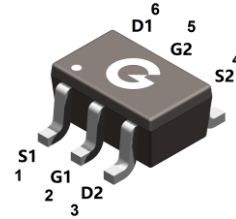
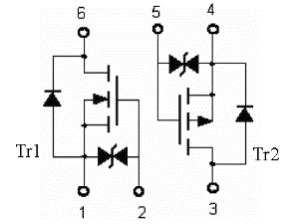


Features

- Advanced trench technology
- Low-voltage drive
- Integrated ESD protection diode:
HBM: NMOS: AEC-Q101-001: H1C (JESD22-A114-B: 1C)
PMOS: 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
TBL1415DW	SOT-363	3000 pcs / Tape & Reel	K5

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

Parameter	Symbol	Q1	Q2	Unit
Drain-to-Source Voltage	V _{DSS}	30	-30	V
Gate-to-Source Voltage	V _{GSS}	±10	±10	V
Continuous Drain Current (T _C = 25°C)	I _D	0.78	-0.36	A
Continuous Drain Current (T _A = 25°C) ^{*1}		0.4	-0.3	
Continuous Drain Current (T _A = 70°C) ^{*1}		0.32	-0.24	
Pulsed Drain Current (t _p = 10μs, T _C = 25°C)	I _{DM}	3.1	-3	A
Pulsed Drain Current (t _p = 10μs, T _A = 25°C)		2	-2	
Single Pulse Avalanche Energy (L = 0.1mH) ^{*3}	E _{AS}	0.1	0.2	mJ
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}	-	-	150	°C/W
Thermal Resistance Junction-to-Air ^{*1}	R _{θJA}	-	-	416	°C/W

Electrical Characteristics-Q1 (@ 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	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} = ±10V, V _{DS} = 0V	-	-	±10	μA
On Characteristics						
R _{DS(ON)}	Drain-Source On-resistance *2	V _{GS} = 4.5V, I _D = 0.5A	-	0.7	1.2	Ω
		V _{GS} = 2.5V, I _D = 0.2A	-	0.8	1.6	
		V _{GS} = 1.8V, I _D = 0.1A	-	0.9	2	
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	0.5	0.7	1.0	V
R _G	Gate Resistance	V _{GS} = 0V, f = 1MHz	-	90	-	Ω
Dynamic Characteristics						
C _{ISS}	Input Capacitance	V _{GS} = 0V V _{DS} = 10V f = 1.0MHz	-	38	-	pF
C _{OSS}	Output Capacitance		-	5	-	
C _{RSS}	Reverse Transfer Capacitance		-	3.4	-	
Switching Characteristics						
t _{d(ON)}	Turn-on Delay Time *4	V _{DD} = 10V V _{GS} = 4V R _G = 10Ω I _D = 0.3A	-	8.3	-	ns
t _r	Turn-on Rise Time *4		-	5.7	-	
t _{d(OFF)}	Turn-Off Delay Time *4		-	35	-	
t _f	Turn-Off Fall Time *4		-	12	-	
Q _G	Total Gate-Charge	V _{DD} = 15V V _{GS} = 4.5V I _D = 0.5A	-	2.1	-	nC
Q _{GS}	Gate to Source Charge		-	0.4	-	
Q _{GD}	Gate to Drain (Miller) Charge		-	0.25	-	
Source-Drain Diode Characteristics						
V _{SD}	Diode Forward Voltage *2	I _{SD} = 0.5A, V _{GS} = 0V	-	0.9	1.2	V

