

### Features

- Advanced trench technology
- Low gate charge
- Fast switching speed
- RoHS compliant with Halogen-free

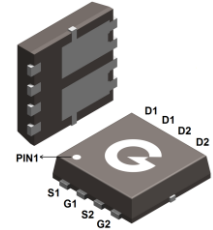
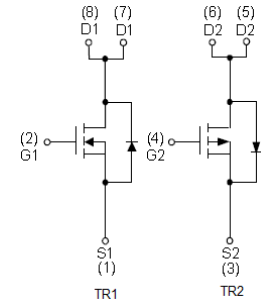
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### Applications

- Synchronous Rectification
- Motor Control
- Portable equipment application

### Mechanical Data

- Case: PDFN3x3-8LC
- Molding Compound: UL Flammability Classification Rating 94V-0
- Terminals: Matte tin-plated leads; solderability-per MIL-STD-202, Method 208



PDFN3×3-8LC

## Ordering Information

Part Number	Package	Shipping Quantity	Marking Code
GBLH4404-3DL8	PDFN3x3-8LC	5000 pcs / Tape & Reel	GBLH4404

## Maximum Ratings (@ T<sub>C</sub> = 25°C unless otherwise specified)

Parameter	Symbol	N	P	Unit
Drain-to-Source Voltage	V <sub>DSS</sub>	40	-40	V
Gate-to-Source Voltage	V <sub>GSS</sub>	±20	±20	V
Continuous Drain Current (T <sub>C</sub> = 25°C)	I <sub>D</sub>	16	-12	A
Continuous Drain Current (T <sub>A</sub> = 25°C) <sup>*1</sup>		5	-3.6	A
Continuous Drain Current (T <sub>A</sub> = 100°C) <sup>*1</sup>		3.1	-2.3	A
Pulsed Drain Current (t <sub>p</sub> = 10μs, T <sub>A</sub> = 25°C)	I <sub>DM</sub>	50	-36	A
Single Pulse Avalanche Energy <sup>*3</sup>	E <sub>AS</sub>	6	11	mJ
Power Dissipation (T <sub>C</sub> = 25°C)	P <sub>D</sub>	16		W
Power Dissipation (T <sub>A</sub> = 25°C) <sup>*1</sup>		1.5		W
Operating Junction Temperature Range	T <sub>J</sub>	-55 ~ +150		°C
Storage Temperature Range	T <sub>STG</sub>	-55 ~ +150		°C

## Thermal Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance Junction-to-Case	R <sub>θJC</sub>	-	-	8	°C/W
Thermal Resistance Junction-to-Air <sup>*1</sup>	R <sub>θJA</sub>	-	-	83	°C/W

### Electrical Characteristics-N (@ T<sub>A</sub> = 25°C unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
<b>Static Characteristics</b>						
V <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	40	-	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 40V, V <sub>GS</sub> = 0V	-	-	1	μA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V	-	-	±100	nA
<b>On Characteristics</b>						
R <sub>DS(ON)</sub>	Drain-Source On-resistance *2	V <sub>GS</sub> = 10V, I <sub>D</sub> = 4A	-	25	35	mΩ
		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 3A	-	33	50	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	1	1.7	2.5	V
R <sub>G</sub>	Gate Resistance	V <sub>GS</sub> = 0V, f = 1MHz	-	9.3	-	Ω
<b>Dynamic Characteristics</b>						
C <sub>ISS</sub>	Input Capacitance	V <sub>GS</sub> = 0V V <sub>DS</sub> = 20V f = 1.0MHz	-	446	-	pF
C <sub>OSS</sub>	Output Capacitance		-	45	-	
C <sub>RSS</sub>	Reverse Transfer Capacitance		-	39	-	
<b>Switching Characteristics</b>						
t <sub>d(ON)</sub>	Turn-on Delay Time *4	V <sub>DD</sub> = 20V V <sub>GS</sub> = 10V R <sub>G</sub> = 5.0Ω I <sub>D</sub> = 3A	-	10	-	ns
t <sub>r</sub>	Turn-on Rise Time *4		-	8	-	
t <sub>d(OFF)</sub>	Turn-Off Delay Time *4		-	29	-	
t <sub>f</sub>	Turn-Off Fall Time *4		-	12	-	
Q <sub>G</sub>	Total Gate-Charge	V <sub>DD</sub> = 20V	-	10.5	-	nC
Q <sub>GS</sub>	Gate to Source Charge	V <sub>GS</sub> = 10V	-	1.3	-	
Q <sub>GD</sub>	Gate to Drain (Miller) Charge	I <sub>D</sub> = 3A	-	2.5	-	
<b>Source-Drain Diode Characteristics</b>						
V <sub>SD</sub>	Diode Forward Voltage *2	I <sub>SD</sub> = 7A, V <sub>GS</sub> = 0V	-	0.9	1.2	V
T <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> = 5A, V <sub>GS</sub> = 0V	-	17	-	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery charge	di/dt = 100A/μs	-	7	-	nC

