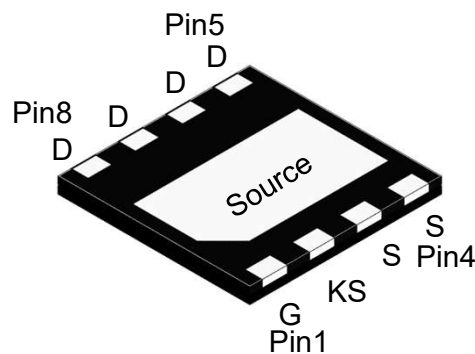
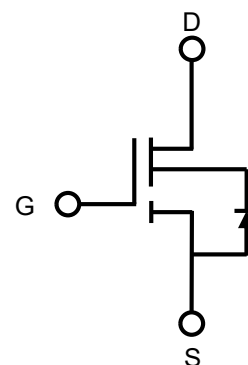
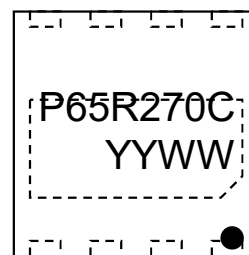


650V Enhancement-mode GaN Transistor

Description

650V Normally-OFF GaN			
$V_{DS}(V)$	$R_{DS(on)}(m\Omega)$	$I_{DS}(A)$	$Q_G(nC)$
650	270	7.9	7.8


Bottom View

Circuit Diagram

Marking (Top View)

Feature

- Normally-off device combines high voltage GaN HEMT and low voltage silicon MOSFET
- Normally off power switch
- Low reverse-recovery charge
- High switching frequency
- Low gate charge, low output charge
- Qualified for industrial applications according to JEDEC Standards
- Package:DFN8*8-8L

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⁾		$V_{DS(transient)}$	800	V
Gate-Source Voltage		V_{GS}	-20 to +20	V
Drain Current-Continuous ²⁾	$T_C = 25^\circ C$	I_D	7.9	A
	$T_C = 125^\circ C$		3.5	A
Pulse Drain Current (pulse width: 100μs)		I_{DM}	14	A
Maximum Power Dissipation		P_D	32	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	$R_{\theta JC}$	-	3.9	-	$^{\circ}\text{C}/\text{W}$

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}	$V_{DS}=650\text{V}, V_{GS}=0\text{V}, T_J=25^{\circ}\text{C}$	-	-	10	μA
		$V_{DS}=650\text{V}, V_{GS}=0\text{V}, T_J=150^{\circ}\text{C}$	-	-	100	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_{DS}=1\text{mA}$	1.2	1.7	2.5	V
Gate Threshold Voltage Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		-	-6.8	-	$\text{mV}/^{\circ}\text{C}$
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20\text{V}$	-	-	± 100	nA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}, I_D=1\text{A}, T_J=25^{\circ}\text{C}$	-	270	320	$\text{m}\Omega$
		$V_{GS}=10\text{V}, I_D=1\text{A}, T_J=150^{\circ}\text{C}$	-	570	-	
Input Capacitance	C_{iss}	$V_{DS}=400\text{V}, V_{GS}=0\text{V}, f=1\text{MHz}$	-	378	-	pF
Output Capacitance	C_{oss}		-	23	-	
Reverse Transfer Capacitance	C_{rss}		-	0.97	-	
Output Charge	Q_{oss}		$V_{GS}=0\text{V}, V_{DS}=0\text{V to }400\text{V}, f=1\text{MHz}$	-	36	
Total Gate Charge	Q_g	$V_{GS}=0\text{V to }10\text{V}, V_{DS}=400\text{V}, I_D=1\text{A}$	-	7.8	-	nC
Gate-Source Charge	Q_{gs}		-	1.1	-	
Gate-Drain Charge	Q_{gd}		-	1.8	-	
Turn-on Delay Time	$t_{d(on)}$	$V_{DS}=400\text{V}, V_{GS}=0\text{V to }10\text{V}, I_D=2.1\text{A}, R_{G-on(ext)}=6.8\Omega, R_{G-off(ext)}=2.2\Omega, L=250\mu\text{H}$	-	2.5	-	ns
Turn-on Rise Time	t_r		-	7	-	
Turn-Off Delay Time	$t_{d(off)}$		-	9.7	-	
Turn-Off Fall Time	t_f		-	28	-	
Reverse Device Characteristics						
Diode Forward Voltage	V_{SD}	$V_{GS}=0\text{V}, I_{SD}=5\text{A}$	-	2.2	-	V
Reverse Recovery Time	t_{rr}	$I_F=5\text{A}, V_{DD}=400\text{V}, dI_F/dt=165\text{A}/\mu\text{s}$	-	13	-	ns
Reverse Recovery Charge	Q_{rr}		-	3.2	-	nC