Electrical Characteristics-Q2 (@ 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	-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} = ±8V, V _{DS} = 0V	-	-	±10	μA
On Characteristics						
R _{DS(ON)}	Drain-Source On-resistance *2	V _{GS} = -4.5V, I _D = -0.3A	-	1.4	2.5	Ω
		V _{GS} = -2.5V, I _D = -0.2A	-	1.8	2.9	
		V _{GS} = -1.8V, I _D = -0.1A	-	2.2	5	
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = -250μA	-0.4	-0.65	-1.0	V
Dynamic Characteristics						
C _{ISS}	Input Capacitance	V _{GS} = 0V	-	6	-	pF
C _{OSS}	Output Capacitance	V _{DS} = -10V	-	5	-	
C _{RSS}	Reverse Transfer Capacitance	f = 1.0MHz	-	1.3	-	
Switching Characteristics						
t _{d(ON)}	Turn-on Delay Time *4	V _{DD} =-10V, V _{GS} = -4.5V R _G = 6Ω, R _L = 150Ω I _D = -0.1A	-	3.4	-	ns
t _r	Turn-on Rise Time *4		-	13	-	
t _{d(OFF)}	Turn-Off Delay Time *4		-	37	-	
t _f	Turn-Off Fall Time *4		-	23	-	
Q _G	Total Gate-Charge	V _{DD} = -15V	-	2.1	-	nC
Q _{GS}	Gate to Source Charge	V _{GS} = -4.5V	-	0.5	-	
Q _{GD}	Gate to Drain (Miller) Charge	I _D = -0.3A	-	0.25	-	
Source-Drain Diode Characteristics						
V _{SD}	Diode Forward Voltage *2	I _{SD} = -0.3 A, V _{GS} = 0V	-	-0.9	-1.3	V

Notes:

- The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper
- The data tested by pulsed, pulse width ≤ 300μs, duty cycle ≤ 2%
- The E_{AS} data shows Max. rating. The test condition is N: V_{DD} = 15V, V_{GS} = 8V, L = 0.1mH
P: V_{DD} = -15V, V_{GS} = -8V, L = 0.1mH
- Guaranteed by design, not subject to production

Ratings and Characteristics Curves-Q1 (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

