

GR-65P150XF: TO-220-FP Cascode GaN HEMT

Description

GR-65P150XF is a normally-off GaN High electron mobility transistor (HEMT) device using the cascode configuration, which provides high breakdown voltage, high current and high operating speed which is suitable for high power applications.

Key Specifications

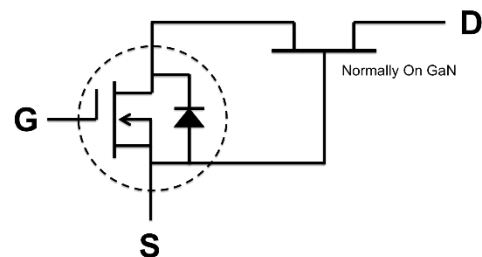
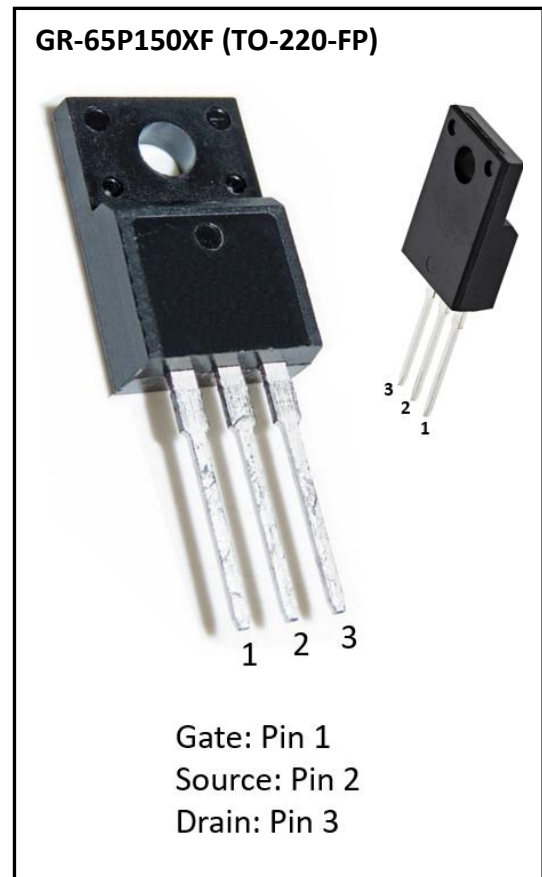
Part Number	GR-65P150XF
V_{DS}	650V
$V_{(TR)DS}$	800V
$R_{DS(ON)}$, typ.	148m Ω
Q_G , typ.	10.62nC
Package	TO-220-FP

Features

- Gate drive voltage compatibility (-20V to +20V)
- High operating frequency
- Pin to Pin with CoolMOS/SJ and SiC MOSFET
- Low Q_{rr}
- ESD-resistant
- Comply with JEDEC standards

Applications

- Switch Mode Power Supplies (SMPS)
- AC-DC/DC-DC Converters: Boost, Buck, QR Flyback, ACF, AHB, LLC, Half/Full Bridge Application
- Motor Drives, Lighting, Server



Cascode Device Structure

1- Electrical Characteristics

➤ **Table 1 Absolute maximum ratings**

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-source voltage	650	V
$V_{(TR)DSS}$	Transient drain to source voltage ^a	800	V
V_{GSS}	Gate- source voltage	-20 ~ +20	V
I_D	Drain current (continuous) at $T_C = 25^\circ\text{C}$ operation	14.0	A
	Drain current (continuous) at $T_C = 100^\circ\text{C}$ operation	9.0	A
$I_{D,Pulse}$	Pulsed drain current (pulse width: 10 μs)	52.5	A
P_D	Maximum power dissipation $T_C=25^\circ\text{C}$	28	W
T_C	Operating temperature	Case	-55 to +150 $^\circ\text{C}$
T_J		Junction	-55 to +150 $^\circ\text{C}$
T_S	Storage temperature	-55 to +150	$^\circ\text{C}$
T_{SOLD}	Soldering peak temperature ^b	260	$^\circ\text{C}$
MSL	Moisture sensitivity level	MSL3	

a. In off-state, spike duty cycle $D < 0.01$, spike duration $< 1\mu\text{s}$

b. For 10 sec., 1.6mm from the case

➤ **Table 2 Thermal Characteristics**

Symbol	Parameter	Value	Unit
$R_{\theta JA}$	Thermal resistance junction-ambient	63	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal resistance junction-case	4.5	$^\circ\text{C}/\text{W}$

