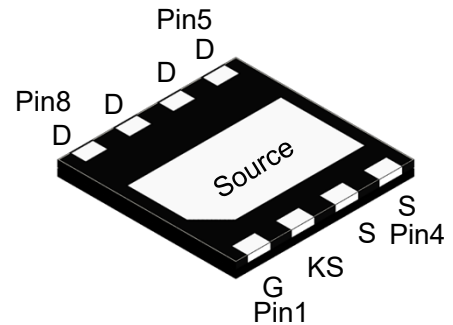


650V Enhancement-mode GaN Transistor

Description

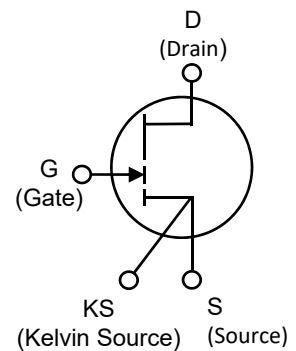
650V Normally-OFF GaN			
$V_{DS}(V)$	$R_{DS(on)}(m\Omega)$	$I_{DS}(A)$	$Q_G(nC)$
650	300	8.0	1.35



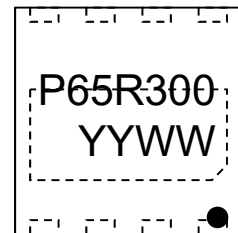
Feature

- Normally off power switch
- No reverse-recovery charge
- Ultra high switching frequency
- Low gate charge, low output charge
- Qualified for industrial applications according to JEDEC Standards
- Package:DFN5060-8L

Bottom View



Circuit Diagram



Pin4 Pin1
Marking (Top View)

Applications

- Fast charger
- Renewable energy
- Telecom and data-com
- Servo motors
- Industrial
- Automotive

Absolute maximum rating@25°C

Rating	Symbol	Value	Units
Drain-Source Voltage	V_{DS}	650	V
Drain-Source Voltage-transient ¹⁾	$V_{DS(transient)}$	750	V
Gate-Source Voltage	V_{GS}	-10 to +7	V
Drain Current-Continuous ²⁾	$T_C = 25^\circ C$	8.0	A
	$T_C = 125^\circ C$	3.5	A
Pulse Drain Current (pulse width: 300μs)	$T_C = 25^\circ C$	11	A
	$T_C = 125^\circ C$	6.0	
Maximum Power Dissipation	P_D	38	W
Junction and Storage Temperature Range	T_J, T_{STG}	-55~+150	°C

Notes:

1. In off-state, spike duty cycle $D < 0.01$, spike duration $< 1\mu s$.
2. For increased stability at high current operation.

Thermal characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Thermal Resistance, Junction - Case	$R_{\theta JC}$	-	3.3	-	$^{\circ}\text{C}/\text{W}$

