

GR-65J050MS: TOLL Cascode GaN HEMT

Description

GR-65J050MS 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

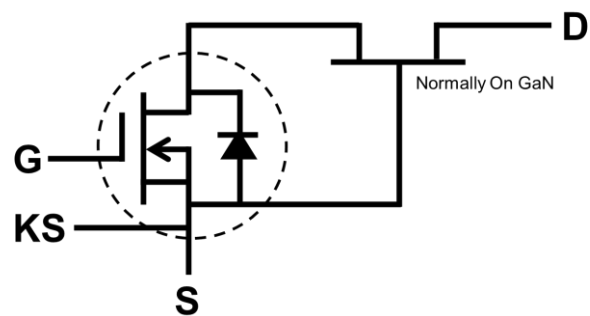
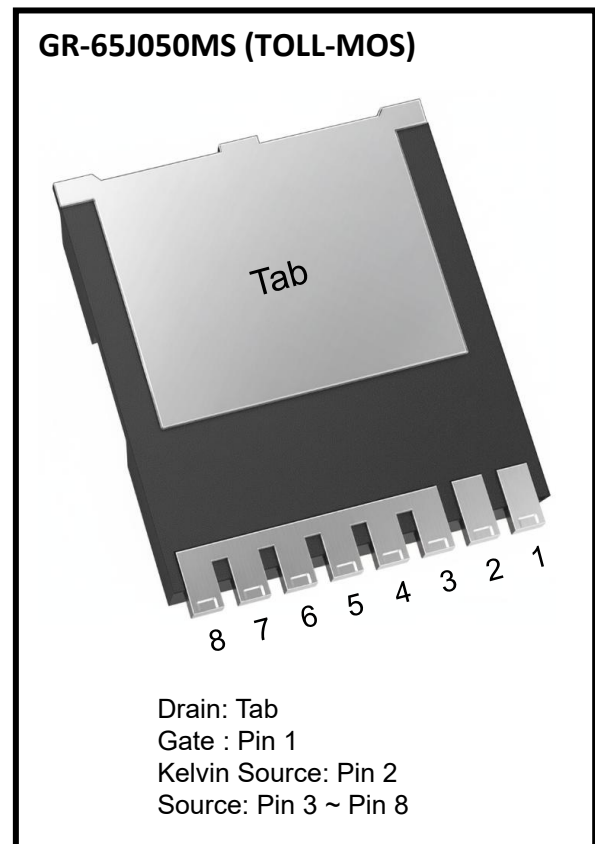
Part Number	GR-65J050MS
V_{DSS}	650V
$V_{(TR)DSS}$	800V
$R_{DS(ON)}$, typ.	48m Ω
Q_G , typ.	11.5nC
Package	TOLL-MOS

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
- Motor Drives



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		36	A
	Drain current (continuous) at $T_C = 100^\circ\text{C}$ operation		23	A
$I_{D, \text{pulse}}$	Pulsed drain current (pulse width: 10 μs)		135	A
P_D	Maximum power dissipation at $T_C = 25^\circ\text{C}$		139	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	55	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal resistance junction-case	0.9	$^\circ\text{C}/\text{W}$

➤ **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	$V_{GS}=V_{DS}$, $I_D=1mA$	2.0	3.0	4.0	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS}=10V$, $I_D=10A$, $T_J=25\text{ }^{\circ}\text{C}$	-	48	58	m Ω
		$V_{GS}=10V$, $I_D=10A$, $T_J=150\text{ }^{\circ}\text{C}$	-	89	-	
I_{DSS}	Drain-source leakage current	$V_{GS}=0V$, $V_{DS}=650V$, $T_J=25^{\circ}\text{C}$	-	3.5	70	μA
		$V_{GS}=0V$, $V_{DS}=650V$, $T_J=150^{\circ}\text{C}$	-	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	$V_{GS}=0V$, $V_{DS}=400V$, $f=1\text{MHz}$	-	745	-	pF
C_{OSS}	Output capacitance		-	48.0	-	
C_{RSS}	Reverse transfer capacitance		-	2.70	-	
Q_G	Gate charge	$V_{GS}=0\sim 10V$, $V_{DS}=400V$, $I_{DS}=10A$	-	11.5	-	nC
Q_{GS}	Gate-source charge		-	2.85	-	
Q_{GD}	Gate-drain charge		-	2.60	-	
Q_{OSS}	Output charge	$V_{GS}=0V$, $V_{DS}=0\sim 400V$	-	72.2	-	
$t_{D(on)}$	Turn-on delay time	$V_{DS}=400V$, $V_{GS}=0\text{ to }10V$, $I_{DS}=5A$, $R_G=25\Omega$	-	12.0	-	ns
$t_{D(off)}$	Turn-off delay time		-	26.0	-	
Q_{RR}	Reverse recovery charge	$I_S=10A$, $V_{DS}=400V$	-	8.8	-	nC