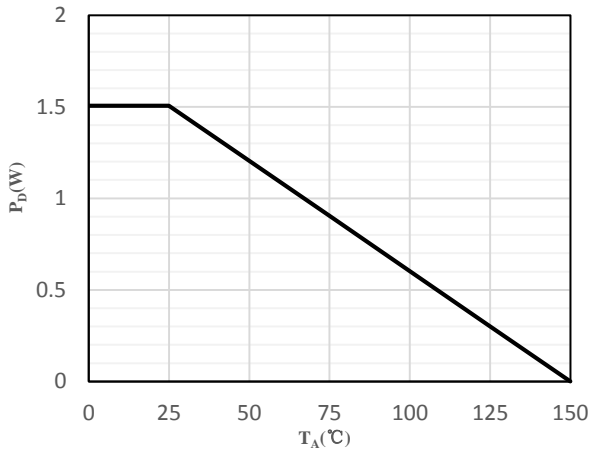
### Electrical Characteristics-P (@ T<sub>A</sub> = 25°C unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
<b>Static Characteristics</b>						
V <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA	-40	-	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = -40V, V <sub>GS</sub> = 0V	-	-	-1	μA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V	-	-	±100	nA
<b>On Characteristics</b>						
R <sub>DS(ON)</sub>	Drain-Source On-resistance *2	V <sub>GS</sub> = -10V, I <sub>D</sub> = -3A	-	57	70	mΩ
		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -2A	-	70	100	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA	-1	-1.4	-2.5	V
R <sub>G</sub>	Gate Resistance	V <sub>GS</sub> = 0V, f = 1MHz	-	25	-	Ω
<b>Dynamic Characteristics</b>						
C <sub>ISS</sub>	Input Capacitance	V <sub>GS</sub> = 0V V <sub>DS</sub> = -20V f = 1.0MHz	-	597	-	pF
C <sub>OSS</sub>	Output Capacitance					
C <sub>RSS</sub>	Reverse Transfer Capacitance					
<b>Switching Characteristics</b>						
t <sub>d(ON)</sub>	Turn-on Delay Time *4	V <sub>DD</sub> = -20V V <sub>GS</sub> = -10V I <sub>D</sub> = -5A R <sub>G</sub> = 2.5Ω	-	6.5	-	ns
t <sub>r</sub>	Turn-on Rise Time *4					
t <sub>d(OFF)</sub>	Turn-Off Delay Time *4					
t <sub>f</sub>	Turn-Off Fall Time *4					
Q <sub>G</sub>	Total Gate-Charge	V <sub>DD</sub> = -20V V <sub>GS</sub> = -10V I <sub>D</sub> = -3A	-	14.5	-	nC
Q <sub>GS</sub>	Gate to Source Charge					
Q <sub>GD</sub>	Gate to Drain (Miller) Charge					
<b>Source-Drain Diode Characteristics</b>						
V <sub>SD</sub>	Diode Forward Voltage *2	I <sub>SD</sub> = -5A, V <sub>GS</sub> = 0V	-	-0.9	-1.2	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> = -5A, V <sub>GS</sub> = 0V di/dt = 100A/μs	-	53	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	27	-	nC