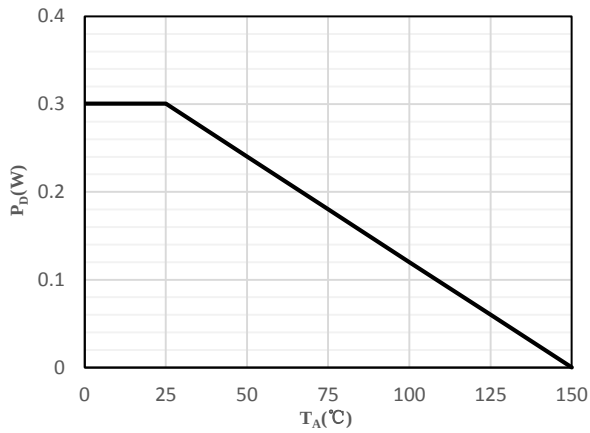


Fig 1 Power Dissipation

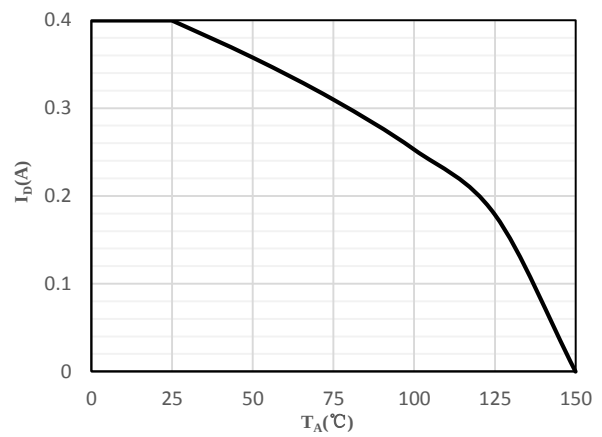


Fig 2 Drain Current

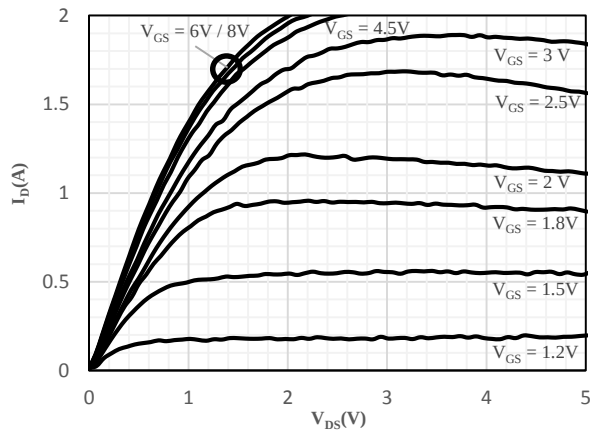


Fig 3 Typical Output Characteristics

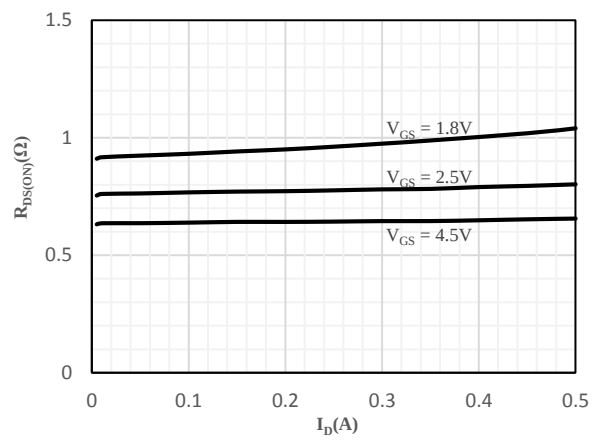


Fig 4 On-Resistance vs. Drain Current and Gate Voltage

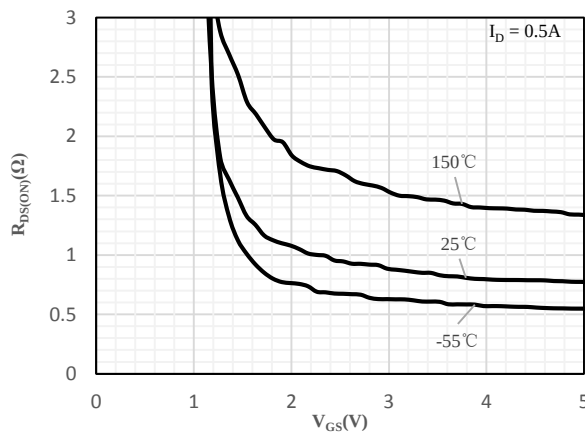


