

N-Channel Enhancement Mode Power MOSFET

Description

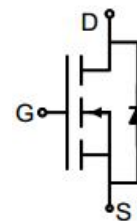
The GC125N65FF uses advanced super junction technology and design to provide excellent $R_{DS(on)}$, low gate charge and operation. This device is suitable for industry's AC-DC SMPS requirement for PFC, AC/DC power conversion, and industrial power application.

General Features

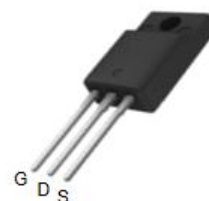
- V_{DS} 650V
- I_D (at $V_{GS} = 10V$) 25A
- $R_{DS(ON)}$ (at $V_{GS} = 10V$) < 125m Ω
- 100% Avalanche Tested
- RoHS Compliant
- Ultra-fast body diode

Application

- Power switch
- DC/DC converters



Schematic diagram



TO-220F

Ordering Information

Device	Package	Marking	Packaging
GC125N65FF	TO-220F	GC125N65F	50pcs/Tube

Absolute Maximum Ratings $T_C = 25^\circ\text{C}$, unless otherwise noted

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	650	V
Continuous Drain Current	$T_C = 25^\circ\text{C}$	25	A
	$T_C = 100^\circ\text{C}$	16	
Pulsed Drain Current (note1)	I_{DM}	75	A
Gate-Source Voltage	V_{GS}	± 30	V
Power Dissipation	P_D	42	W
Single pulse avalanche energy (note2)	E_{AS}	20	mJ
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 To 150	$^\circ\text{C}$

Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Ambient	R_{thJA}	62	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Case	R_{thJC}	3	$^\circ\text{C/W}$

Specifications $T_J = 25^\circ\text{C}$, unless otherwise noted

Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static Parameters						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	650	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 650V, V_{GS} = 0V$	--	--	5	μA
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 30V$	--	--	± 100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	3.2	4.0	4.6	V
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 12A$	--	108	125	m Ω
Forward Transconductance	g_{FS}	$V_{DS} = 5V, I_D = 12A$	--	13	--	S
Dynamic Parameters						
Input Capacitance	C_{iss}	$V_{GS} = 0V,$ $V_{DS} = 400V,$ $f = 0.5MHz$	--	1600	--	pF
Output Capacitance	C_{oss}		--	50	--	
Reverse Transfer Capacitance	C_{rss}		--	6	--	
Total Gate Charge	Q_g	$V_{DD} = 400V,$ $I_D = 12A,$ $V_{GS} = 10V$	--	52	--	nC
Gate-Source Charge	Q_{gs}		--	14	--	
Gate-Drain Charge	Q_{gd}		--	30	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 400V,$ $I_D = 12A,$ $R_G = 2\Omega$	--	25	--	ns
Turn-on Rise Time	t_r		--	50	--	
Turn-off Delay Time	$t_{d(off)}$		--	65	--	
Turn-off Fall Time	t_f		--	28	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	$T_C = 25^\circ C$	--	--	25	A
Body Diode Voltage	V_{SD}	$T_J = 25^\circ C, I_{SD} = 12A, V_{GS} = 0V$	--	--	1.2	V
Reverse Recovery Charge	Q_{rr}	$I_F = 12A, V_{GS} = 0V$ $di/dt = 100A/\mu s$	--	0.4	--	μC
Reverse Recovery Time	T_{rr}		--	97	--	ns

