

Features

- Electrostatic sensitive devices
- High-speed switching
- Drive circuits can be simple
- Parallel use is easy
- JESD22-A114-B ESD rating of class 3A per human body model
- Halogen free
- Qualified to AEC-Q101 standards for high reliability

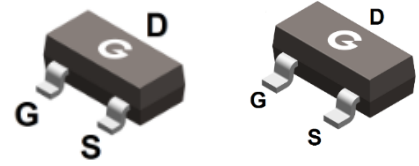
HF

Typical Applications

- P-channel enhancement mode effect transistor
- Switching application

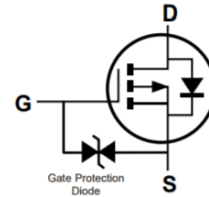
Mechanical Data

- 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



TBL3415ES
SOT-23

TBL3415ES-3L
SOT-23-3L



Ordering Information

Part Number	Package	Shipping Quantity	Marking Code
TBL3415ES	SOT-23	3000 pcs / Tape & Reel	3415E
TBL3415ES-3L	SOT-23-3L	3000 pcs / Tape & Reel	3415E

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}	±10	V
Continuous Drain Current (T _A = 25°C)	I _D	-4	A
Continuous Drain Current (T _A = 70°C)		-3.5	A
Pulsed Drain Current (t _p = 10μs, T _A = 25°C)	I _{DM}	-20	A
Single Pulse Avalanche Energy ^{*3}	E _{AS}	8.2	mJ
Power Dissipation (T _A = 25°C)	P _D	1.4	W
Power Dissipation (T _A = 70°C)		0.9	W
Operating Junction Temperature Range	T _J	-55 to +150	°C
Storage Temperature Range	T _{STG}	-55 to +150	°C

Thermal Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance Junction-to-Case ^{*1}	R _{θJC}	-	37.8	45	°C/W
Thermal Resistance Junction-to-Air ^{*1}	R _{θJA}	-	84	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} = ±10V, V _{DS} = 0V	-	-	±10	μA
On Characteristics						
R _{DS(ON)}	Drain-Source On-resistance *2	V _{GS} = -4.5V, I _D = -4A	-	40	50	mΩ
		V _{GS} = -2.5V, I _D = -4A	-	55	70	
		V _{GS} = -1.8V, I _D = -2A	-	78	100	
V _{GS(TH)}	Static Drain-Source On-resistance	V _{DS} = V _{GS} , I _D = -250μA	-0.45	-0.75	-1	V
R _G	Gate Resistance	V _{GS} = 0V, f = 1MHz	-	35	-	Ω
Dynamic Characteristics						
g _{FS}	Forward Transconductance	V _{DS} = -5V, I _D = -4A	8	12	-	S
C _{ISS}	Input Capacitance	V _{GS} = 0V V _{DS} = -10V f = 1.0MHz	-	1181	-	pF
C _{OSS}	Output Capacitance		-	115	-	
C _{RSS}	Reverse Transfer Capacitance		-	101	-	
Switching Characteristics						
Q _G	Total Gate-Charge	V _{DD} = -10V V _{GS} = -4.5V I _D = 4A	-	11	-	nC
Q _{GS}	Gate to Source Charge		-	1.9	-	
Q _{GD}	Gate to Drain (Miller) Charge		-	2.6	-	
Source-Drain Diode Characteristics						
V _{SD}	Diode Forward Voltage *2	I _S = -1A, V _{GS} = 0V	-	-0.8	-1	V

Notes:

1. The data tested by surface mounted on a 1 inch² FR-4 board with 20Z 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} = -15V, V_{GS} = -5V, L = 0.5mH