2- Typical Characteristic Curves

Fig 1. On-Region Characteristics

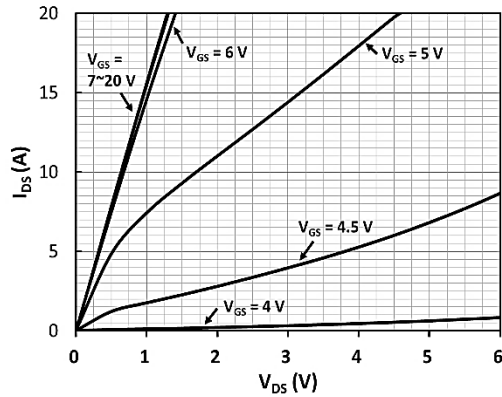


Fig 2. On-Resistance vs Drain Current and Temperature

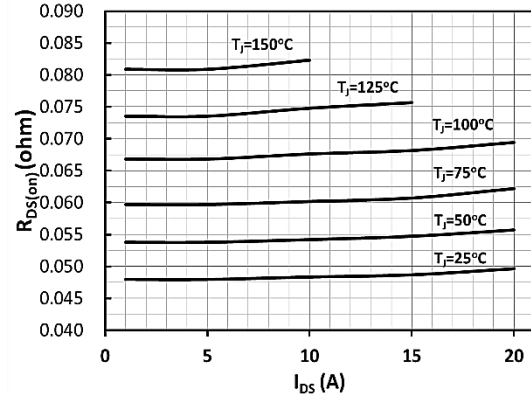


Fig 3. On-Resistance with Drain Current

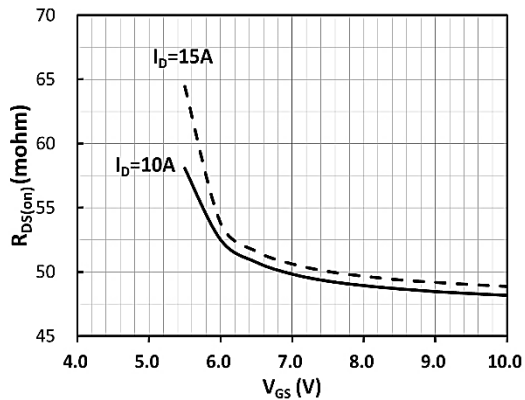


Fig 4. On-Resistance Variation with Temperature

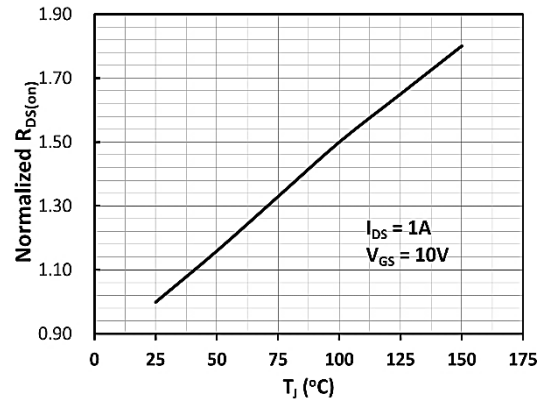


