N-Channel Enhancement Mode MOSFET

TBL2312-6L

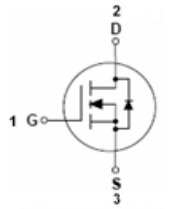
Features

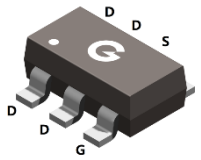
HF

- Advanced trench technology
- Low on-resistance
- Fast switching speed
- Electrostatic sensitive devices
- HBM: AEC-Q101-001: H1A (JESD22-A114-B: 1A)
- RoHS compliant with Halogen-free
- Qualified to AEC-Q101 Standards

Mechanical Data

- Case: SOT-23-6L
- Molding Compound: UL Flammability Classification Rating 94V-0
- Terminals: Matte tin-plated leads; solderability-per MIL-STD-202, Method 208





SOT-23-6L

Ordering Information

Part Number	Package	Shipping Quantity	Marking Code
TBL2312-6L	SOT-23-6L	3000 pcs / Tape & Reel	2312

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

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	20	V
Gate-to-Source Voltage	V_{GSS}	±12	V
Continuous Drain Current (T_A = 25°C) *1	I_D	4.9	A
Continuous Drain Current (T_A = 70°C) *1		3.9	A
Pulsed Drain Current (t_p =10μs, T_A = 25°C)	I_{DM}	30	A
Single Pulse Avalanche Energy *3	E_{AS}	10	mJ
Power Dissipation (T_A = 25°C) *1	P_D	1.4	W
Operating Junction Temperature Range	T_J	-55 ~ +150	°C
Storage Temperature Range	T_{STG}	-55 ~ +150	°C

Thermal Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	-	-	50	°C/W
Thermal Resistance Junction-to-Air *1	$R_{\theta JA}$	-	-	90	°C/W

Electrical Characteristics (@ T_A = 25°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	20	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 20V, V_{GS} = 0V	-	-	1	μA
I_{GSS}	Gate-Body Leakage Current	V_{GS} = ±12V, V_{DS} = 0V	-	-	±100	nA
On Characteristics						
$R_{DS(ON)}$	Drain-Source On-resistance *2	V_{GS} = 4.5V, I_D = 5A	-	15	31	mΩ
		V_{GS} = 2.5V, I_D = 4.5A	-	18	37	
		V_{GS} = 1.8V, I_D = 4A	-	24	85	
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	0.4	0.8	1.2	V
R_G	Gate Resistance	V_{GS} = 0V, f = 1MHz	-	7.5	-	Ω
Dynamic Characteristics						
C_{ISS}	Input Capacitance	V_{GS} = 0V V_{DS} = 8V f = 1.0MHz	-	891	-	pF
C_{OSS}	Output Capacitance		-	136	-	
C_{RSS}	Reverse Transfer Capacitance		-	126	-	
Switching Characteristics						
$t_{d(ON)}$	Turn-on Delay Time *4	V_{GS} = 4.5V, V_{DD} = 10V R_G = 6Ω, R_L = 10Ω I_D = 1A	-	15	-	ns
t_r	Turn-on Rise Time *4		-	40	-	
$t_{d(OFF)}$	Turn-Off Delay Time *4		-	48	-	
t_f	Turn-Off Fall Time *4		-	31	-	
Q_G	Total Gate-Charge	V_{DS} = 10V V_{GS} = 4.5V I_D = 5A	-	12.5	-	nC
Q_{GS}	Gate to Source Charge		-	1.7	-	
Q_{GD}	Gate to Drain (Miller) Charge		-	3.2	-	
Source-Drain Diode Characteristics						
V_{SD}	Diode Forward Voltage *2	I_S = 1.8A, V_{GS} = 0 V	-	0.7	1.2	V

Notes:

