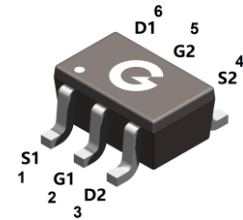
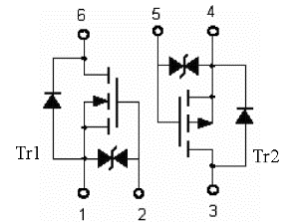


Features

- Advanced trench technology
- High speed switching
- Low-voltage drive
- Integrated ESD protection diode:
HBM: AEC-Q101-001: H2 (JESD22-A114-B: 2)
- RoHS compliant with Halogen-free
- Qualified to AEC-Q101 Standards

HF



SOT-363

Mechanical Data

- Case: SOT-363
- 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
TBL1213	SOT-363	3000 pcs / Tape & Reel	1213

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

Parameter	Symbol	T _{r1}	T _{r2}	Unit
Drain-to-Source Voltage	V _{DSS}	20	-20	V
Gate-to-Source Voltage	V _{GSS}	±8	±8	V
Continuous Drain Current (T _A = 25°C) *1	I _D	0.82	-0.65	A
Continuous Drain Current (T _A = 70°C) *1		0.66	-0.52	A
Pulsed Drain Current (t _p = 10μs, T _A = 25°C)	I _{DM}	5	-5	A
Power Dissipation (T _A = 25°C) *1	P _D	0.3		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 _{θJC}	-	-	230	°C/W
Thermal Resistance Junction-to-Air *1	R _{θJA}	-	-	415	°C/W

Electrical Characteristics- T_{r1} @ $T_A = 25^\circ\text{C}$ 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	20	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 20V, V _{GS} = 0V	-	-	100	nA
I _{GSS}	Gate-Body Leakage Current	V _{GS} = ±8V, V _{DS} = 0V	-	-	±10	μA
On Characteristics						
R _{DS(ON)}	Drain-Source On-resistance* ²	V _{GS} =4.5V, I _D =0.6A	-	0.22	0.4	Ω
		V _{GS} =2.5V, I _D =0.2A	-	0.28	0.456	
		V _{GS} =1.8V, I _D =0.1A	-	0.35	0.546	
V _{GS(TH)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250uA	0.5	0.67	1.2	V
R _G	Gate Resistance	V _{GS} = 0V, f = 1MHz	-	115	-	Ω
Dynamic Characteristics						
C _{ISS}	Input Capacitance	V _{GS} = 0V V _{DS} = 10V f = 1.0MHz	-	67	-	pF
C _{OSS}	Output Capacitance		-	12	-	
C _{RSS}	Reverse Transfer Capacitance		-	8	-	
Switching Characteristics						
t _{d(ON)}	Turn-on Delay Time* ³	V _{DD} = 10V V _{GS} = 4V I _D = 0.15A R _G = 10Ω	-	2.8	-	ns
t _r	Turn-on Rise Time* ³		-	20	-	
t _{d(OFF)}	Turn-Off Delay Time* ³		-	23	-	
t _f	Turn-Off Fall Time* ³		-	23	-	
Q _G	Total Gate-Charge	V _{DS} = 10V V _{GS} = 4.5V I _D = 0.5A	-	2.35	-	nC
Q _{GS}	Gate to Source Charge		-	0.46	-	
Q _{GD}	Gate to Drain (Miller) Charge		-	0.35	-	
Source-Drain Diode Characteristics						
V _{SD}	Diode Forward Voltage * ²	I _S = 0.5A, V _{GS} = 0 V	-	0.9	1.0	V

