

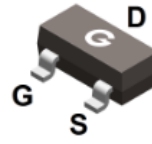
Features

- Electrostatic Sensitive Devices
- $R_{DS(ON)} < 28m\Omega$ @ $V_{GS} = 10V$
- $R_{DS(ON)} < 43m\Omega$ @ $V_{GS} = 4.5V$
- RoHS compliant with Halogen-free
- Qualified to AEC-Q101 Standards

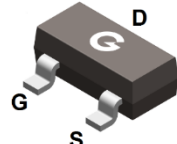
HF

Mechanical Data

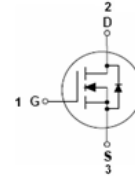
- Case: SOT-23, SOT-23-3L
- Molding Compound: UL Flammability Classification Rating 94V-0
- Terminals: Matte tin-plated leads; solderability-per MIL-STD-202, Method 208



TBL3404
SOT-23



TBL3404-3L
SOT-23-3L



Ordering Information

Part Number	Package	Shipping Quantity	Marking Code
TBL3404	SOT-23	3000 pcs / Tape & Reel	3404
TBL3404-3L	SOT-23-3L	3000 pcs / Tape & Reel	3404

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

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	30	V
Gate-to-Source Voltage	V_{GSS}	± 20	V
Continuous Drain Current ($T_A = 25^\circ\text{C}$) *1	I_D	5.8	A
Continuous Drain Current ($T_A = 70^\circ\text{C}$) *1		4.9	A
Pulsed Drain Current ($t_p = 10\mu\text{s}$, $T_A = 25^\circ\text{C}$)	I_{DM}	30	A
Single Pulse Avalanche Energy *4	E_{AS}	8	mJ
Power Dissipation ($T_A = 25^\circ\text{C}$) *1	P_D	1.25	W
Power Dissipation ($T_A = 25^\circ\text{C}$) *2		0.53	W
Operating Junction Temperature Range	T_J	$-55 \sim +150$	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	$-55 \sim +150$	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	-	45	50	$^\circ\text{C/W}$
Thermal Resistance Junction-to-Air *1	$R_{\theta JA}$	-	95	100	$^\circ\text{C/W}$
Thermal Resistance Junction-to-Air *2		-	-	238	$^\circ\text{C/W}$

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	30	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 24V, V _{GS} = 0V	-	-	1	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} = ±20V, V _{DS} = 0V	-	-	±100	nA
On Characteristics						
R _{DS(ON)}	Static Drain-Source On-resistance *3	V _{GS} = 10V, I _D = 5.8A	-	22	28	mΩ
		V _{GS} = 4.5V, I _D = 5A	-	31	43	
V _{GS(TH)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	1.2	1.6	2.6	V
R _G	Gate Resistance	V _{GS} = 0V, f = 1MHz	-	8.4	-	Ω
Dynamic Characteristics						
g _{FS}	Forward Transconductance	V _{DS} = 5V, I _D = 5.8A	-	22	-	S
C _{ISS}	Input Capacitance	V _{GS} = 0V	-	515	-	pF
C _{OSS}	Output Capacitance	V _{DS} = 15V	-	76	-	
C _{RSS}	Reverse Transfer Capacitance	f = 1.0MHz	-	65	-	
Switching Characteristics						
Q _G	Total Gate-Charge	V _{GS} = 10V	-	14.4	-	nC
Q _{GS}	Gate to Source Charge	V _{DS} = 15V	-	2.4	-	
Q _{GD}	Gate to Drain (Miller) Charge	I _D = 5.8A	-	2.6	-	
t _{d(ON)}	Turn-on Delay Time *5	V _{GS} = 10V	-	4.5	-	ns
t _r	Turn-on Rise Time *5	V _{DD} = 15V	-	2.4	-	
t _{d(OFF)}	Turn-Off Delay Time *5	R _L = 2.6Ω	-	14.8	-	
t _f	Turn-Off Fall Time *5	R _G = 3Ω	-	2.5	-	
Source-Drain Diode Characteristics						
V _{SD}	Diode Forward Voltage *3	I _S = 1A, V _{GS} = 0 V	-	0.75	1.0	V
t _{rr}	Reverse Recovery Time	I _F = 5A, V _{GS} = 0V	-	75	-	ns
Q _{rr}	Reverse Recovery Charge	di/dt = 100A/μs	-	36	-	nC

