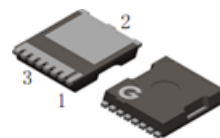
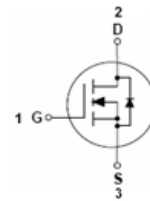


Features

- Advanced Shielded-Gate Trench technology
- Low on-resistance
- Superior thermal resistance
- HBM: AEC-Q101-001: H3A (JESD22-A114-B: 3A)
- RoHS compliant with Halogen-free
- Qualified to AEC-Q101 Standards

HF



TOLL

Mechanical Data

- Case: TOLL
- Molding Compound: UL Flammability Classification Rating 94V-0
- Terminals: Matte tin-plated leads; solderability-per MIL-STD-202, Method 208

Ordering Information

Part Number	Package	Shipping Quantity	Marking Code
TBL013N10TH-TL	TOLL	2000 pcs / Tape & Reel	013N10TH

Maximum Ratings (@ T_C = 25°C unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V _{DSS}	100	V
Gate-to-Source Voltage	V _{GSS}	±20	V
Continuous Drain Current (T _C = 25°C)	I _D	400	A
Continuous Drain Current (T _C = 100°C)		280	
Continuous Drain Current (T _A = 25°C) *1		50	
Continuous Drain Current (T _A = 100°C) *1		35	
Pulsed Drain Current (t _p = 10μs, T _C = 25°C)	I _{DM}	1600	A
Single Pulse Avalanche Energy *3	E _{AS}	4000	mJ
Power Dissipation (T _C = 25°C)	P _D	500	W
Power Dissipation (T _A = 25°C) *1		7.5	
Operating Junction Temperature Range	T _J	-55 ~ +175	°C
Storage Temperature Range	T _{STG}	-55 ~ +175	°C

Thermal Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance Junction-to-Case	R _{θJC}	-	0.21	0.3	°C/W
Thermal Resistance Junction-to-Air *1	R _{θJA}	-	10	20	°C/W

Electrical Characteristics (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
V _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0V, I _D = 250μA	100	-	-	V
		V _{GS} = 0V, I _D = 1mA	100	-	-	
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 100V, V _{GS} = 0V	-	-	1	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} = ±20V, V _{DS} = 0V	-	-	±100	nA
On Characteristics						
R _{DS(ON)}	Drain-Source On-resistance *2	V _{GS} = 10V, I _D = 100A	-	1.25	1.38	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	2	3	4	V
R _G	Gate Resistance	V _{GS} = 0V, f = 1MHz	-	1.1	-	Ω
Dynamic Characteristics						
C _{ISS}	Input Capacitance	V _{GS} = 0V V _{DS} = 40V f = 100kHz	-	16370	-	pF
C _{OSS}	Output Capacitance		-	2890	-	
C _{RSS}	Reverse Transfer Capacitance		-	150	-	
Switching Characteristics						
t _{d(ON)}	Turn-on Delay Time	V _{DD} = 50V V _{GS} = 15V R _G = 3.3Ω I _D = 50A	-	62	-	ns
t _r	Turn-on Rise Time		-	129	-	
t _{d(OFF)}	Turn-Off Delay Time		-	180	-	
t _f	Turn-Off Fall Time		-	42	-	
Q _G	Total Gate-Charge	V _{DD} = 50V V _{GS} = 10V I _D = 100A	-	252	-	nC
Q _{GS}	Gate to Source Charge		-	76	-	
Q _{GD}	Gate to Drain (Miller) Charge		-	66	-	
Source-Drain Diode Characteristics						
V _{SD}	Diode Forward Voltage *2	I _{SD} = 100A, V _{GS} = 0V	-	0.85	1.2	V
t _{rr}	Reverse Recovery Time	I _F = 40A, V _{GS} = 0V	-	108	-	ns
Q _{rr}	Reverse Recovery Charge	di _F /dt = 100A/μs	-	308	-	nC

Notes:

- The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper
- The data tested by pulsed, pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
- The E_{AS} data shows Max. rating. The test condition is $V_{DD} = 80V, V_{GS} = 10V, L = 50mH$

Ratings and Characteristics Curves (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