Electrical characteristics per line@25°C (unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0\text{V}$	650	-	-	V
Total Drain Leakage Current	I_{DSS}	$V_{DS} = 650\text{V}, V_{GS} = 0\text{V}$	-	1.0	10	μA
		$V_{DS} = 650\text{V}, V_{GS} = 0\text{V}, T_J = 150^{\circ}\text{C}$	-	10	50	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = 1\text{V}, I_D = 10\mu\text{A}/\text{mm}$	-	2.5	-	V
		$V_{DS} = 1\text{V}, I_D = 10\mu\text{A}/\text{mm}, T_J = 125^{\circ}\text{C}$	-	3.0	-	
Gate-Source Leakage Current	I_{GSS}	$V_{GS} = 6\text{V}, V_{DS} = 0\text{V}$	-	60	-	μA
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 6\text{V}, I_D = 1\text{A}$	-	300	-	m Ω
		$V_{GS} = 6\text{V}, I_D = 1\text{A}, T_J = 150^{\circ}\text{C}$	-	660	-	
Input Capacitance	C_{iss}	$V_{DS} = 400\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$	-	46	-	pF
Output Capacitance	C_{oss}		-	18	-	
Reverse Transfer Capacitance	C_{rss}		-	0.7	-	
Effective Output Capacitance, Energy Related	$C_{oss(er)}$	$V_{GS} = 0\text{V}, V_{DS} = 0\text{V to } 400\text{V}$	-	27	-	pF
Effective Output Capacitance, Time Related	$C_{oss(tr)}$		-	40	-	
Output Charge	Q_{oss}	$V_{GS} = 0\text{V}, V_{DS} = 0\text{V to } 400\text{V}$	-	16	-	nC
Total Gate Charge	Q_g	$V_{GS} = 0 \text{ to } 6\text{V}, V_{DS} = 400\text{V}, I_D = 1\text{A}$	-	1.35	-	nC
Gate-Source Charge	Q_{gs}		-	0.15	-	
Gate-Drain Charge	Q_{gd}		-	0.5	-	
Turn-on Delay Time	$t_{d(on)}$	$V_{DS} = 400\text{V}, V_{GS} = 0\text{V to } 6\text{V}, I_D = 3\text{A}, R_{G-on(ext)} = 6.8\Omega, R_{G-off(ext)} = 2.2\Omega, L = 250\mu\text{H}$	-	4.4	-	ns
Turn-on Rise Time	t_r		-	11.8	-	
Turn-Off Delay Time	$t_{d(off)}$		-	4.1	-	
Turn-Off Fall Time	t_f		-	11.2	-	
Reverse Device Characteristics						
Diode Forward Voltage	V_{SD}	$V_{GS} = 0\text{V}, I_S = 3\text{A}$	-	3.0	-	V
Reverse Recovery Charge	Q_{rr}	$I_S = 3\text{A}, V_{DS} = 400\text{V},$	-	0	-	nC

