

Features

- Low on-resistance
- High-speed switching
- Drive circuits can be simple
- Parallel use is easy
- HBM: AEC-Q101-001: H2 (JESD22-A114-B: 2)
- RoHS compliant with Halogen-free
- Qualified to AEC-Q101 Standards

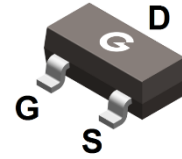
HF

Typical Applications

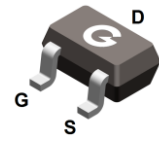
- P-channel enhancement mode effect transistor
- Switching application

Mechanical Data

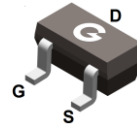
- Case: SOT-23, SOT-323, SOT-523, DFN1006-3
- Molding Compound: UL Flammability Classification Rating 94V-0
- Terminals: Matte tin-plated leads; solderability-per MIL-STD-202, Method 208



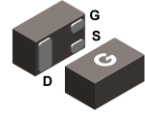
TBSS84ES
SOT-23



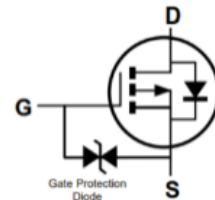
TBSS84ESW
SOT-323



TBSS84EST
SOT-523



TBSS84ESL
DFN1006-3



Ordering Information

Part Number	Package	Shipping Quantity	Marking Code
TBSS84ES	SOT-23	3000 pcs / Tape & Reel	ES
TBSS84ESW	SOT-323	3000 pcs / Tape & Reel	ES
TBSS84EST	SOT-523	3000 pcs / Tape & Reel	ES
TBSS84ESL	DFN1006-3	10000 pcs / Tape & Reel	ES

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

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V _{DSS}	-60	V
Gate-to-Source Voltage	V _{GSS}	±20	V
Continuous Drain Current (T _A = 25°C) *1	I _D	-130	mA
Continuous Drain Current (T _A = 70°C) *1		-100	
Pulsed Drain Current (t _p = 10μs, T _A = 25°C)	I _{DM}	-520	mA
Single Pulse Avalanche Energy (L = 0.1mH) *3	E _{AS}	0.3	mJ

Thermal Characteristics

Parameter		Symbol	Value	Unit
Power Dissipation ^{*1}	SOT-23	P _D	0.36	W
	SOT-323		0.20	
	SOT-523		0.15	
	DFN1006-3		0.15	
Thermal Resistance Junction-to-Air ^{*1}	SOT-23	R _{θJA}	347	°C/W
	SOT-323		625	
	SOT-523		834	
	DFN1006-3		834	
Thermal Resistance Junction-to-Lead ^{*1}	SOT-23	R _{θJL}	208	°C/W
	SOT-323		375	
	SOT-523		500	
	DFN1006-3		500	
Thermal Resistance Junction-to-Case ^{*1}	SOT-23	R _{θJC}	175	°C/W
	SOT-323		315	
	SOT-523		421	
	DFN1006-3		421	
Operating Junction Temperature Range		T _J	-55 ~ +150	°C
Storage Temperature Range		T _{STG}	-55 ~ +150	°C

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	-60	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = -50V, V _{GS} = 0V	-	-	-1	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} = ±20V, V _{DS} = 0V	-	-	±10	μA
On Characteristics						
R _{DS(ON)}	Drain-Source On-resistance *2	V _{GS} = -5V, I _D = -0.1A	-	2.4	8	Ω
		V _{GS} = -10V, I _D = -0.13A	-	2.0	6	
V _{GS(TH)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = -250μA	-1	-1.5	-2	V
R _G	Gate Resistance	V _{GS} = 0V, f = 1MHz	-	721	-	Ω
Dynamic Characteristics						
C _{ISS}	Input Capacitance	V _{GS} = 0V	-	53	-	pF
C _{OSS}	Output Capacitance	V _{DS} = -20V	-	11	-	
C _{RSS}	Reverse Transfer Capacitance	f = 1.0MHz	-	5	-	
Switching Characteristics						
t _{d(ON)}	Turn-on Delay Time *4	V _{DS} = -15V R _L = -50Ω I _D = -2.5A	-	2.5	-	ns
t _r	Turn-on Rise Time *4		-	1	-	
t _{d(OFF)}	Turn-Off Delay Time *4		-	16	-	
t _f	Turn-Off Fall Time *4		-	8	-	
Q _G	Total Gate-Charge	V _{DS} = -25V	-	2.5	-	nC
Q _{GS}	Gate to Source Charge	V _{GS} = -4.5V	-	0.83	-	
Q _{GD}	Gate to Drain (Miller) Charge	I _D = -0.2A	-	0.82	-	
Source-Drain Diode Characteristics						
V _{SD}	Diode Forward Voltage *2	I _S = -0.26A, V _{GS} = 0 V	-	-0.9	-1.4	V
I _S	Continuous Source Current	T _A = 25°C	-	-	-0.13	A
I _{SM}	Pulsed Source Current	t _p =10μs, T _A = 25°C	-	-	-0.52	A

