N＋P Channel Enhancement Mode MOSFET

BL2038-6L

Features

HF

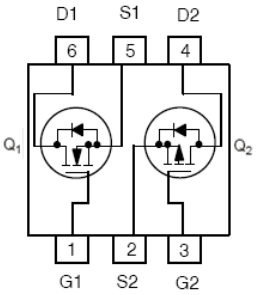
- Low on-resistance
- Low input capacitance
- Fast switching speed
- Low input/output leakage
- Fast switching speed

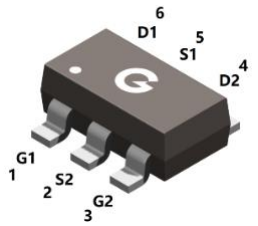
Typical Applications

- Motor control
- Power Management Functions
- DC-DC Converters
- Backlighting

Mechanical Data

- Case: SOT-23-6L
- Molding Compound: UL Flammability Classification Rating 94V-0
- Terminals: Matte tin-plated leads; solderability-per MIL-STD-202, Method 208





SOT-23-6L

Ordering Information

Part Number	Package	Shipping Quantity	Marking Code
BL2038-6L	SOT-23-6L	3000 pcs / Tape & Reel	2038

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

Parameter	Symbol	Q1	Q2	Unit
Drain-to-Source Voltage	V_{DSS}	20	-20	V
Gate-to-Source Voltage	V_{GSS}	±12	±12	V
Continuous Drain Current (T_A = 25°C) *1	I_D	4.5	-3.2	A
Continuous Drain Current (T_A = 70°C) *1		3.6	-2.6	A
Pulsed Drain Current (t_p = 10μs, T_A = 25°C)	I_{DM}	25	-20	A
Single Pulse Avalanche Energy *4	E_{AS}	5	5	mJ
Power Dissipation (T_A = 25°C) *1	P_D	1.1		W
Power Dissipation (T_A = 25°C) *2		0.7		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-Air *1	$R_{\theta JA}$	-	100	110	°C/W
Thermal Resistance Junction-to-Air *2		-	-	180	°C/W

Notes:

1. The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper
2. The data tested by surface mounted on a minimum recommended FR-4 board

Electrical Characteristics-Q_1 (@ 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} = ±12V, V_{DS} = 0V	-	-	±100	nA
On Characteristics						
$R_{DS(ON)}$	Drain-Source On-resistance *3	V_{GS} = 4.5V, I_D = 4A	-	23	35	mΩ
		V_{GS} = 2.5V, I_D = 2.5A	-	29	43	
		V_{GS} = 1.8V, I_D = 1A	-	51	75	
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250uA	0.4	0.8	1	V
R_G	Gate Resistance	V_{GS} = 0V, f = 1MHz	-	9	-	Ω
Dynamic Characteristics						
C_{ISS}	Input Capacitance	V_{GS} = 0V V_{DS} = 10V f = 1.0MHz	-	426	-	pF
C_{OSS}	Output Capacitance		-	76	-	
C_{RSS}	Reverse Transfer Capacitance		-	66	-	
Switching Characteristics						
$t_{d(ON)}$	Turn-on Delay Time *5	V_{DD} = 10V V_{GS} = 4.5V I_D = 3.6A R_G = 6Ω	-	9	-	ns
t_r	Turn-on Rise Time *5		-	23	-	
$t_{d(OFF)}$	Turn-Off Delay Time *5		-	38	-	
t_f	Turn-Off Fall Time *5		-	3	-	
Q_G	Total Gate-Charge	V_{DD} = 10V V_{GS} = 4.5V I_D = 3.6A	-	6.4	-	nC
Q_{GS}	Gate to Source Charge		-	1.1	-	
Q_{GD}	Gate to Drain (Miller) Charge		-	1.8	-	
Source-Drain Diode Characteristics						
V_{SD}	Diode Forward Voltage *3	I_{SD} = 1A,V_{GS} = 0V	-	0.7	1.1	V

