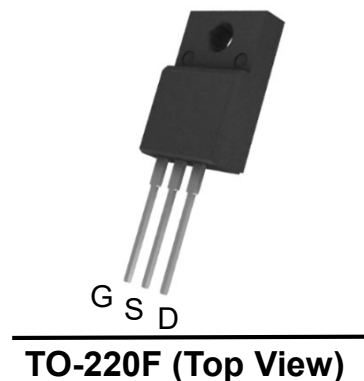


650V Enhancement-mode GaN Transistor

Description

650V Normally-OFF GaN			
$V_{DS}(V)$	$R_{DS(on)}(m\Omega)$	$I_{DS}(A)$	$Q_G(nC)$
650	600	4.8	7.9

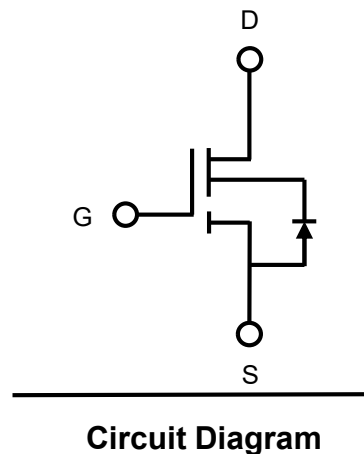


Feature

- Easy to drive—compatible with standard gate drivers
- Low conduction and switching losses
- RoHS compliant and Halogen-free

Applications

- Adapter
- 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⁾	$T_C = 25^\circ C$	4.8	A
	$T_C = 125^\circ C$	2.1	A
Pulse Drain Current (pulse width: 100 μ s)	I_{DM}	8	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	$R_{\theta JC}$	-	5	-	$^{\circ}\text{C}/\text{W}$

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	$V_{GS(th)}$	$V_{GS} = V_{DS}, I_D = 1\text{mA}$	3.3	4	4.8	V
Gate Threshold Voltage Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		-	-7	-	$\text{mV}/^{\circ}\text{C}$
Gate-Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20\text{V}$	-	-	± 100	nA
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{V}, I_D = 1\text{A}, T_J = 25^{\circ}\text{C}$	-	600	720	$\text{m}\Omega$
		$V_{GS} = 10\text{V}, I_D = 1\text{A}, T_J = 150^{\circ}\text{C}$	-	1260	-	
Input Capacitance	C_{iss}	$V_{DS} = 400\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$	-	293	-	pF
Output Capacitance	C_{oss}		-	17	-	
Reverse Transfer Capacitance	C_{rss}		-	3.74	-	
Output Charge	Q_{oss}	$V_{GS} = 0\text{V}, V_{DS} = 0\text{V to } 400\text{V}, f = 1\text{MHz}$	-	22.2	-	nC
Total Gate Charge	Q_g	$V_{GS} = 0 \text{ to } 10\text{V}, V_{DS} = 400\text{V}, I_D = 1\text{A}$	-	7.9	-	nC
Gate-Source Charge	Q_{gs}		-	2.31	-	
Gate-Drain Charge	Q_{gd}		-	1.65	-	
Turn-on Delay Time	$t_{d(on)}$	$V_{DS} = 400\text{V}, V_{GS} = 0\text{V to } 10\text{V}, I_D = 2.1\text{A}, R_{G-on(ext)} = 6.8\Omega, R_{G-off(ext)} = 2.2\Omega, L = 250\mu\text{H}$	-	3.2	-	ns
Turn-on Rise Time	t_r		-	5.5	-	
Turn-Off Delay Time	$t_{d(off)}$		-	7.4	-	
Turn-Off Fall Time	t_f		-	27	-	
Reverse Device Characteristics						
Diode Forward Voltage	V_{SD}	$V_{GS} = 0\text{V}, I_{SD} = 2.5\text{A}$	-	2.3	-	V
Reverse Recovery Time	t_{rr}	$I_F = 2.5\text{A}, V_{DD} = 400\text{V}, di_F/dt = 165\text{A}/\mu\text{s}$	-	16	-	ns
Reverse Recovery Charge	Q_{rr}		-	6.8	-	nC

