

### Features

- Reliable and Rugged
- Green device available
- RoHS compliant with Halogen-free

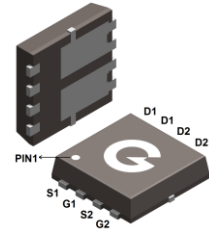
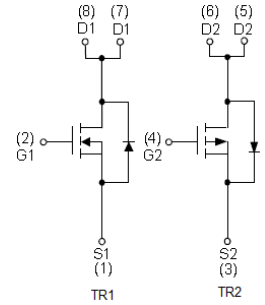
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### Applications

- 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



PDFN3x3-8LC

### Ordering Information

Part Number	Package	Shipping Quantity	Marking Code
GBLH4402-3DL8	PDFN3x3-8LC	5000 pcs / Tape & Reel	GBLH4402

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

Parameter	Symbol	N Channel	P Channel	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	-10.5	A
Continuous Drain Current (T <sub>C</sub> = 100°C)		10	-6.6	A
Continuous Drain Current (T <sub>A</sub> = 25°C) *1		7	-4.6	A
Continuous Drain Current (T <sub>A</sub> = 100°C) *1		4.5	-2.9	A
Pulsed Drain Current (t <sub>p</sub> = 10μs, T <sub>C</sub> = 25°C)	I <sub>DM</sub>	64	-42	A
Single Pulse Avalanche Energy *3	E <sub>AS</sub>	18	20	mJ
Power Dissipation (T <sub>C</sub> = 25°C)	P <sub>D</sub>	10		W
Power Dissipation (T <sub>A</sub> = 25°C) *1		2		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>	-	-	12	°C/W
Thermal Resistance Junction-to-Air *1	R <sub>θJA</sub>	-	-	62	°C/W

### Electrical Characteristics-N (@ T<sub>C</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	-	17	21	mΩ
		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 3A	-	21	27	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	-	4.5	-	Ω
<b>Dynamic Characteristics</b>						
C <sub>ISS</sub>	Input Capacitance	V <sub>GS</sub> = 0V V <sub>DS</sub> = 20V f = 1.0MHz	-	732	-	pF
C <sub>OSS</sub>	Output Capacitance		-	59	-	
C <sub>RSS</sub>	Reverse Transfer Capacitance		-	46	-	
<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> = 8A R <sub>G</sub> = 3Ω, R <sub>L</sub> = 1Ω	-	10	-	ns
t <sub>r</sub>	Turn-on Rise Time *4		-	12	-	
t <sub>d(OFF)</sub>	Turn-Off Delay Time *4		-	32	-	
t <sub>f</sub>	Turn-Off Fall Time *4		-	8	-	
Q <sub>G</sub>	Total Gate-Charge	V <sub>DD</sub> = 20V V <sub>GS</sub> = 10V I <sub>D</sub> = 5A	-	16.7	-	nC
Q <sub>GS</sub>	Gate to Source Charge		-	2.6	-	
Q <sub>GD</sub>	Gate to Drain (Miller) Charge		-	2.5	-	
<b>Source-Drain Diode Characteristics</b>						
V <sub>SD</sub>	Diode Forward Voltage *2	I <sub>SD</sub> = 8A, V <sub>GS</sub> = 0V	-	0.8	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>S</sub> = 8A, V <sub>GS</sub> = 0V di/dt = 100A/μs	-	17	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	6.2	-	nC

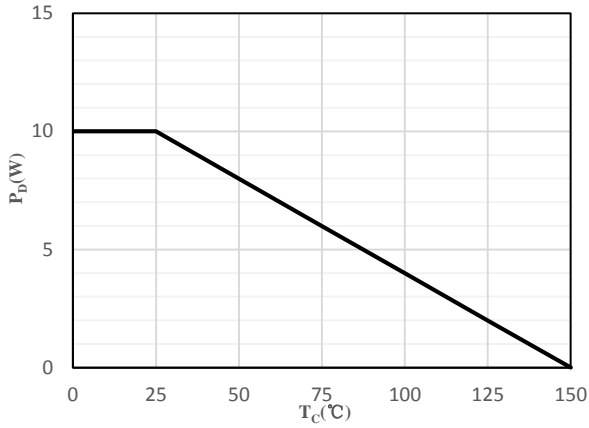
### Electrical Characteristics-P (@ T<sub>c</sub> = 25°C unless otherwise specified)

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 <sup>*2</sup>	V <sub>GS</sub> = -10V, I <sub>D</sub> = -5A	-	46	55	mΩ
		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -4A	-	56	70	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA	-1	-1.5	-2.5	V
R <sub>G</sub>	Gate Resistance	V <sub>GS</sub> = 0V, f = 1MHz	-	7.5	-	Ω
<b>Dynamic Characteristics</b>						
C <sub>ISS</sub>	Input Capacitance	V <sub>GS</sub> = 0V V <sub>DS</sub> = -20V f = 1.0MHz	-	882	-	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 <sup>*4</sup>	V <sub>GS</sub> = -10V V <sub>DD</sub> = -20V I <sub>D</sub> = -5A R <sub>G</sub> = 2.5Ω	-	7.2	-	ns
t <sub>r</sub>	Turn-on Rise Time <sup>*4</sup>					
t <sub>d(OFF)</sub>	Turn-Off Delay Time <sup>*4</sup>					
t <sub>f</sub>	Turn-Off Fall Time <sup>*4</sup>					
Q <sub>G</sub>	Total Gate-Charge	V <sub>DD</sub> = -20V V <sub>GS</sub> = -10V I <sub>D</sub> = -5A	-	19.3	-	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 <sup>*2</sup>	I <sub>SD</sub> = -5A, V <sub>GS</sub> = 0V	-	-0.9	-1.2	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>S</sub> = -5A, V <sub>GS</sub> = 0V di/dt = 100A/μs	-	35	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	22	-	nC