Electrical Characteristics- T_{r2} (@ $T_A = 25^\circ\text{C}$ 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	-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} = ±4.5V, V _{DS} = 0V	-	-	±10	μA
On Characteristics						
R _{DS(ON)}	Drain-Source On-resistance ^{*2}	V _{GS} = -4.5V, I _D = -780mA	-	0.40	0.48	Ω
		V _{GS} = -4V, I _D = -300mA	-	0.44	0.55	
		V _{GS} = -2.5V, I _D = -660mA	-	0.6	0.67	
		V _{GS} = -1.8V, I _D = -100mA	-	0.75	2.2	
V _{GS(TH)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = -250uA	-0.5	-0.6	-1.2	V
R _G	Gate Resistance	V _{GS} = 0V, f = 1MHz	-	94	-	Ω
Dynamic Characteristics						
C _{ISS}	Input Capacitance	V _{GS} = 0V	-	76	-	pF
C _{OSS}	Output Capacitance	V _{DS} = -16V	-	13	-	
C _{RSS}	Reverse Transfer Capacitance	f = 1.0MHz	-	10	-	
Switching Characteristics						
t _{d(ON)}	Turn-on Delay Time ^{*3}	V _{DD} = -10V	-	8	-	ns
t _r	Turn-on Rise Time ^{*3}	V _{GS} = -4.5V	-	5.5	-	
t _{d(OFF)}	Turn-Off Delay Time ^{*3}	R _G = 3Ω	-	30	-	
t _f	Turn-Off Fall Time ^{*3}	R _G = 50Ω	-	17	-	
Q _G	Total Gate-Charge	V _{DS} = -16V	-	2.6	-	nC
Q _{GS}	Gate to Source Charge	V _{GS} = -4.5V	-	0.57	-	
Q _{GD}	Gate to Drain (Miller) Charge	I _D = -0.2A	-	0.34	-	
Source-Drain Diode Characteristics						
V _{SD}	Diode Forward Voltage ^{*2}	I _S = -0.15A, V _{GS} = 0 V	-	-0.8	-1.2	V

Notes:

1. The data tested by surface mounted on a minimum recommended pad
2. The data tested by pulsed, pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
3. Guaranteed by design, not subject to production

Ratings and Characteristics Curves- T_{r1} (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