Electrical Characteristics-Q_2 (@ 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} = -16V, V_{GS} = 0V	-	-	-1	μA
I_{GSS}	Gate-Body Leakage Current	V_{GS} = ±12V, V_{DS} = 0V	-	-	±100	nA
On Characteristics						
$R_{DS(ON)}$	Drain-Source On-resistance *3	V_{GS} = -4.5V, I_D = -3A	-	56	74	mΩ
		V_{GS} = -2.5V, I_D = -1.5A	-	77	110	
		V_{GS} = -1.8V, I_D = -1A	-	96	168	
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = -250uA	-0.4	-0.7	-1.0	V
R_G	Gate Resistance	V_{GS} = 0V, f = 1MHz	-	27	-	Ω
Dynamic Characteristics						
C_{ISS}	Input Capacitance	V_{GS} = 0V V_{DS} = -10V f = 1.0MHz	-	550	-	pF
C_{OSS}	Output Capacitance		-	70	-	
C_{RSS}	Reverse Transfer Capacitance		-	61	-	
Switching Characteristics						
$t_{d(ON)}$	Turn-on Delay Time *5	V_{DD} = -10V V_{GS} = -4.5V I_D = -1A R_G = 10Ω	-	11	-	ns
t_r	Turn-on Rise Time *5		-	35	-	
$t_{d(OFF)}$	Turn-Off Delay Time *5		-	30	-	
t_f	Turn-Off Fall Time *5		-	10	-	
Q_G	Total Gate-Charge	V_{DD} = -10V V_{GS} = -4.5V I_D = -3.6A	-	6.5	-	nC
Q_{GS}	Gate to Source Charge		-	1.6	-	
Q_{GD}	Gate to Drain (Miller) Charge		-	1.4	-	
Source-Drain Diode Characteristics						
V_{SD}	Diode Forward Voltage *3	I_{SD} = -0.6A,V_{GS} = 0V	-	-0.7	-1.0	V

Notes:

3. The data tested by pulsed, pulse width ≤ 300μs, duty cycle ≤ 2%
4. The E_{AS} data shows Max. rating. N: The test condition is V_{DD} = 10V, V_{GS} = 6V, L = 0.1mH;
   P: The test condition is V_{DD} = -10V, V_{GS} = -6V, L = 0.1mH
5. Guaranteed by design, not subject to production

Ratings and Characteristics Curves-Q_1 (@ T_A = 25°C unless otherwise specified)

