

GR-65J050ED: TOLL-9 Cascode GaN HEMT

Description

GR-65J050ED 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-65J050ED
V_{DSS}	650V
$V_{(TR)DSS}$	800V
$R_{DS(ON)}$, typ.	49m Ω
Q_G , typ.	12.6nC
Package	DFN 9.9 x 10.5 mm

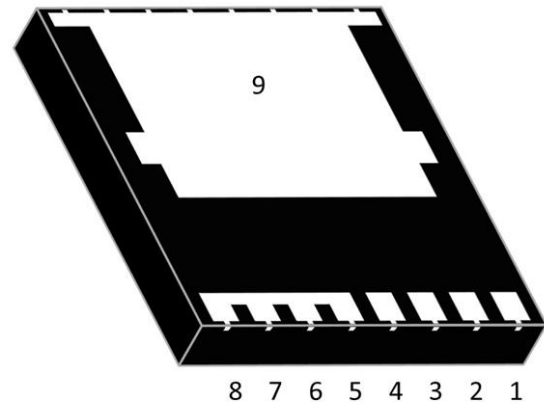
Features

- Gate drive voltage compatibility (-20V to +20V)
- High operating frequency
- Low Q_{rr}
- ESD-resistant
- Comply with JEDEC standards

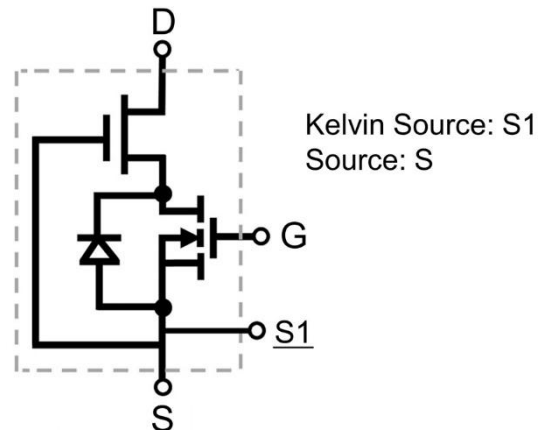
Applications

- Switch Mode Power Supplies (SMPS)
- AC-DC/ DC-DC Converters
- Motor Drives

GR-65J050ED (TOLL-9)



Gate: Pin 1
Drain: Pin 9
Kelvin Source: Pin 2
Source: Pin 3 ~ Pin 8



Cascode Device Structure

1- Electrical Characteristics

➤ **Table 1 Absolute maximum ratings**

Symbol	Parameter		Value	Unit
V_{DS}	Drain-source voltage		650	V
V_{GS}	Gate- source voltage		-20V ~ +20V	V
I_D	Drain current (continuous) at $T_C = 25^\circ\text{C}$ operation		30.8	A
	Drain current (continuous) at $T_C = 100^\circ\text{C}$ operation		19.5	A
$I_{D,pulse}$	Pulsed drain current (pulse width: 10 μs)		115.5	A
P_D	Maximum power dissipation $T_C=25^\circ\text{C}$		96	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	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal resistance junction-case	1.3	$^\circ\text{C/W}$

➤ **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	$V_{GS}=V_{DS}$, $I_D=1mA$	2.0	3.0	4.0	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS}=10V$, $I_D=5A$, $T_J=25\text{ }^{\circ}\text{C}$	-	49	60	m Ω
		$V_{GS}=10V$, $I_D=5A$, $T_J=150\text{ }^{\circ}\text{C}$	-	88	-	
I_{DSS}	Drain-source leakage current	$V_{GS}=0V$, $V_{DS}=650V$, $T_J=25\text{ }^{\circ}\text{C}$	-	3.5	70	μA
		$V_{GS}=0V$, $V_{DS}=650V$, $T_J=150\text{ }^{\circ}\text{C}$	-	17.5	-	
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	$V_{GS}=0V$, $V_{DS}=400V$, $f=1MHz$	-	682	-	pF
C_{OSS}	Output capacitance		-	32.0	-	
C_{RSS}	Reverse transfer capacitance		-	1.38	-	
Q_G	Gate charge	$V_{GS}=0\sim 10V$, $V_{DS}=400V$, $I_{DS}=5A$	-	12.6	-	nC
Q_{GS}	Gate-source charge		-	3.5	-	
Q_{GD}	Gate-drain charge		-	2.4	-	
Q_{OSS}	Output charge	$V_{GS}=0V$, $V_{DS}=0\sim 400V$	-	51.6	-	nC
$t_{D(on)}$	Turn-on delay time	$V_{DS}=400V$, $V_{GS}=0$ to $10V$, $I_{DS}=2A$, $R_G=25\Omega$	-	12	-	ns
$t_{D(off)}$	Turn-off delay time		-	19.5	-	
Q_{RR}	Reverse recovery charge	$I_S=5A$, $V_{DS}=400V$	-	9.0	-	nC

