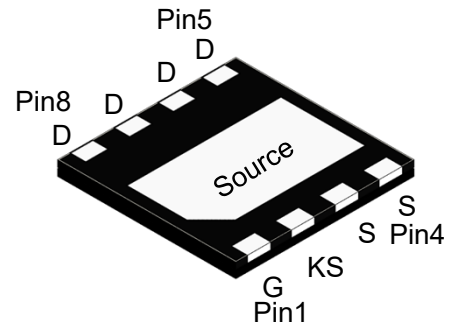
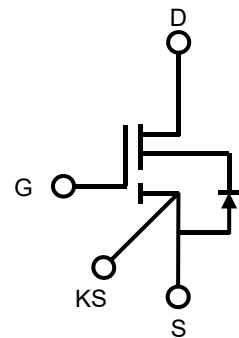
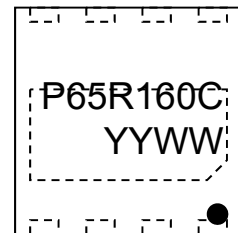


**650V Enhancement-mode GaN Transistor**
**Description**

650V Normally-OFF GaN			
$V_{DS}(V)$	$R_{DS(on)}(m\Omega)$	$I_{DS}(A)$	$Q_G(nC)$
650	160	16	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 <sup>1)</sup>	$V_{DS(transient)}$	800	V
Gate-Source Voltage	$V_{GS}$	-20 to +20	V
Drain Current-Continuous <sup>2)</sup>	$I_D$	$T_C = 25^\circ C$	16
		$T_C = 125^\circ C$	7.0
Pulse Drain Current (pulse width: 100 $\mu$ s)	$I_{DM}$	21	A
Maximum Power Dissipation	$P_D$	78	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	$R_{\theta JC}$	-	1.6	-	$^{\circ}\text{C}/\text{W}$

## 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	$I_{DSS}$	$V_{DS} = 650\text{V}, V_{GS} = 0\text{V}$	-	-	10	$\mu\text{A}$
		$V_{DS} = 650\text{V}, V_{GS} = 0\text{V}, T_J = 150^{\circ}\text{C}$	-	-	100	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}, I_D = 1\text{mA}$	1.0	1.7	3.0	V
Gate Threshold Voltage Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		-	-6.8	-	$\text{mV}/^{\circ}\text{C}$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20\text{V}$	-	-	$\pm 100$	nA
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{V}, I_D = 1\text{A}$	-	160	220	m $\Omega$
		$V_{GS} = 10\text{V}, I_D = 1\text{A}, T_J = 150^{\circ}\text{C}$	-	340	-	
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	-	nC
Total Gate Charge	$Q_g$	$V_{GS} = 0 \text{ to } 10\text{V}, V_{DS} = 400\text{V}, I_D = 1\text{A}$	-	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	$t_r$		-	7.0	-	
Turn-Off Delay Time	$t_{d(off)}$		-	9.7	-	
Turn-Off Fall Time	$t_f$		-	28	-	
Reverse Device Characteristics						
Diode Forward Voltage	$V_{SD}$	$V_{GS} = 0\text{V}, I_{SD} = 10\text{A}$	-	2.5	-	V
Reverse Recovery Time	$t_{rr}$	$I_F = 10\text{A}, V_{DD} = 400\text{V}, di_F/dt = 165\text{A}/\mu\text{s}$	-	13	-	ns
Reverse Recovery Charge	$Q_{rr}$		-	3.2	-	nC

