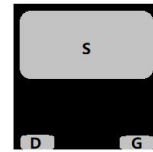# MGZ31N65

650V GaN FET Enhancement Mode

Features

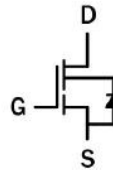- 650V, 6.5A, $R_{DS(on)}$(typ.) = 250mΩ@VGS = 8V.
- Very low Q_{RR}
- Reduced Crossover Loss
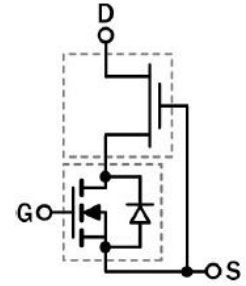- RoHS Compliant and Halogen-free Packaging

PQFN8*8
Bottom View

Application

- Power adapters
- Low power SMPS
- Lighting

Cascode Schematic Symbol

Cascode Device Structure

Absolute Maximum Ratings （Tc = 25°C unless otherwise noted）

Symbol	Parameter		Limit	Unit
			PQFN8*8	
V_{DS}	Drain-Source Voltage		650	V
$V_{(TR)DSS}$	Transient Drain to Source Voltage [a]		725	V
V_{GSS}	Gate-Source Voltage		± 18	V
P_D	Maximum power Dissipation @T_C = 25°C		21	W
I_D	Drain Current-Continuous	T_C = 25°C [b]	6.5	A
	Drain Current-Continuous	T_C = 100°C [b]	4.0	A
I_{DM}	Drain Current-Pulsed	Pulse Width = 10μs	30	A
T_C	Operating Temperature Case		-55 to +150	°C
T_J	Operating Temperature Junction		-55 to +150	°C
T_S	Storage Temperature		-55 to +150	°C
T_{SOLD}	Soldering Peak Temperature [c]		260	°C

Thermal Characteristics

Symbol	Parameter	Typical	Unit
$R_{θJC}$	Thermal Resistance Junction-Case	5.9	°C/W
$R_{θJA}$	Thermal Resistance Junction-Ambient	50	°C/W

Electrical Characteristics（ T_J = 25°C unless otherwise noted）

■ Off Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$V_{(BL)DSS}$	Reverse Breakdown Voltage	V_{GS} = 0V	650	-	-	V
I_{DSS}	Reverse Leakage Current	V_{GS} = 0V, V_{DS} = 650V	-	-	15	µA
I_{GSS}	Gate-to-source Leakage Current	V_{DS} = 0V, V_{GS} = ±18V	-	-	±100	nA

■ On Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D =500µA	1.1	2.0	2.9	V
$R_{DS(on)eff}$	On Resistance	V_{GS} = 8V, I_D =5A	-	250	330	mΩ
		V_{GS} = 8V, I_D =5A T_J = 150°C	-	500	-	

■ Dynamic Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
C_{ISS}	Input Capacitance	V_{GS} = 0 V, V_{DS} = 400 V f=1MHz	-	760	-	pF
C_{OSS}	Output Capacitance		-	16	-	
C_{RSS}	Transfer Capacitance		-	2	-	
$C_{o(er)}$	Output Capacitance, energy related	V_{GS} = 0 V, V_{DS} = 0~400 V	-	24	-	pF
$C_{o(tr)}$	Output Capacitance, time related		-	47	-	