Notes:

1. The data tested by surface mounted on a minimum recommended FR-4 board with 2OZ copper
2. The data tested by pulsed, pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
3. The E_{AS} data shows Max. rating. The test condition is $V_{DD} = -30V, V_{GS} = -10V, L = 0.1mH$
4. Guaranteed by design, not subject to production

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

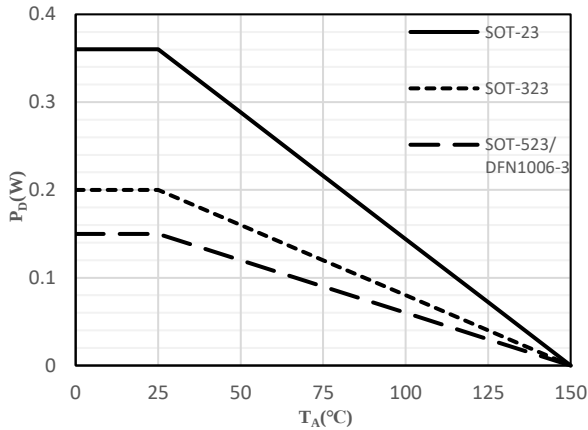


Fig 1 Power Dissipation

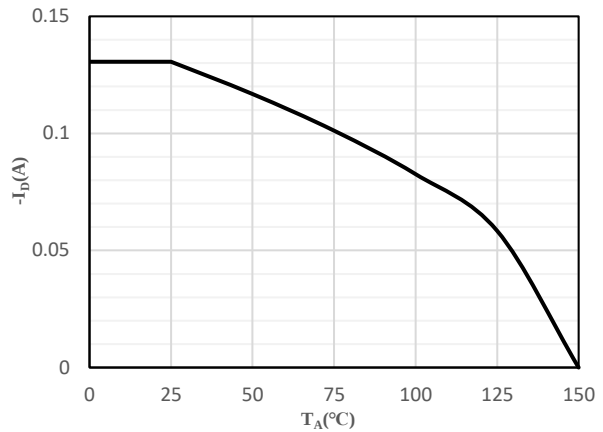


Fig 2 Drain Current

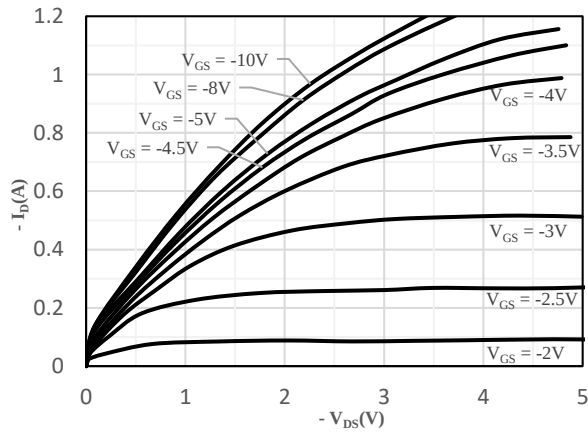
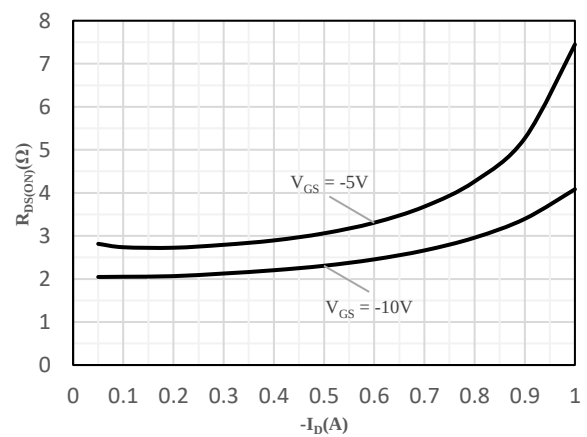