Typical Characteristics

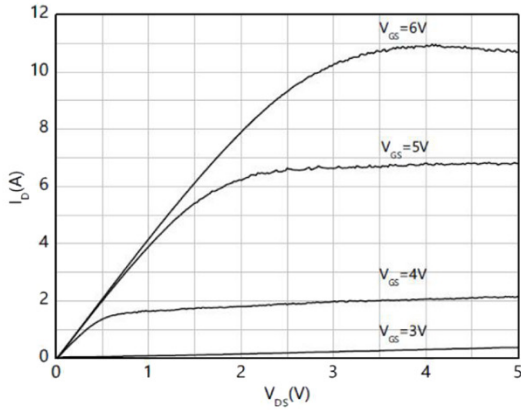


Figure 1. Typical output characteristics
T_j=25°C

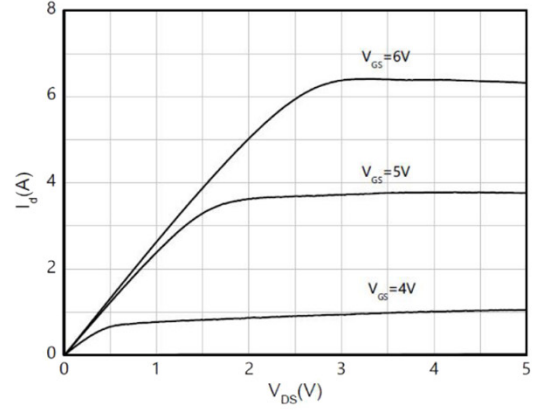


Figure 2. Typical output characteristics
T_j=125°C

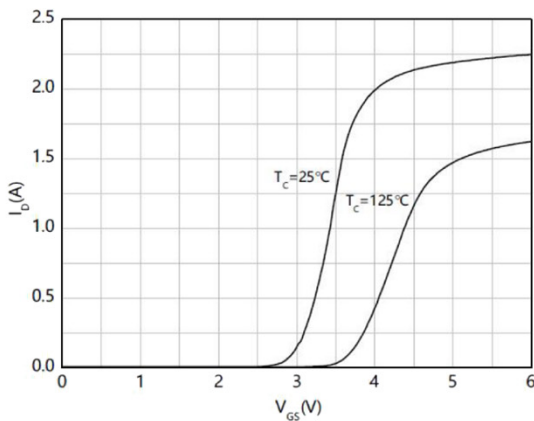


Figure 3. Typical transfer characteristics
V_{DS}=1V

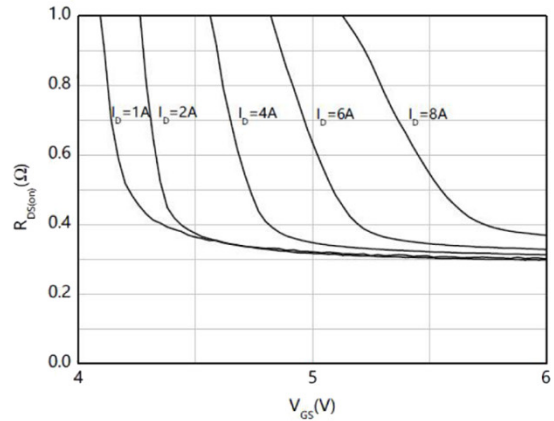


Figure 4. Typical on-state resistance
T_j=25°C

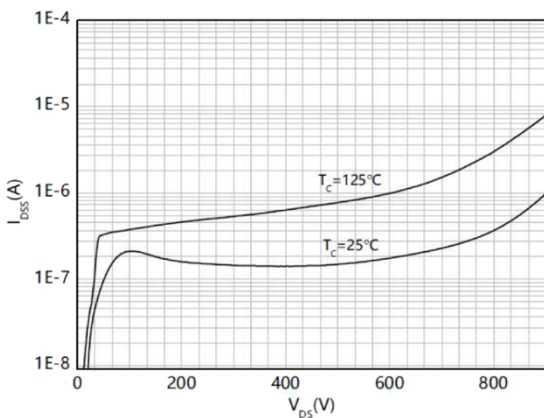


Figure 5. Drain-source leakage characteristics