2- Typical Characteristic Curves

Fig 1. On-Region Characteristics

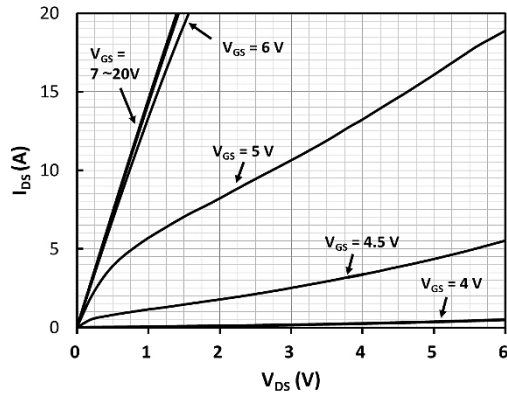


Fig 2. On-Resistance vs Drain Current and Temperature

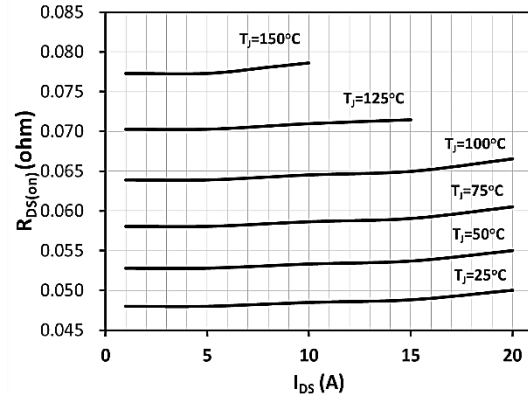


Fig 3. On-Resistance with Drain Current

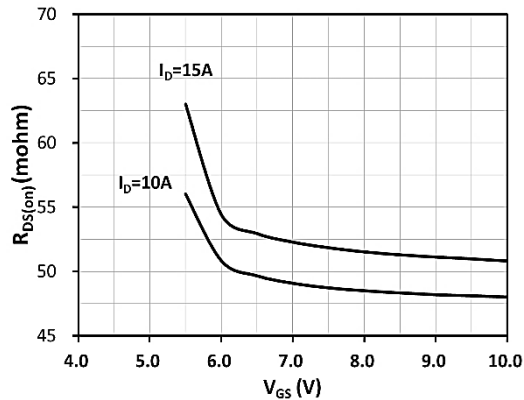


Fig 4. On-Resistance Variation with Temperature

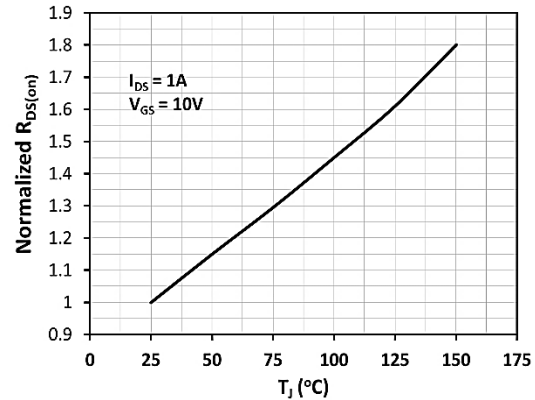