Fig 3 Output Characteristics



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

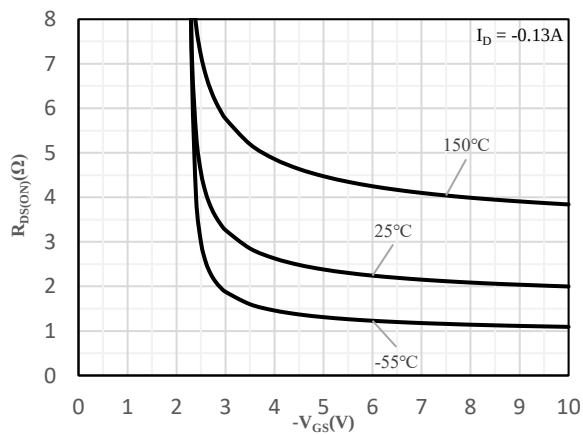


Fig 5 On-Resistance vs. Gate-Source Voltage

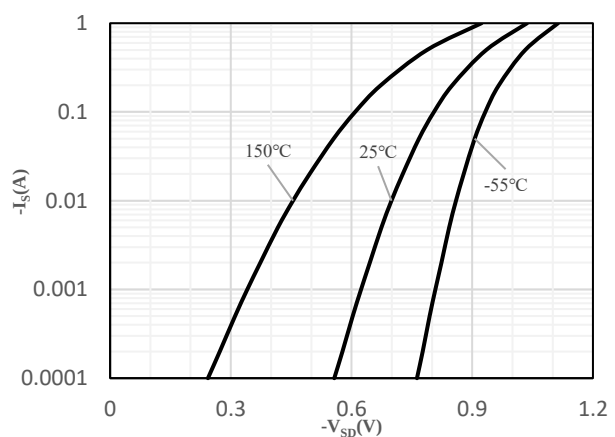


Fig 6 Body-Diode Characteristics

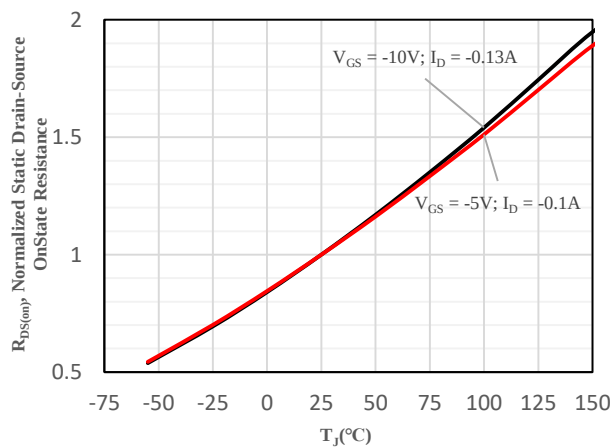


Fig 7 Normalized On-Resistance vs. Junction Temperature

