
Avalanche Test Circuit and Waveforms(P-Channel)



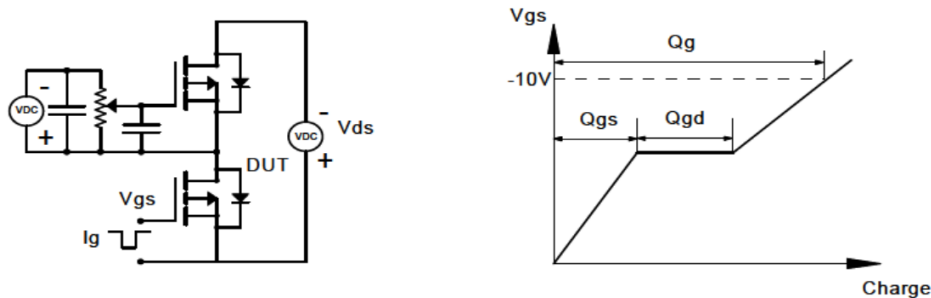
Switching Time Test Circuit and Waveforms(P-Channel)



Diode Recovery Test Circuit and Waveforms(P-Channel)



Gate Charge Test Circuit and Waveform(P-Channel)



Customer Service

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