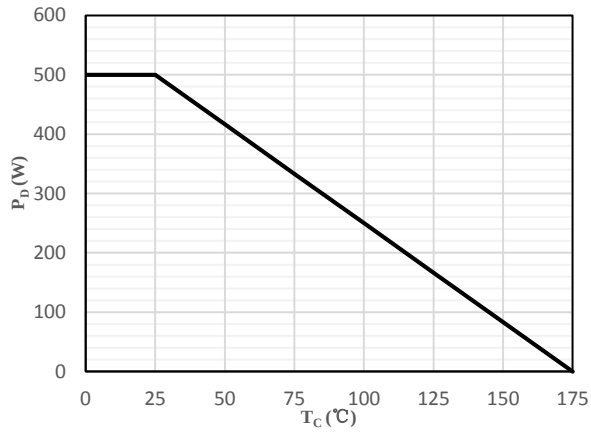


Fig 1 Power Dissipation

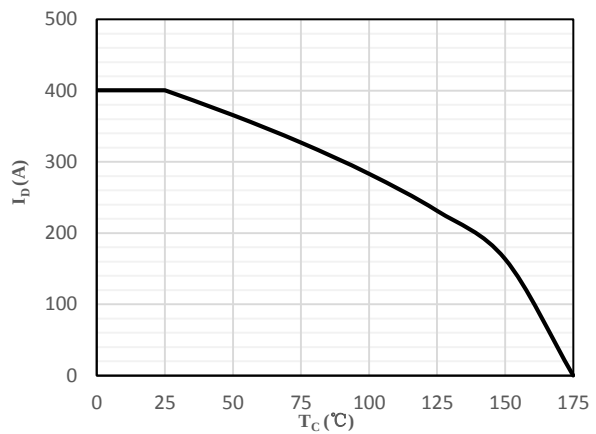


Fig 2 Drain Current

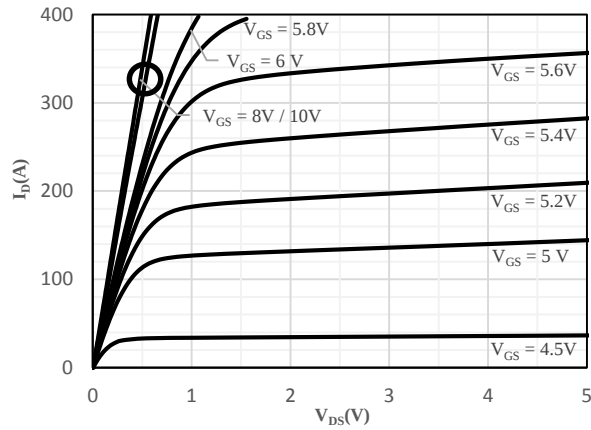
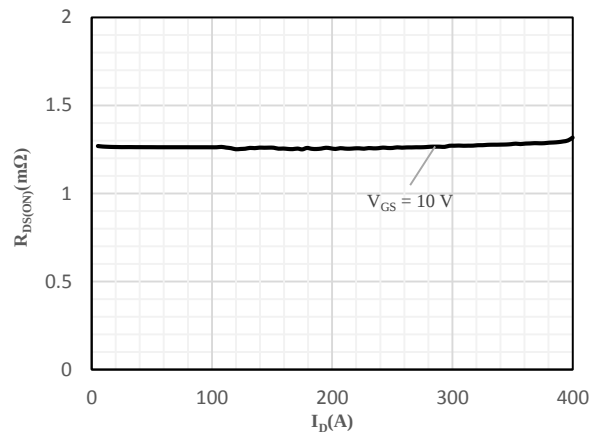