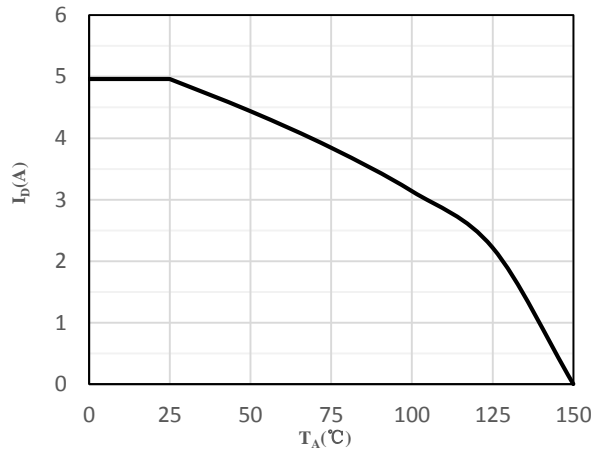
Notes:

- The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper
- The data tested by pulsed, pulse width ≤ 300μs, duty cycle ≤ 2%
- The E<sub>AS</sub> data shows Max. rating. The test condition is N: V<sub>DD</sub> = 25V, V<sub>GS</sub> = 10V, L = 0.5mH  
P: V<sub>DD</sub> = -25V, V<sub>GS</sub> = -10V, L = 0.5mH
- Guaranteed by design, not subject to production

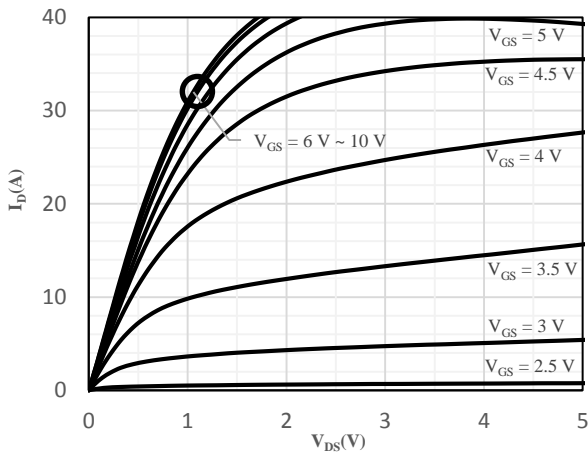
**Ratings and Characteristics Curves-N** (@  $T_A = 25^\circ\text{C}$  unless otherwise specified)