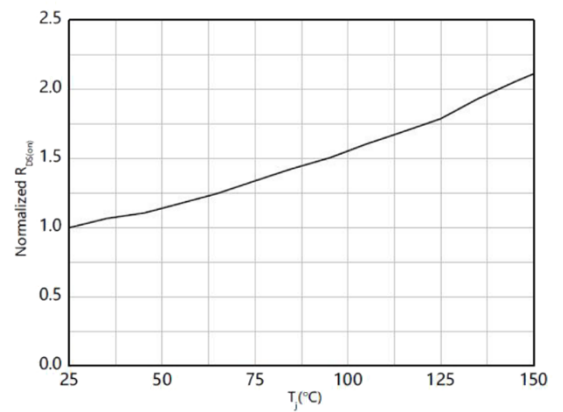


Figure 6. Drain-source on-state resistance

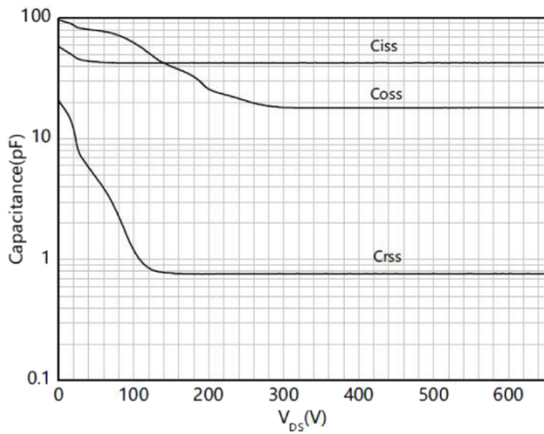


Figure 7. Typical capacitance
f = 1MHz

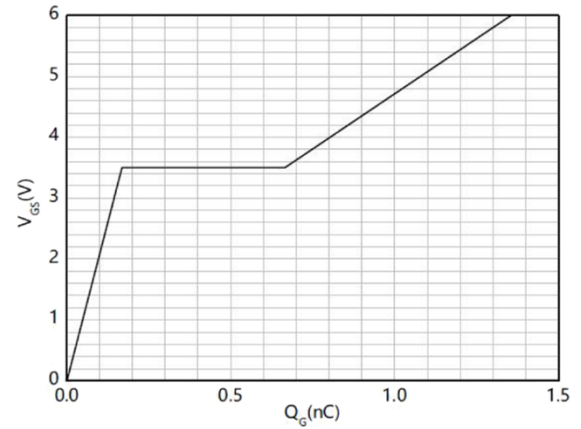


Figure 8. Typical gate charge
V_DS = 400V; I_D = 1A

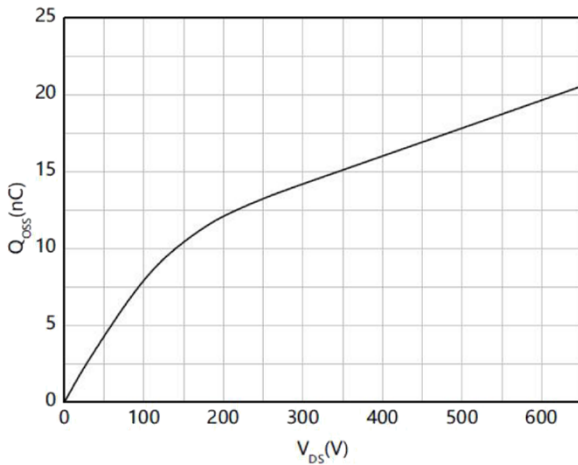


Figure 9. Typical output charge
f = 1MHz

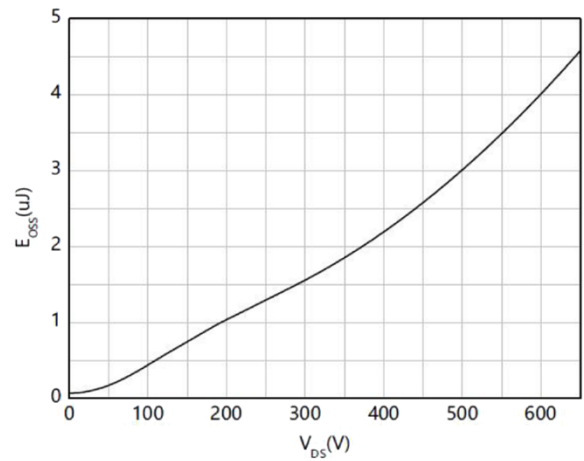


Figure 10. Typical Coss stored energy
f = 1MHz

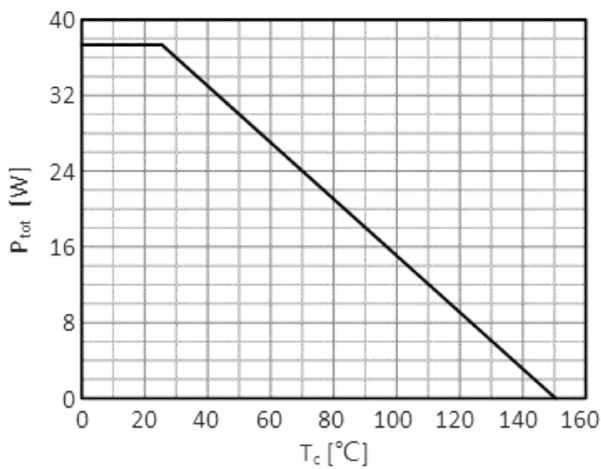


Figure 11. Power dissipation