➤ **Table 3 ESD Rating**

Symbol	Reference	Value	Unit
HBM (G-S) (G-D)	ANSI/ESDA/JEDEC JS-001-2024	2000	V
HBM (D-S)	ANSI/ESDA/JEDEC JS-001-2024	8000	V

➤ **Table 4** Electrical Characteristics ($T_{CASE} = 25\text{ }^{\circ}\text{C}$ unless otherwise stated)

Symbol	Parameter	Conditions	Values			Unit
			min.	typ.	max.	
$V_{(BL)DSS}$	Drain-source voltage	$V_{GS}=0V$	650	-	-	V
$V_{GS(th)}$	Gate threshold voltage	$V_{GS}=V_{DS}$, $I_D=1mA$	1.3	1.7	3.0	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS}=10V$, $I_D=5A$, $T_J=25\text{ }^{\circ}\text{C}$	-	148	182	$m\Omega$
		$V_{GS}=10V$, $I_D=5A$, $T_J=150\text{ }^{\circ}\text{C}$	-	274	-	
I_{DSS}	Drain-source leakage current	$V_{GS}=0V$, $V_{DS}=650V$, $T_J=25^{\circ}\text{C}$	-	2.5	50	μA
		$V_{GS}=0V$, $V_{DS}=650V$, $T_J=150^{\circ}\text{C}$	-	10	-	
I_{GSS}	Gate-to-source forward leakage current	$V_{GS}=20V$	-	-	100	nA
	Gate-to-source reverse leakage current	$V_{GS}=-20V$	-	-	-100	
C_{ISS}	Input capacitance	$V_{GS}=0V$, $V_{DS}=400V$, $f=1MHz$	-	990	-	pF
C_{OSS}	Output capacitance		-	22.1	-	
C_{RSS}	Reverse transfer capacitance		-	2.52	-	
Q_G	Gate charge	$V_{GS}=0\sim 10V$, $V_{DS}=400V$, $I_{DS}=5A$	-	10.62	-	nC
Q_{GS}	Gate-source charge		-	2.43	-	
Q_{GD}	Gate-drain charge			2.21		
Q_{OSS}	Output charge	$V_{GS}=0V$, $V_{DS}=0\sim 400V$	-	35.5	-	
$t_{D(on)}$	Turn-on delay time	$V_{DS}=400V$, $V_{GS}=0$ to $10V$, $I_{DS}=5A$, $R_G=25\Omega$	-	8.0	-	ns
$t_{D(off)}$	Turn-off delay time		-	13	-	
Q_{RR}	Reverse recovery charge	$I_S=5A$, $V_{DS}=400V$	-	6.0	-	nC