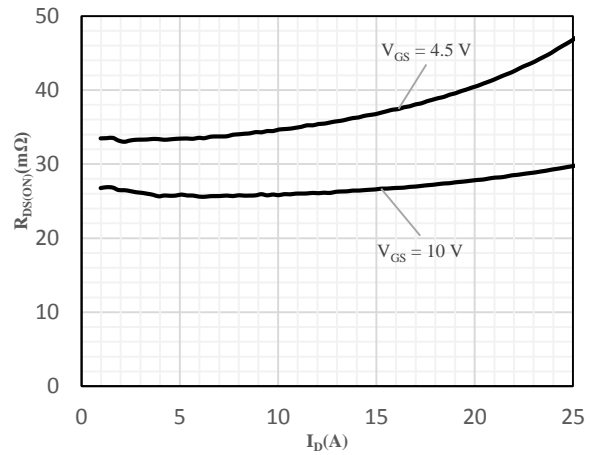
**Fig 1 Power Dissipation**



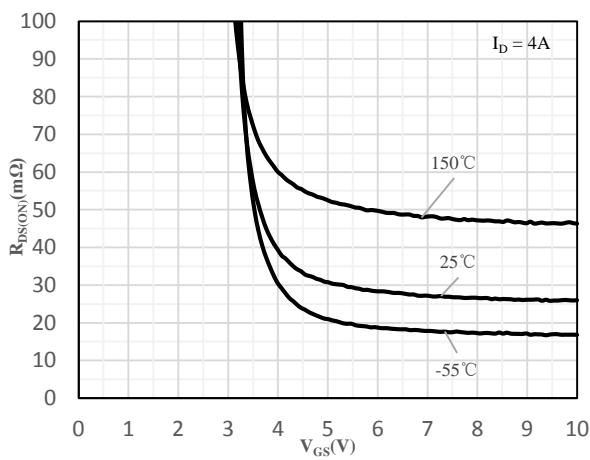
**Fig 2 Drain Current**



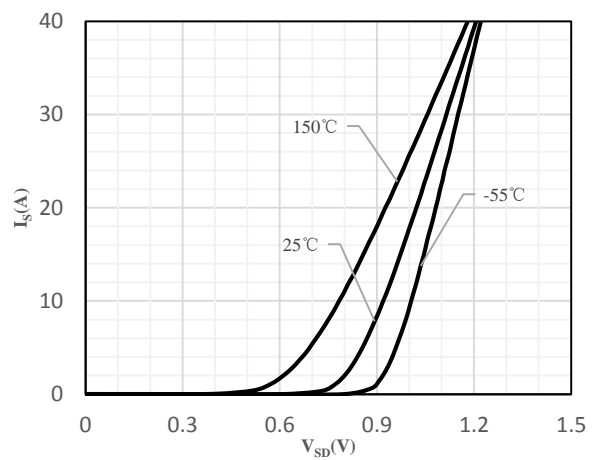
**Fig 3 Typical Output Characteristics**