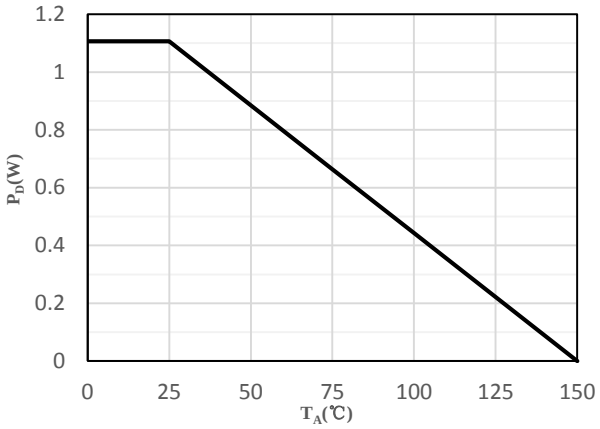


Fig 1 Power Dissipation

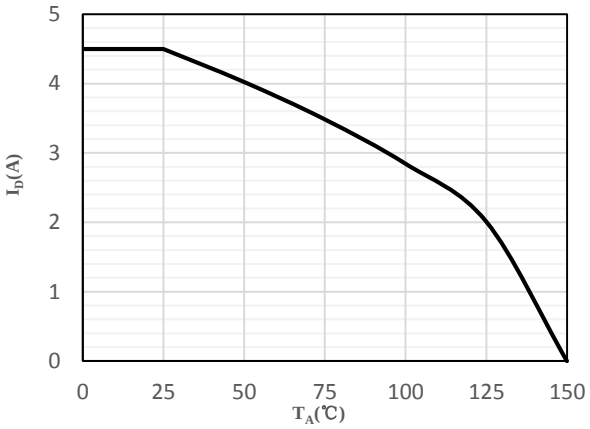


Fig 2 Drain Current

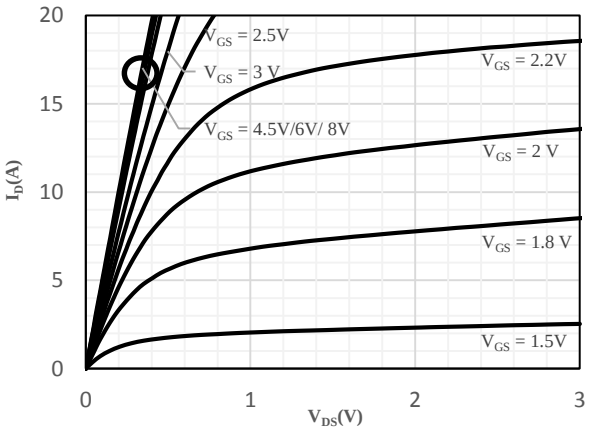


Fig 3 Typical Output Characteristics

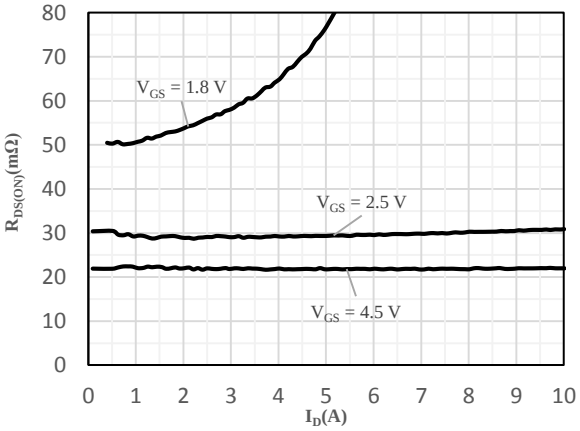


Fig 4 On-Resistance vs. Drain Current and Gate Voltage

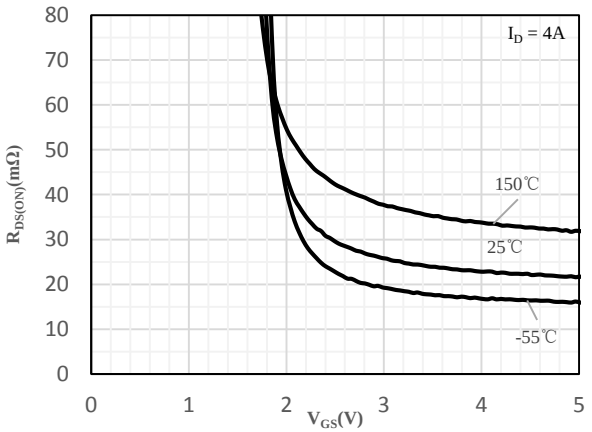


Fig 5 On-Resistance vs. Gate-Source Voltage

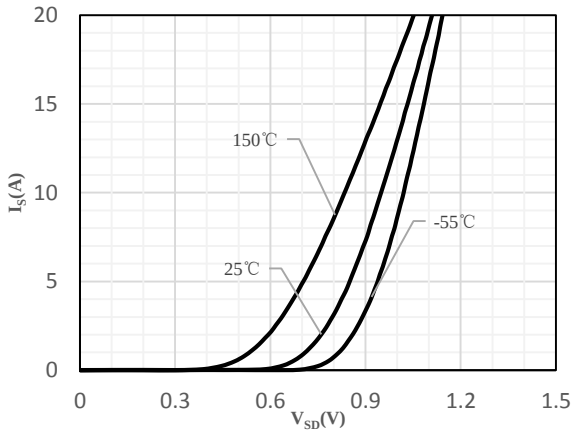


Fig 6 Body-Diode Characteristics

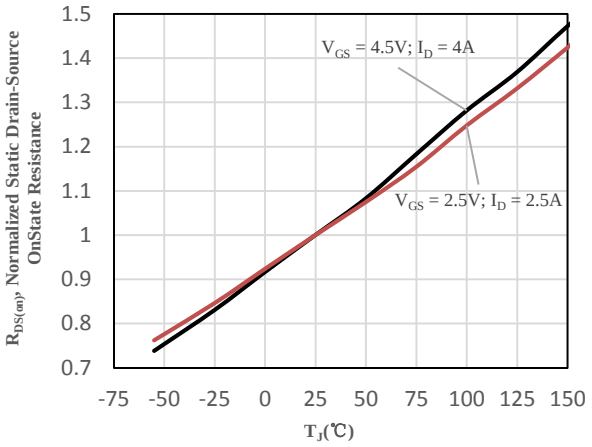