Typical Characteristics

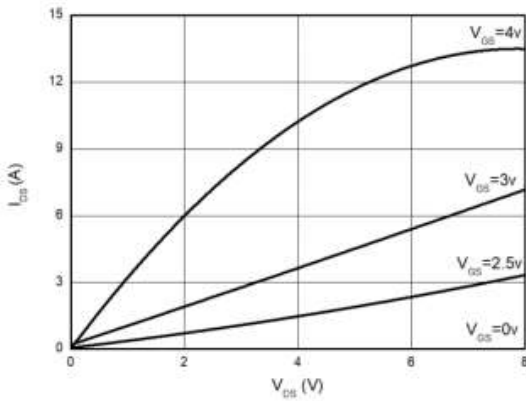


Figure 1. Typical Output Characteristics $T_j=25^{\circ}\text{C}$

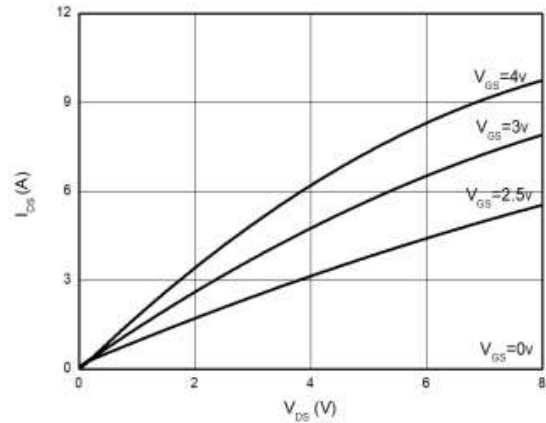


Figure 2. Typical Output Characteristics $T_j=125^{\circ}\text{C}$

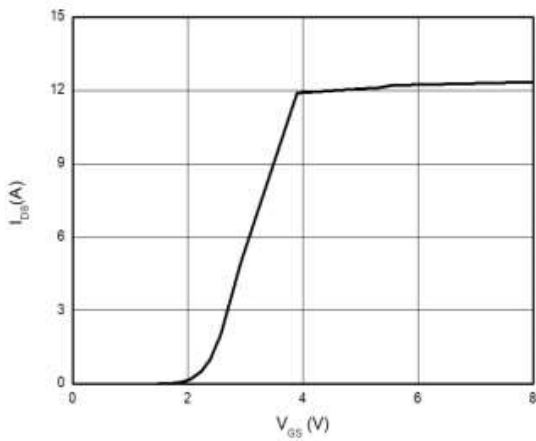


Figure 3. Typical Transfer Characteristics ($V_{DS}=5\text{V}$)