Fig 5. Threshold Voltage with Temperature

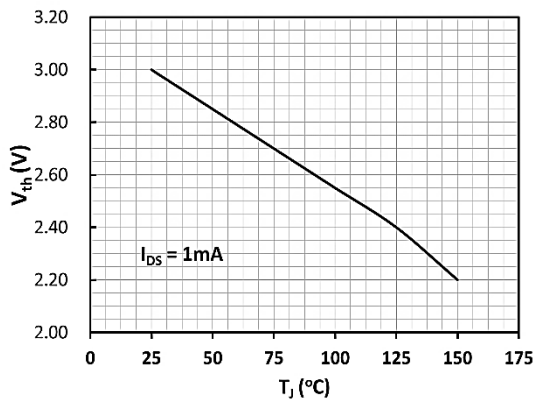


Fig 6. Capacitance Characteristics

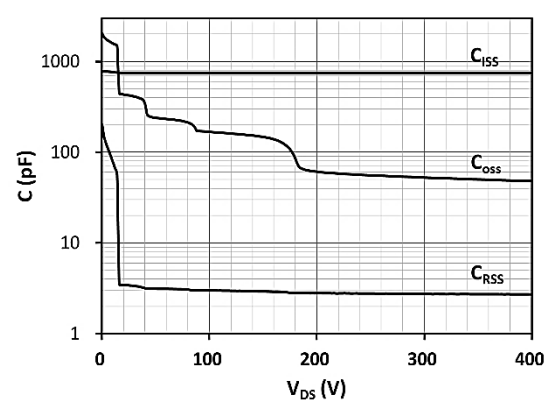


Fig 7. Gate Charge Characteristics, Q_g

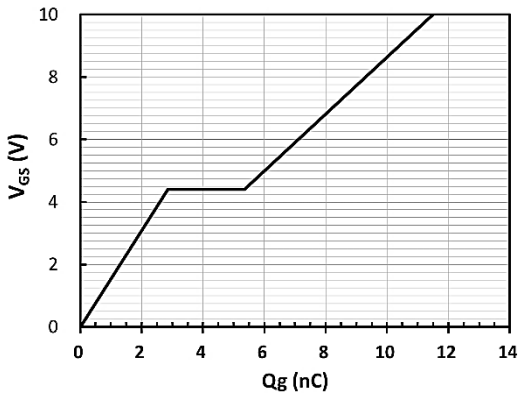


Fig 8. Capacitance Characteristics, Q_{oss}

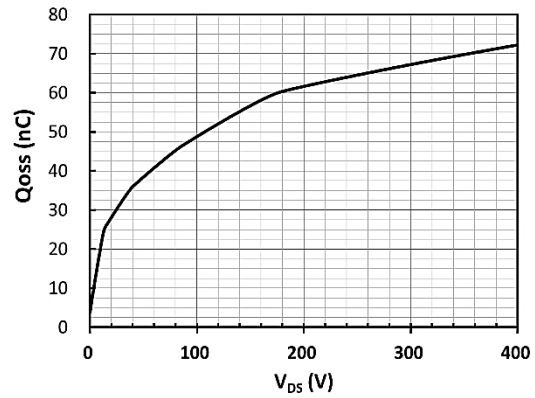
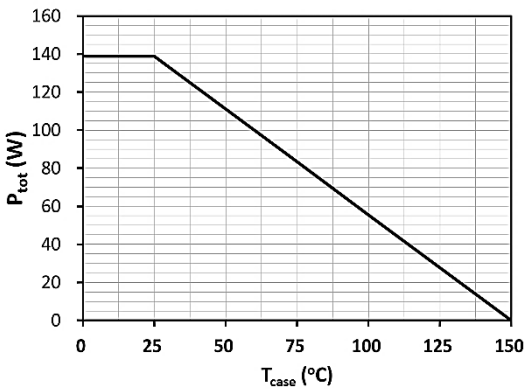
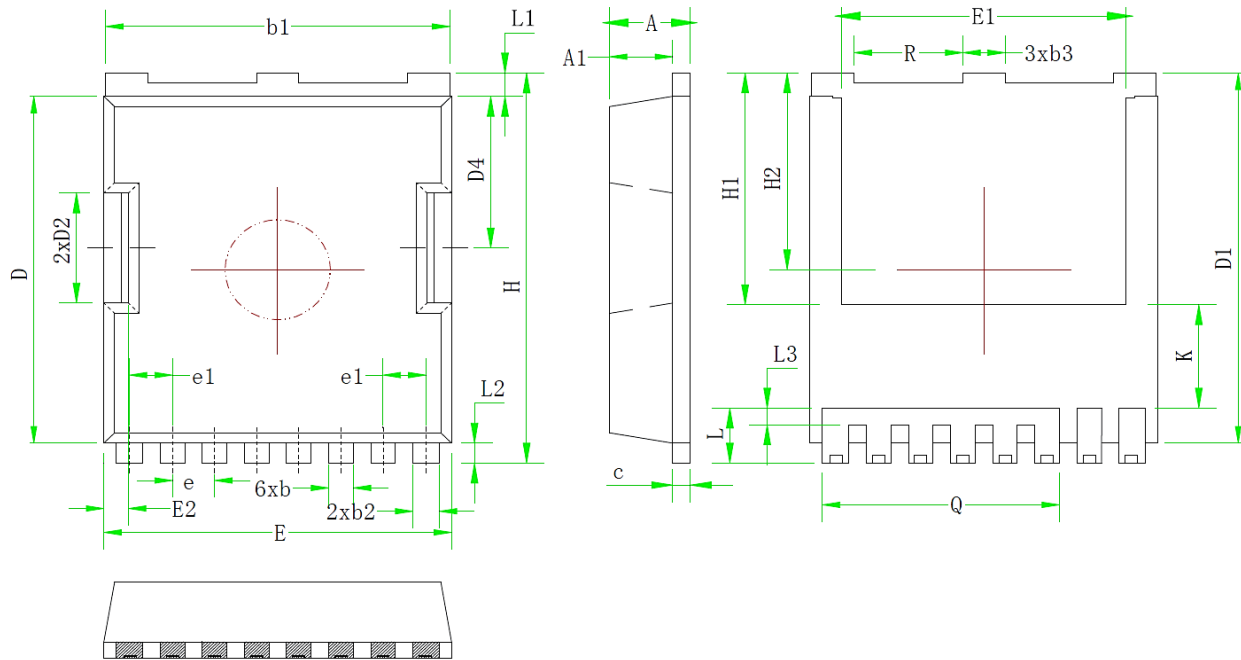