Fig 7 Normalized On-Resistance vs. Junction Temperature

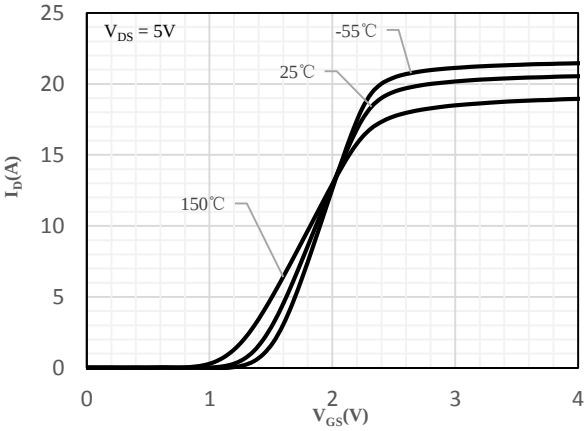


Fig 8 Transfer Characteristics

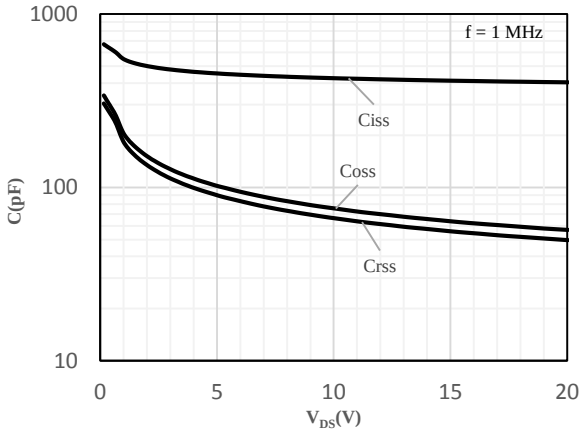


Fig 9 Capacitance Characteristics

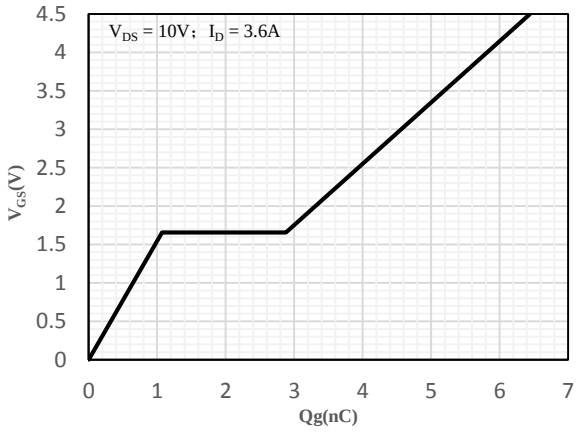


Fig 10 Gate-Charge Characteristics

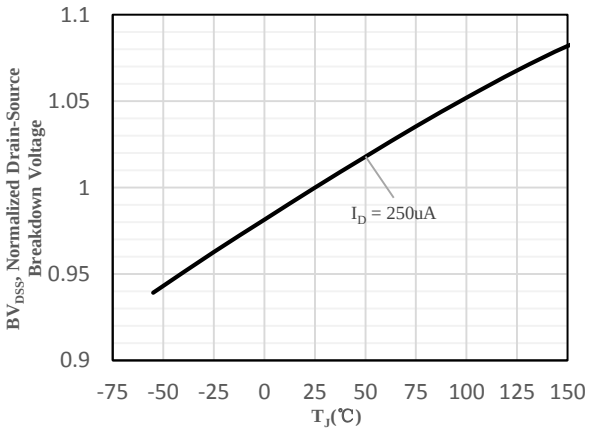


Fig 11 Normalized Breakdown Voltage vs. Junction Temperature

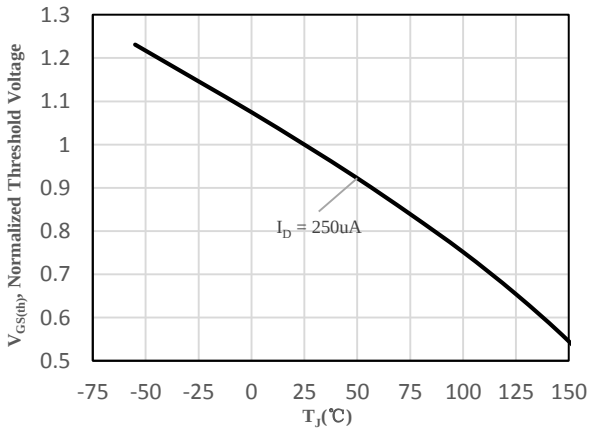


Fig 12 Normalized $V_{GS(th)}$ vs. Junction Temperature

Ratings and Characteristics Curves-Q_2 (@ T_A = 25°C unless otherwise specified)