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



**Fig 5 On-Resistance vs. Gate-Source Voltage**



**Fig 6 Body-Diode Characteristics**

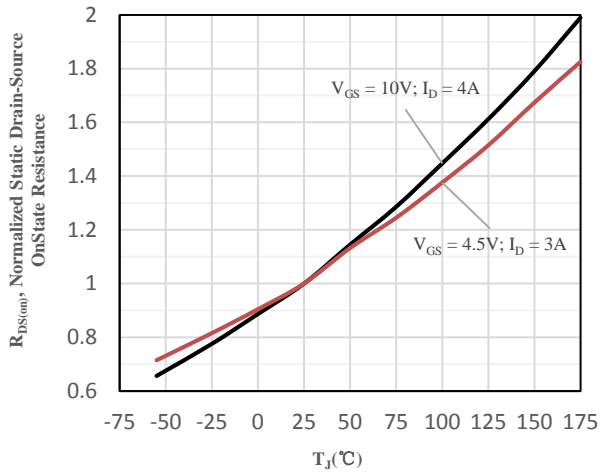


Fig 7 Normalized On-Resistance vs. Junction Temperature

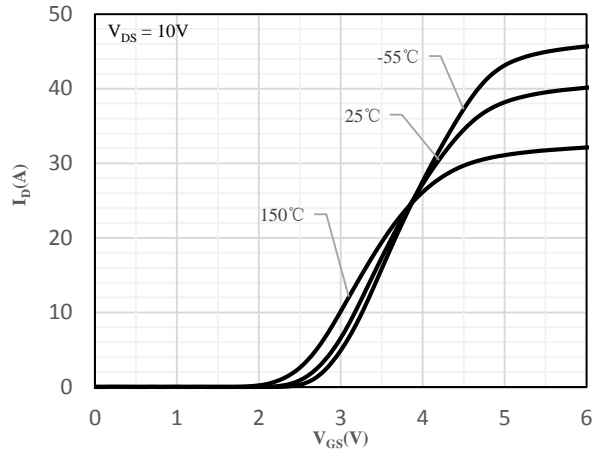


Fig 8 Transfer Characteristics

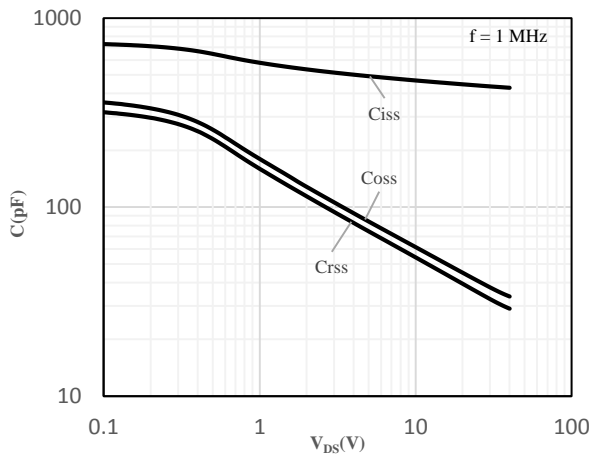


Fig 9 Capacitance Characteristics

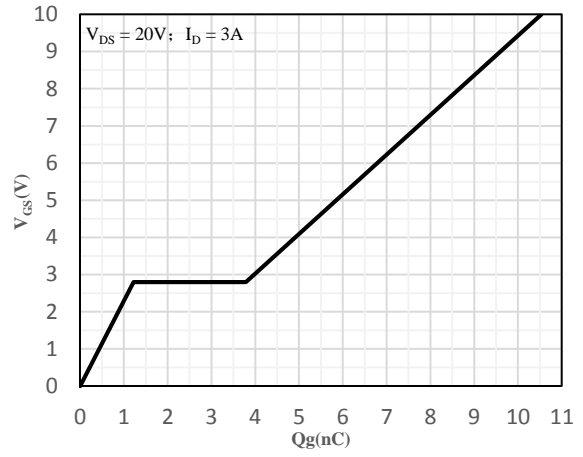


Fig 10 Gate-Charge Characteristics

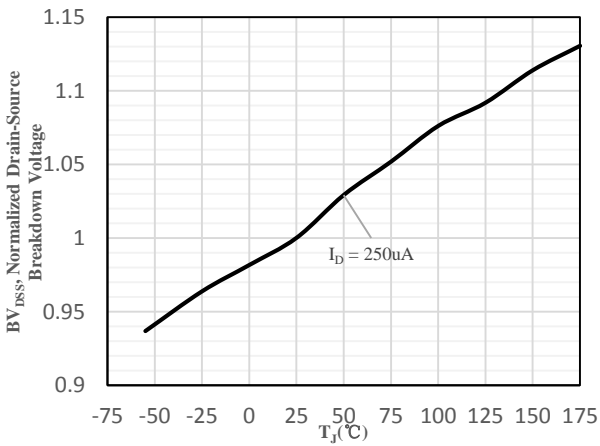


Fig 11 Normalized Breakdown Voltage vs. Junction Temperature

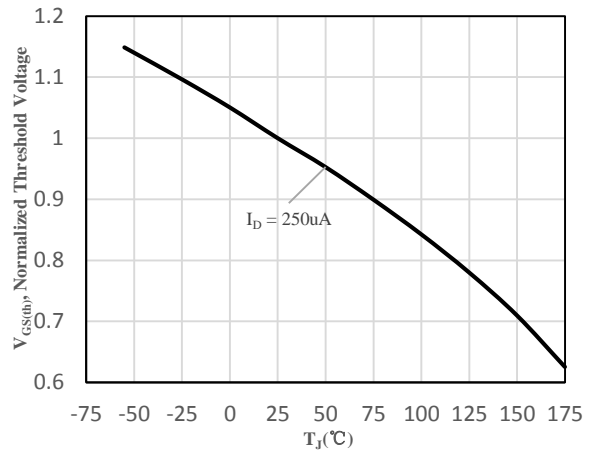
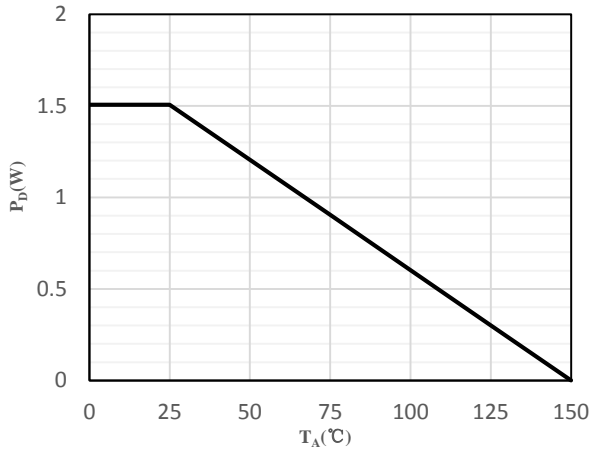
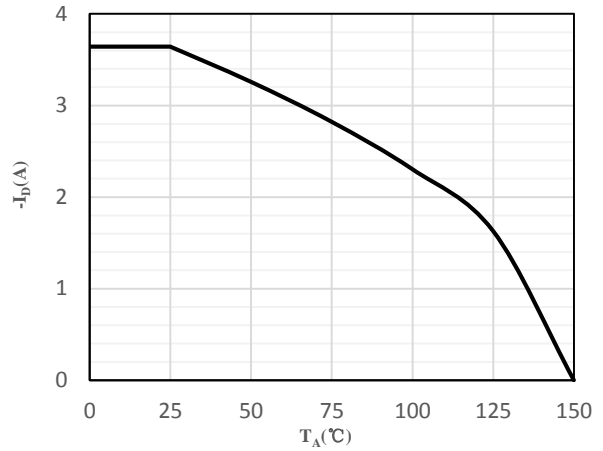