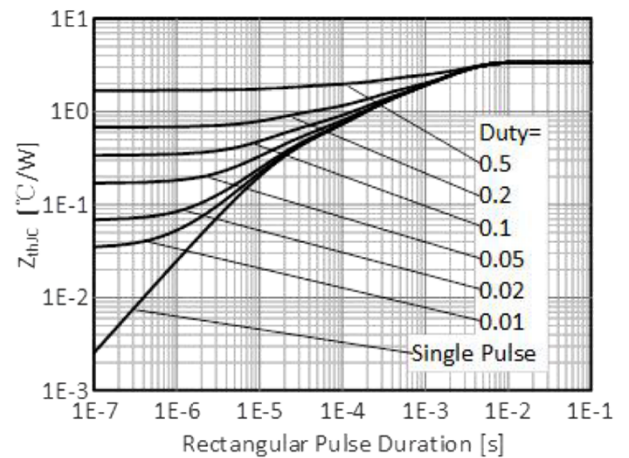


Figure 12. Transient thermal impedance

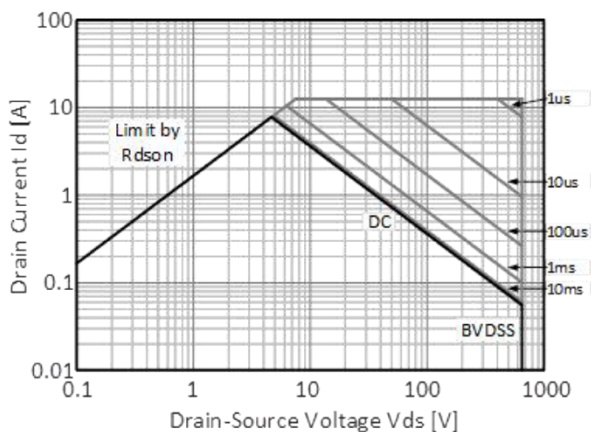


Figure 13. Safe operation area
 $T_c=25^\circ\text{C}$

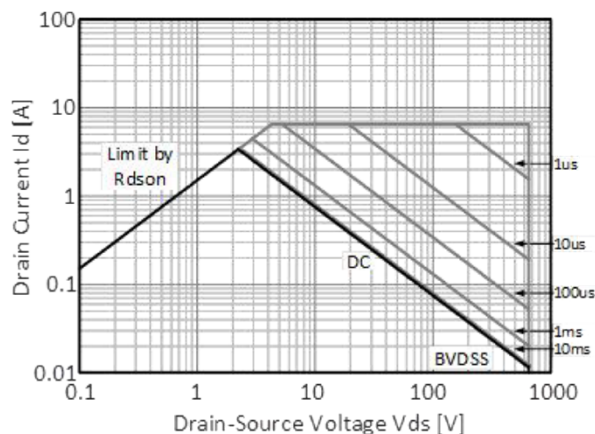


Figure 14. Safe operation area
 $T_c=125^\circ\text{C}$

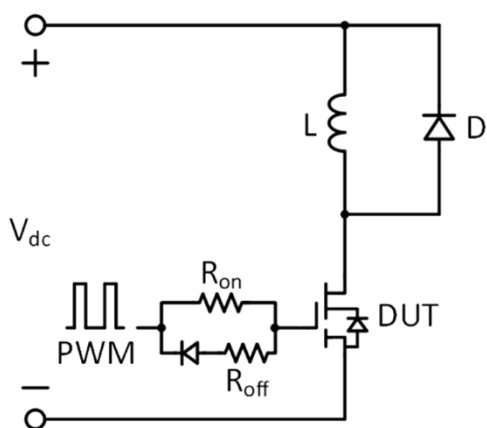


Figure 15. Switching times with inductive load
 $V_{DS}=400\text{V}$, $V_{GS}=0\text{V to }10\text{V}$, $I_D=3\text{A}$,
 $R_{G-on(ext)}=6.8\Omega$, $R_{G-off(ext)}=2.2\Omega$, $L=250\mu\text{H}$