Typical Characteristics

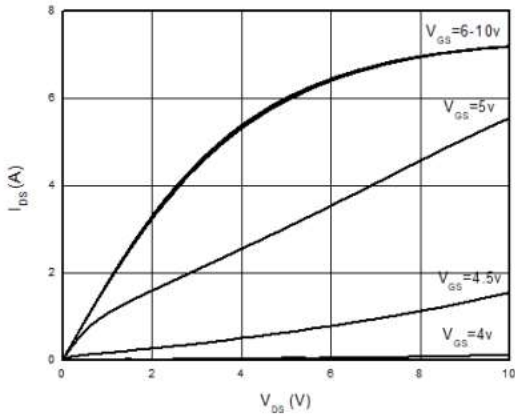


Figure 1. Typical Output Characteristics $T_j=25^\circ\text{C}$

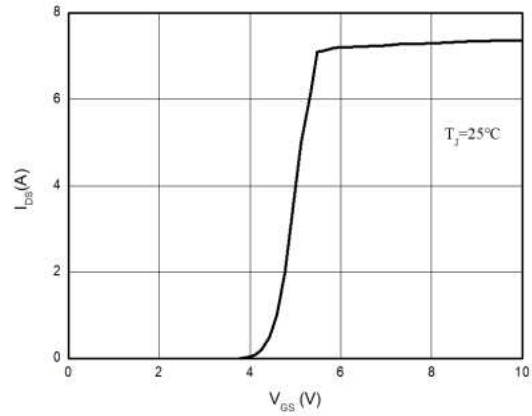


Figure 2. Typical Transfer Characteristics ($V_{DS}=10\text{V}$)

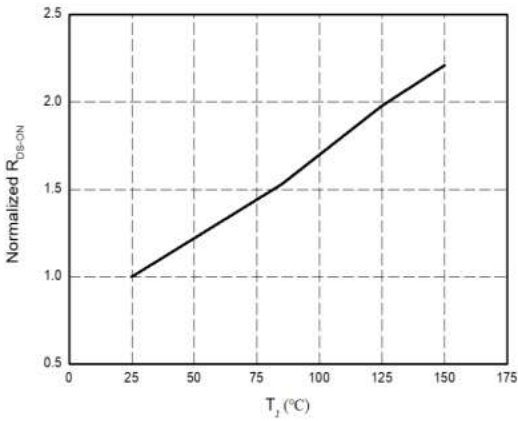


Figure 3. Normalized On-resistance

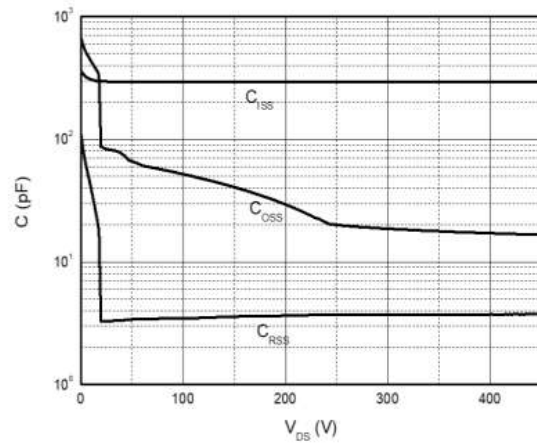


Figure 4. Typical Capacitance ($f=1\text{MHz}$)

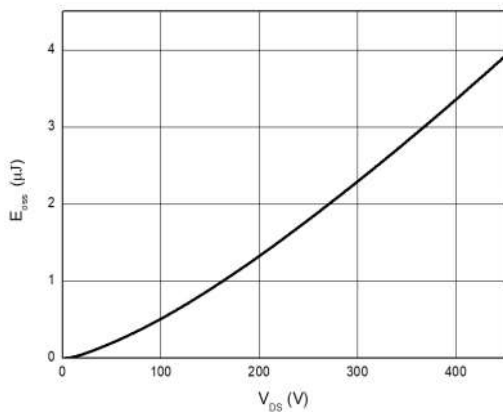


Figure 5. Typical C_{OSS} Stored Energy

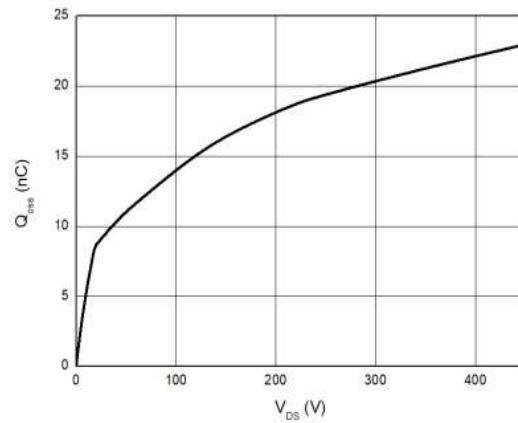


Figure 6. Typical Q_{OSS}

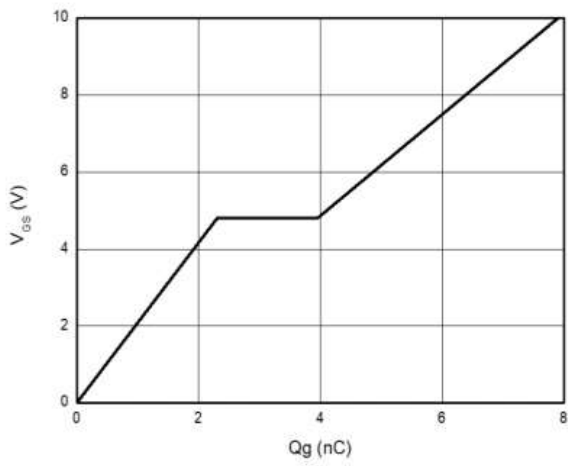


Figure 7. Typical Gate Charge ($V_{DS}=400V$, $I_D=1A$)