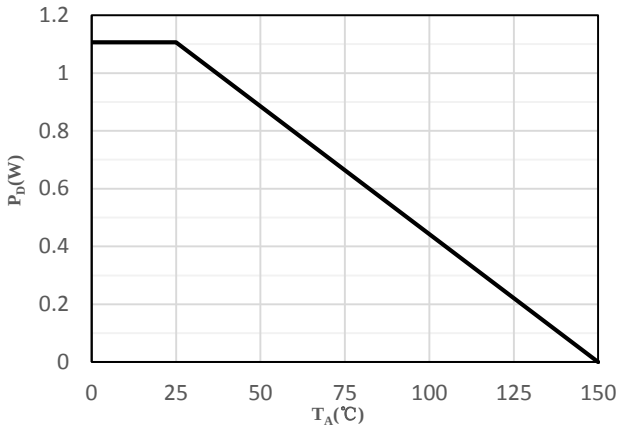


Fig 1 Power Dissipation

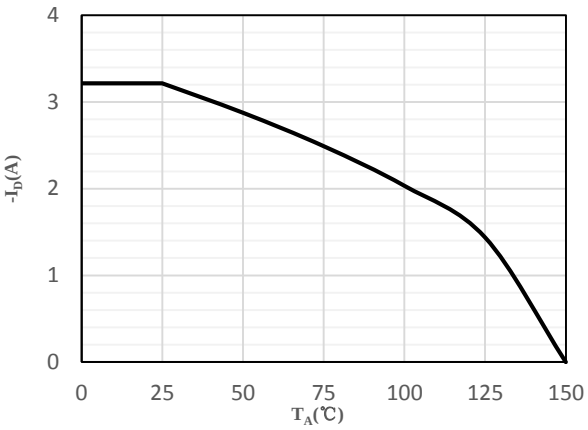


Fig 2 Drain Current

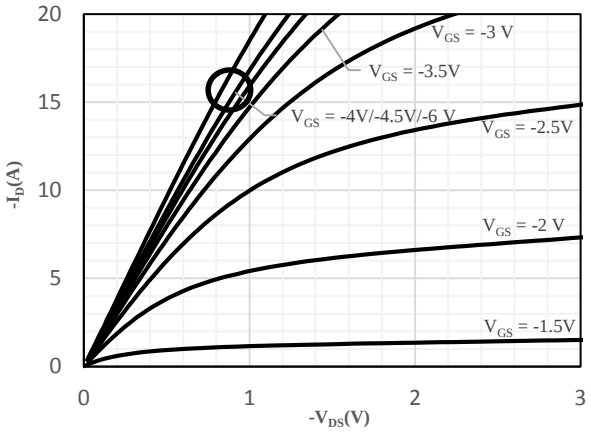


Fig 3 Typical Output Characteristics

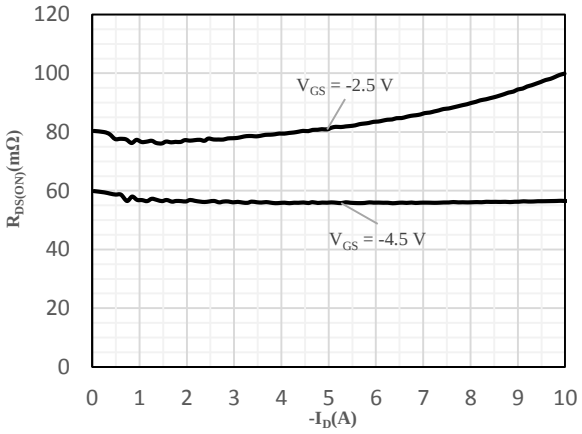


Fig 4 On-Resistance vs. Drain Current and Gate Voltage

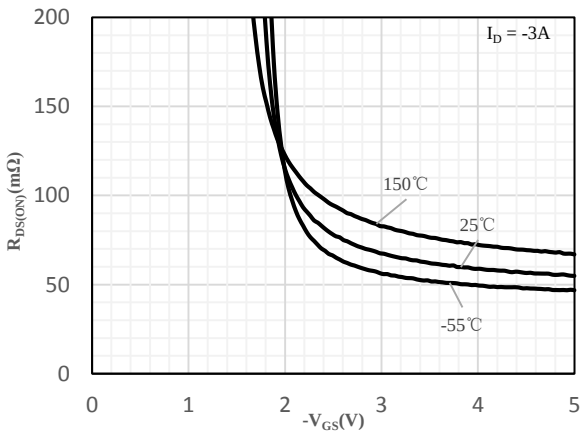


Fig 5 On-Resistance vs. Gate-Source Voltage

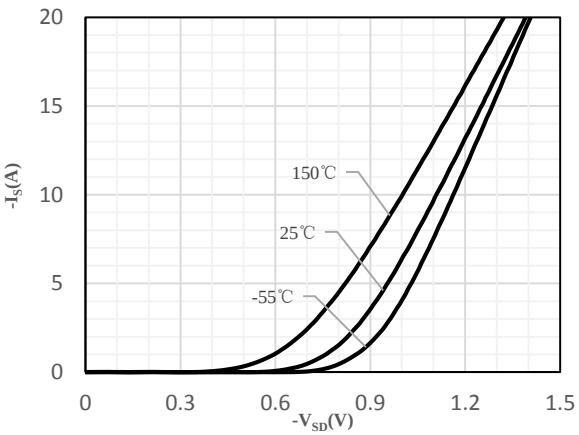