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

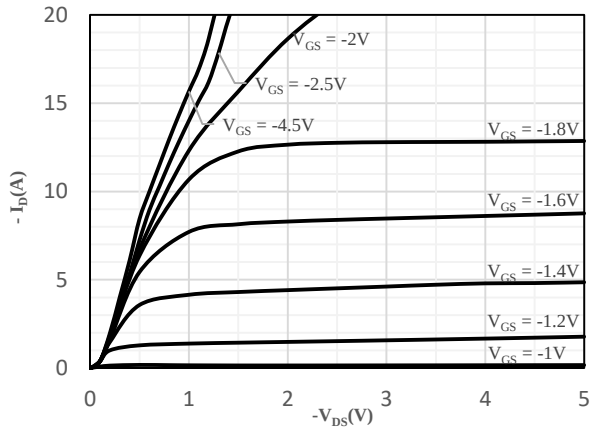


Fig 1 Typical Output Characteristics

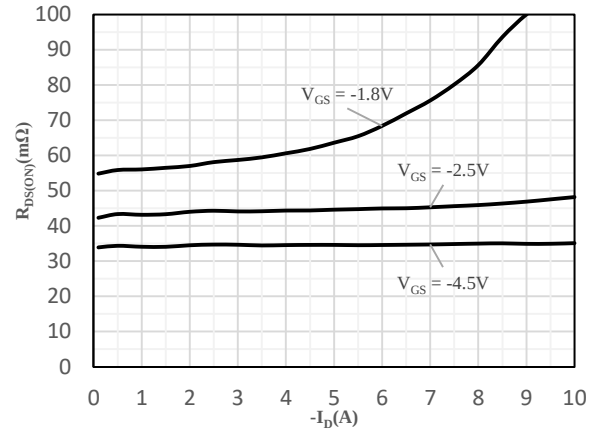


Fig 2 On-Resistance vs. Drain Current and Gate Voltage

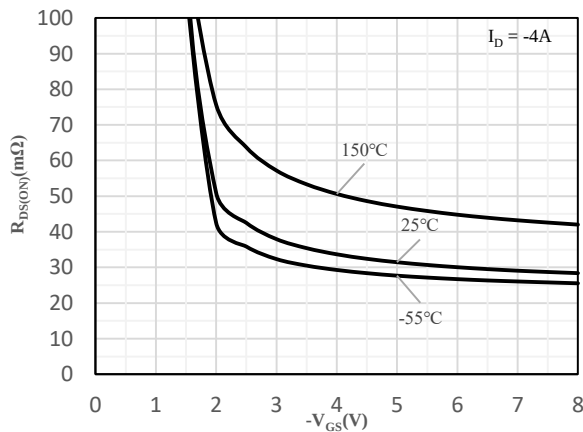


Fig 3 On-Resistance vs. Gate-Source Voltage

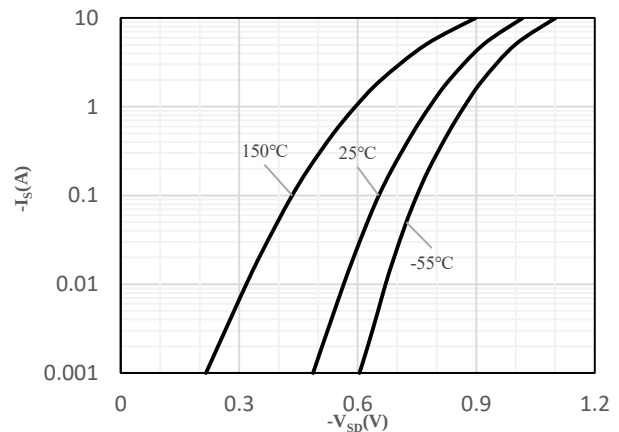