Notes:

1. The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper
2. The data tested by surface mounted on a minimum recommended FR-4 board
3. The data tested by pulsed, pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$
4. The E_{AS} data shows Max. rating. The test condition is $V_{DD} = 15\text{V}, V_{GS} = 10\text{V}, L = 0.1\text{mH}$
5. Guaranteed by design, not subject to production

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

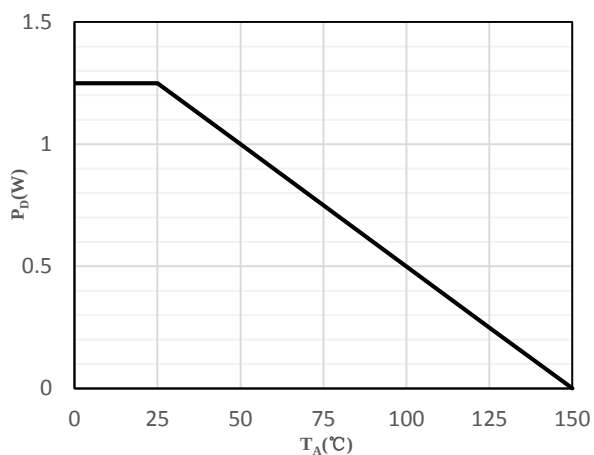


Fig 1 Power Dissipation

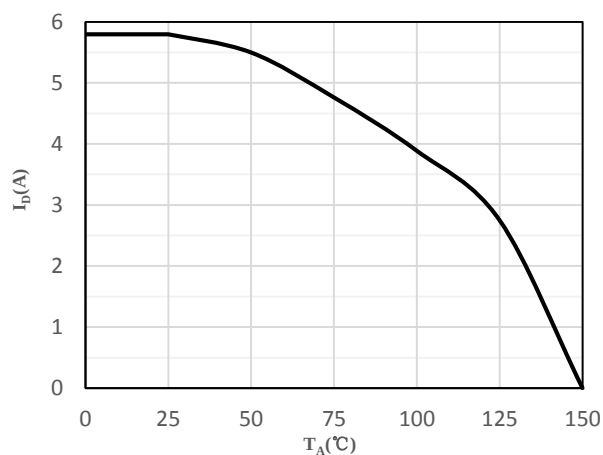


Fig 2 Drain Current

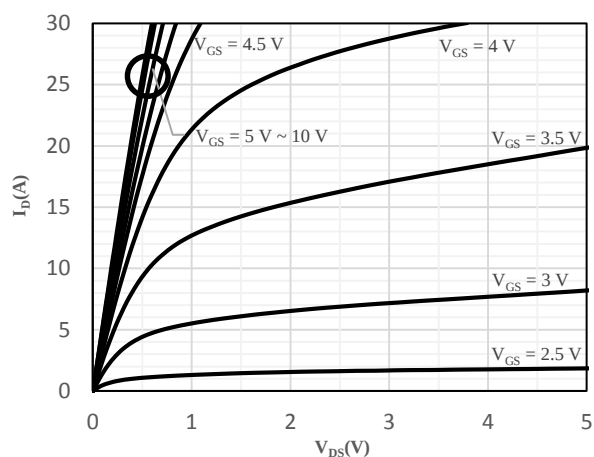
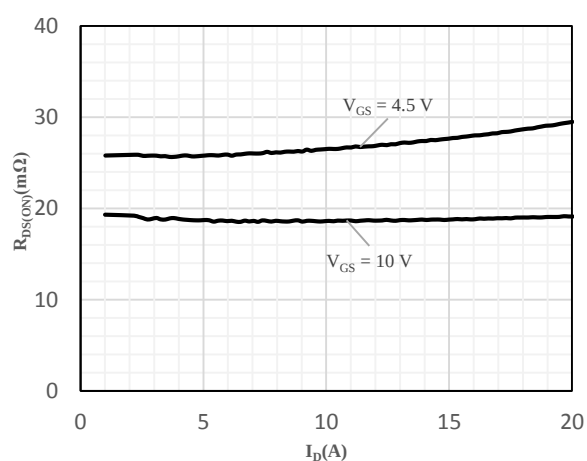