Fig 9. Power Dissipation Derating, P_{tot}



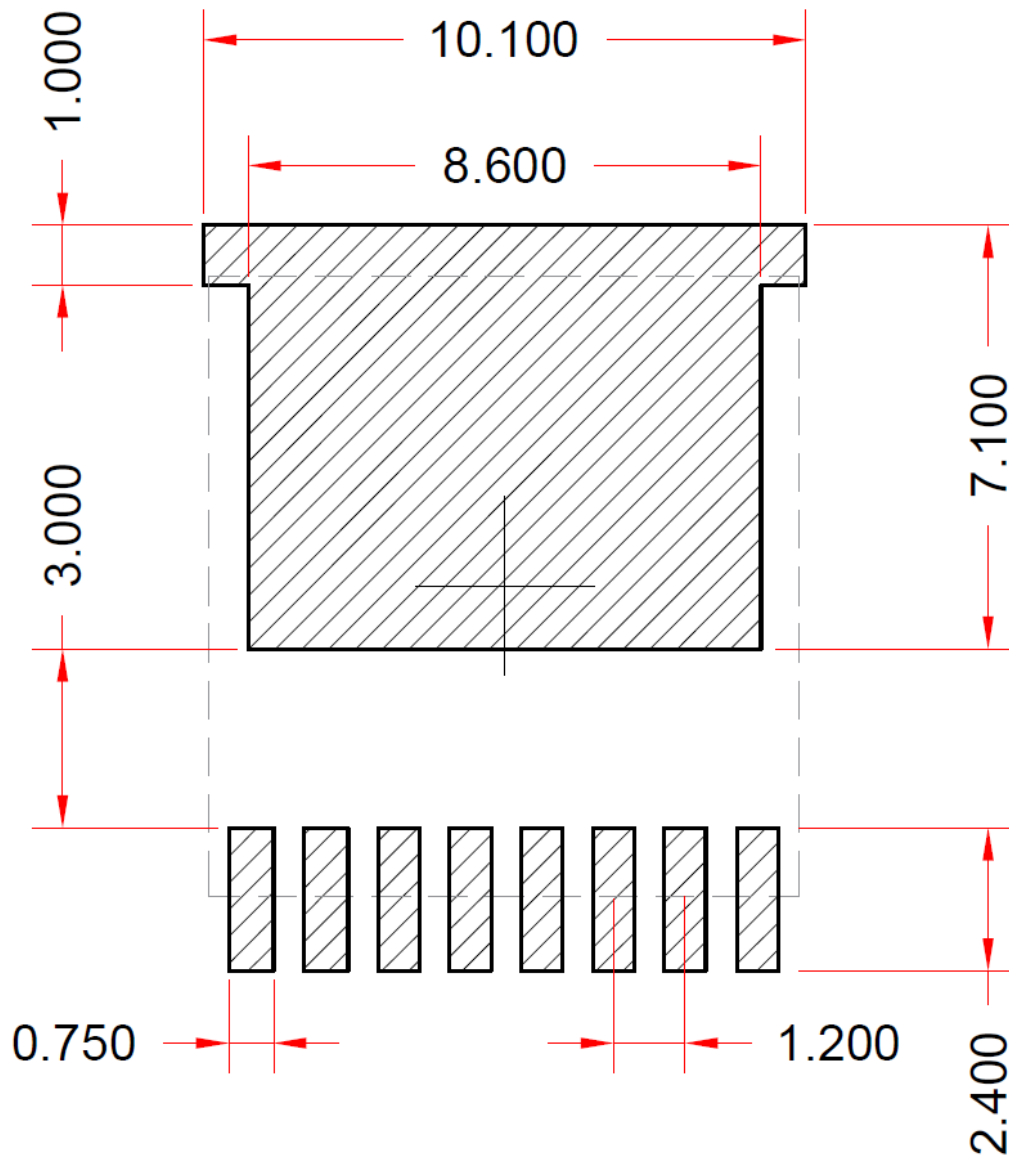
3- Package Outline Dimensions, GR-TOLL-MOS