1. The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper
2. The data tested by pulsed, pulse width ≤ 300μs, duty cycle ≤ 2%
3. The E_{AS} data shows Max. rating. The test condition is V_{DD} = 10V, V_{GS} = 10V, L = 0.1mH
4. Guaranteed by design, not subject to production

Ratings and Characteristics Curves (@ T_A = 25°C unless otherwise specified)

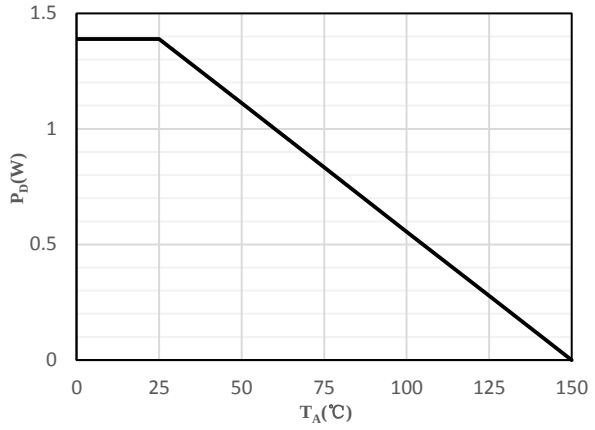


Fig 1 Power Dissipation

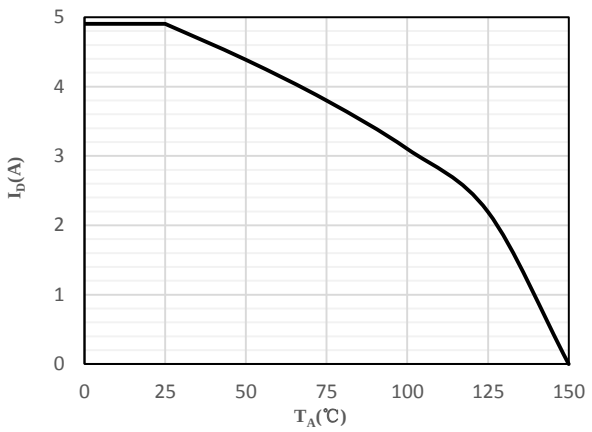