Fig 3 Typical Output Characteristics



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

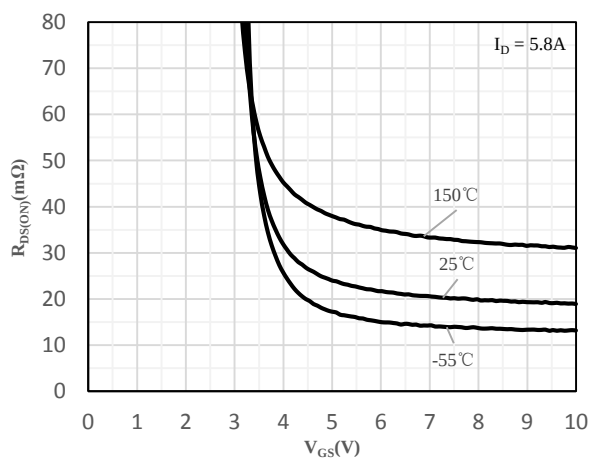


Fig 5 On-Resistance vs. Gate-Source Voltage

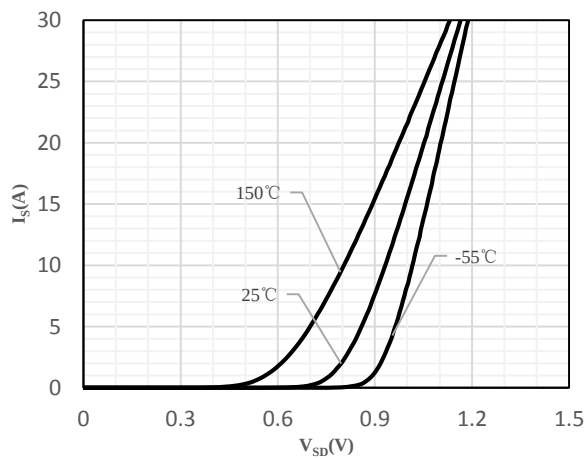


Fig 6 Body-Diode Characteristics

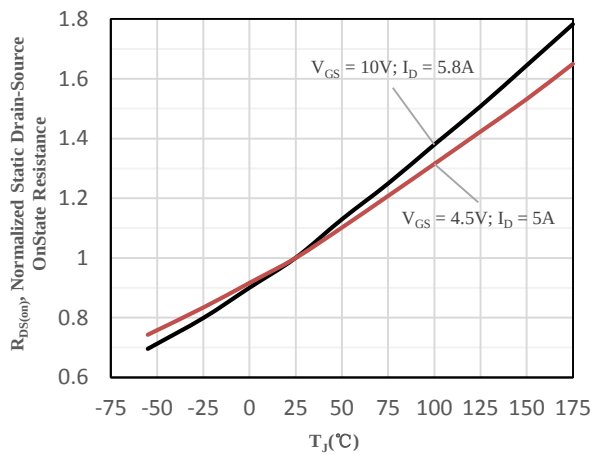


Fig 7 Normalized On-Resistance vs. Junction Temperature

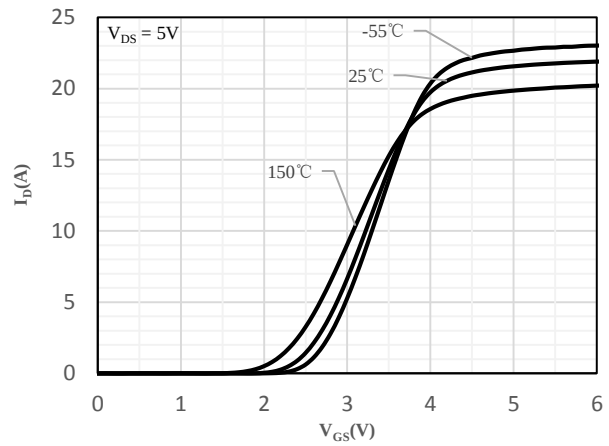


Fig 8 Transfer Characteristics

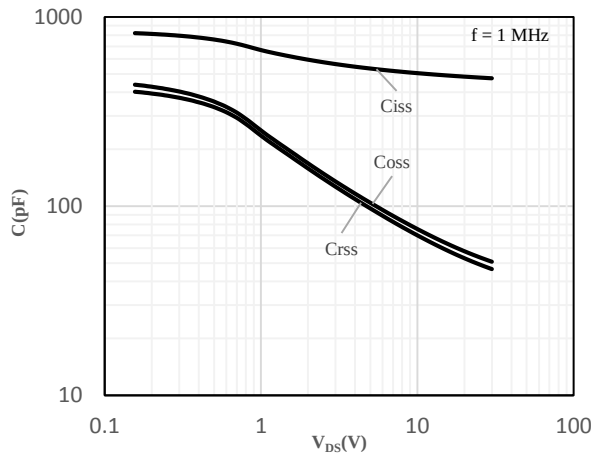