Fig 4 Body-Diode Characteristics

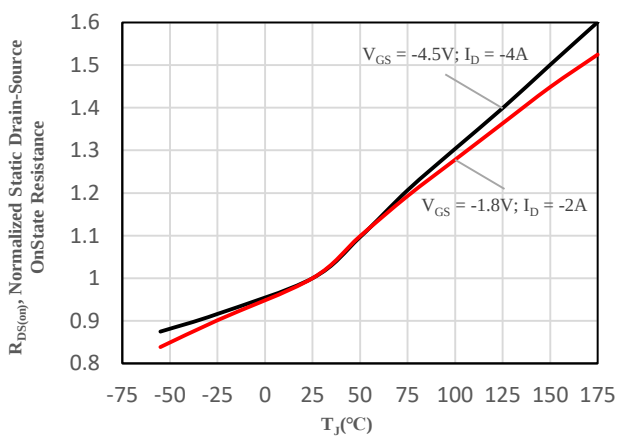


Fig 5 Normalized On-Resistance vs. Junction Temperature

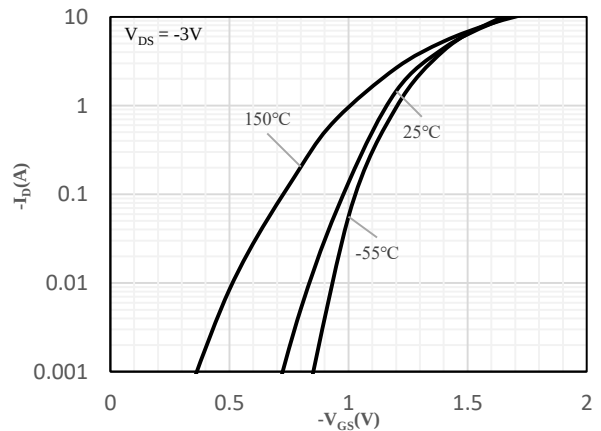


Fig 6 Transfer Characteristics

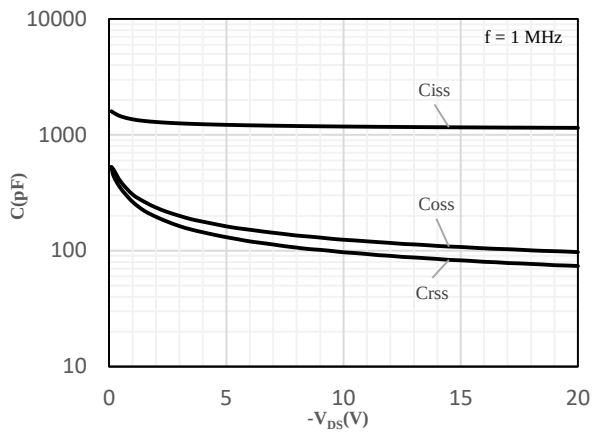


Fig 7 Capacitance Characteristics

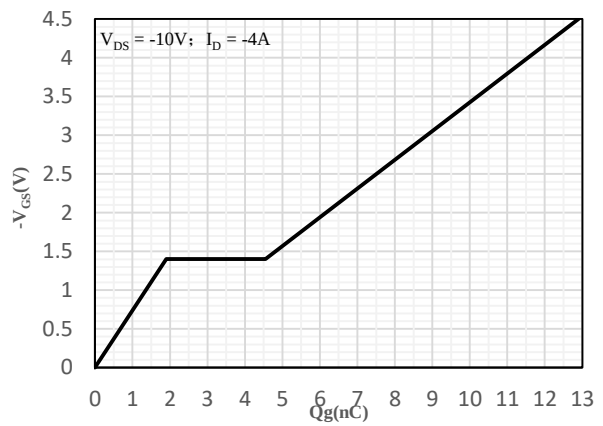
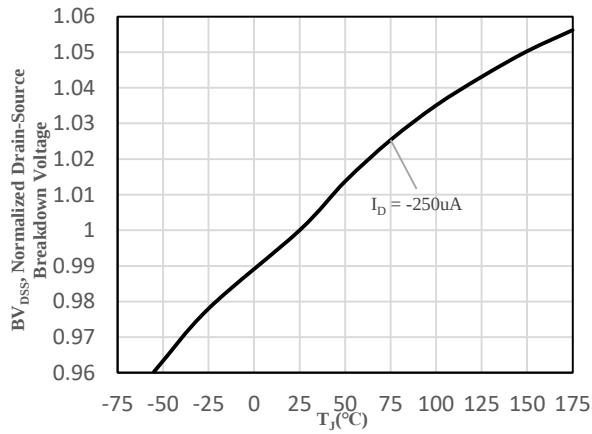