Fig 2 Drain Current

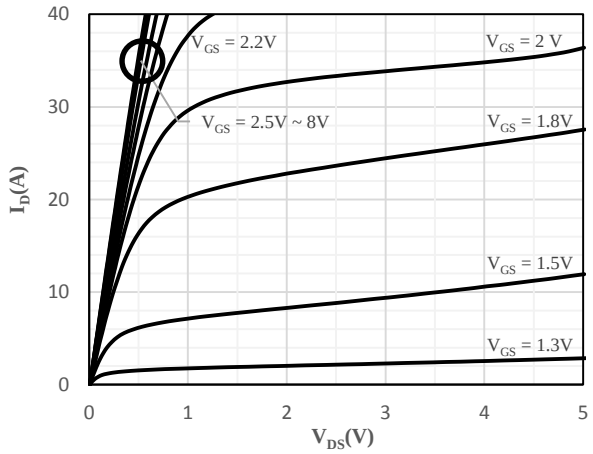


Fig 3 Typical Output Characteristics

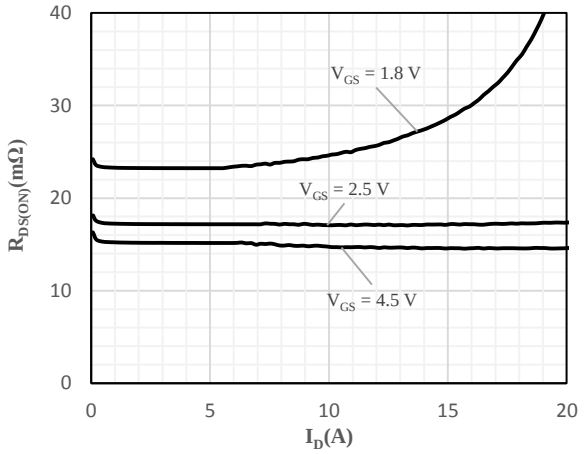


Fig 4 On-Resistance vs. Drain Current and Gate Voltage

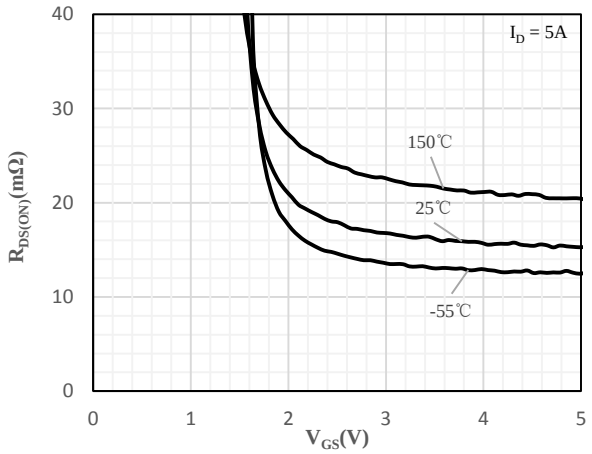


Fig 5 On-Resistance vs. Gate-Source Voltage

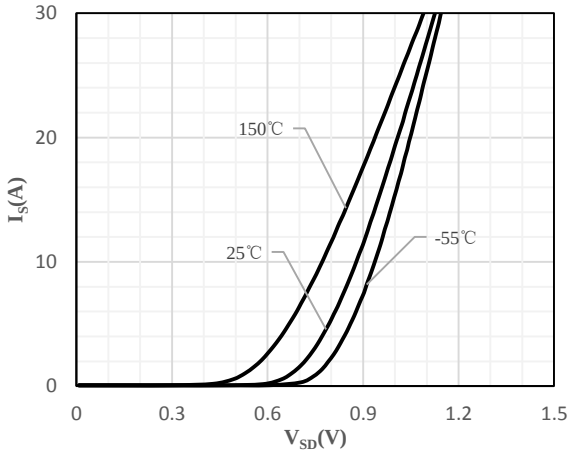


Fig 6 Body-Diode Characteristics

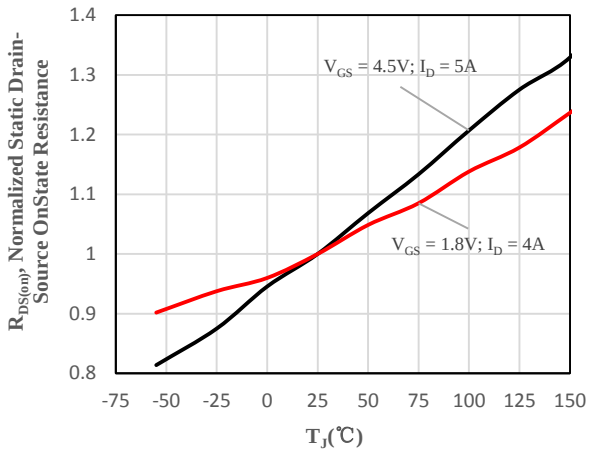


Fig 7 Normalized On-Resistance vs. Junction Temperature