Fig 12 Normalized  $V_{GS(th)}$  vs. Junction Temperature

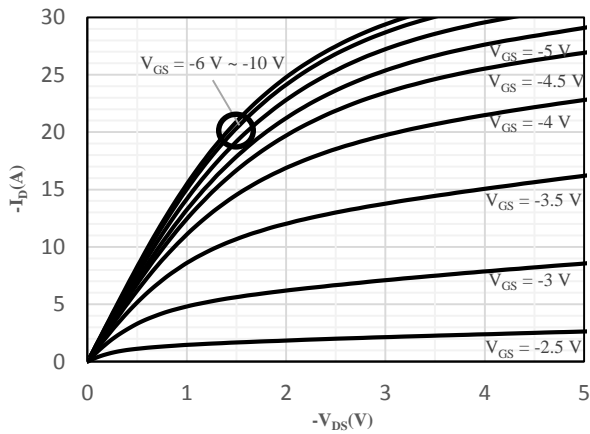
**Ratings and Characteristics Curves-P** (@  $T_A = 25^\circ\text{C}$  unless otherwise specified)



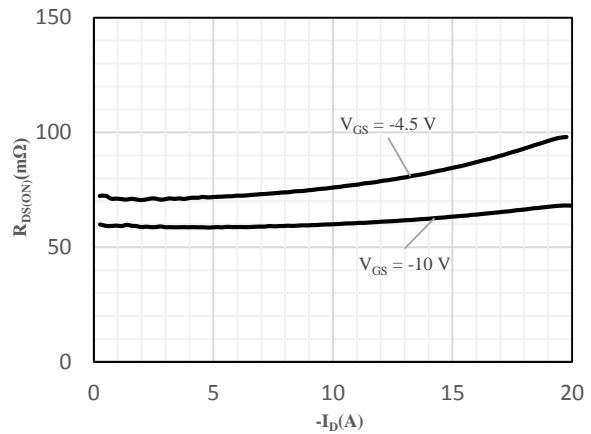
**Fig 1 Power Dissipation**



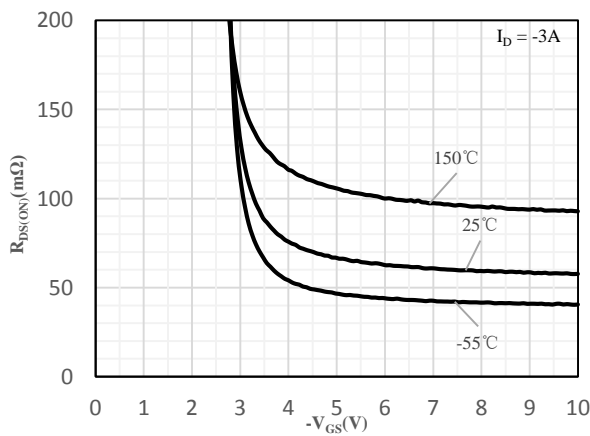
**Fig 2 Drain Current**



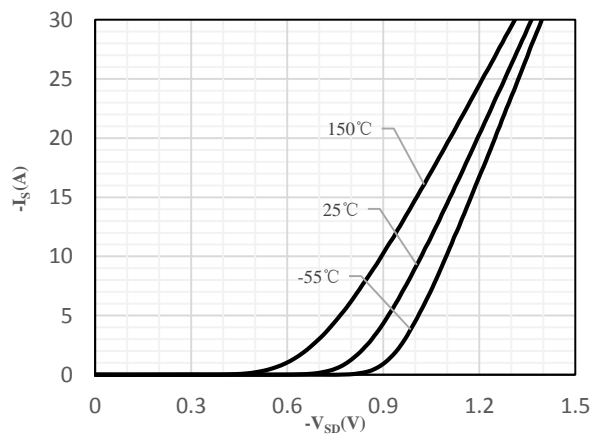
**Fig 3 Typical Output Characteristics**