Fig 6 Body-Diode Characteristics

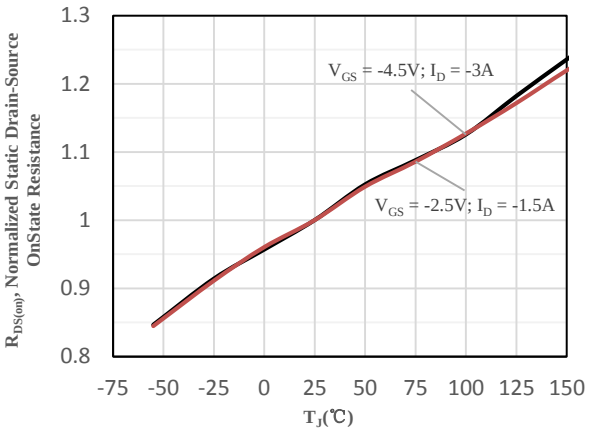


Fig 7 Normalized On-Resistance vs. Junction Temperature

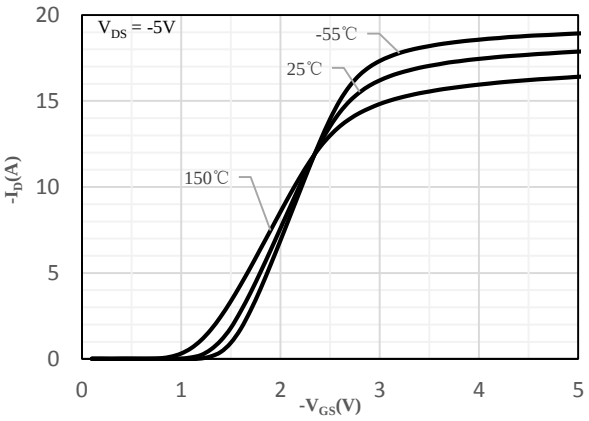


Fig 8 Transfer Characteristics

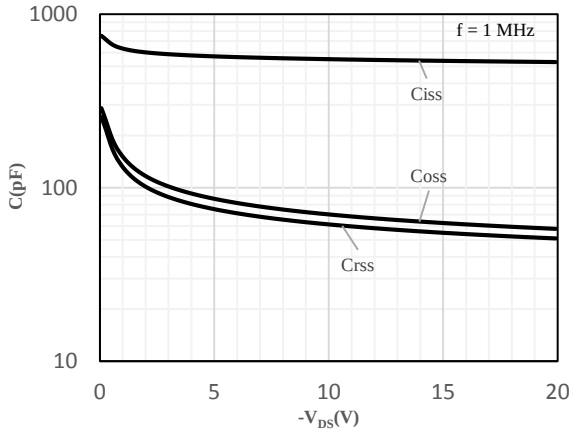


Fig 9 Capacitance Characteristics

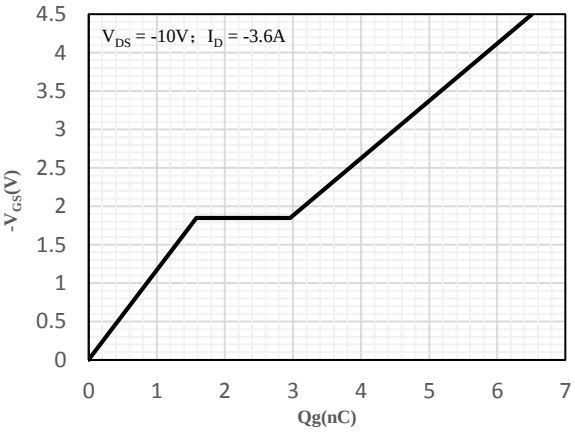


Fig 10 Gate-Charge Characteristics

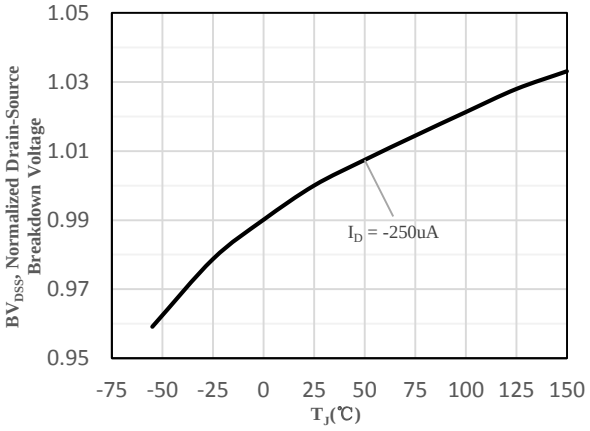


Fig 11 Normalized Breakdown Voltage vs. Junction Temperature