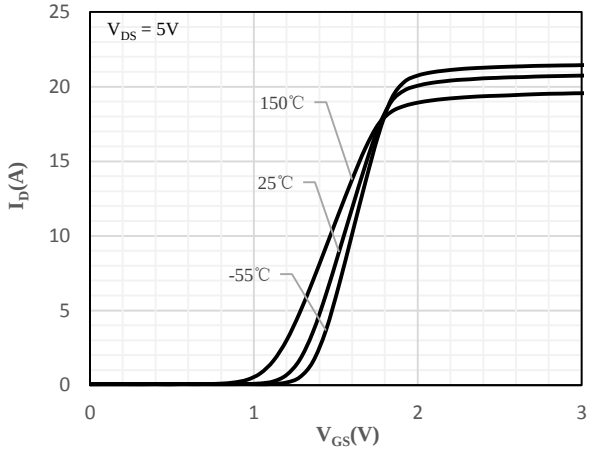


Fig 8 Transfer Characteristics

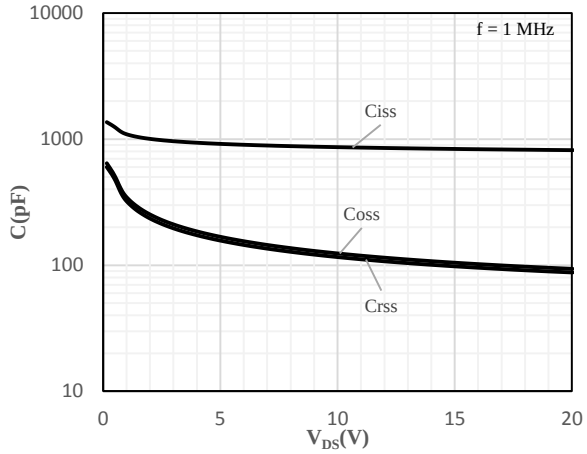


Fig 9 Capacitance Characteristics

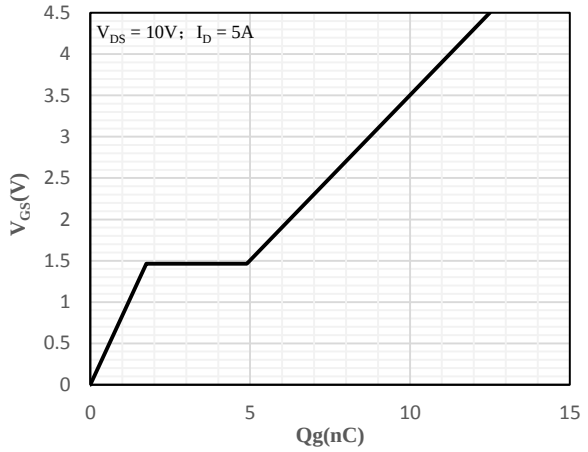


Fig 10 Gate-Charge Characteristics

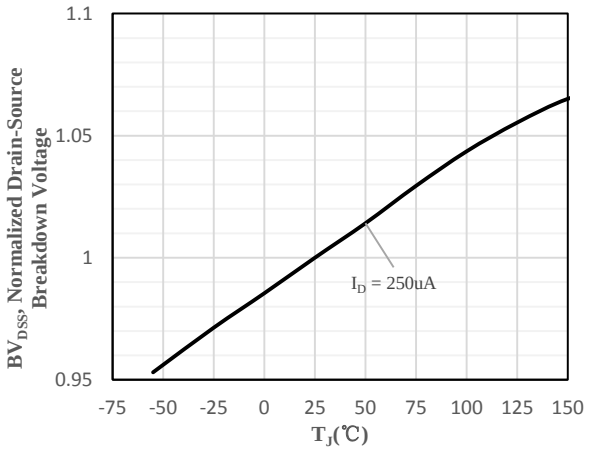


Fig 11 Normalized Breakdown Voltage vs. Junction Temperature

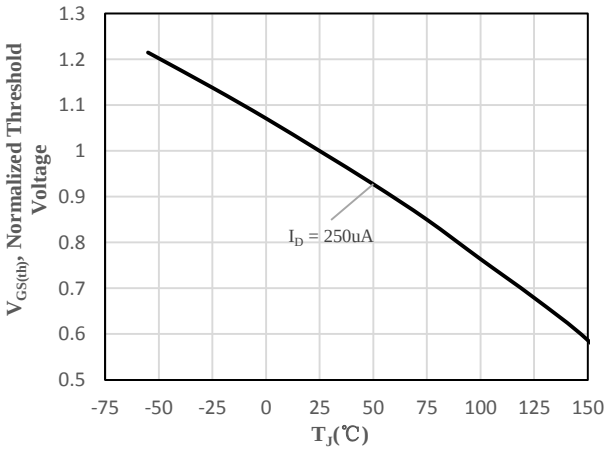


Fig 12 Normalized $V_{GS(th)}$ vs. Junction Temperature