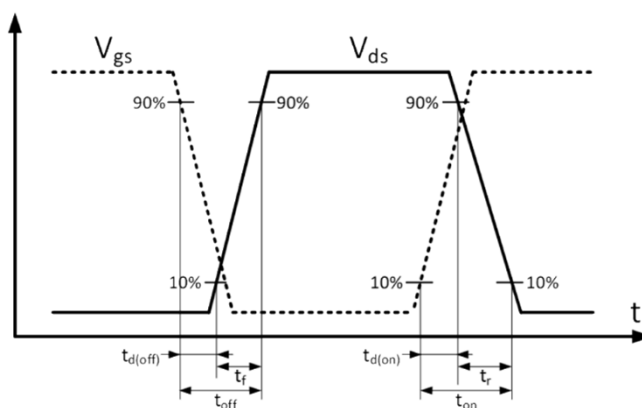
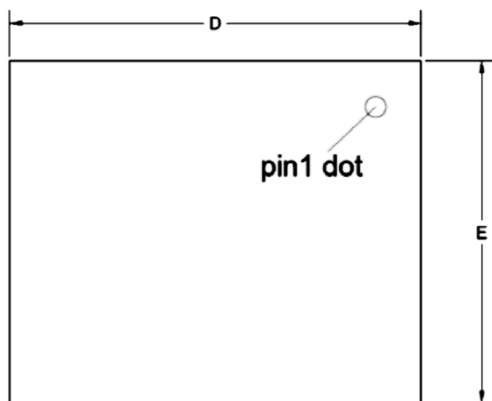


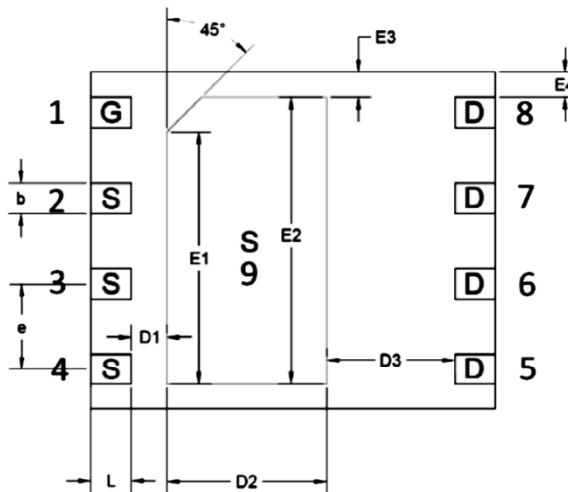
Figure 16. Switching times with waveform

Product Dimension (DFN5060-8L)

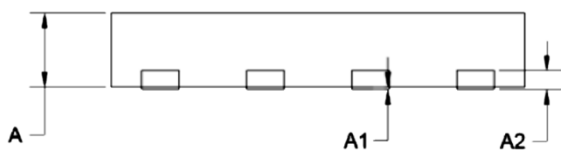
Top view



Bottom view




Side view(left/right)



Dim	Millimeters		Inches		Dim	Millimeters		Inches	
	Min	Max	Min	Max		Min	Max	Min	Max
A	0.85	0.95	0.033	0.037	E1	3.65	3.85	0.144	0.152
A1	0.00	0.05	0.000	0.002	E2	4.16	4.36	0.164	0.172
A2	0.203 Ref.		0.008 Ref.		E3	0.27	0.47	0.011	0.019
D	5.90	6.10	0.232	0.240	E4	0.27	0.47	0.011	0.019
E	4.90	5.10	0.193	0.201	b	0.40	0.50	0.016	0.020
D1	0.43	0.63	0.017	0.025	e	1.17	1.37	0.046	0.054
D2	2.27	2.47	0.089	0.097	L	0.50	0.70	0.020	0.028
D3	1.80	2.00	0.071	0.079					


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