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature

2. EAS condition : $T_J = 25^\circ\text{C}, V_{DD} = 50V, V_{GS} = 10V, L = 10mH, R_G = 25\Omega$

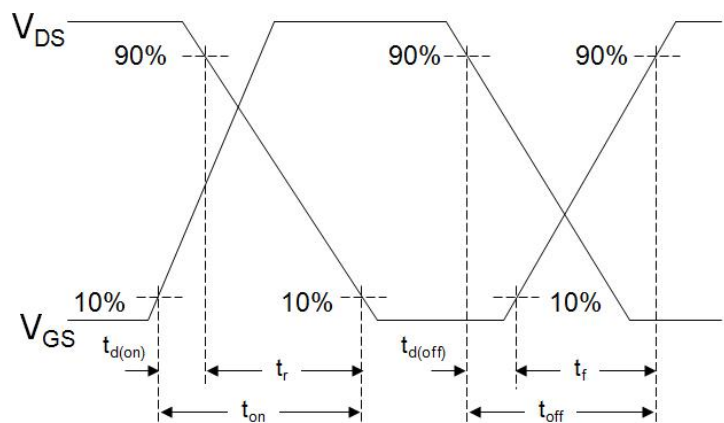
The table shows the minimum avalanche energy, which is 80mJ when the device is tested until failure