2- Typical Characteristic Curves

Fig 1. On-Region Characteristics

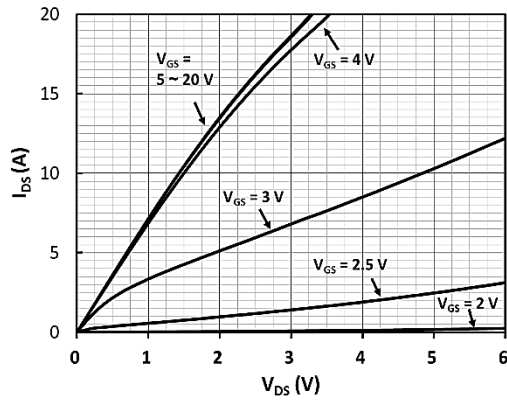


Fig 2. On-Resistance vs Drain Current and Temperature

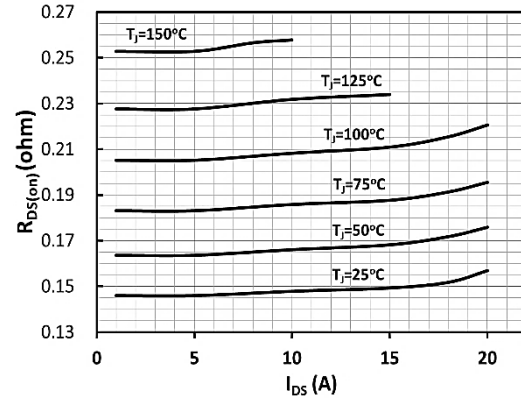


Fig 3. On-Resistance with Drain Current

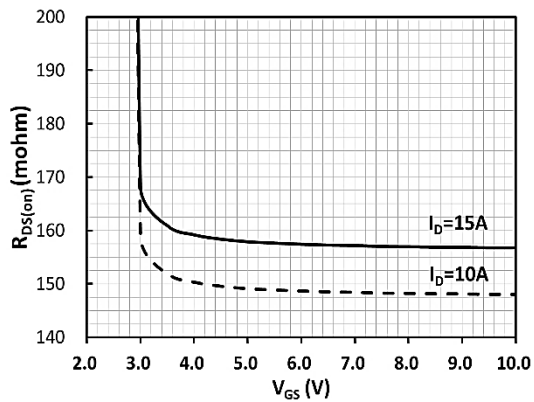


Fig 4. On-Resistance Variation with Temperature

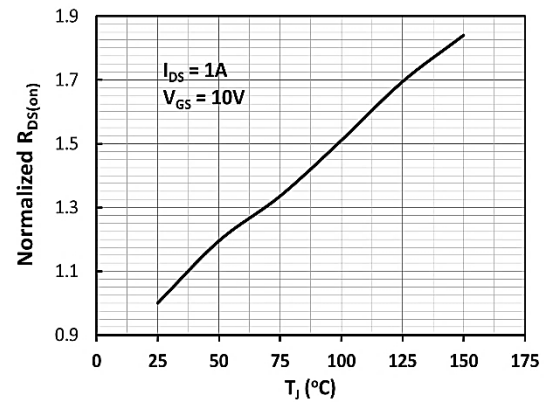