Typical Characteristics

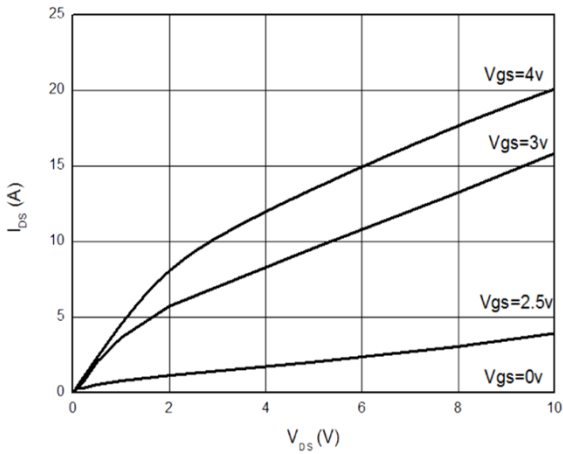


Figure 1. Typical Output Characteristics  $T_j=25^\circ\text{C}$

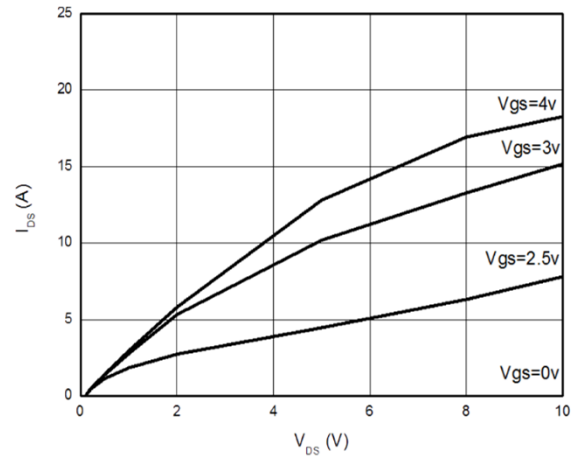


Figure 2. Typical Output Characteristics  $T_j=125^\circ\text{C}$

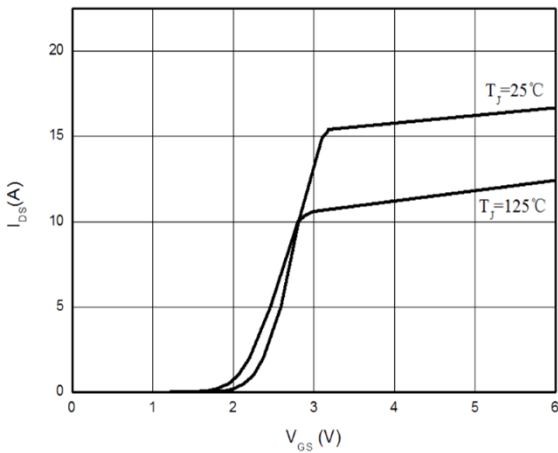


Figure 3. Typical Transfer Characteristics ( $V_{DS}=5\text{V}$ )

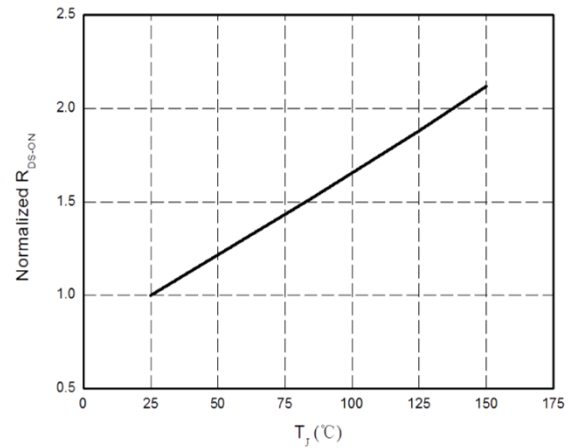


Figure 4. Normalized On-resistance

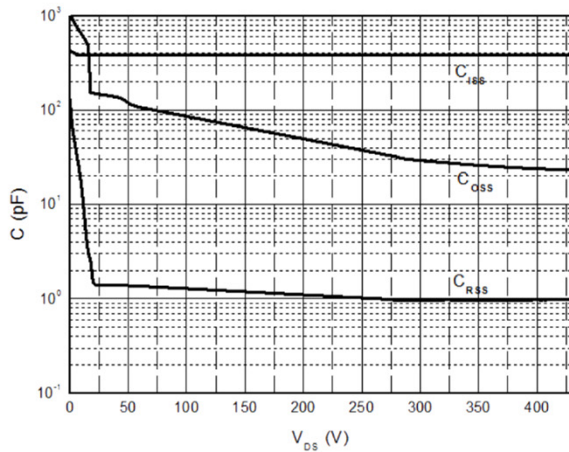


Figure 5. Typical Capacitance ( $f=1\text{MHz}$ )