3. Identical low side and high side switch with identical R_G

Gate Charge Test Circuit



Switch Time Test Circuit



EAS Test Circuit



Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

Figure 1. Output Characteristics

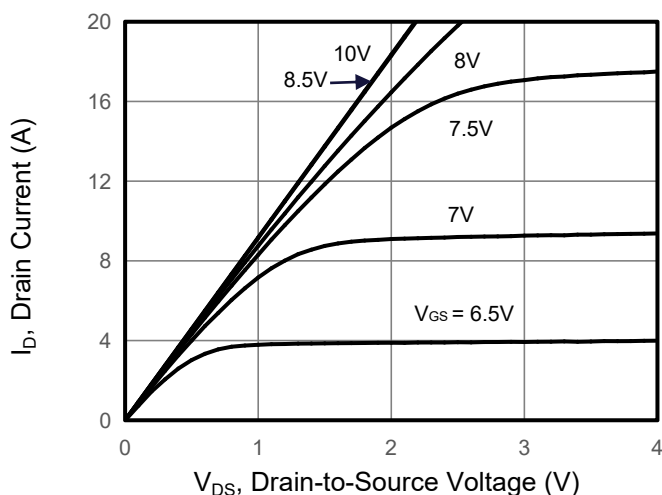


Figure 2. Transfer Characteristics

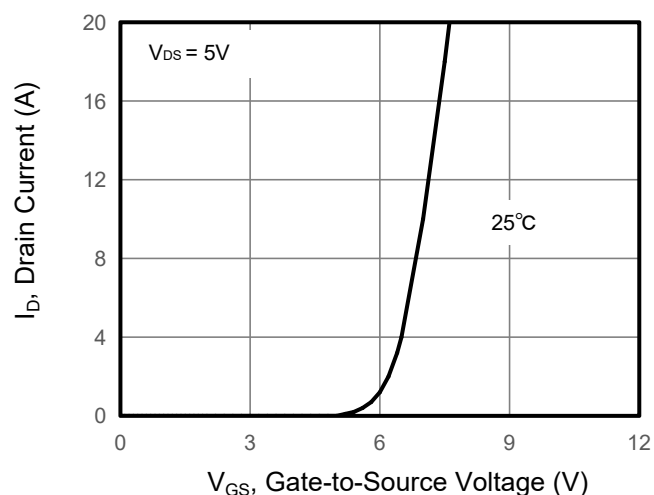


Figure 3. Drain Source On Resistance

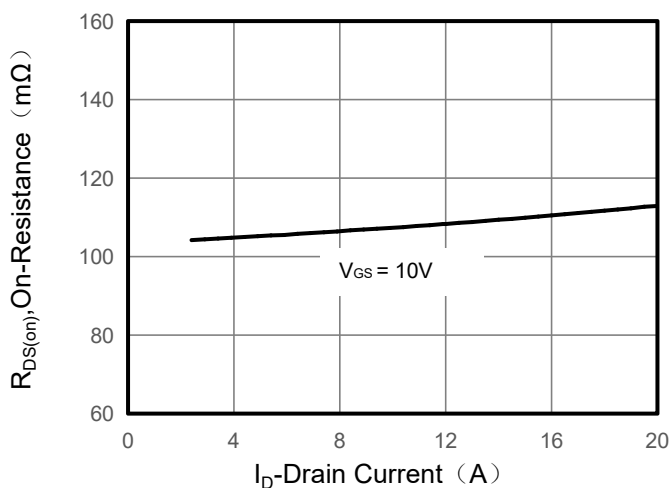


Figure 4. Gate Charge

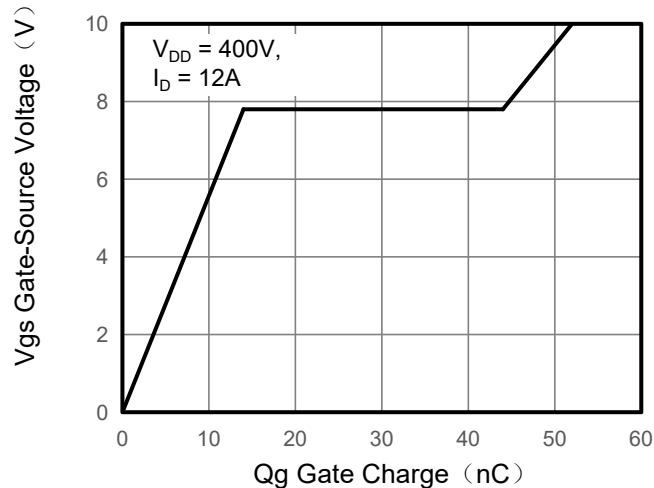


Figure 5. Capacitance

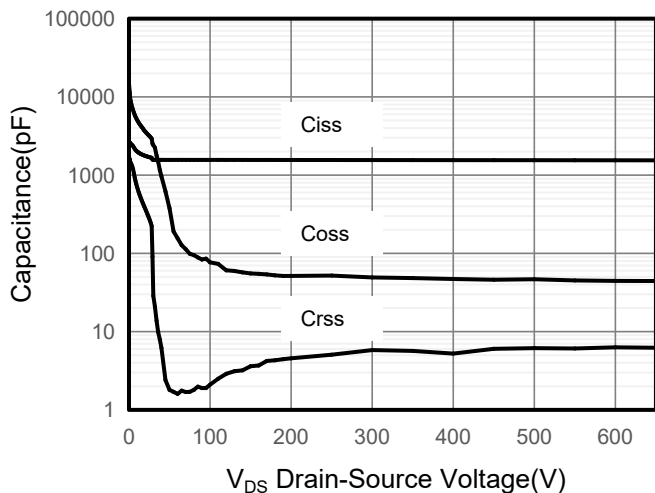
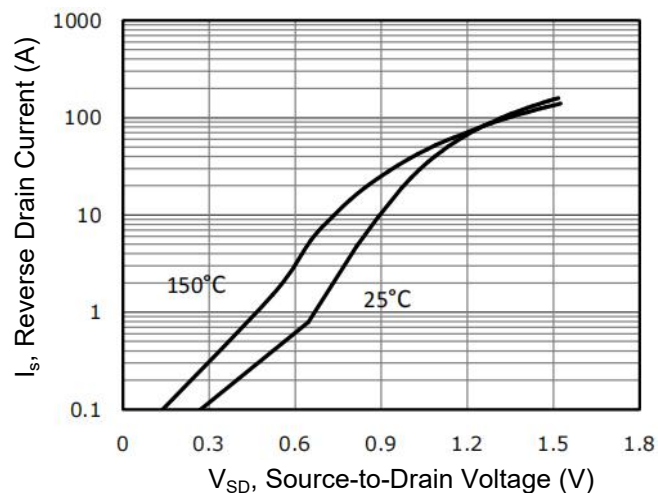