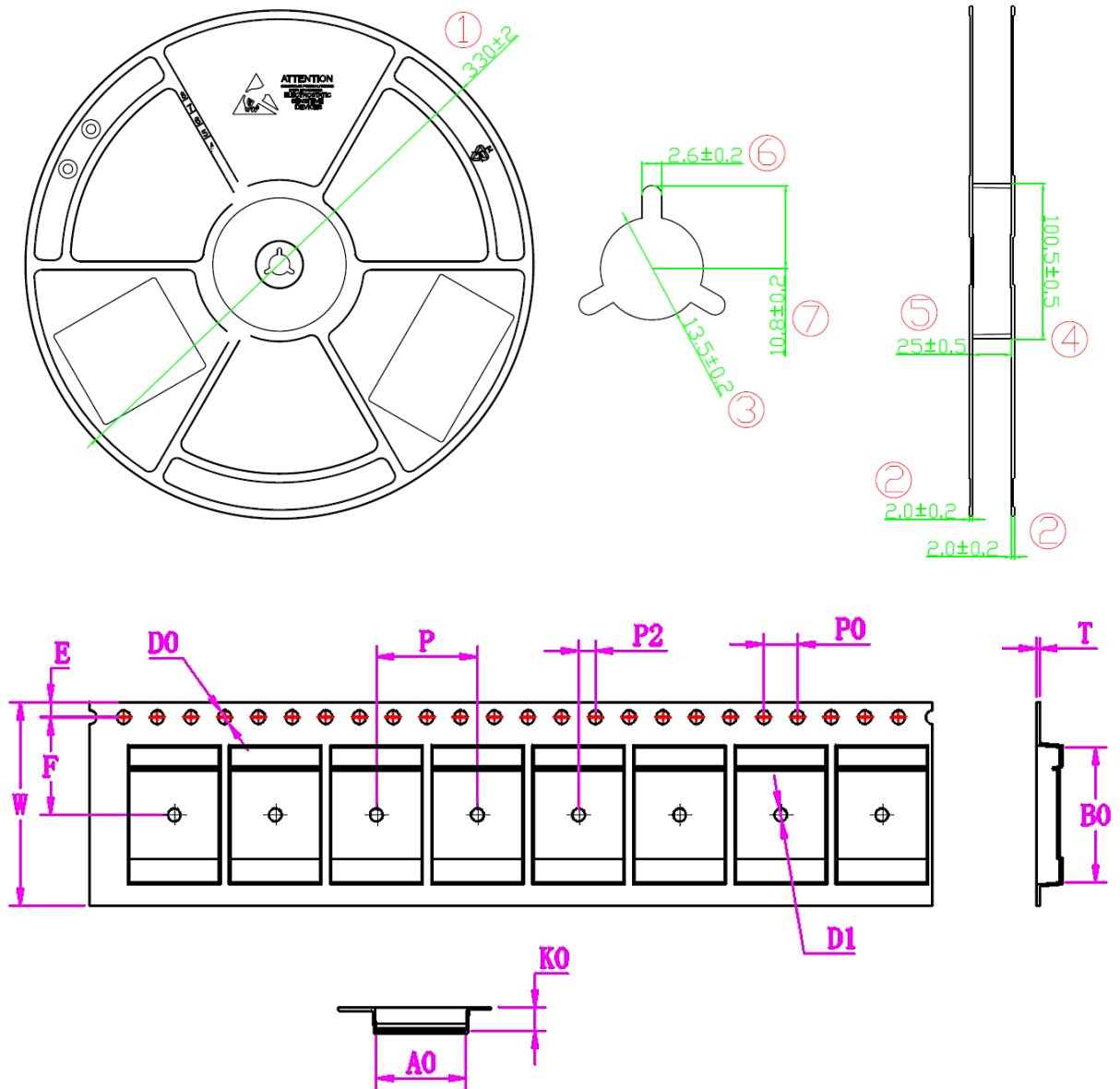
➤ Table 5 Dimension of GR-TOLL-MOS

SYMBOL	DIMENSION (IN MM)			SYMBOL	DIMENSION (IN MM)		
	MIN.	NOM.	MAX.		MIN.	NOM.	MAX.
A	2.25	2.30	2.35	E	9.85	9.90	9.95
A1	1.75	1.80	1.85	E1	8.00	8.10	8.20
b	0.65	0.70	0.75	E2	0.65	0.70	0.75
b1	9.75	9.80	9.90	H	11.60	11.70	11.80
b2	0.70	0.75	0.80	H1	6.95 BSC		
b3	1.15	1.20	1.25	H2	5.90 BSC		
c	0.45	0.50	0.55	K	3.10 REF		
D	10.35	10.40	10.45	L	1.55	1.65	1.75
D1	11.00	11.10	11.20	L1	0.65	0.70	0.75
D2	3.25	3.30	3.35	L2	0.50	0.60	0.70
D4	4.50	4.55	4.60	L3	0.40	0.50	0.60
e	1.20 BSC			Q	6.75 REF		
e1	1.225 BSC			R	3.00	3.10	3.20

4- Recommended PCB Footprint, GR-TOLL-MOS

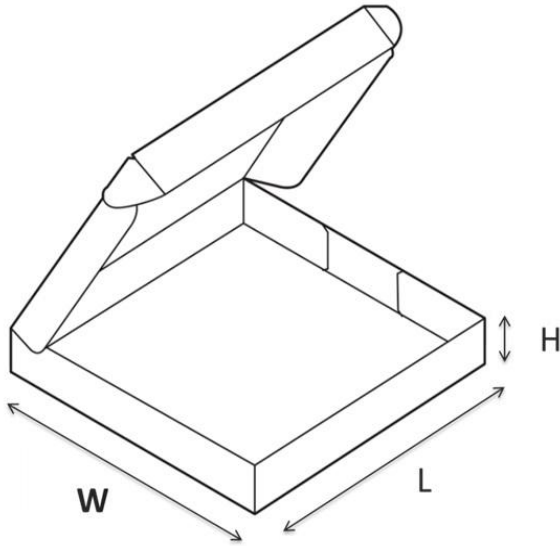