Fig 8 Gate-Charge Characteristics



**Fig 9 Normalized Breakdown Voltage
vs. Junction Temperature**

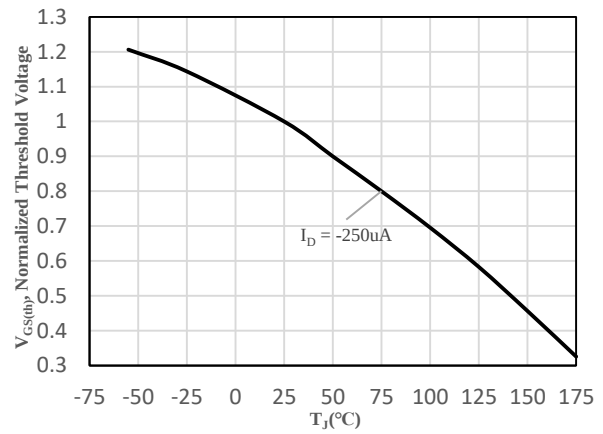


Fig 10 Normalized $V_{GS(th)}$ vs. Junction Temperature

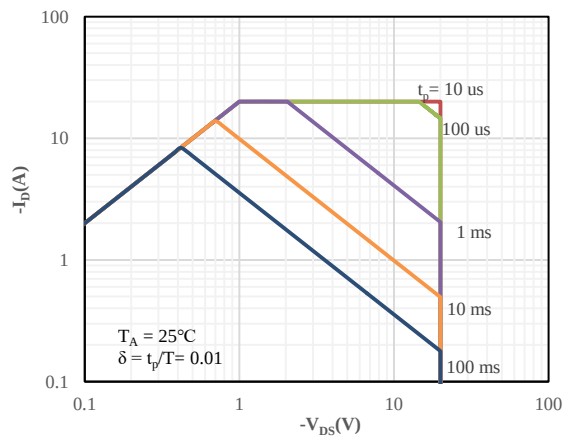


Fig 11 Safe Operation Area

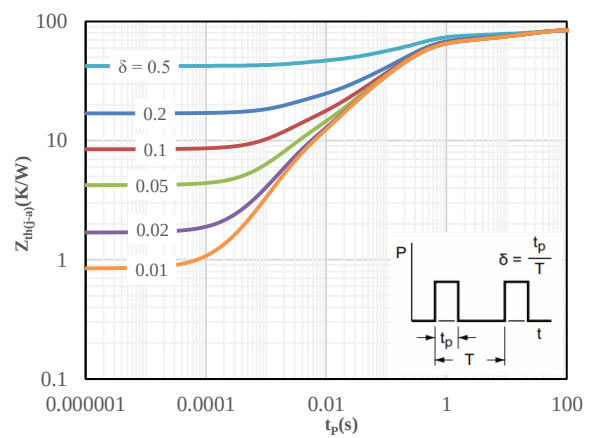
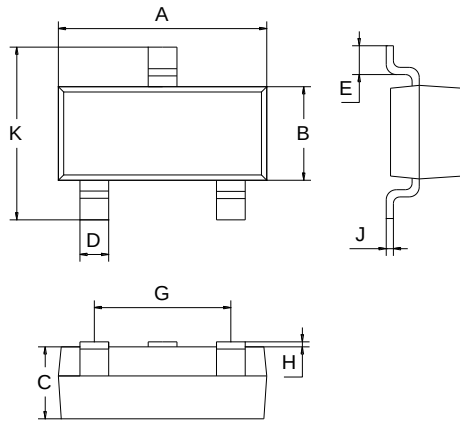
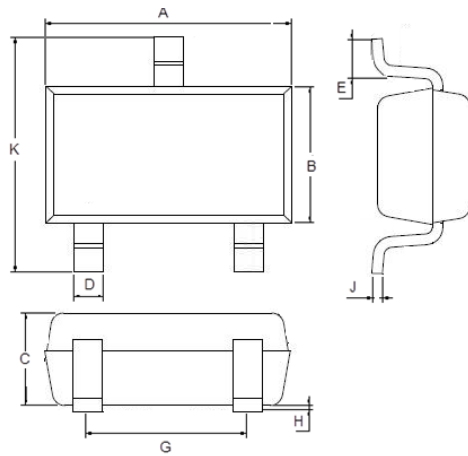


Fig 12 Maximum transient thermal impedance

Package Outline Dimensions (Unit: mm)



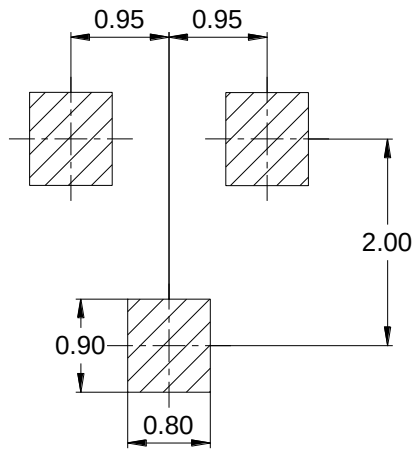
SOT-23		
Dimension	Min.	Max.
A	2.70	3.10
B	1.10	1.50
C	0.90	1.10
D	0.30	0.50
E	0.35	0.48
G	1.80	2.00
H	0.02	0.10
J	0.05	0.15
K	2.20	2.60



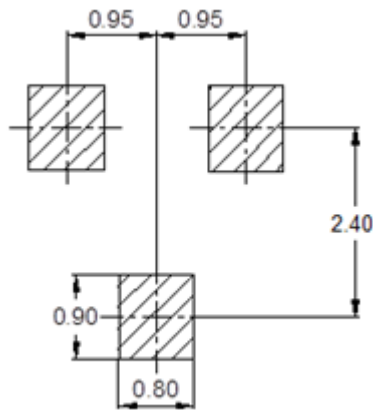
SOT-23-3L		
Dimension	Min.	Max.
A	2.80	3.00
B	1.50	1.70
C	1.00	1.20
D	0.35	0.45
E	0.35	0.55
G	1.80	2.00
H	0.02	0.10
J	0.10	0.20
K	2.60	3.00

Mounting Pad Layout (Unit: mm)

SOT-23



SOT-23-3L



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