Figure 6. Source-Drain Diode Forward



Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

Figure 7. Drain-Source On-Resistance

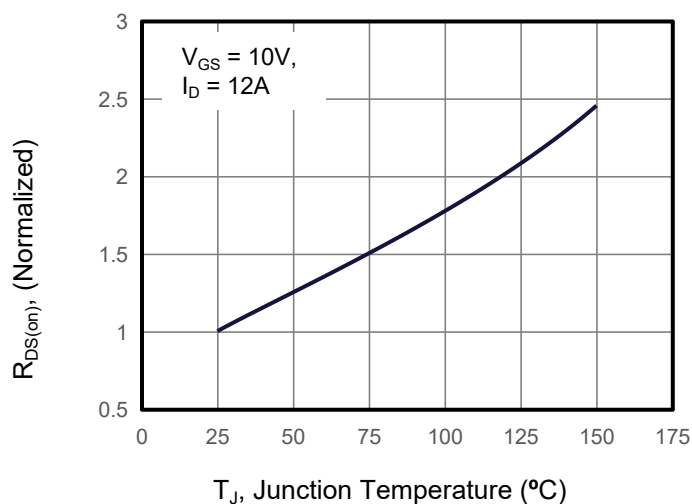


Figure 8. Safe Operation Area

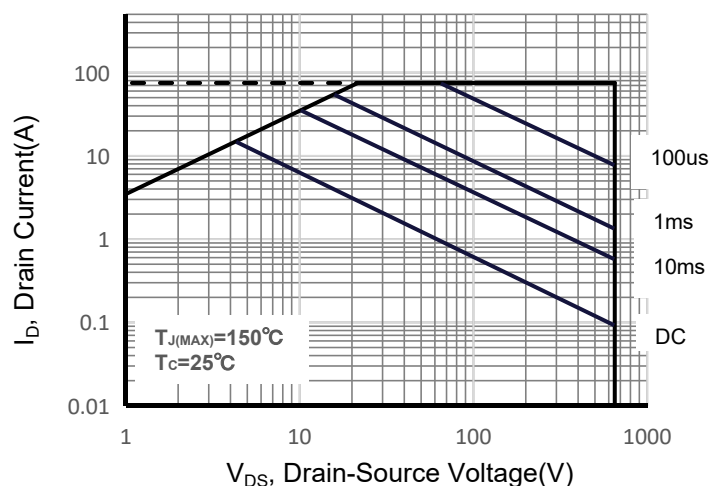


Figure 9. Maximum Continuous Drain Current vs Case Temperature

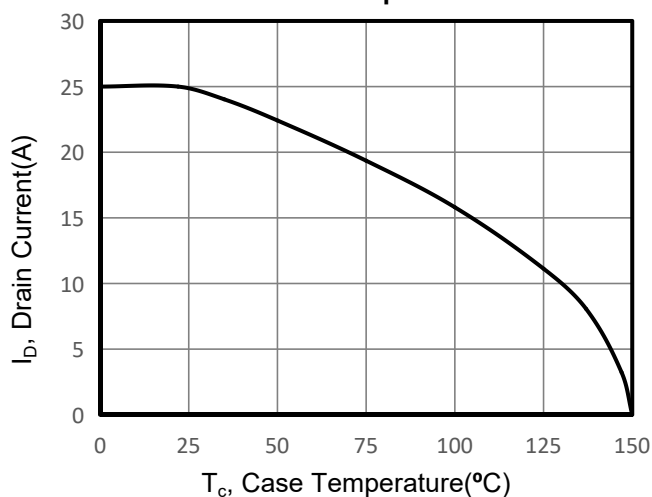
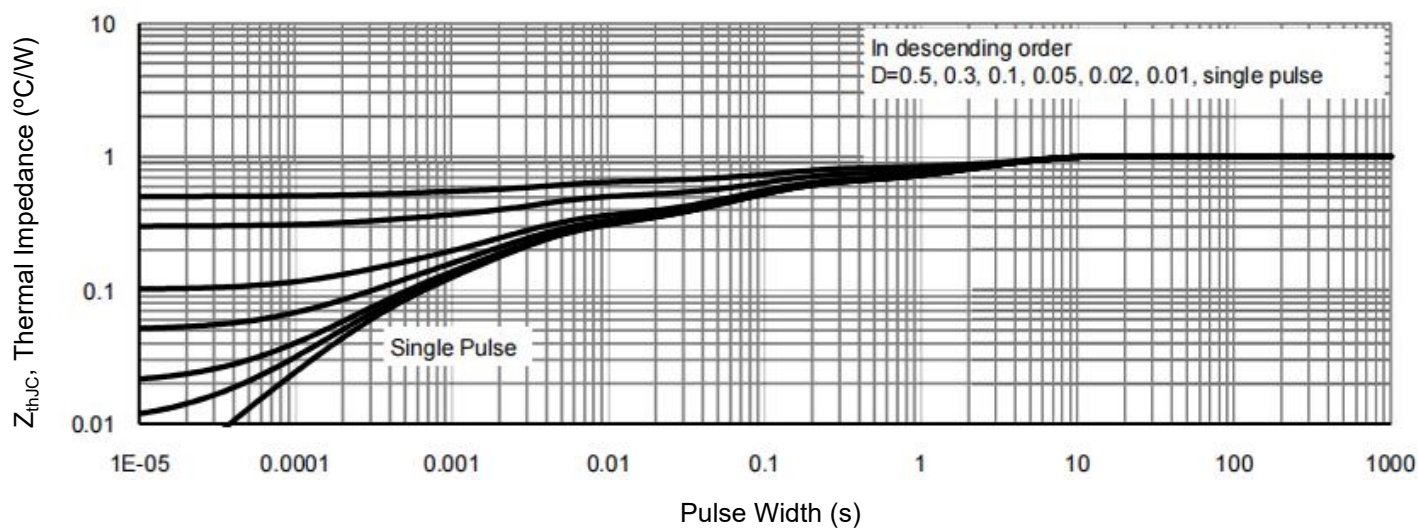
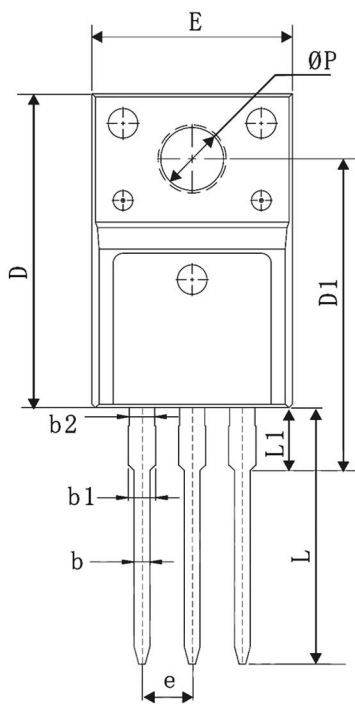