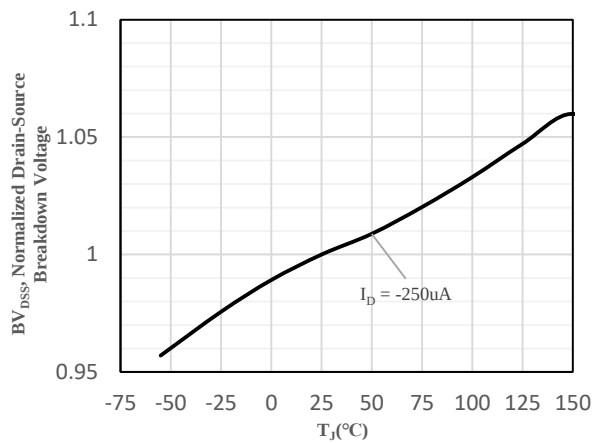


Fig 8 Normalized Breakdown Voltage vs. Junction Temperature

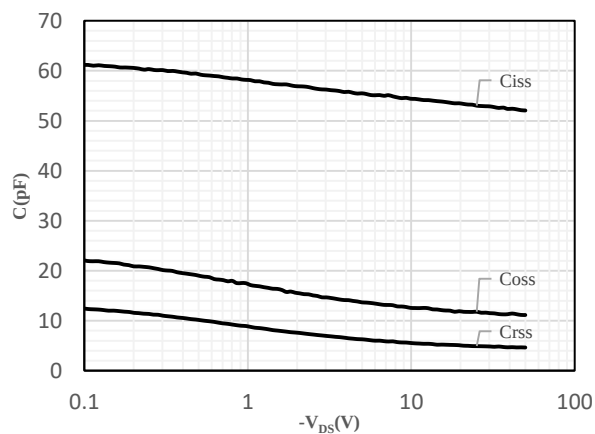


Fig 9 Capacitance Characteristics

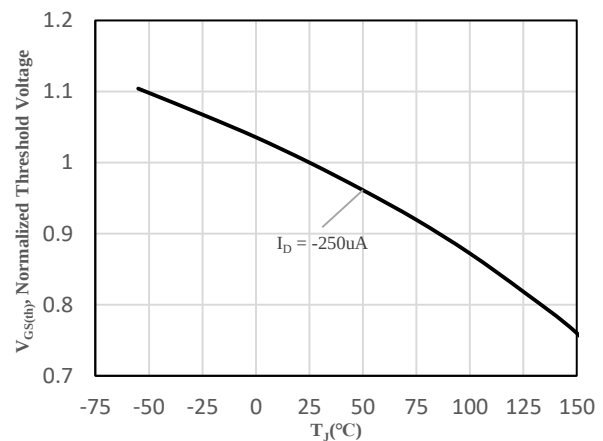


Fig 10 Normalized $V_{GS(th)}$ vs. Junction Temperature

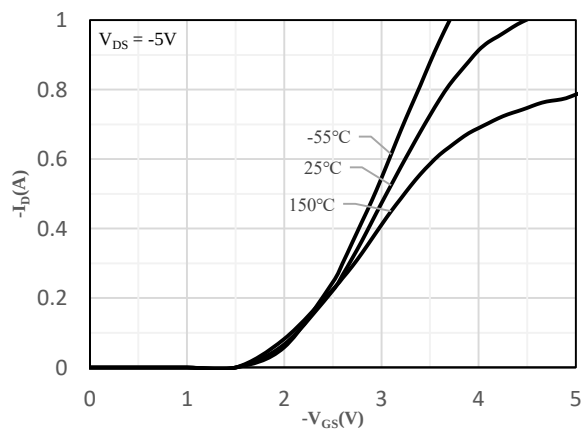