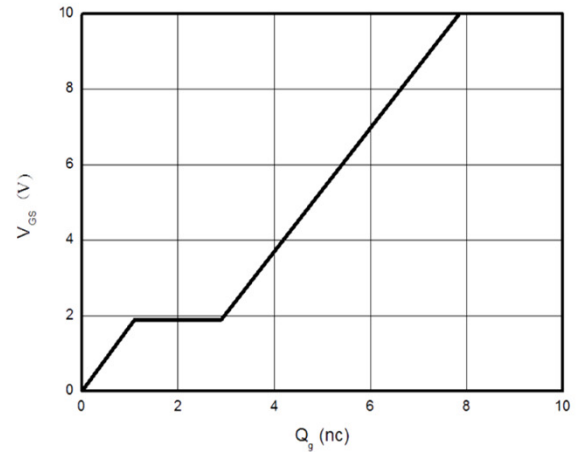


Figure 6. Typical Gate Charge ( $V_{DS}=400\text{V}$ ,  $I_D=1\text{A}$ )

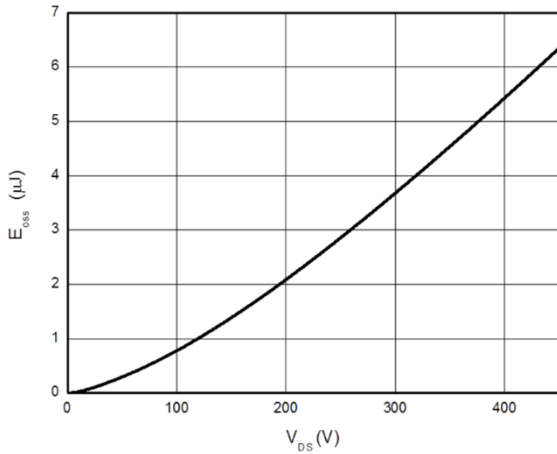


Figure 7. Typical Coss Stored Energy

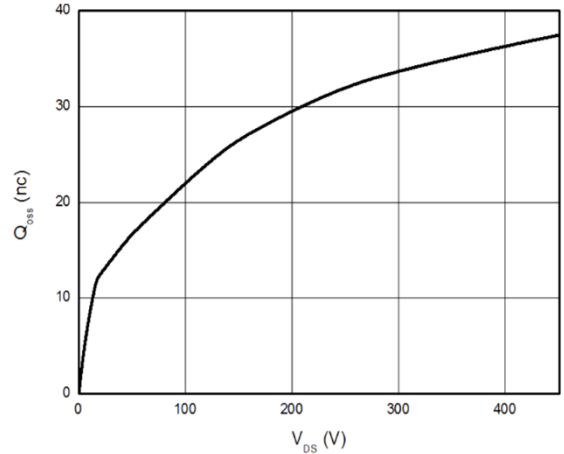


Figure 8. Typical Qoss

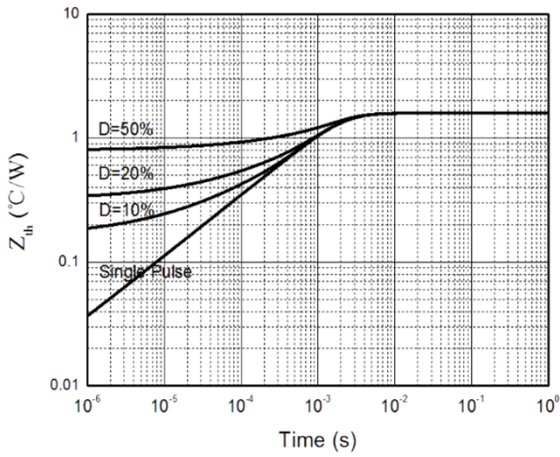


Figure 9. Transient Thermal Resistance

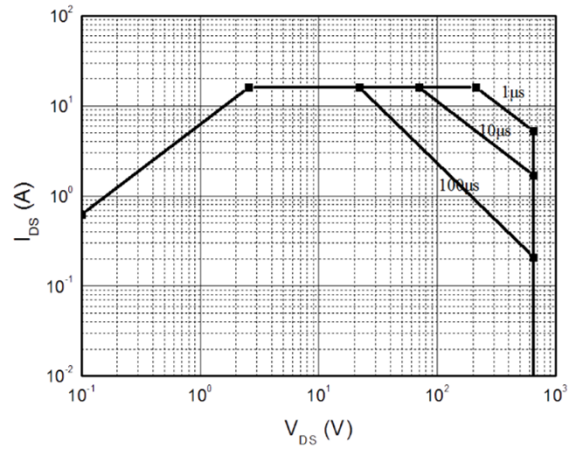


Figure 10. Safe Operating Area Tj=25°C