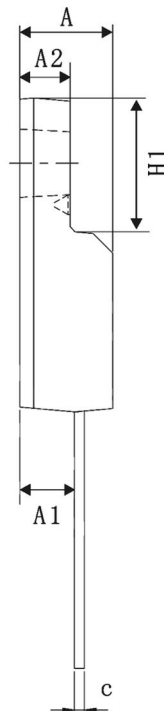
Figure 10. Normalized Maximum Transient Thermal Impedance



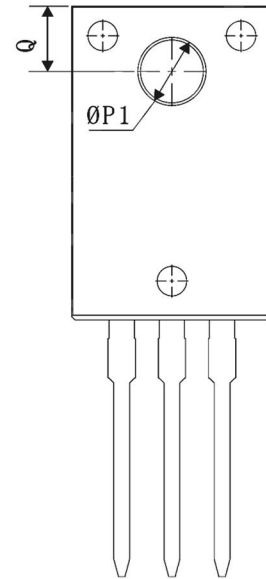
TO-220F Package Information



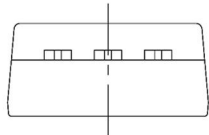
TOP VIEW



SIDE VIEW



Back VIEW



BOTTOM VIEW

COMMON DIMENSIONS
(UNITS OF MEASURE=mm)

SYMBOL	MIN	NOM	MAX
A	4.50	4.70	4.90
A1	2.56	2.76	2.96
A2	2.34	2.54	2.74
b	0.70	0.80	0.90
b1	1.28	1.38	1.48
b2	1.18	1.28	1.38
c	0.40	0.50	0.60
D	15.67	15.87	16.07
D1	15.50	15.75	16.00
e	2.54BSC		
E	9.96	10.16	10.36
H1	6.75REF		
L	12.78	12.98	13.18
L1			3.50
Q	3.20	3.30	3.40
ØP	3.08	3.18	3.28
ØP1	3.35	3.45	3.55