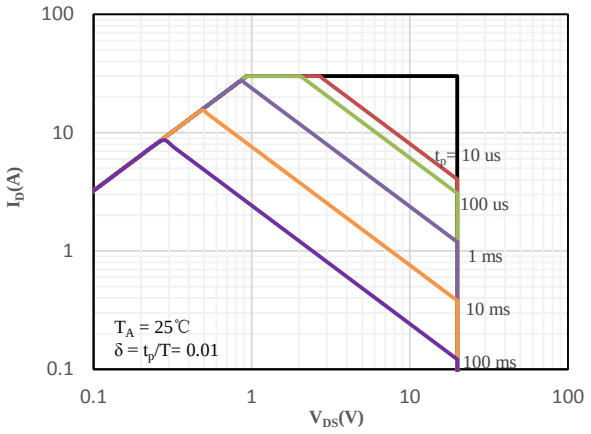


Fig 13 Safe Operating Area

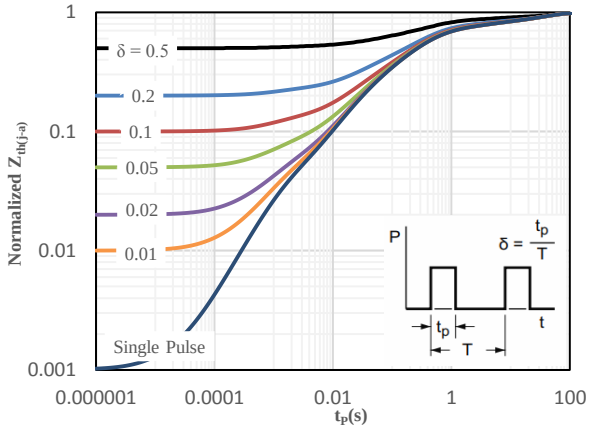
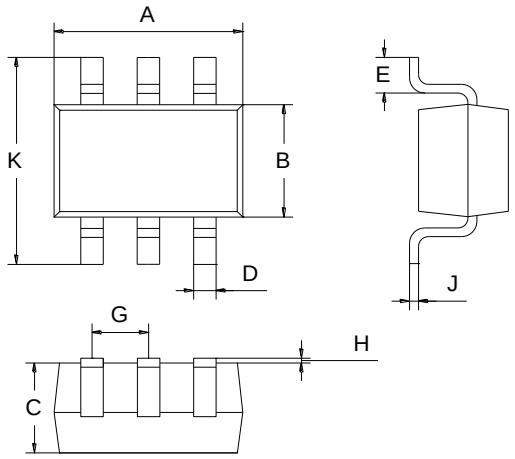
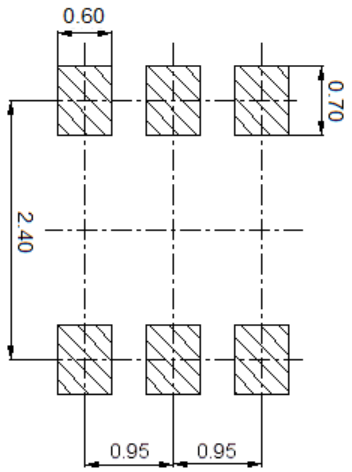


Fig 14 Normalized Maximum transient thermal impedance

Package Outline Dimensions (Unit: mm)



SOT-23-6L		
Dimension	**Min.**	**Max.**
A	2.80	3.00
B	1.50	1.70
C	1.00	1.20
D	0.35	0.45
E	0.35	0.55
G	0.90	1.00
H	0.02	0.10
J	0.10	0.20
K	2.60	3.00

Mounting Pad Layout (Unit: mm)

SOT-23-6L