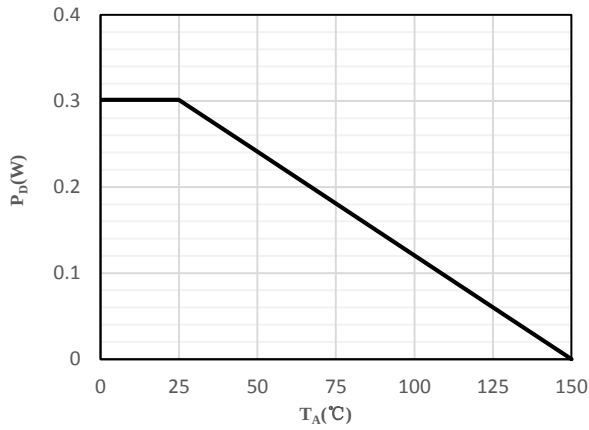


Fig 1 Power Dissipation

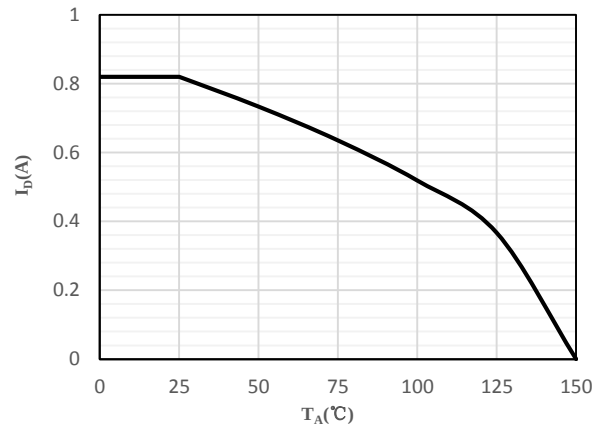


Fig 2 Drain Current

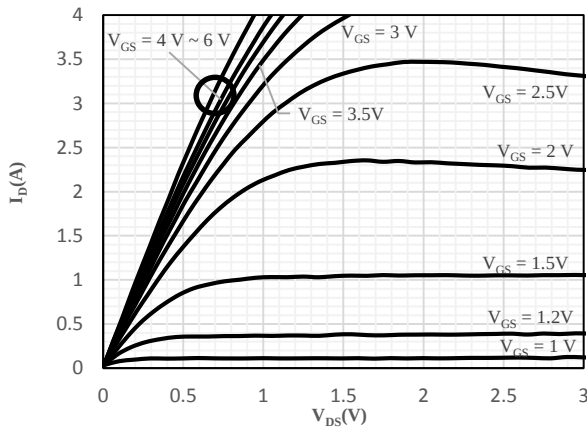


Fig 3 Typical Output Characteristics

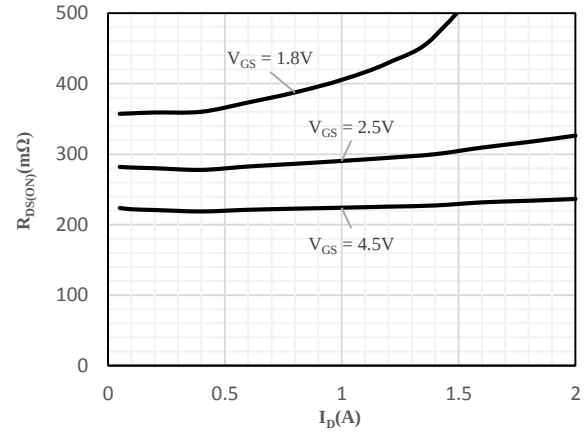


Fig 4 On-Resistance vs. Drain Current and Gate Voltage

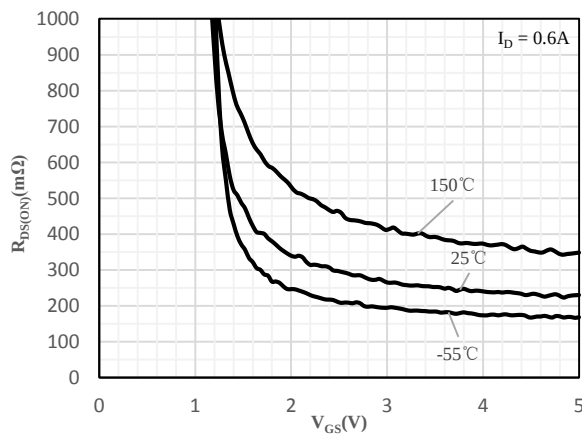