Fig 5. Threshold Voltage with Temperature

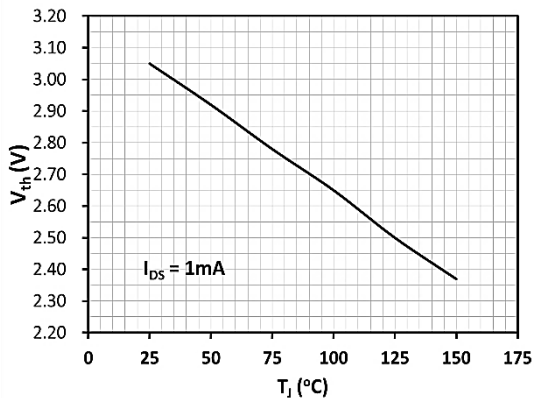


Fig 6. Capacitance Characteristics

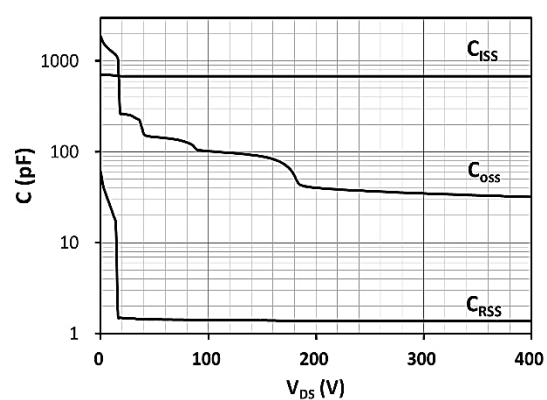


Fig 7. Gate Charge Characteristics, Qg

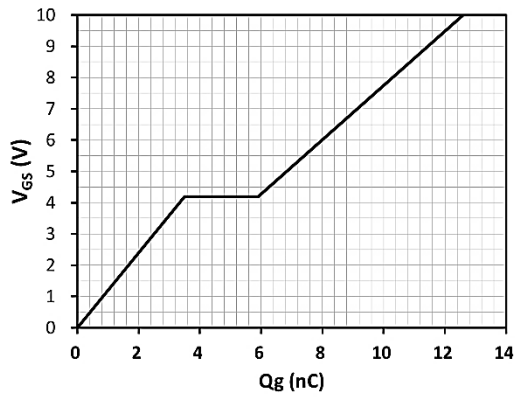


Fig 8. Capacitance Characteristics, Qoss

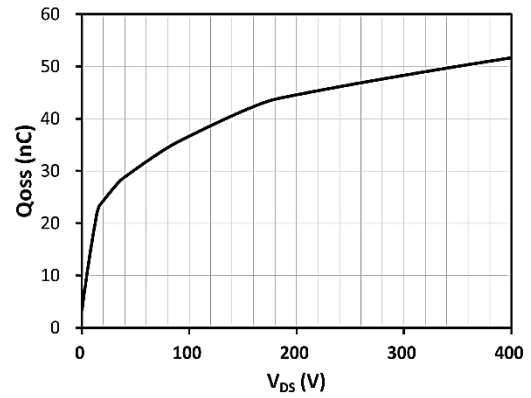
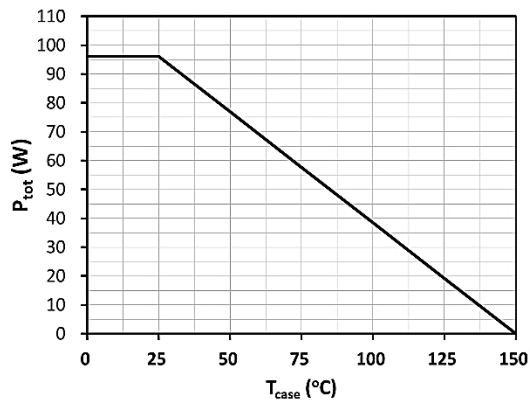
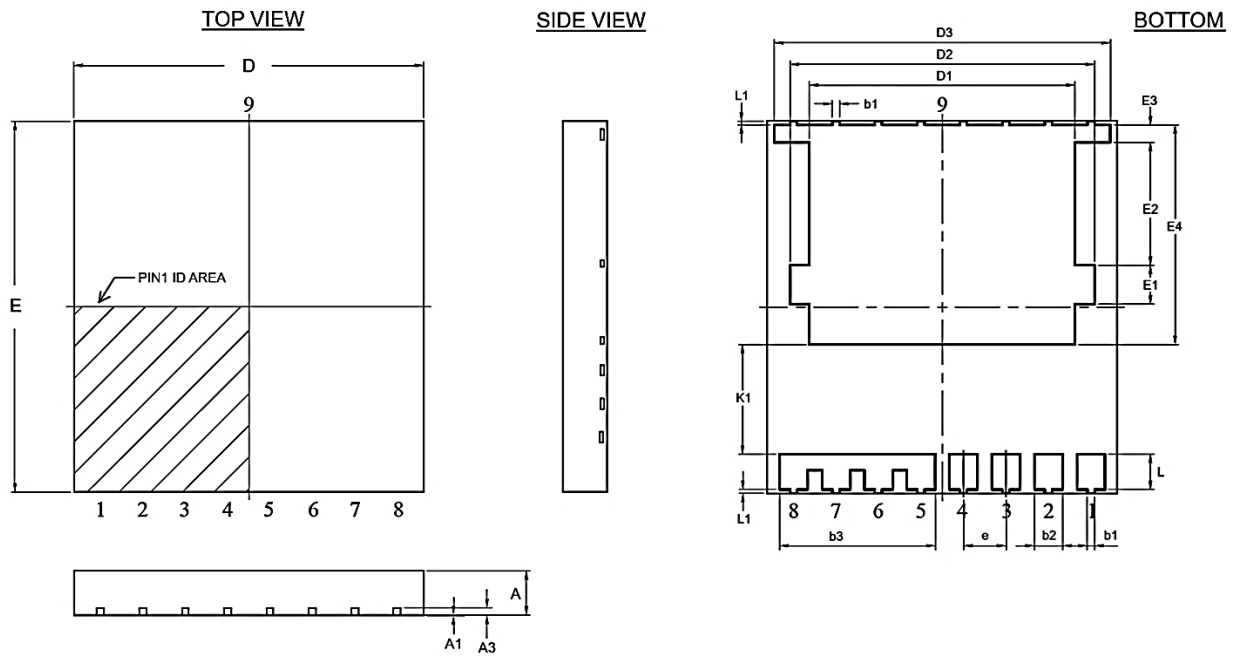