Fig 3 Typical Output Characteristics



**Fig 4 On-Resistance vs. Drain Current
and Gate Voltage**

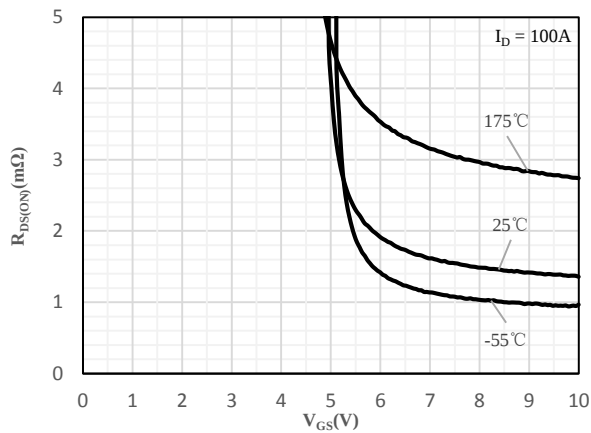


Fig 5 On-Resistance vs. Gate-Source Voltage

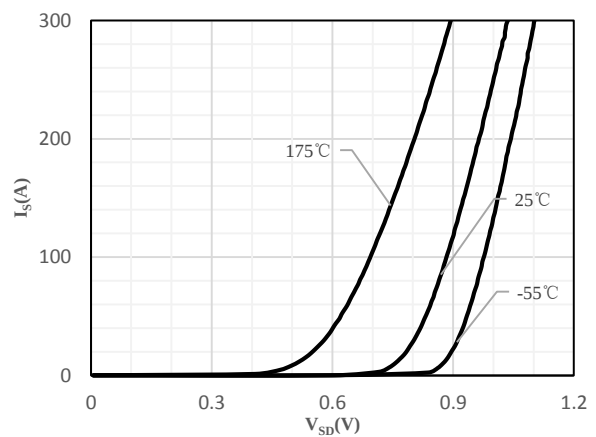


Fig 6 Body-Diode Characteristics

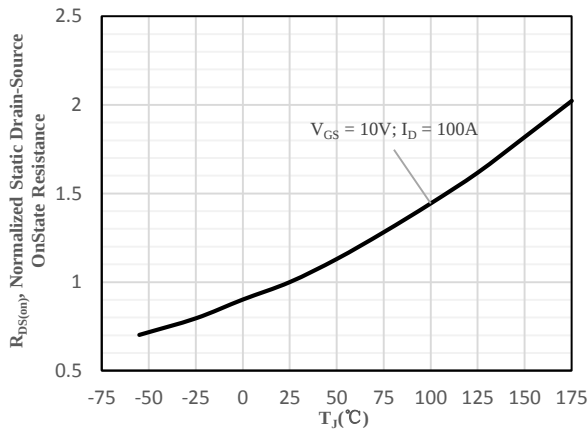


Fig 7 Normalized On-Resistance vs. Junction Temperature

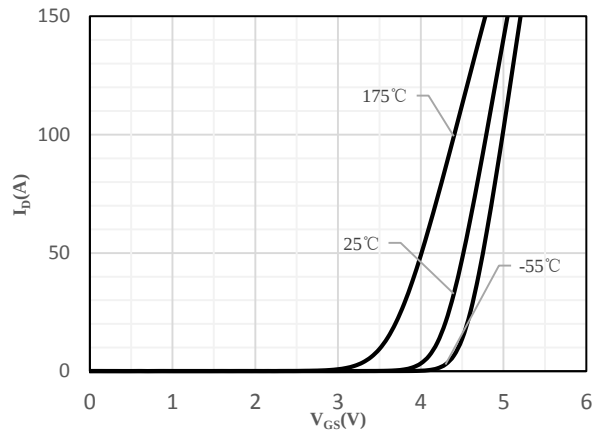


Fig 8 Transfer Characteristics

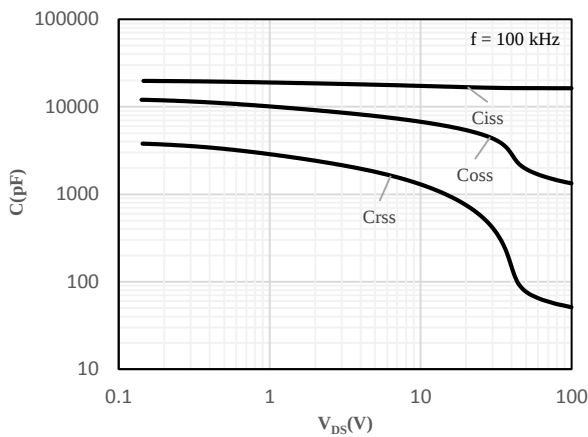


Fig 9 Capacitance Characteristics

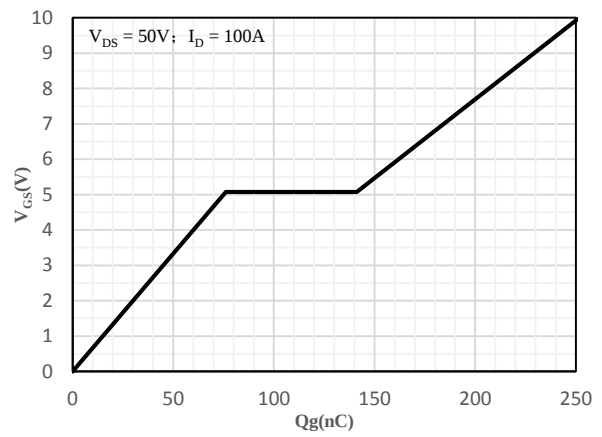


Fig 10 Gate-Charge Characteristics

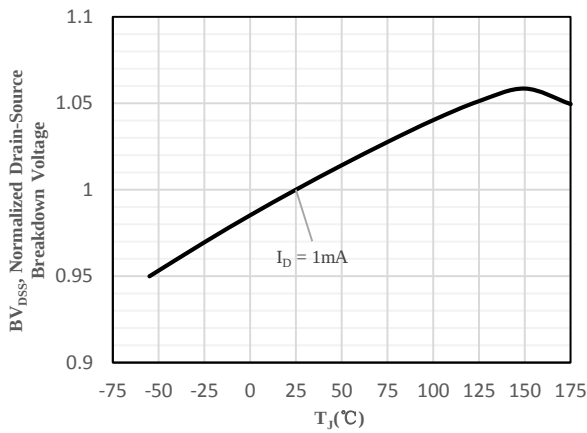