Fig 11 Transfer Characteristics

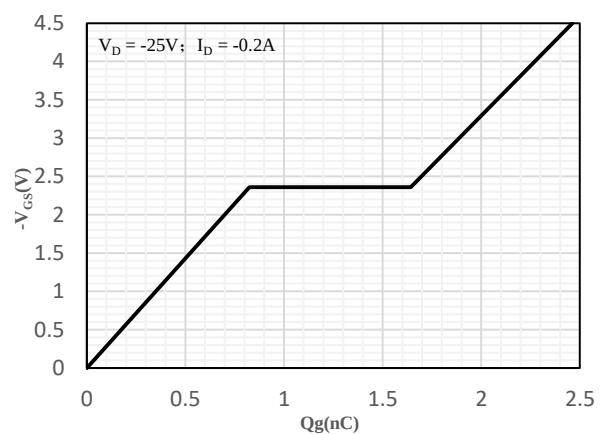
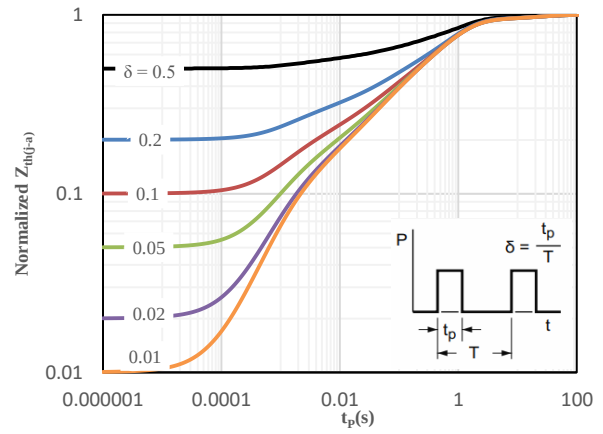
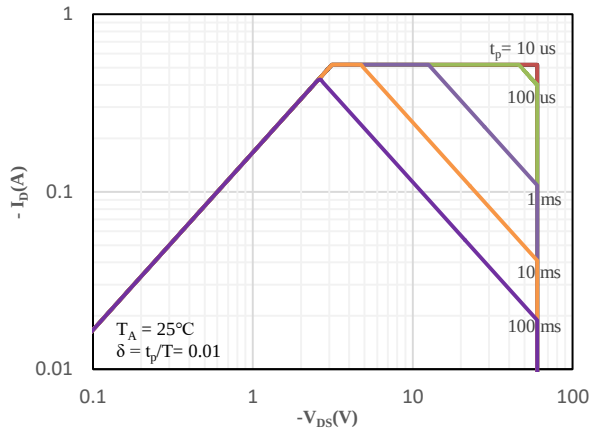
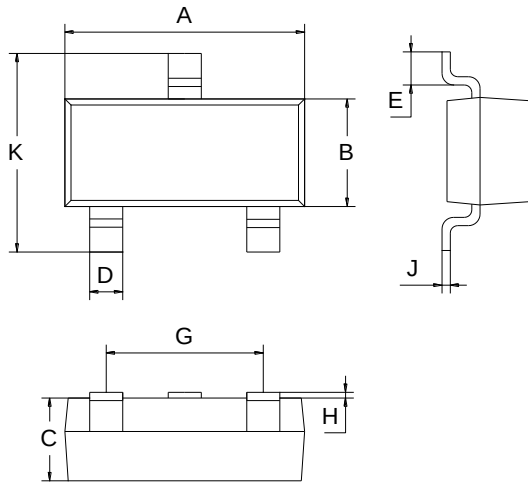


Fig 12 Gate-Charge Characteristics



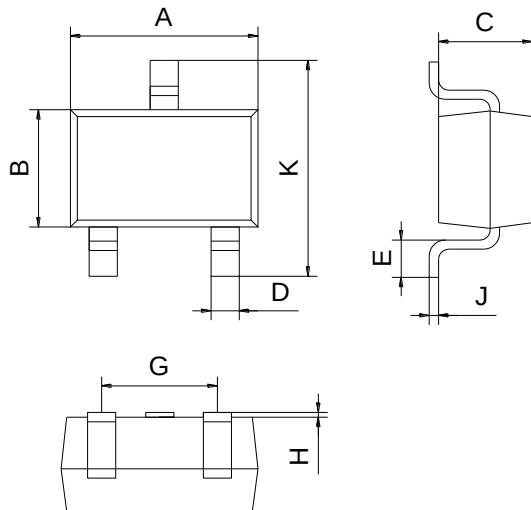
Package Outline Dimensions (Unit: mm)