5- Tape Reel & Package Information



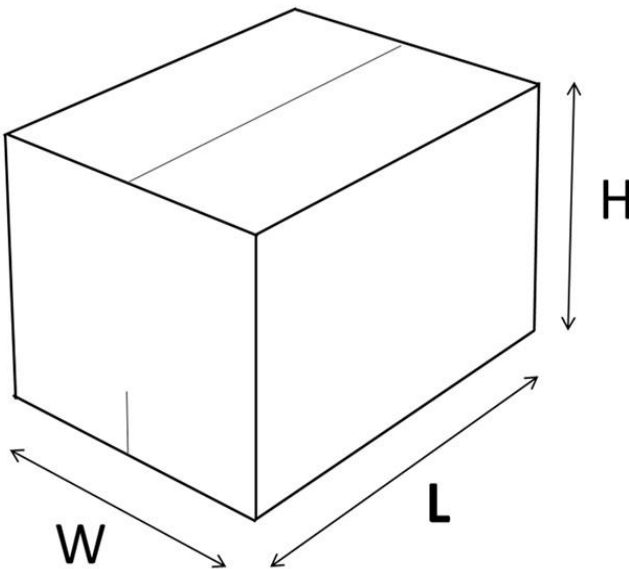
Symbol	A0	B0	K0	D0	D1	P	P0
Spec.	10.3 ± 0.1	12.1 ± 0.1	2.65 ± 0.1	1.5 ± 0.1	1.6 ± 0.1	12.0 ± 0.1	4.0 ± 0.1
Symbol	W	E	F	P2	T	-	10*P0
Spec.	24.0 ± 0.3	1.75 ± 0.1	11.5 ± 0.1	2.0 ± 0.1	0.35 ± 0.05	-	40 ± 0.2

Package Information



	Inner BOX, mm
L	360
W	340
H	50
Weight	2.0 KG

Each box contains one Reel, and
each Reel contains 2000 components



	Outer Carton (mm)
L	380
W	360
H	340
Weight	14.5 KG

Each Carton contains 6 boxes,
Total of 12500 components

6- Change Log

Version	Date	Description
01	Nov 28, 2023	Initial version
02	August 22, 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.