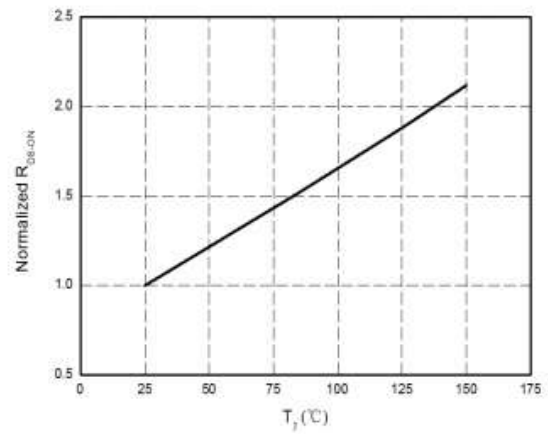


Figure 4. Normalized On-resistance

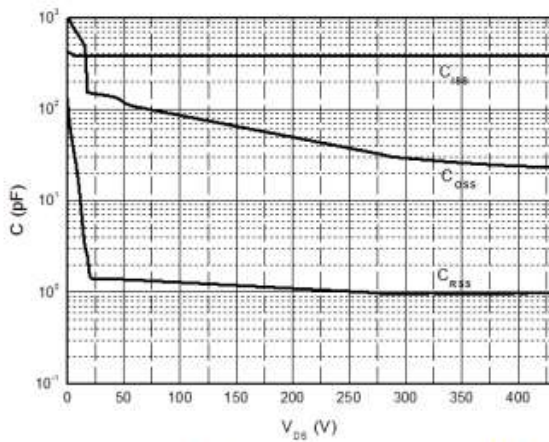


Figure 5. Typical Capacitance ($f=1\text{MHz}$)

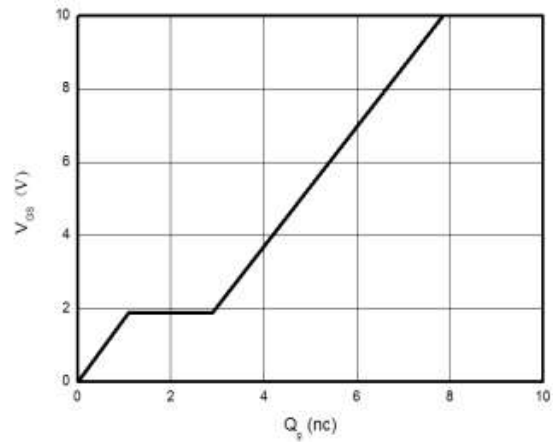


Figure 6. Typical Gate Charge ($V_{DS}=400\text{V}$, $I_D=1\text{A}$)