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



**Fig 5 On-Resistance vs. Gate-Source Voltage**



**Fig 6 Body-Diode Characteristics**

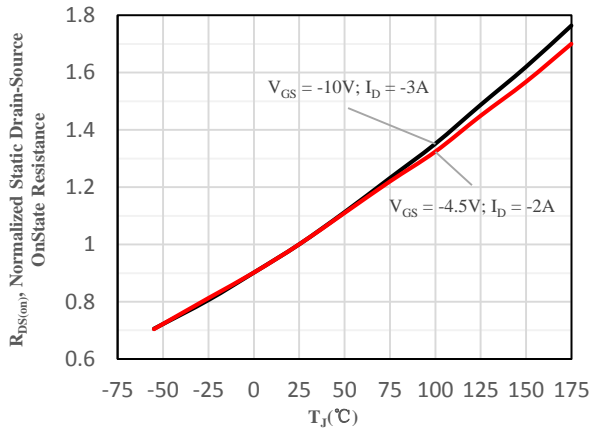


Fig 7 Normalized On-Resistance vs. Junction Temperature

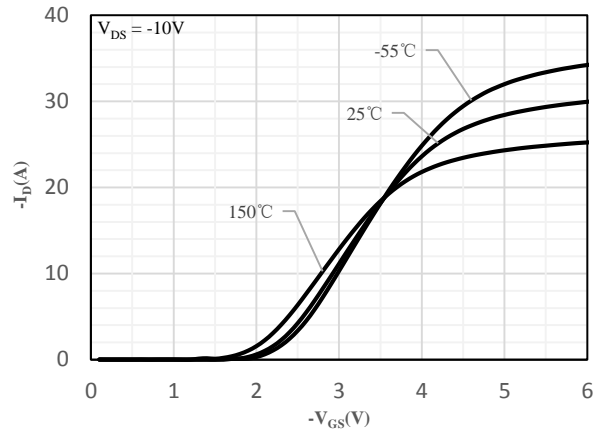


Fig 8 Transfer Characteristics

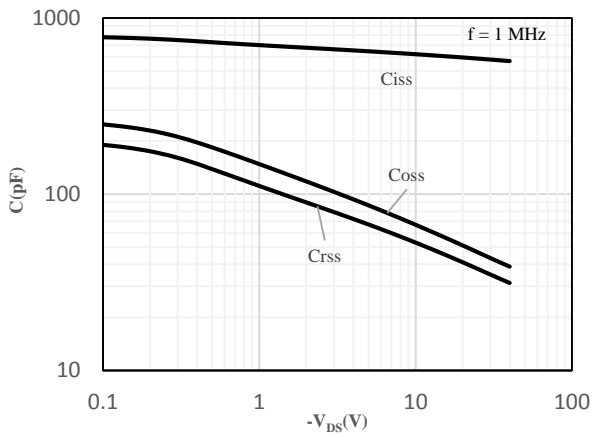


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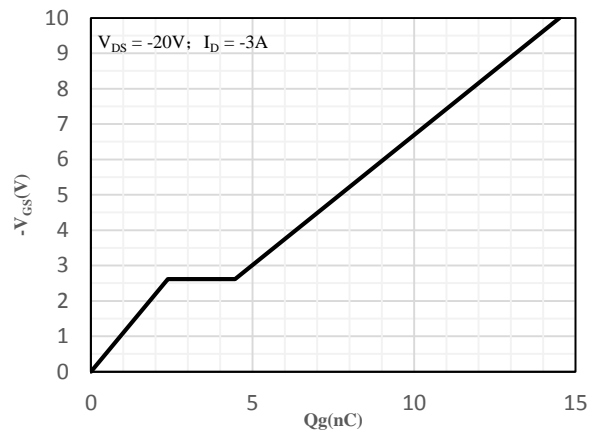


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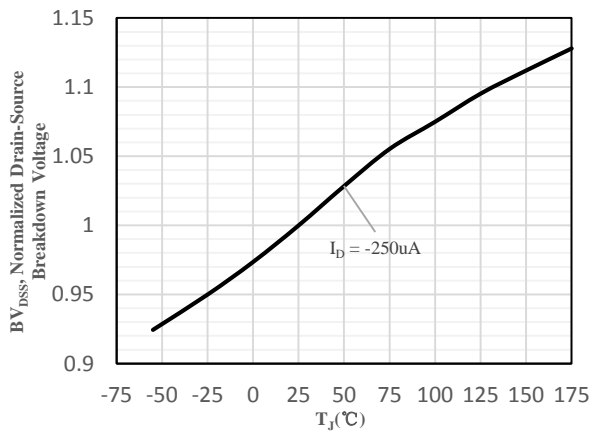