Fig 5 On-Resistance vs. Gate-Source Voltage

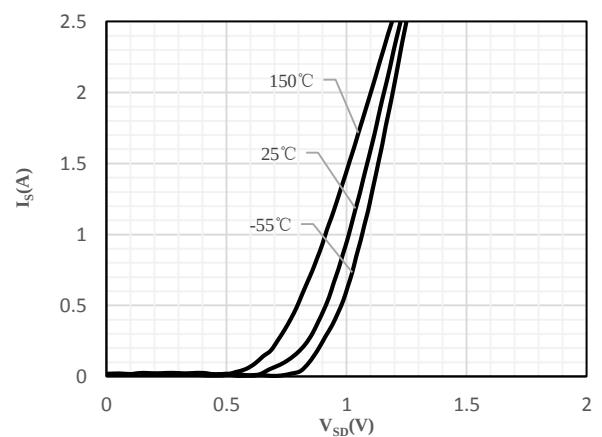


Fig 6 Body-Diode Characteristics

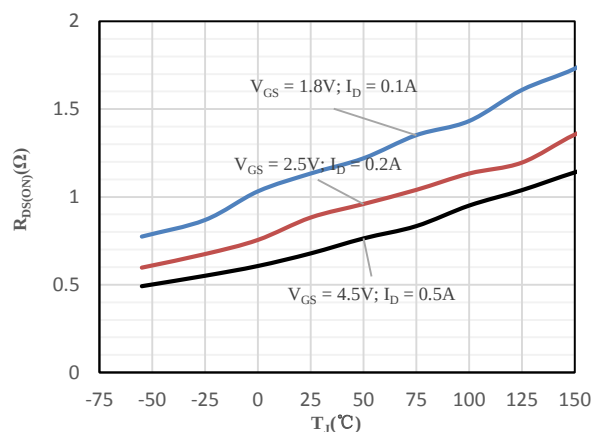


Fig 7 On-Resistance vs. Junction Temperature

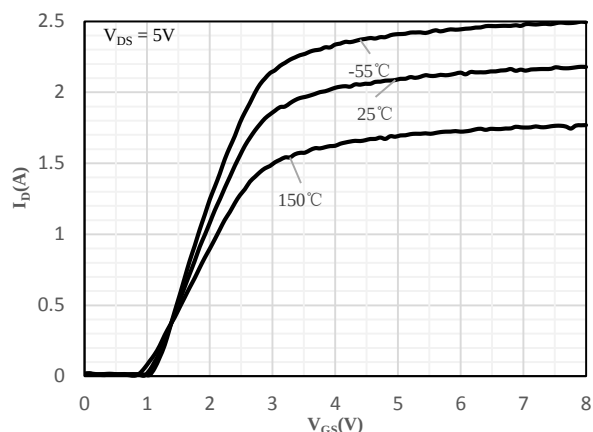


Fig 8 Transfer Characteristics

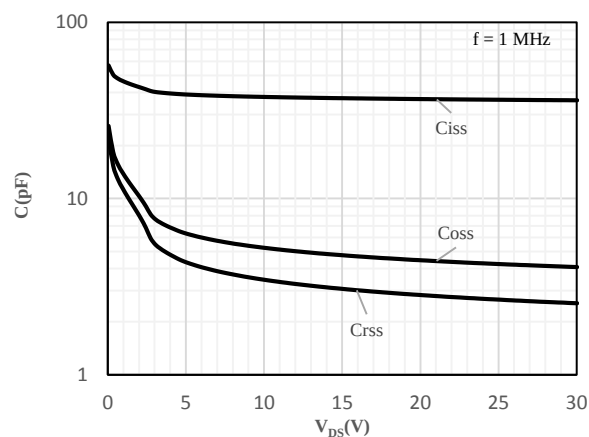