SOT-23



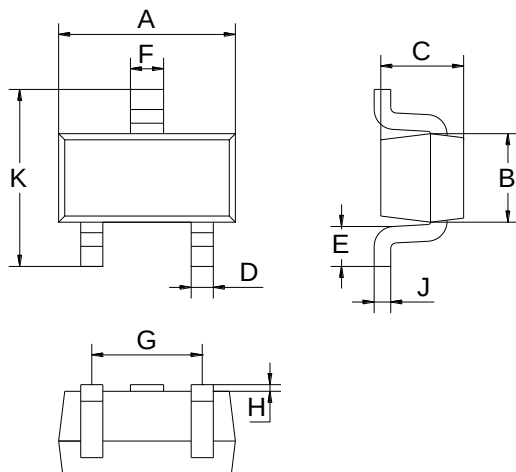
SOT-23		
Dimension	Min.	Max.
A	2.70	3.10
B	1.10	1.50
C	0.90	1.10
D	0.30	0.50
E	0.35	0.48
G	1.80	2.00
H	0.02	0.10
J	0.05	0.15
K	2.20	2.60

SOT-323



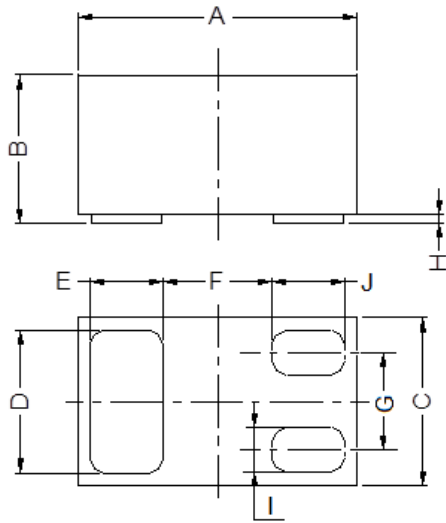
SOT-323		
Dimension	Min.	Max.
A	2.00	2.20
B	1.15	1.35
C	0.90	1.10
D	0.15	0.35
E	0.25	0.40
G	1.20	1.40
H	0.02	0.10
J	0.05	0.15
K	2.20	2.40

SOT-523



SOT-523		
Dimension	Min.	Max.
A	1.50	1.70
B	0.75	0.85
C	0.60	0.80
D	0.15	0.30
E	0.30	0.40
F	0.25	0.40
G	0.90	1.10
H	0.02	0.10
J	0.08	0.18
K	1.45	1.75

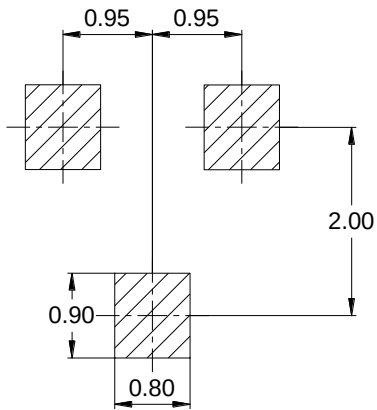
DFN1006-3



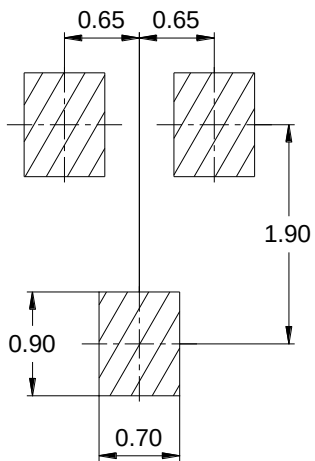
DFN1006-3			
Dimension	Min.	Typ.	Max.
A	0.95	1.00	1.075
B	0.47	0.50	0.53
C	0.55	0.60	0.675
D	0.45	0.50	0.55
E/J	0.20	0.25	0.30
F	-	0.40	-
G	-	0.35	-
H	0	0.03	0.05
I	0.10	0.15	0.20

Mounting Pad Layout (Unit: mm)

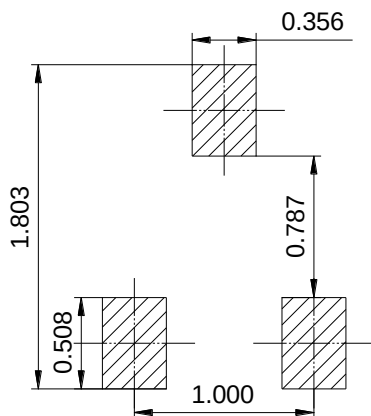
SOT-23



SOT-323



SOT-523



DFN1006-3