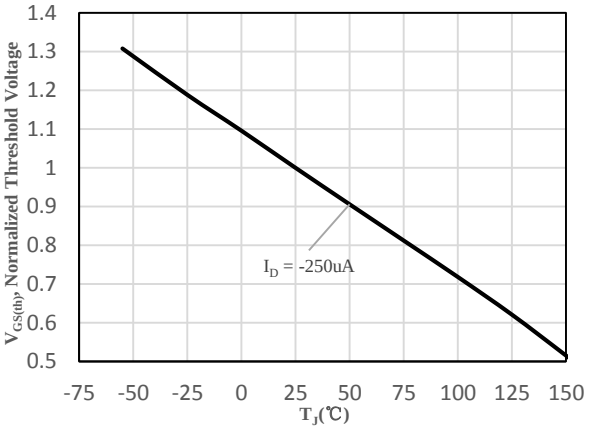
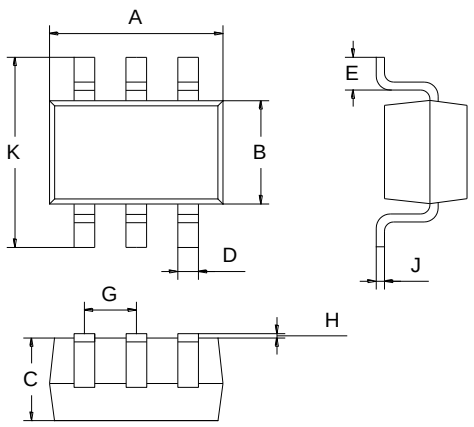


Fig 12 Normalized $V_{GS(th)}$ vs. Junction Temperature

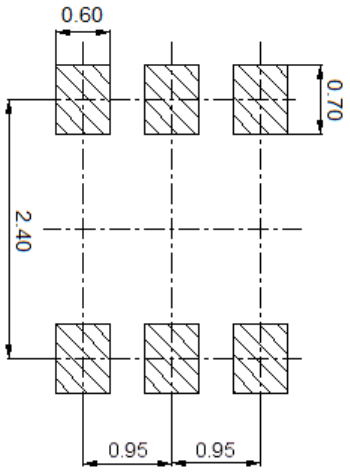
Package Outline Dimensions (Unit: mm)



SOT-23-6L		
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	0.90	1.00
H	0.02	0.10
J	0.10	0.20
K	2.60	3.00

Package Outline Dimensions (Unit: mm)

SOT-23-6L



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