Fig 9 Capacitance Characteristics

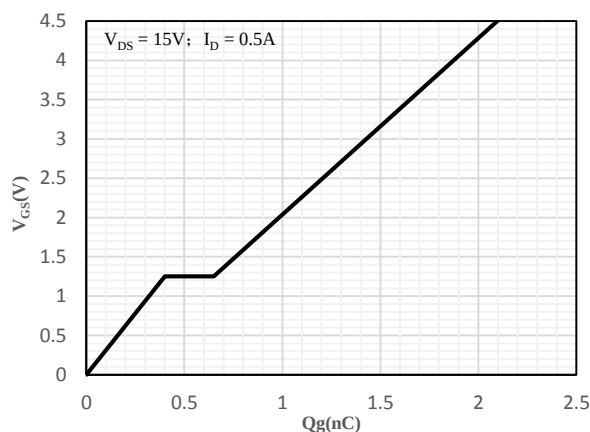


Fig 10 Gate-Charge Characteristics

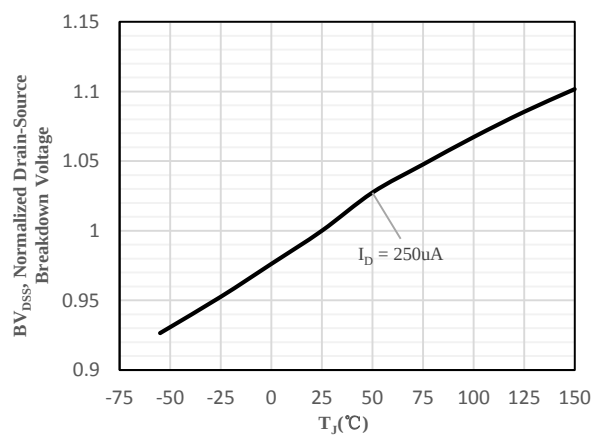


Fig 11 Normalized Breakdown Voltage
vs. Junction Temperature

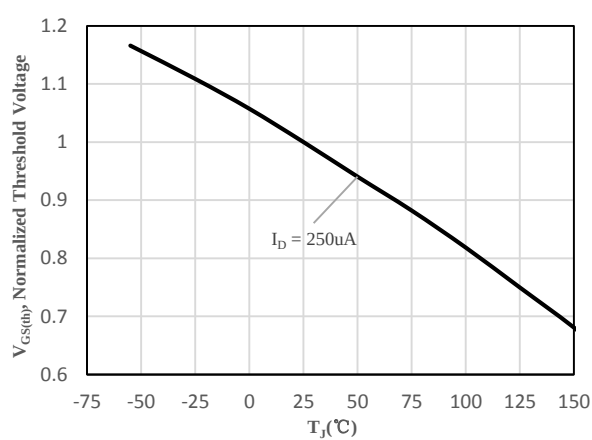
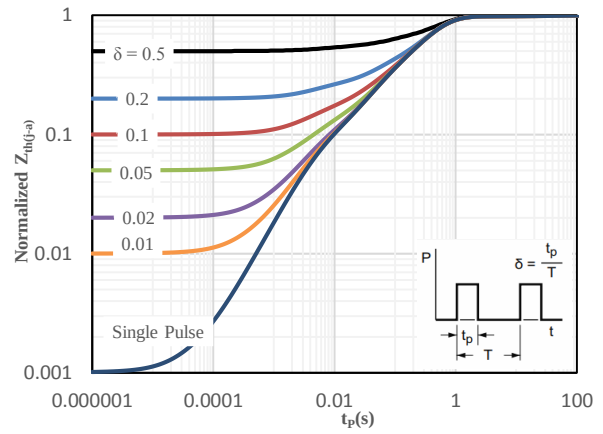
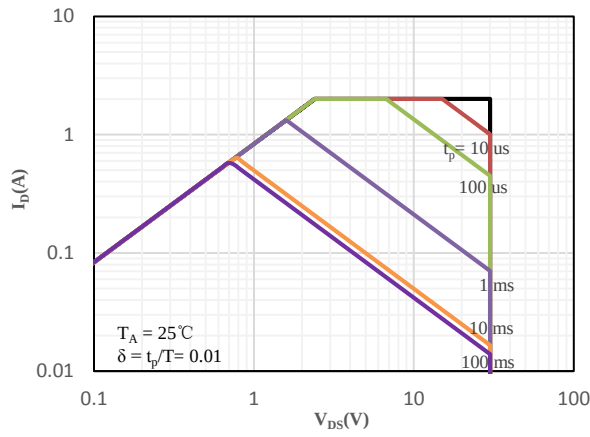