Fig 9 Capacitance Characteristics

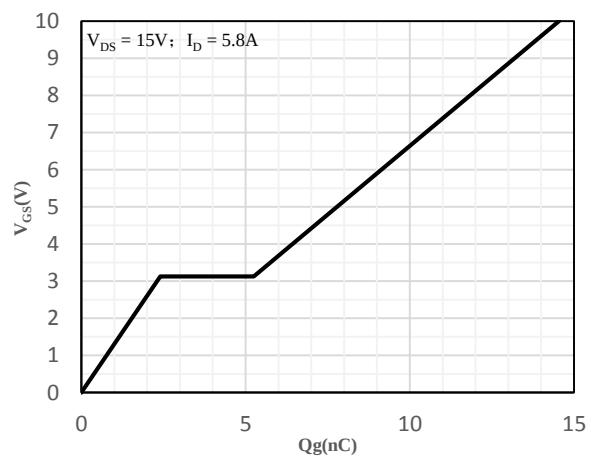


Fig 10 Gate-Charge Characteristics

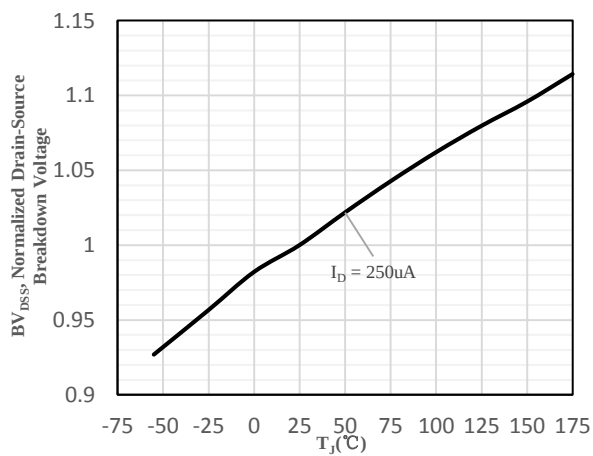


Fig 11 Normalized Breakdown Voltage vs. Junction Temperature

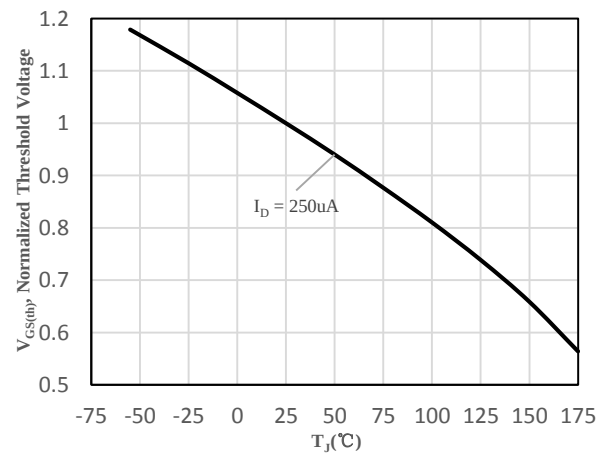


Fig 12 Normalized $V_{GS(th)}$ vs. Junction Temperature

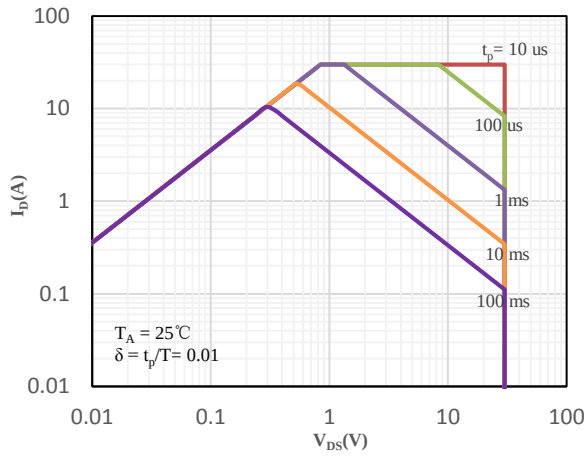


Fig 13 Safe Operation Area

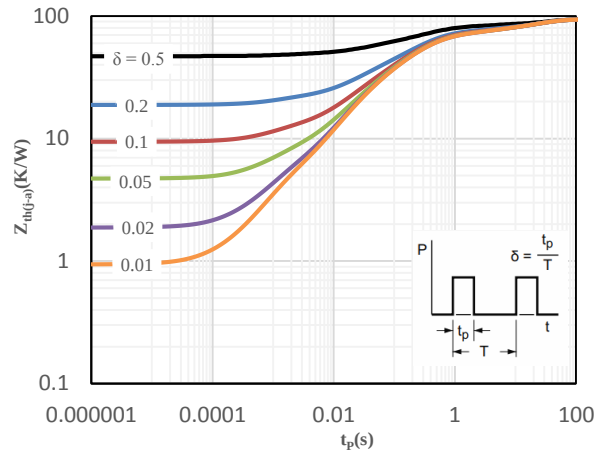
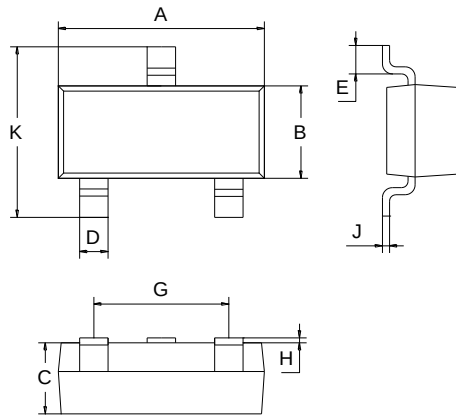