Fig 11 Normalized Breakdown Voltage vs. Junction Temperature

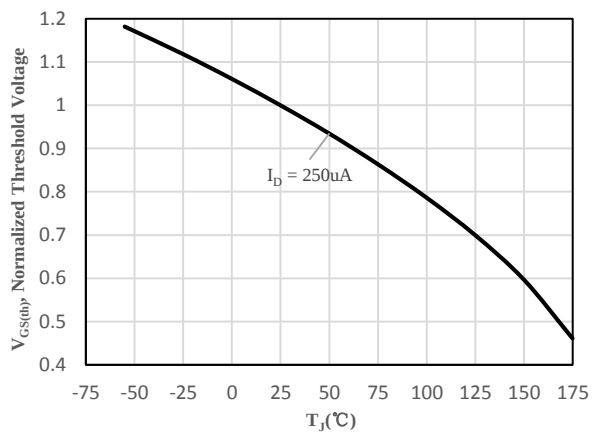


Fig 12 Normalized $V_{GS(th)}$ vs. Junction Temperature

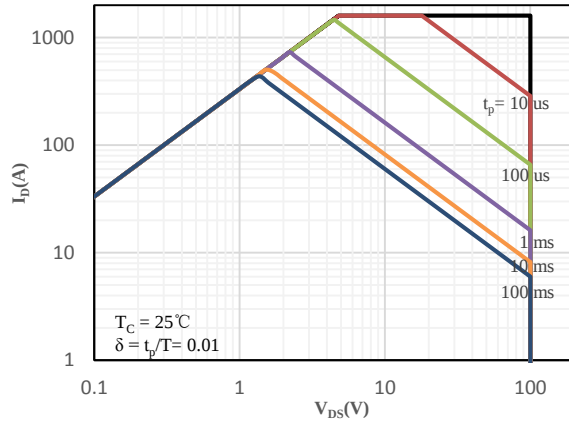


Fig 13 Safe Operating Area

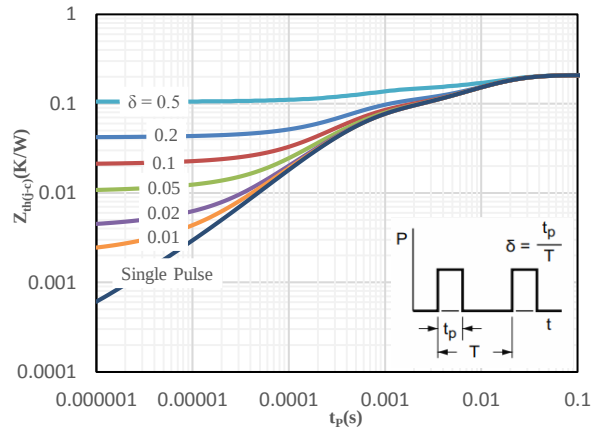
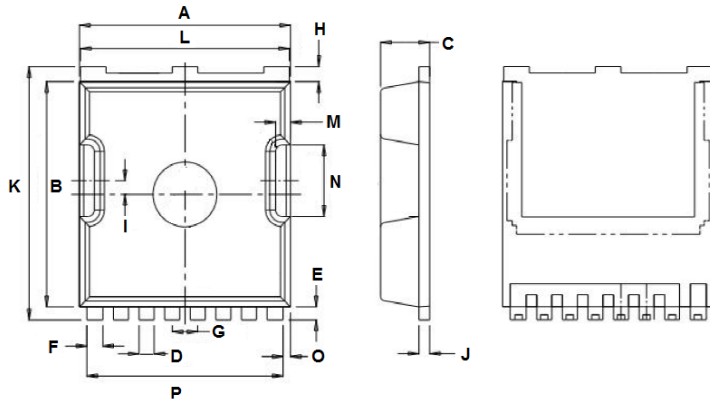


Fig 14 Maximum transient thermal impedance

Package Outline Dimensions (Unit: mm)



TOLL		
Dimension	Min.	Max.
A	9.70	10.10
B	10.20	10.60
C	2.10	2.50
D	0.60	0.80
E	0.50	0.70
F	0.65	0.85
G	1.10	1.30
H	0.60	0.80
I	0.55	0.75
J	0.45	0.55
K	11.50	11.90
L	9.60	10.00
M	0.50	0.70
N	3.10	3.50
O	0.25	0.45
P	9.00	9.40

SOLDERING FOOTPRINT (Unit: mm)