■ On Characteristics

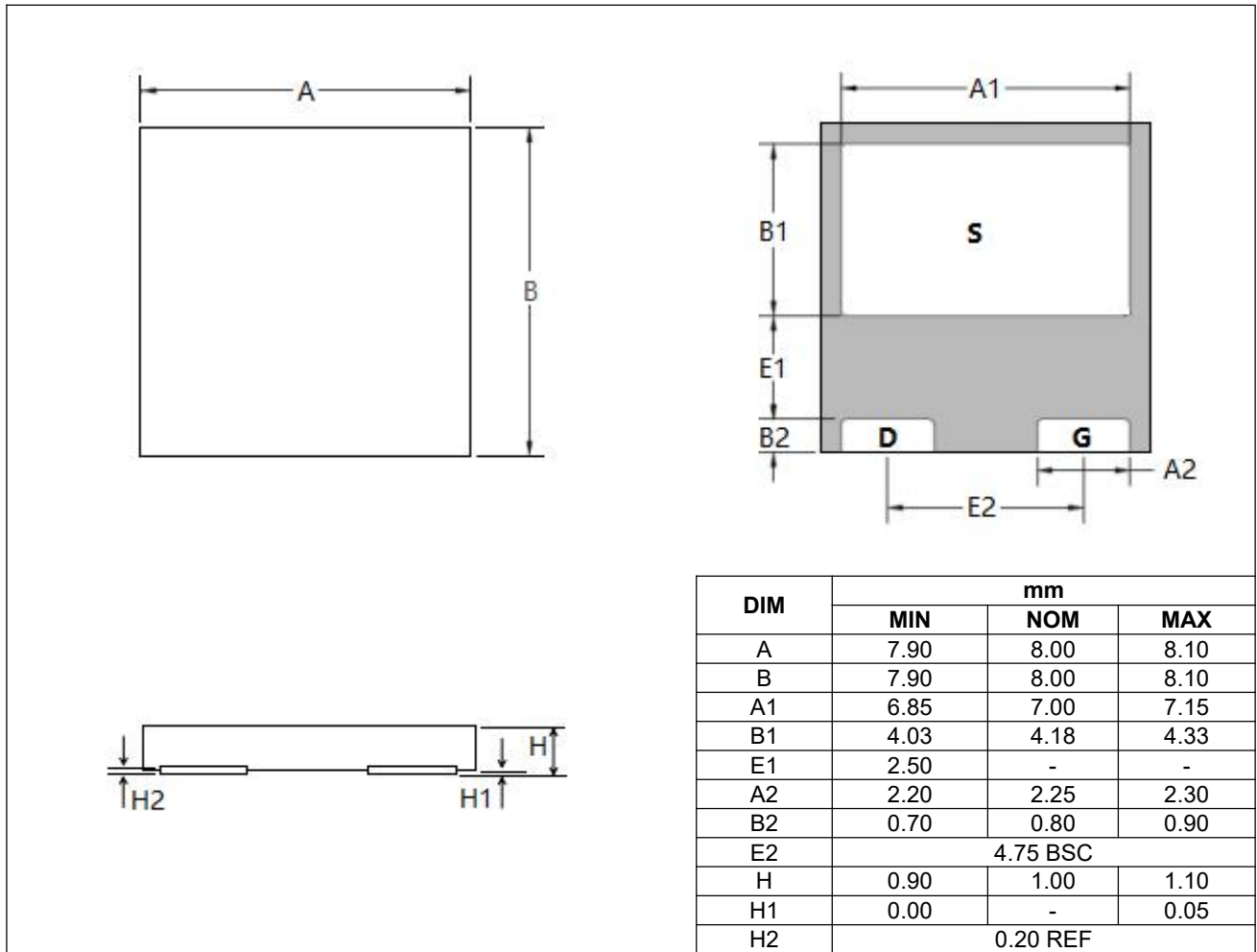| Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-On Delay Time	V_{GS} = 0~8 V, V_{DS} = 400 V , I_D = 4 A , Rg = 30 Ω	-	20	-	ns
t_r	Turn-On Rise Time		-	4	-	
$t_{d(off)}$	Turn-Off Delay Time		-	52	-	
t_f	Turn-Off Fall Time		-	10	-	
Q_G	Total Gate Charge	V_{GS} = 0~8 V, V_{DS} = 400 V , I_D = 4 A	-	9.5	-	nC
Q_{GS}	Gate-Source Charge		-	2.7	-	
Q_{GD}	Gate-Drain Charge		-	2.5	-	
Q_{OSS}	Output Charge	V_{GS}=0V, V_{DS}=0~400 V	-	19	-	nC

■ **Drain-Source Diode Characteristics**

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
I_S	Reverse Current	V_{GS} = 0 V, T_C=100˚C, ≤25% duty cycle	-	-	4.0	A
V_{SD}	Reverse Voltage	V_{GS} = 0V, I_S = 2 A	-	1.2	-	V
		V_{GS} = 0V, I_S = 4 A	-	1.6	-	V
t_{RR}	Reverse Recovery Time	I_S = 4 A ,V_{DS}= 400V, di/dt = 1000 A/µs	-	15	-	ns
Q_{RR}	Reverse Recovery Charge		-	22	-	nC

Notes:

a. In off-state, spike duty cycle D<0.01, spike duration <1μs

b. For increased stability at high current operation

c. Reflow MSL3

■ PQFN8X8 Package Information

DIM	mm		
	MIN	NOM	MAX
A	7.90	8.00	8.10
B	7.90	8.00	8.10
A1	6.85	7.00	7.15
B1	4.03	4.18	4.33
E1	2.50	-	-
A2	2.20	2.25	2.30
B2	0.70	0.80	0.90
E2	4.75 BSC		
H	0.90	1.00	1.10
H1	0.00	-	0.05
H2	0.20 REF		

■ Revision History

Version	Date	Subjects (major changes since last revision)
0.1	2021-05-07	Preliminary version