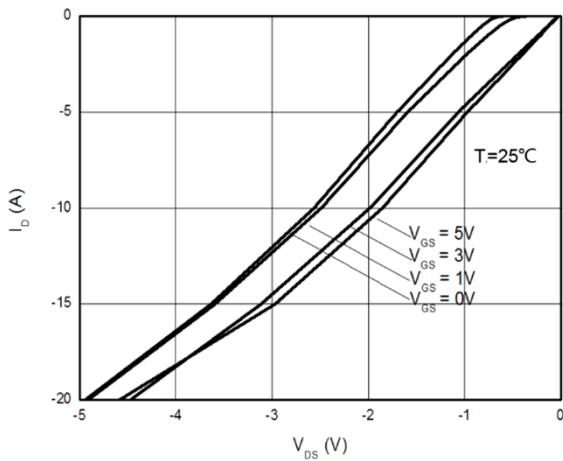


Figure 11. Channel Reverse Characteristics Tj=25°C

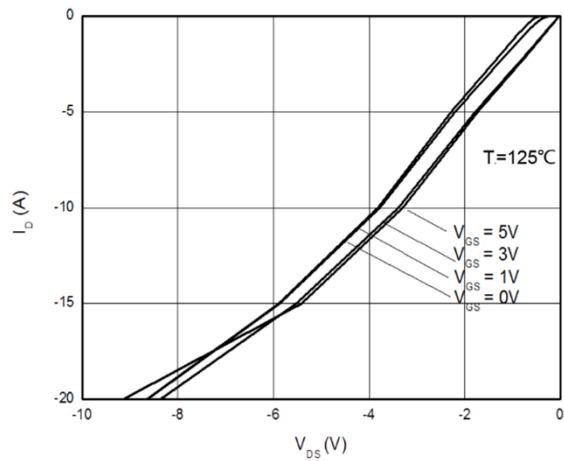
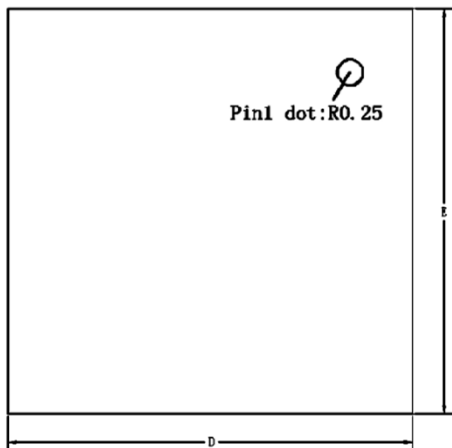


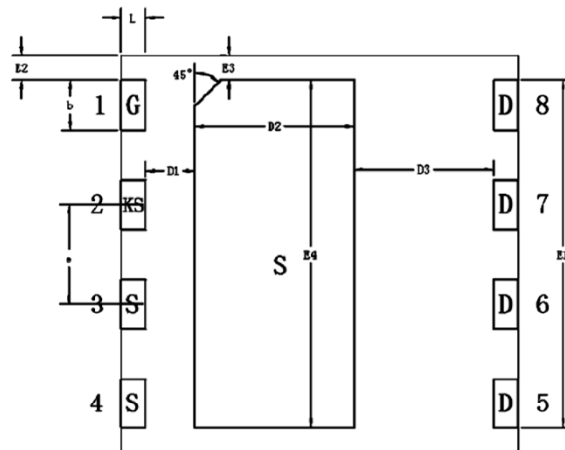
Figure 12 Channel Reverse Characteristics Tj=125°C

Product Dimension (DFN8\*8-8L)

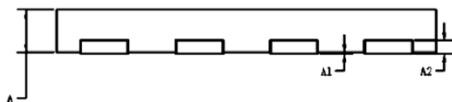
Top view



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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