Fig 5. Threshold Voltage with Temperature

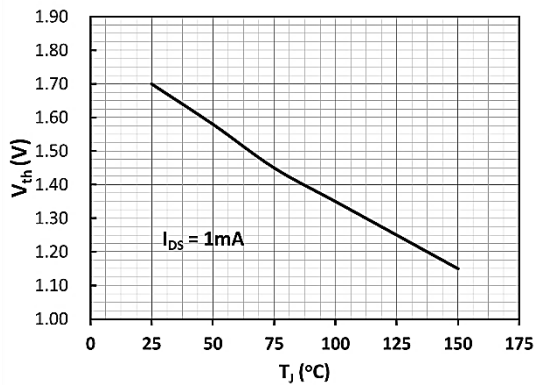


Fig 6. Capacitance Characteristics

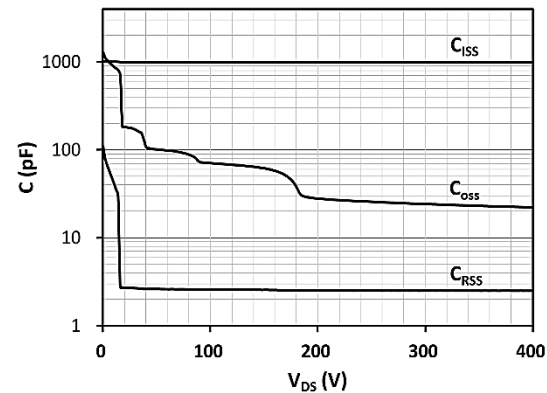


Fig 7. Gate Charge Characteristics, Q_g

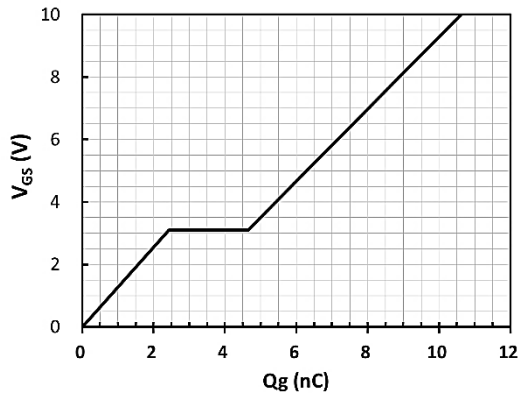


Fig 8. Capacitance Characteristics, Q_{oss}

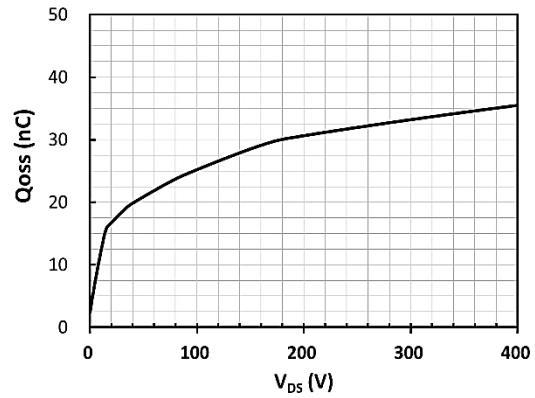
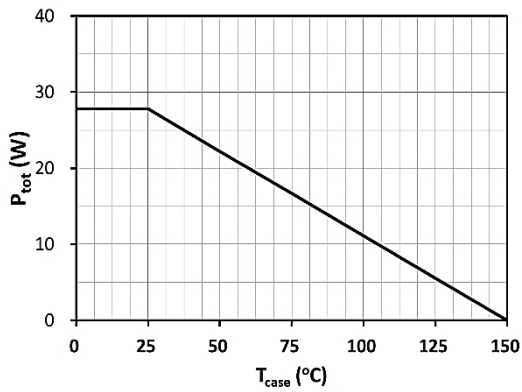
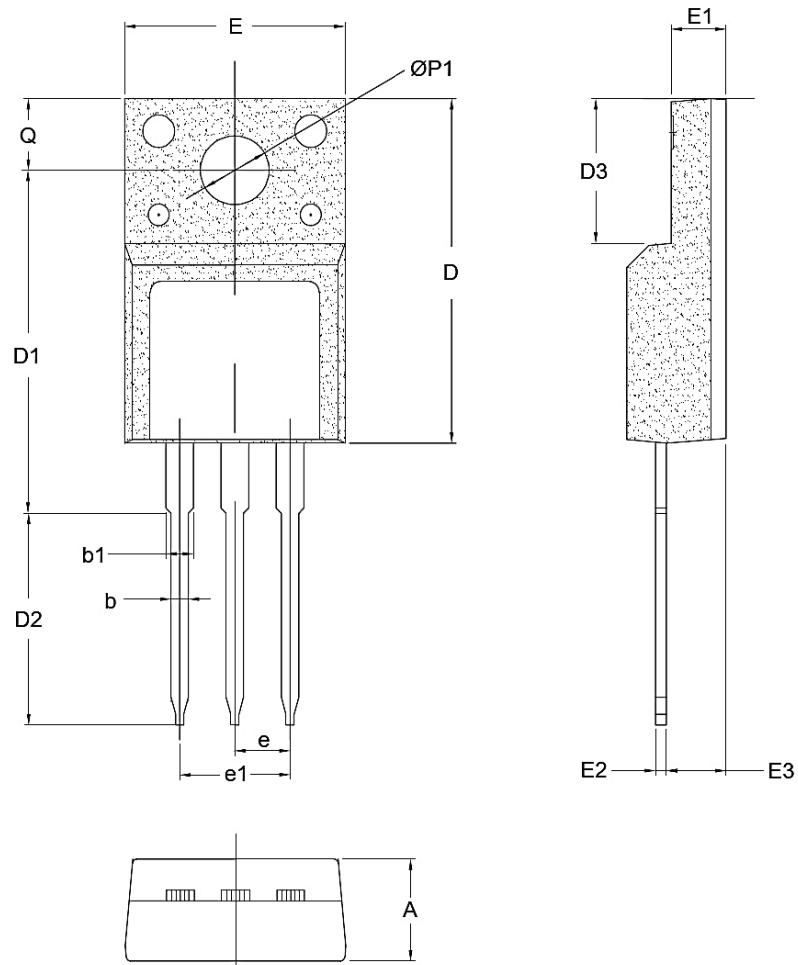