Fig 11 Normalized Breakdown Voltage vs. Junction Temperature

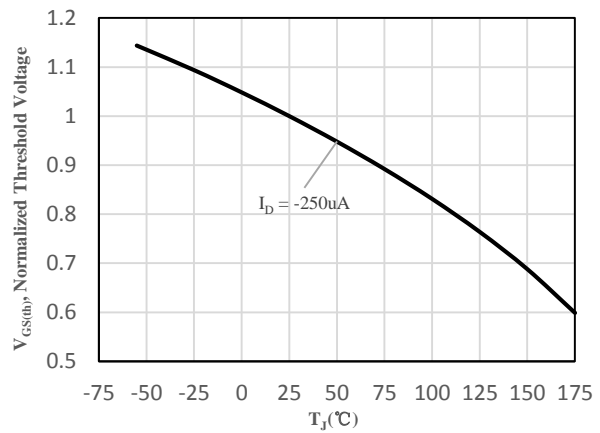
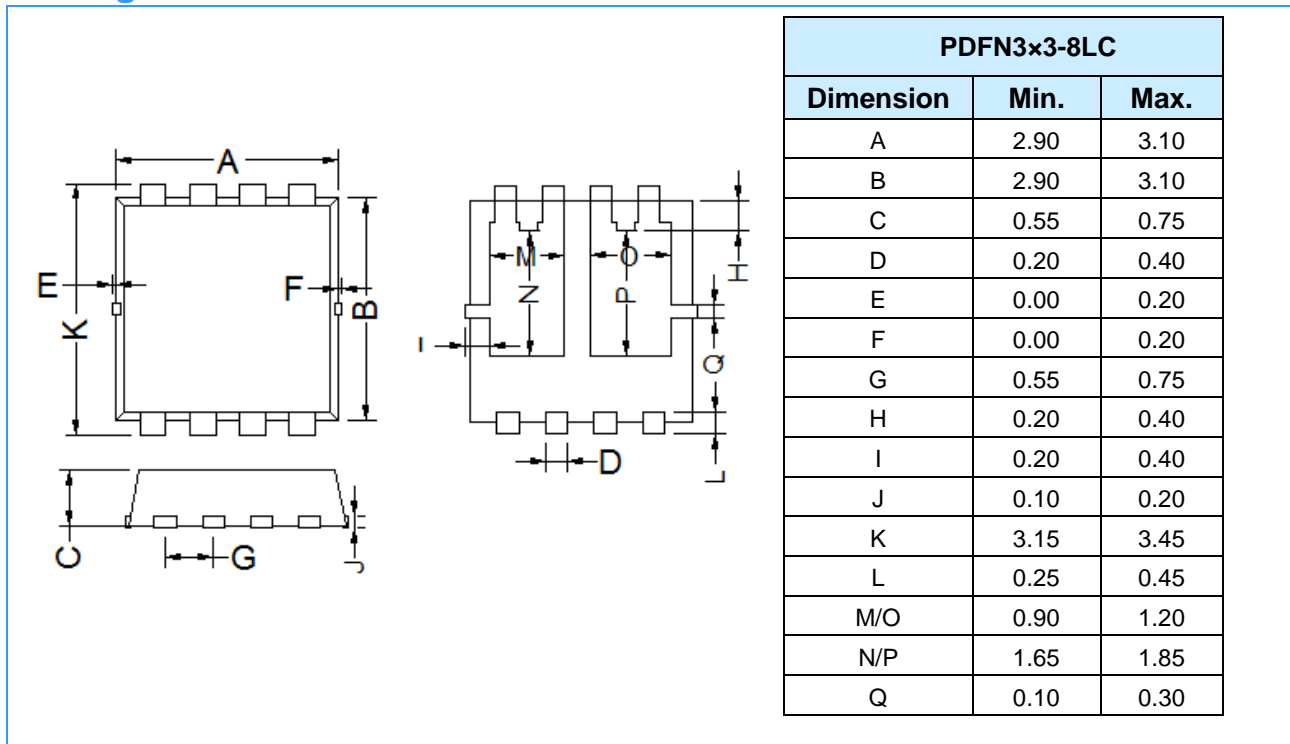


Fig 12 Normalized  $V_{GS(th)}$  vs. Junction Temperature

**Package Outline Dimensions** (Unit: mm)



**Mounting Pad Layout** (Unit: mm)