Fig 12 Normalized $V_{GS(th)}$ vs. Junction Temperature



Ratings and Characteristics Curves-Q2 (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

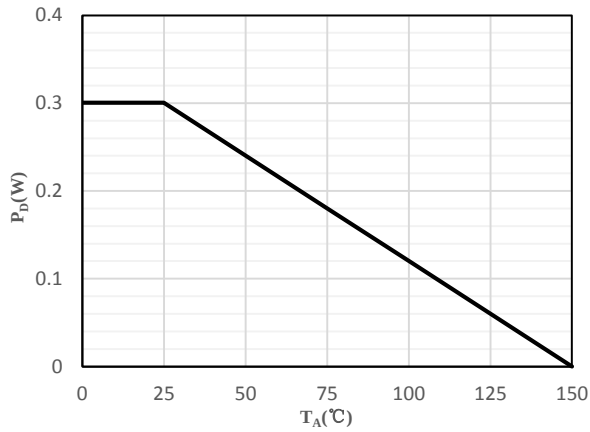


Fig 1 Power Dissipation

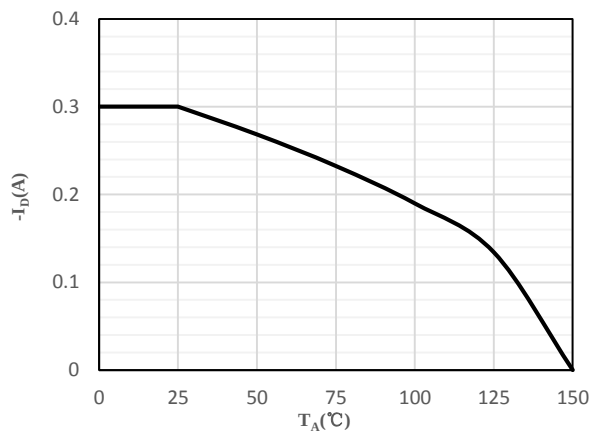


Fig 2 Drain Current

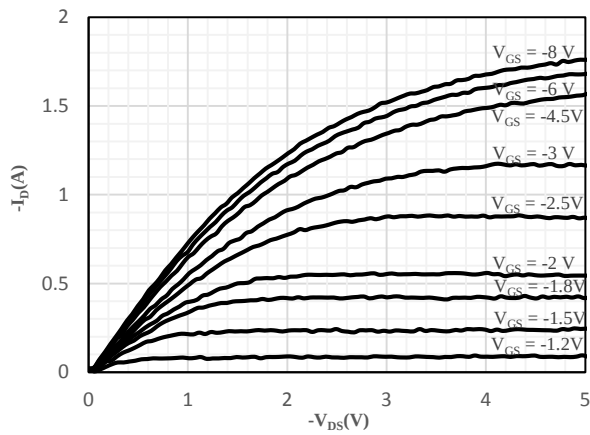


Fig 3 Typical Output Characteristics

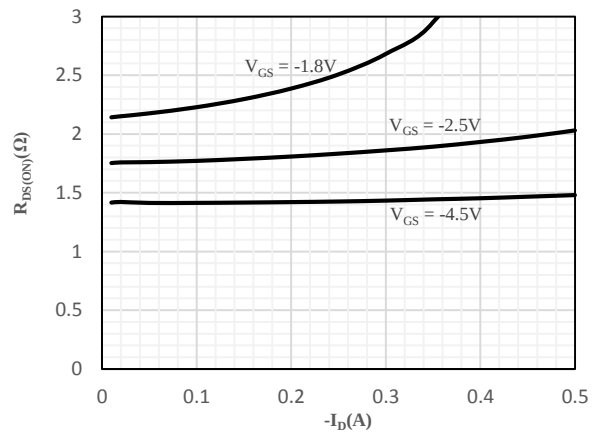


Fig 4 On-Resistance vs. Drain Current