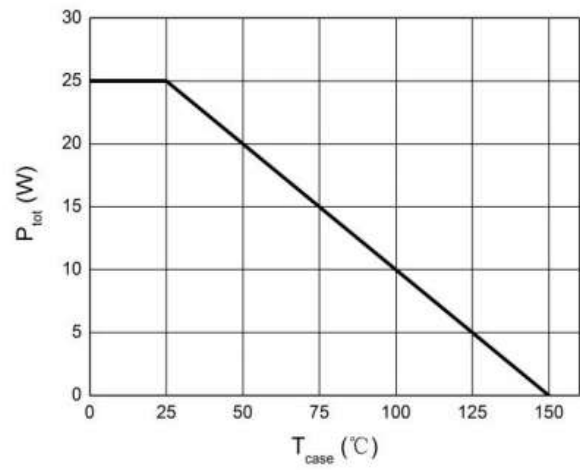
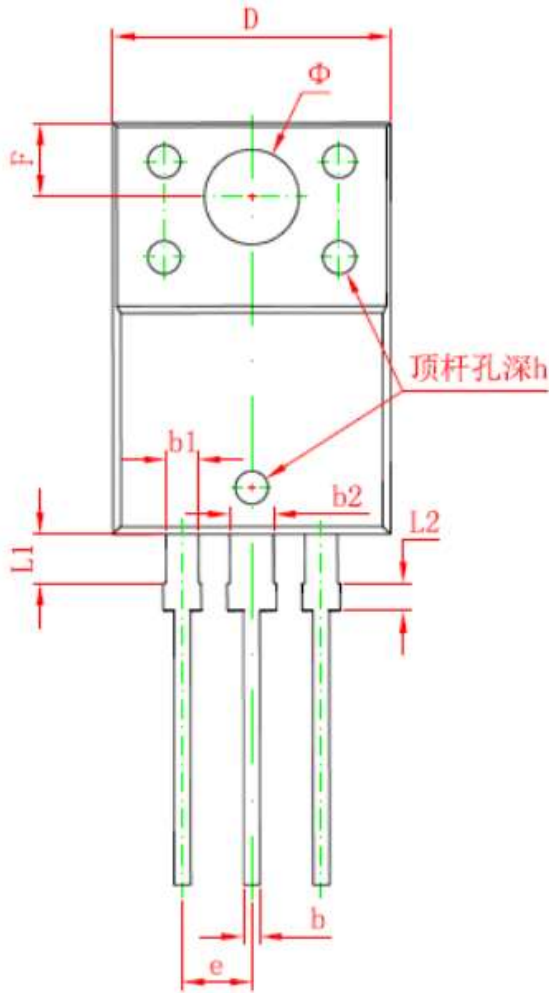


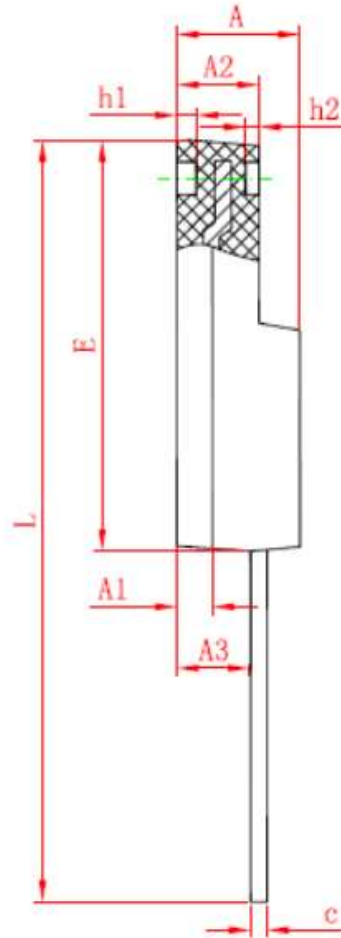
Figure 8. Power Dissipation

Product Dimension (TO-220F)

Top view



Side view



Dim	Millimeters		Inches		Dim	Millimeters		Inches	
	Min	Max	Min	Max		Min	Max	Min	Max
A	4.300	4.700	0.169	0.185	e	2.540 TYP.		0.100 TYP.	
A1	1.300 REF.		1.300 REF.		F	2.700 REF.		0.106 REF.	
A2	2.800	3.200	0.110	0.126	Φ	3.500 REF.		0.138 REF.	
A3	2.500	2.900	0.098	0.114	h	0.000	0.300	0.000	0.012
b	0.500	0.750	0.020	0.030	h1	0.800 REF.		0.031 REF.	
b1	1.100	1.350	0.043	0.053	h2	0.500 REF.		0.020 REF.	
b2	1.500	1.750	0.059	0.069	L	28.000	28.400	1.102	1.118
c	0.500	0.750	0.020	0.030	L1	1.700	1.900	0.067	0.075
D	9.960	10.360	0.392	0.408	L2	0.900	1.100	0.035	0.043
E	14.800	15.200	0.583	0.598					