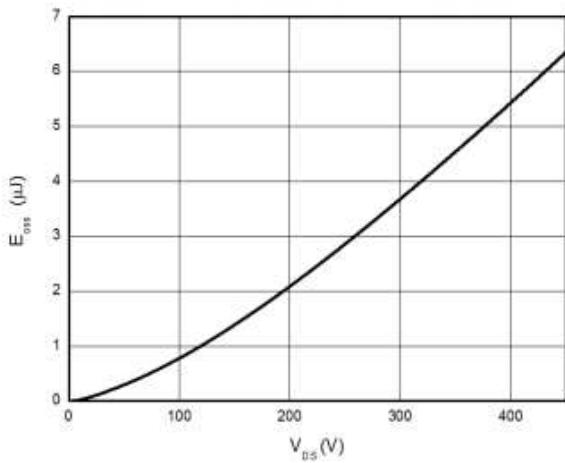


Figure 7. Typical Coss Stored Energy

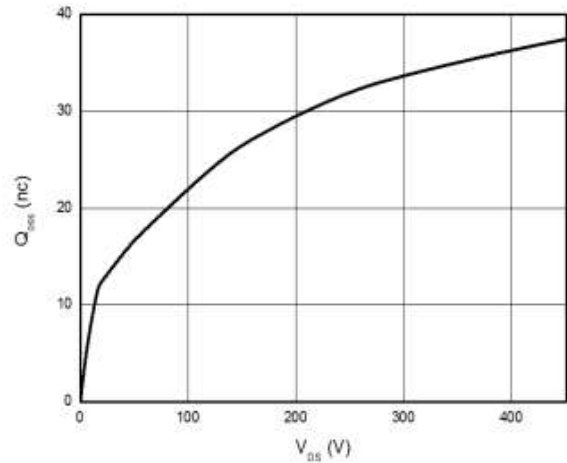


Figure 8. Typical Qoss

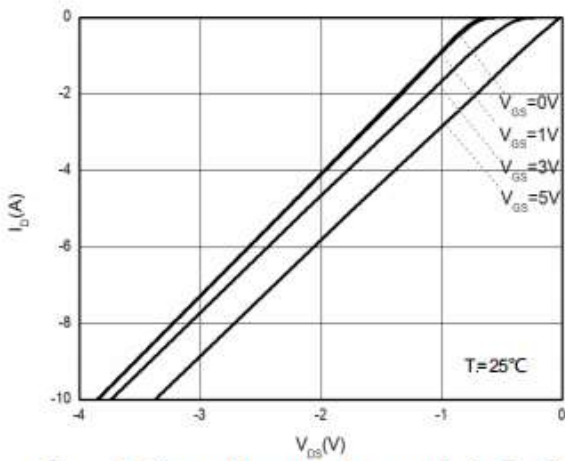


Figure 9. Channel Reverse Characteristics Tj=25°C

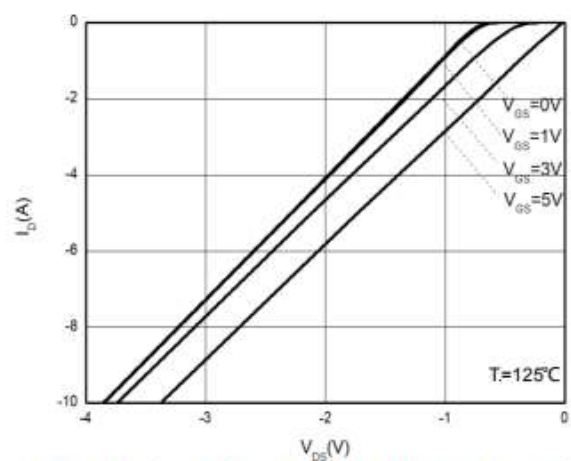


Figure 10 Channel Reverse Characteristics Tj=125°C

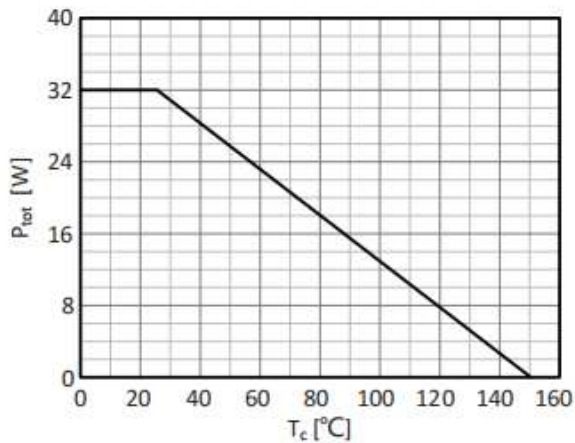


Figure 11. Power Dissipation

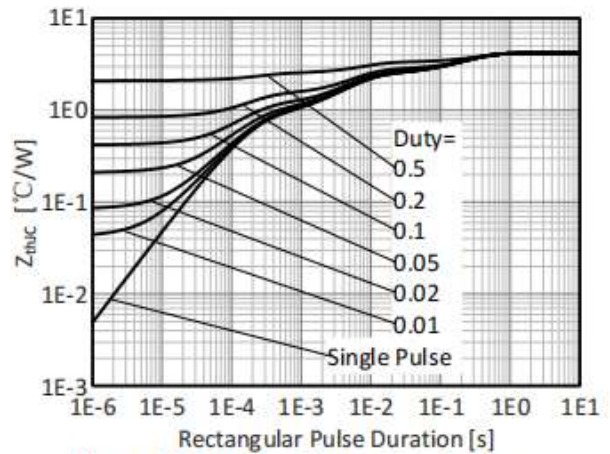


Figure 12. Transient Thermal Resistance

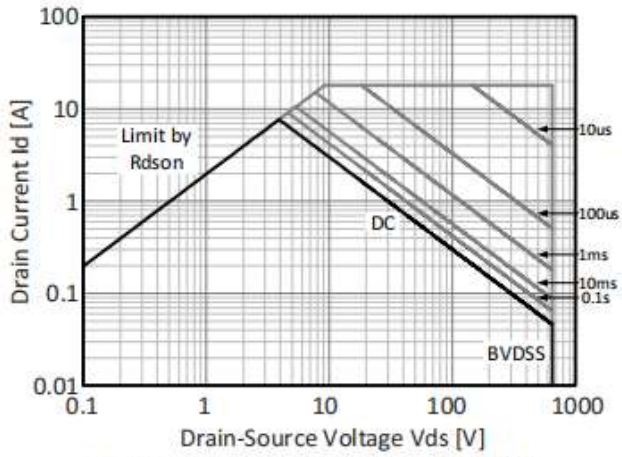


Figure 13. Safe Operating Area $T_c=25^\circ\text{C}$

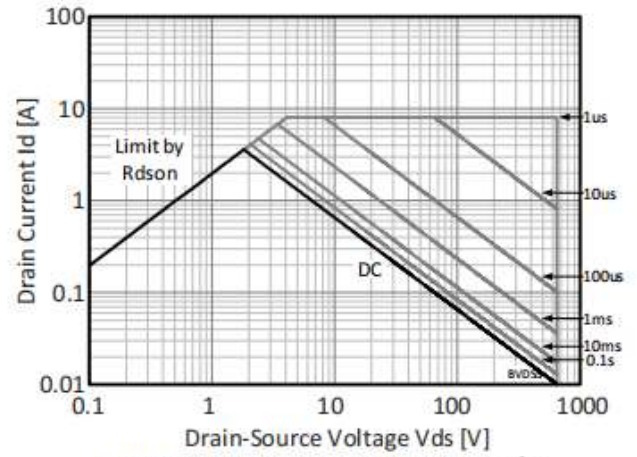
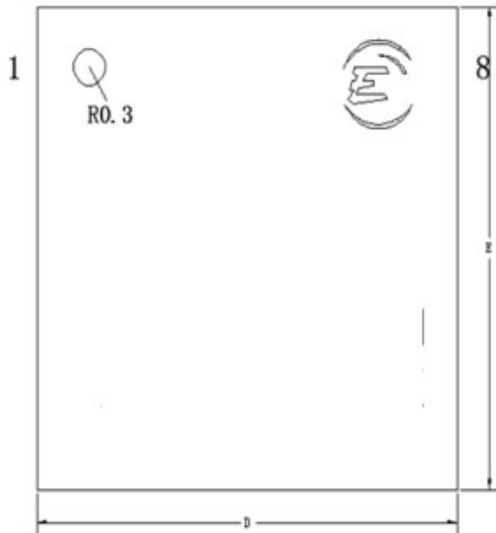


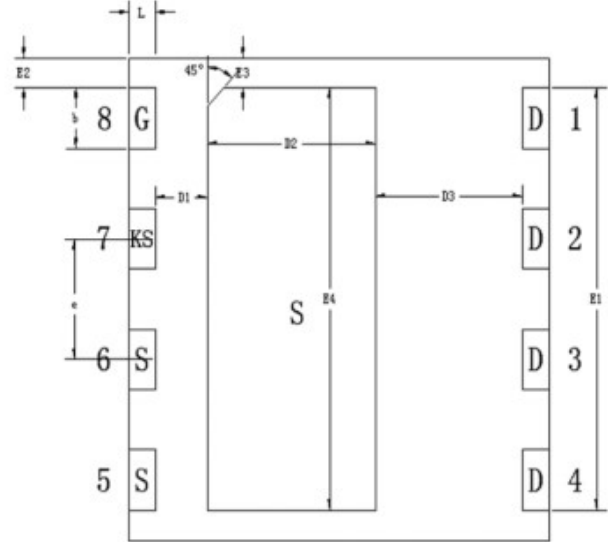
Figure 14. Safe Operating Area $T_c=125^\circ\text{C}$

Product Dimension (DFN8*8-8L)

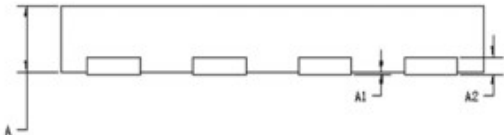
Top view



Bottom view




Side view(left/right)



Dim	Millimeters		Inches		Dim	Millimeters		Inches	
	Min	Max	Min	Max		Min	Max	Min	Max
A	1.05	1.15	0.041	0.045	E1	6.90	7.10	0.272	0.280
A1	0.00	0.05	0.000	0.002	E2	0.40	0.60	0.016	0.024
A2	0.203 Ref.		0.008 Ref.		E3	0.40	0.60	0.016	0.024
D	7.90	8.10	0.311	0.319	E4	6.90	7.10	0.272	0.280
E	7.90	8.10	0.311	0.319	b	0.90	1.10	0.035	0.043
D1	0.90	1.10	0.035	0.043	e	1.90	2.10	0.075	0.083
D2	3.10	3.30	0.122	0.130	L	0.40	0.60	0.016	0.024
D3	2.70	2.90	0.106	0.114					


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