Fig 5 On-Resistance vs. Gate-Source Voltage

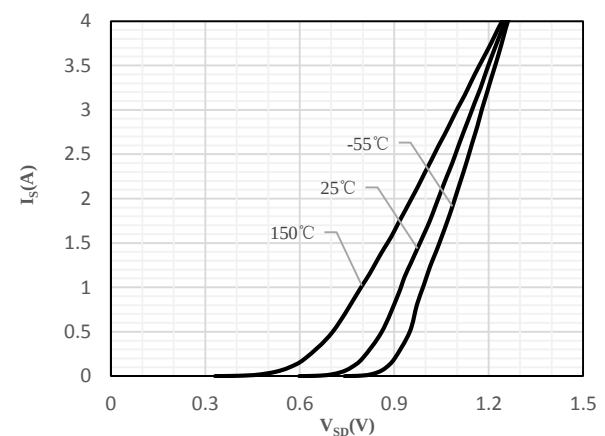


Fig 6 Body-Diode Characteristics

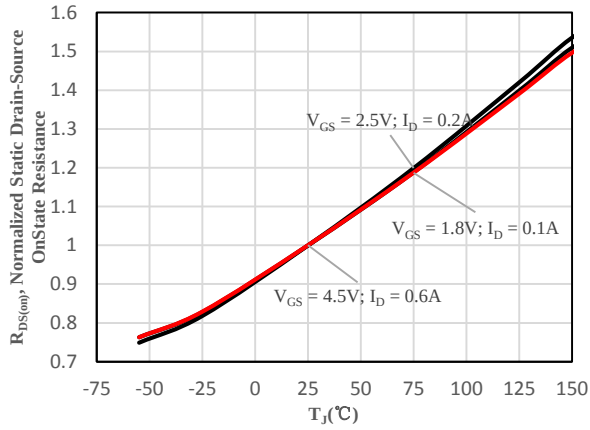


Fig 7 Normalized On-Resistance vs. Junction Temperature

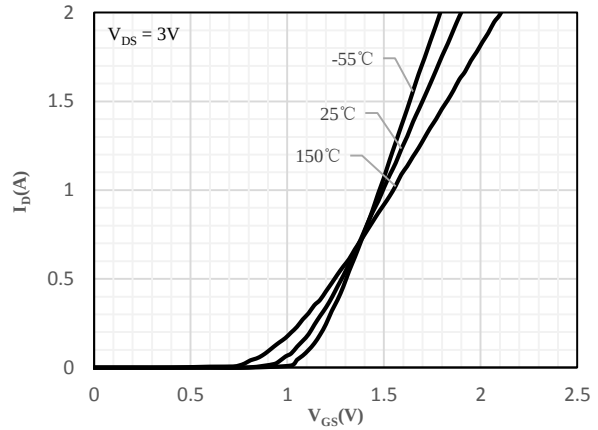


Fig 8 Transfer Characteristics

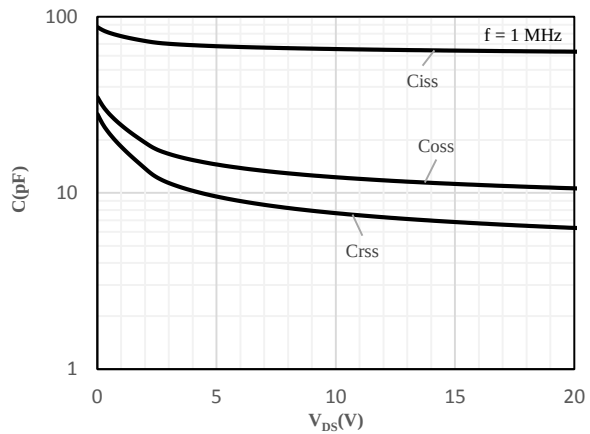


Fig 9 Capacitance Characteristics