Fig 9. Power Dissipation Derating, P_{tot}



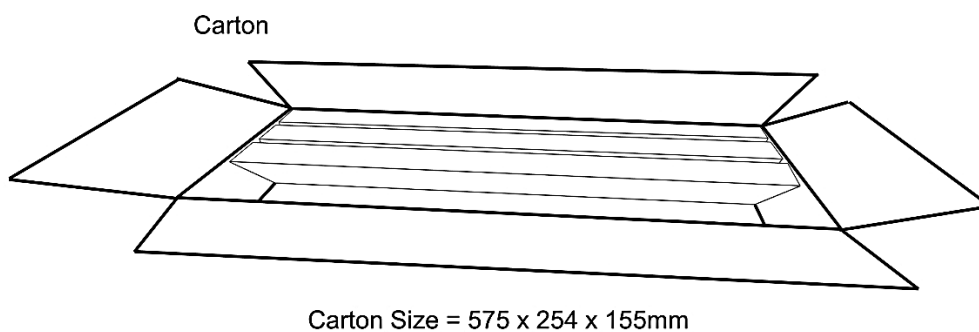
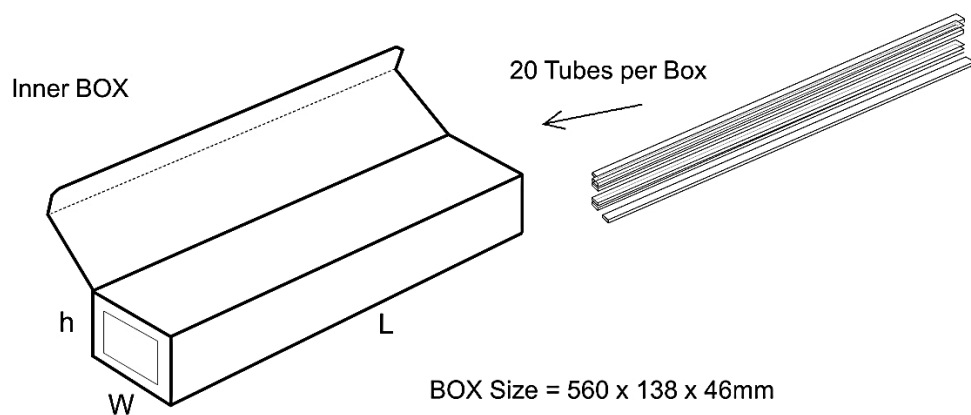
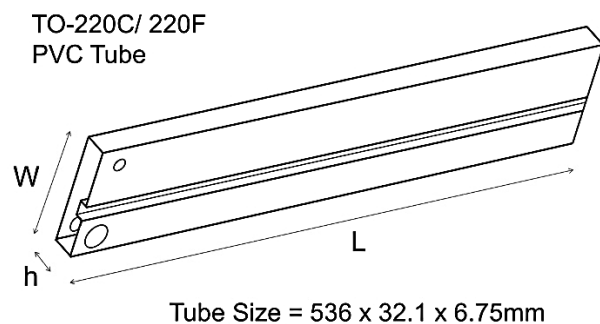
3- Package Outline Dimensions, GR-TO-220-FP



➤ Table 5 Dimension of GR-TO-220-FP

SYMBOL	DIMENSION (IN MM)			SYMBOL	DIMENSION (IN MM)		
	MIN.	NOM.	MAX.		MIN.	NOM.	MAX.
A	4.40	4.70	5.00	D1	15.5	15.8	16.1
b	1.18	1.28	1.48	D2	9.45	9.75	10.0
b1	0.70	0.80	0.95	D3	6.38	6.68	6.98
e	2.54 BSC			E1	2.24	2.54	2.84
e1	5.08 BSC			E2	0.45	0.50	0.66
D	15.57	15.87	16.17	E3	2.46	2.76	3.06
E	9.86	10.16	10.46	Q	3.00	3.30	3.60
-	-	-	-	ØP1	3.22	3.42	3.62

4- Tube Package Information



Package Type	Tube	Inner Box	Carton
TO-220C/ TO-220F	50 EA	1000 EA	5000 EA
-	-	X20 Tube	X5 Box

5- Change Log

Version	Date	Description
01	Nov 28, 2023	Initial version
02	March 27, 2025	Electrical characteristics, Curve and Package information revised.
03	April 16, 2026	Electrical characteristics revised

- **Note:** GaNrich semiconductor reserves the right to revise products and/or specifications without notice.