Fig 9. Power Dissipation Derating, Ptot



3- Package Outline Dimensions, GR- TOLL-9



➤ Table 5 Dimension of GR -TOLL-9

SYMBOL	DIMENSION (MM)			SYMBOL	DIMENSION (IN MM)		
	MIN.	NOM.	MAX.		MIN.	NOM.	MAX.
A	1.20	1.25	1.30	E3	0.40	0.50	0.60
A1	--	0.02	0.05	E4	6.10	6.20	6.30
A3	0.203 REF			L	1.00	1.10	1.20
D	9.80	9.90	10.0	L1	0.10 REF		
D1	7.40	7.50	7.60	K1	3.00	3.10	3.20
D2	8.50	8.60	8.70	b1	0.20 REF		
D3	9.40	9.50	9.60	b2	0.70	0.80	0.90
E	10.4	10.5	10.6	b3	4.30	4.40	4.50
E1	1.00	1.10	1.20	e	2.10 BSC		
E2	3.37	3.47	3.57	--	--	--	--

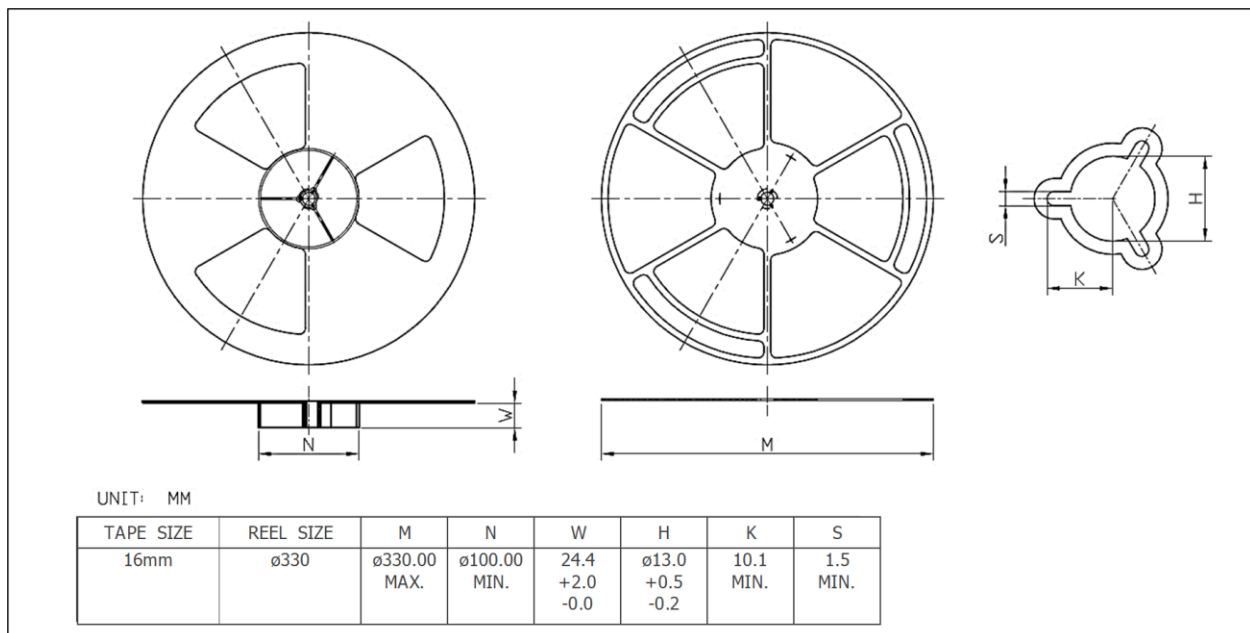
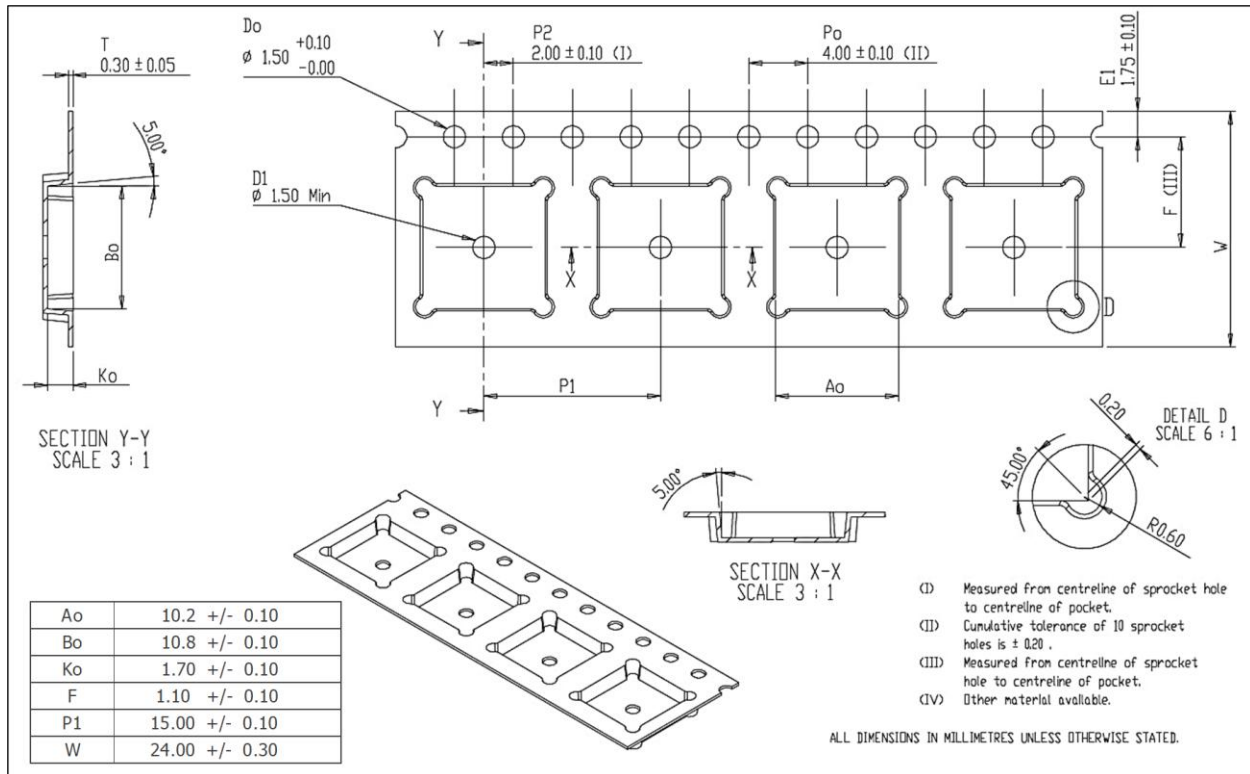
Technical drawing of a mechanical part with dimensions $a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z$.

SYMBOL	DIMENSION	SYMBOL	DIMENSION
a	9.70	g	2.90
b	6.60	h	0.10
c	1.20	i	4.40
d	1.20	j	1.25
e	0.80	k	0.35
f	0.40		

(2) Drawing not to scale.

*According to **IPC (IPC-A-610)**, solder voids are considered to be a defect when the overall calculated area of all voids in any given solder ball/joint is greater than 25% of the total solder ball area.

4- Tape and Reel Information



5- Change Log

Version	Date	Description
01	September 2, 2024	Initial version
02	February 17, 2025	Add Characteristic Curve
03	April 16, 2026	Electrical characteristics revised

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