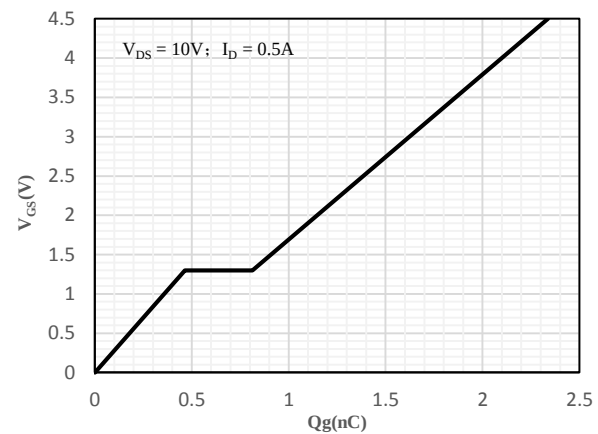


Fig 10 Gate-Charge Characteristics

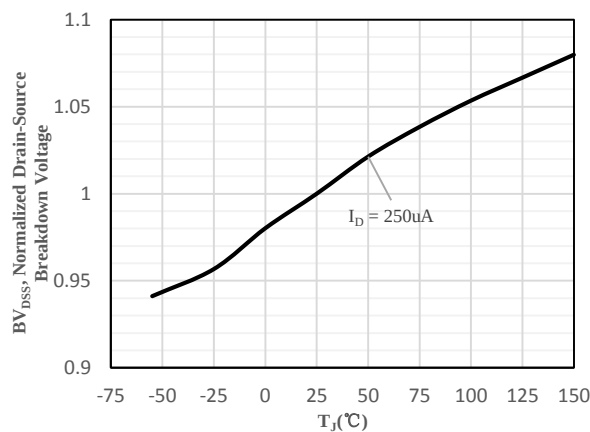


Fig 11 Normalized Breakdown Voltage vs. Junction Temperature

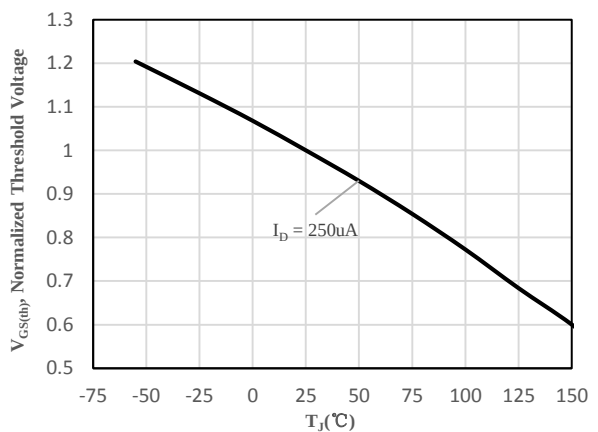


Fig 12 Normalized $V_{GS(th)}$ vs. Junction Temperature

Ratings and Characteristics Curves- T_{r2} (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