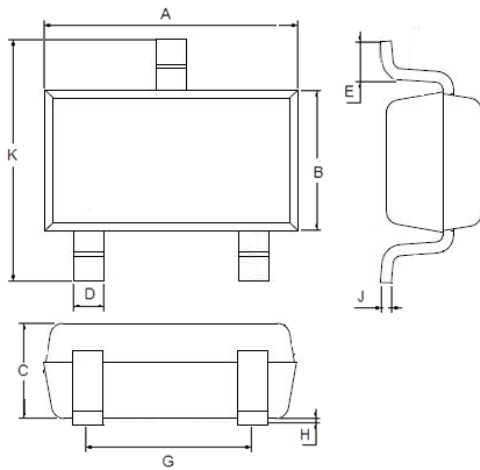


Fig 14 Maximum transient thermal impedance

Package Outline Dimensions (Unit: mm)



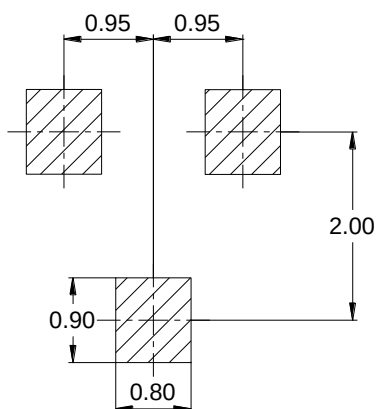
SOT-23		
Dimension	Min.	Max.
A	2.70	3.10
B	1.10	1.50
C	0.90	1.10
D	0.30	0.50
E	0.35	0.48
G	1.80	2.00
H	0.02	0.10
J	0.05	0.15
K	2.20	2.60



SOT-23-3L		
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	1.80	2.00
H	0.02	0.10
J	0.10	0.20
K	2.60	3.00

Package Outline Dimensions (Unit: mm)

SOT-23



SOT-23-3L