and Gate Voltage

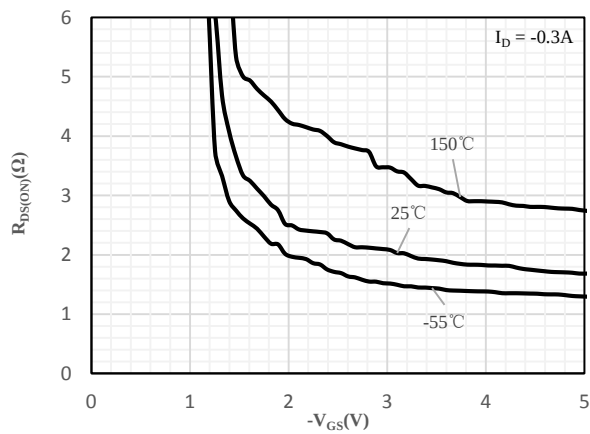


Fig 5 On-Resistance vs. Gate-Source Voltage

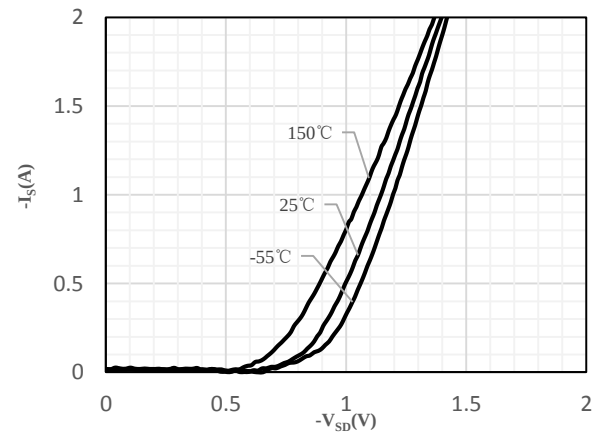


Fig 6 Body-Diode Characteristics

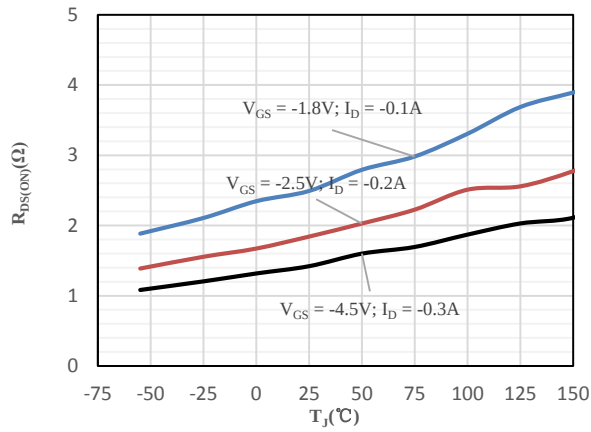


Fig 7 On-Resistance vs. Junction Temperature

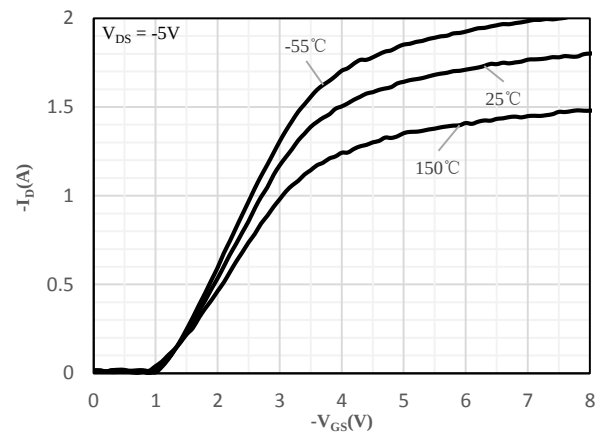


Fig 8 Transfer Characteristics

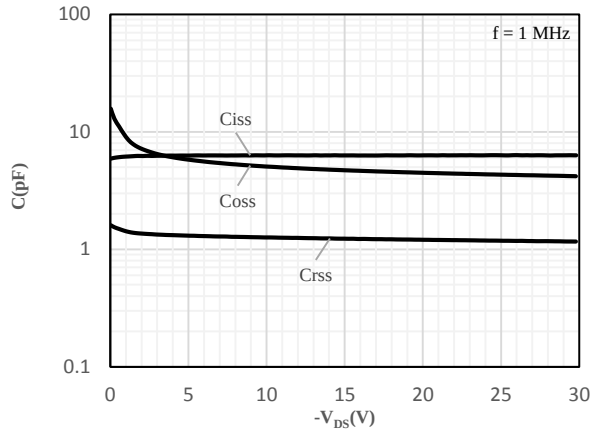


Fig 9 Capacitance Characteristics

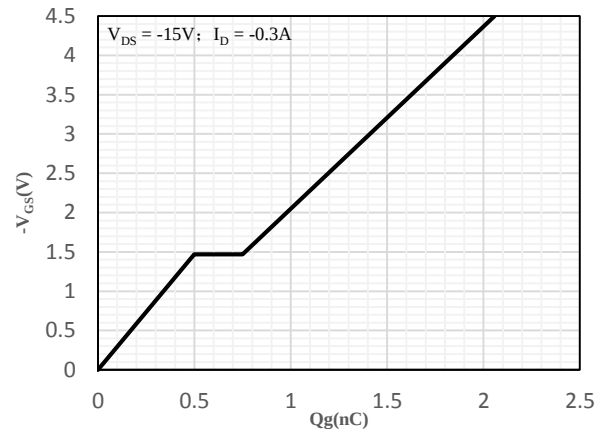