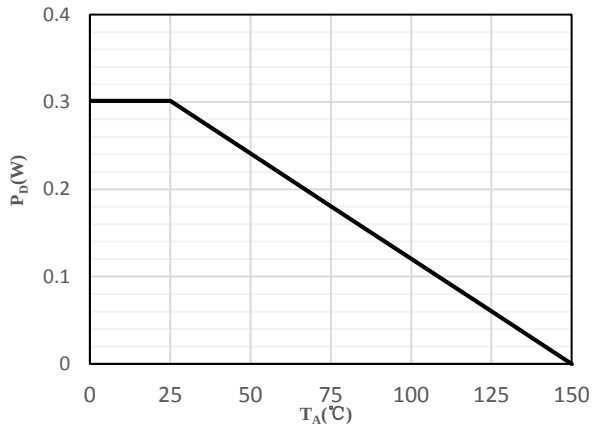


Fig 1 Power Dissipation

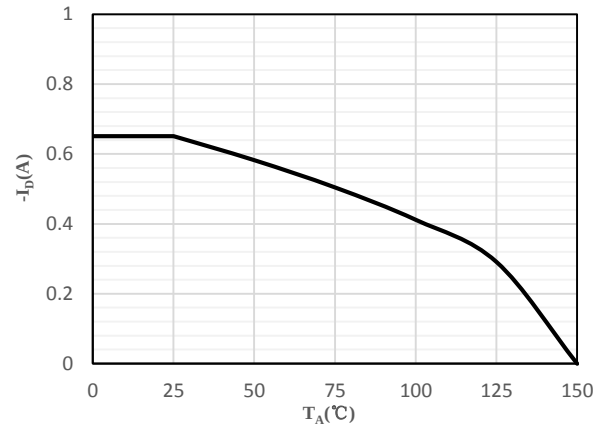


Fig 2 Drain Current

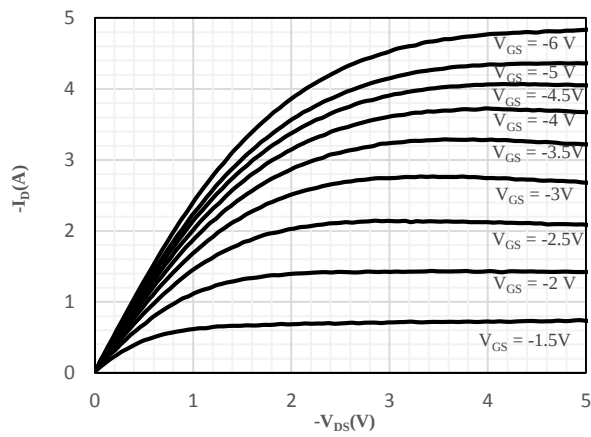


Fig 3 Typical Output Characteristics

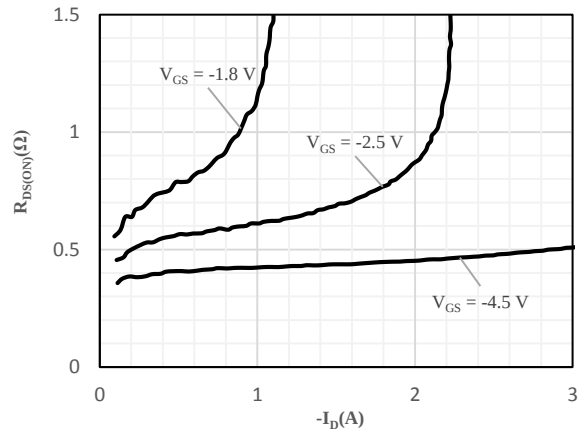


Fig 4 On-Resistance vs. Drain Current
and Gate Voltage

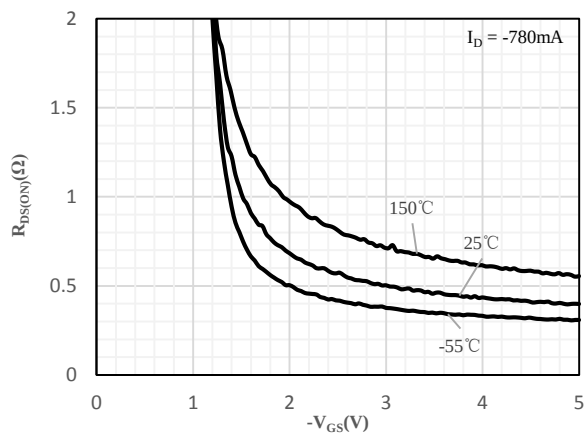


Fig 5 On-Resistance vs. Gate-Source Voltage

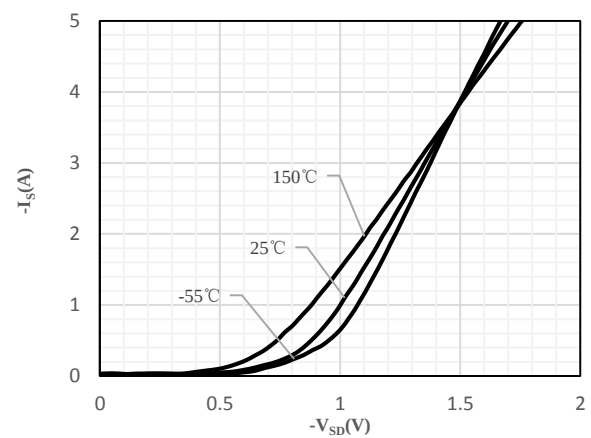


Fig 6 Body-Diode Characteristics

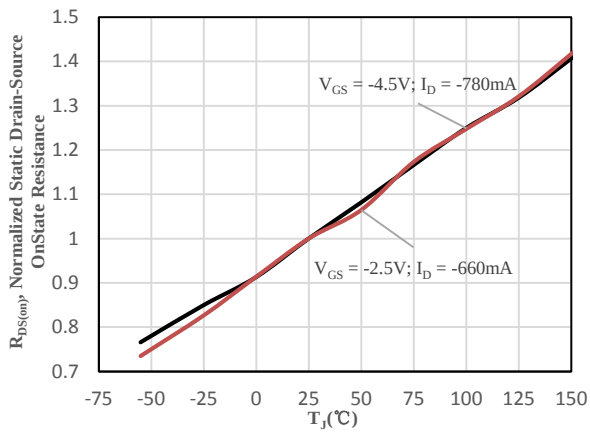


Fig 7 Normalized On-Resistance vs. Junction Temperature

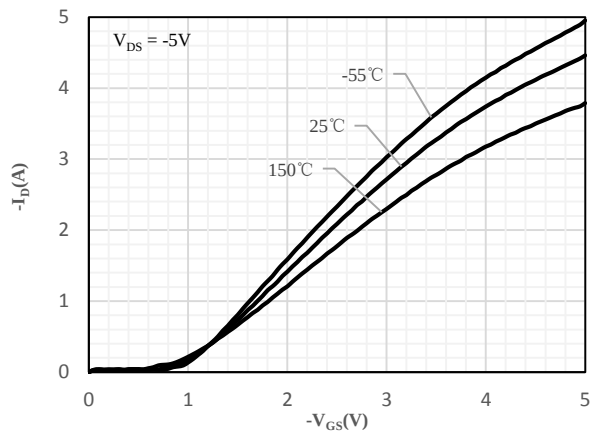


Fig 8 Transfer Characteristics

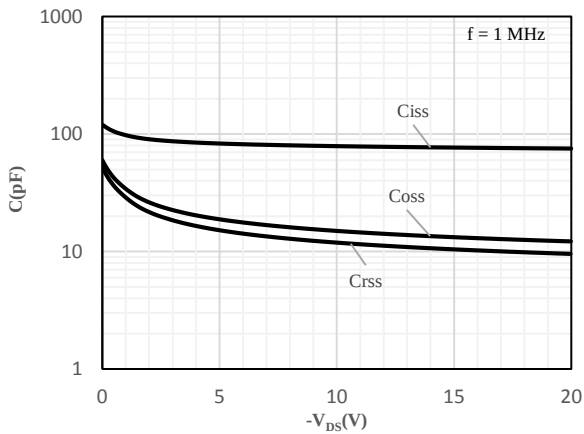


Fig 9 Capacitance Characteristics

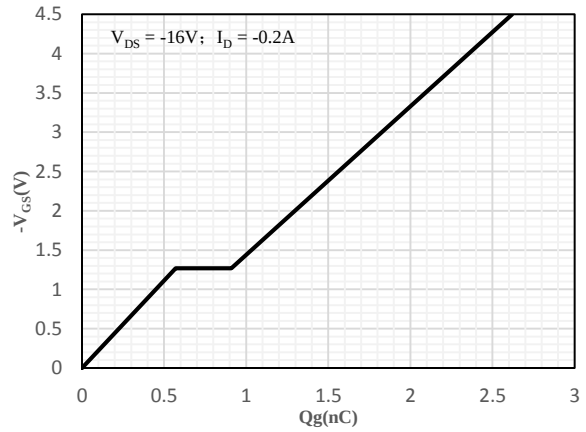