Fig 10 Gate-Charge Characteristics

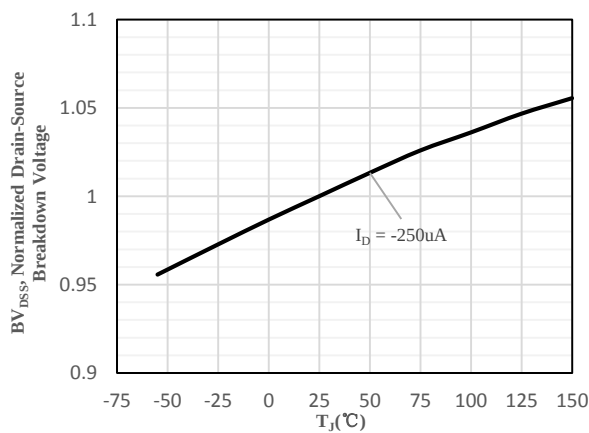


Fig 11 Normalized Breakdown Voltage
vs. Junction Temperature

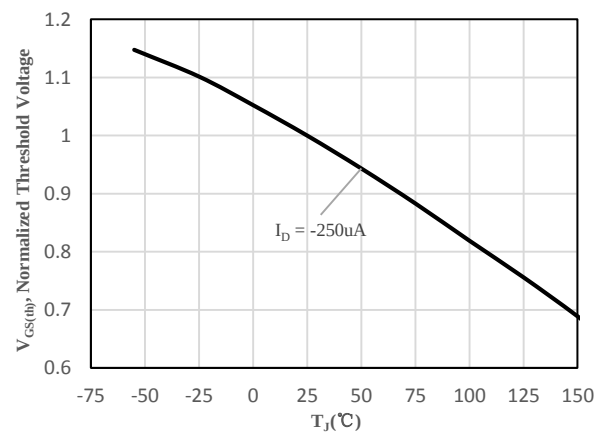
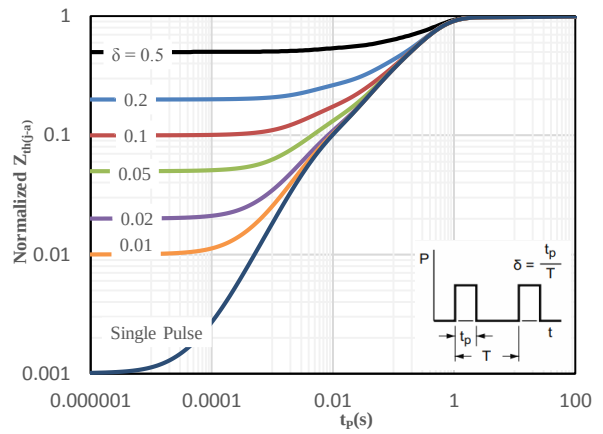
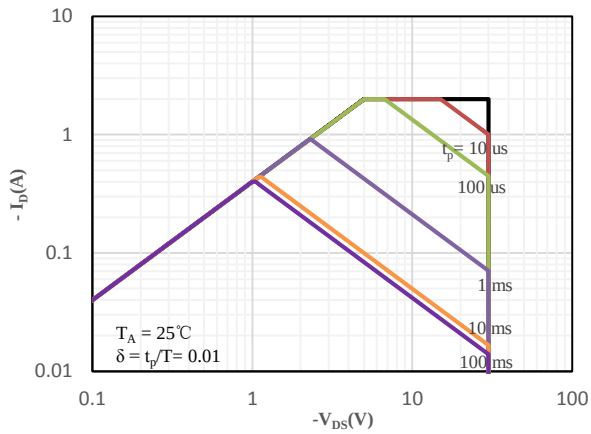
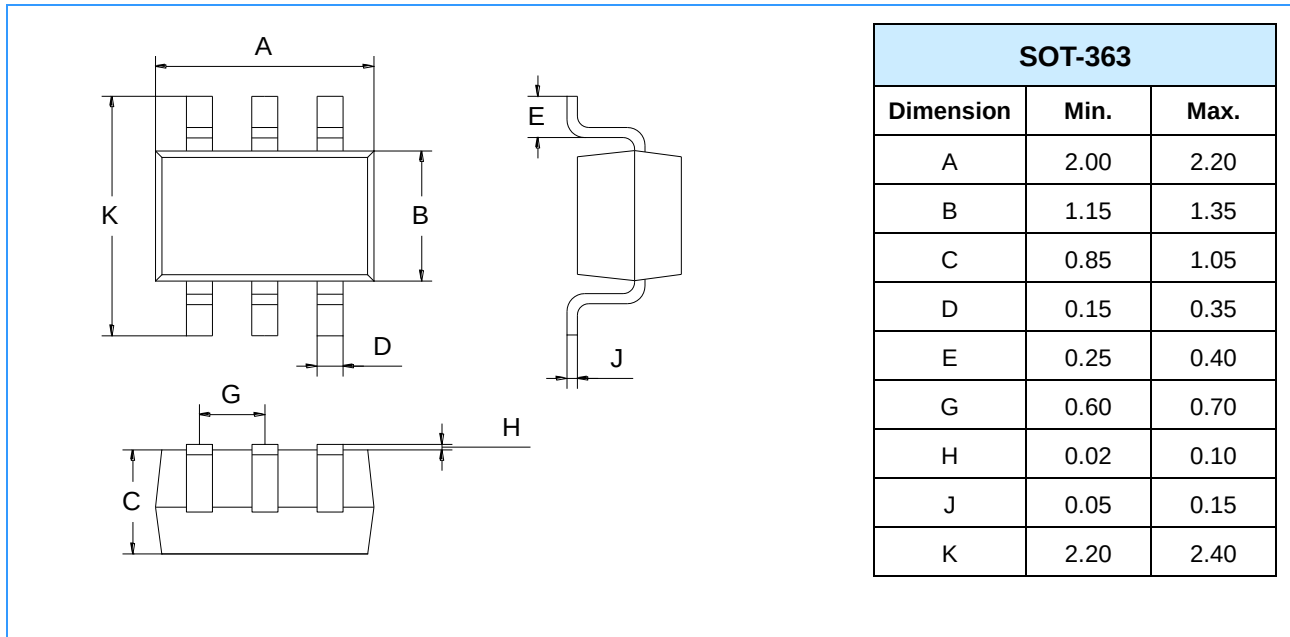


Fig 12 Normalized $V_{GS(th)}$ vs. Junction Temperature



Package Outline Dimensions (Unit: mm)



Mounting Pad Layout (Unit: mm)