Fig 10 Gate-Charge Characteristics

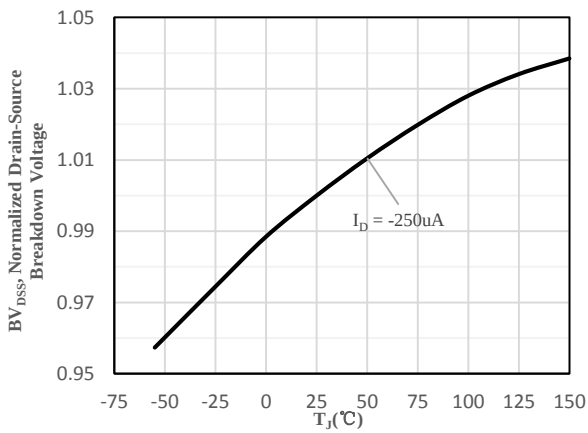


Fig 11 Normalized Breakdown Voltage vs. Junction Temperature

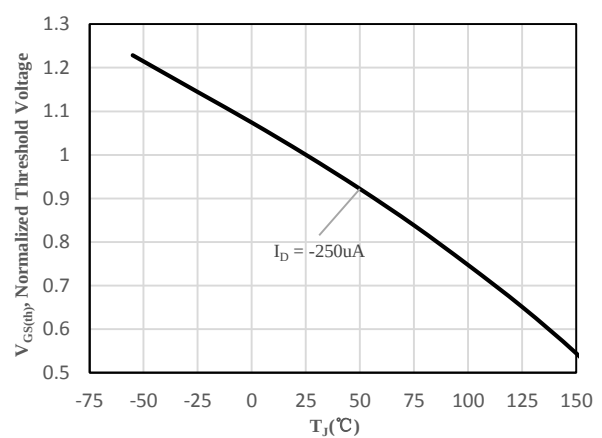
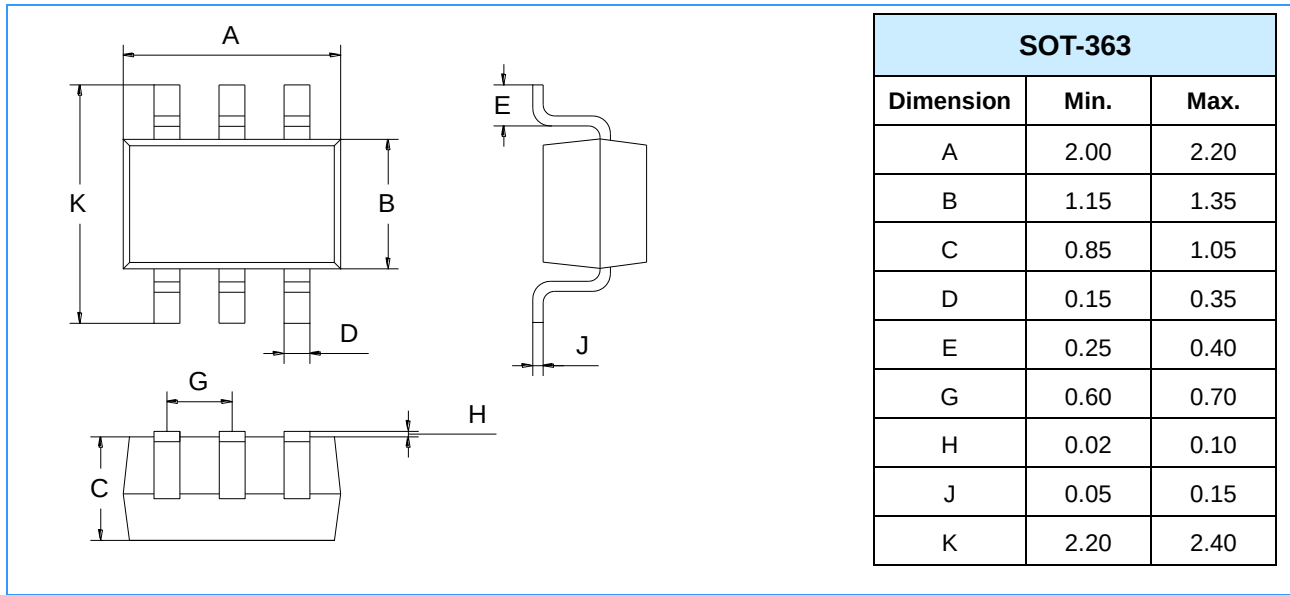


Fig 12 Normalized $V_{GS(th)}$ vs. Junction Temperature

Package Outline Dimensions (Unit: mm)



Mounting Pad Layout (Unit: mm)