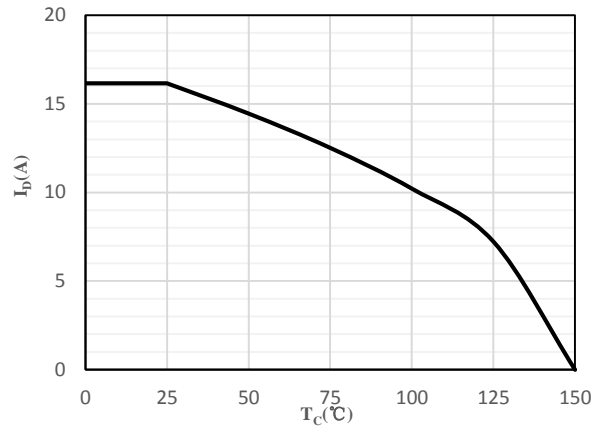
Notes:

- 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 channel: V<sub>DD</sub> = 20V, V<sub>GS</sub> = 10V, L = 10mH  
P channel: V<sub>DD</sub> = -20V, V<sub>GS</sub> = -10V, L = 10mH
- Guaranteed by design, not subject to production

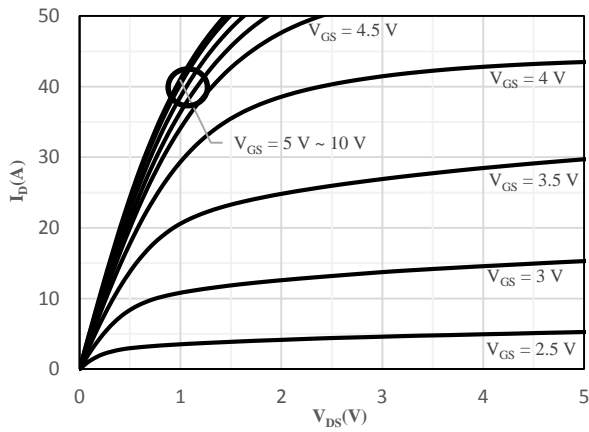
**Ratings and Characteristics Curves-N** (@  $T_A = 25^\circ\text{C}$  unless otherwise specified)



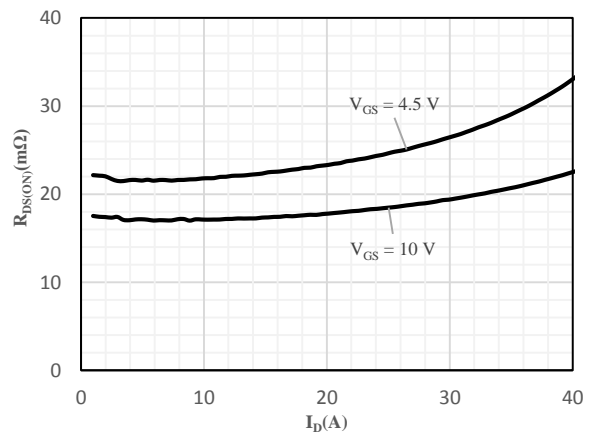
**Fig 1 Power Dissipation**



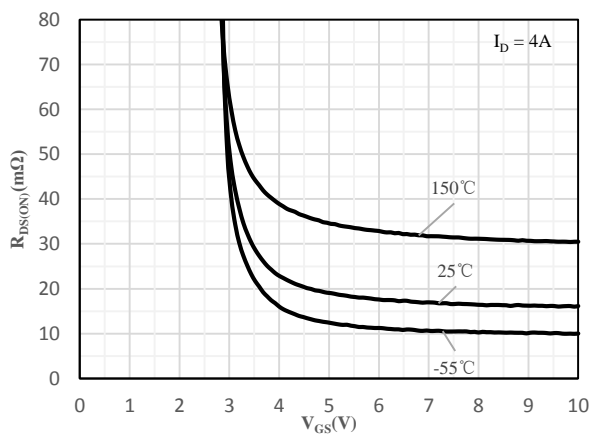
**Fig 2 Drain Current**



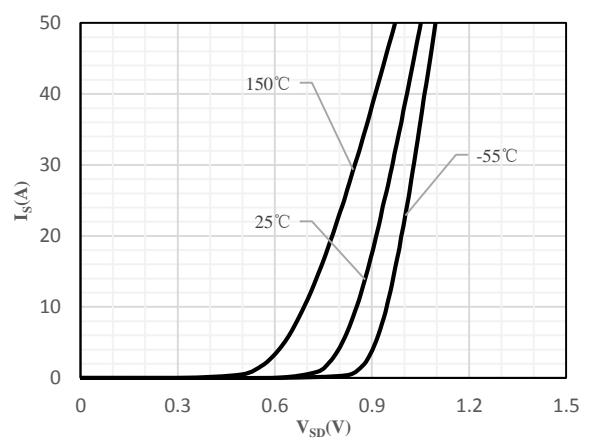
**Fig 3 Typical Output Characteristics**



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



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



**Fig 6 Body-Diode Characteristics**

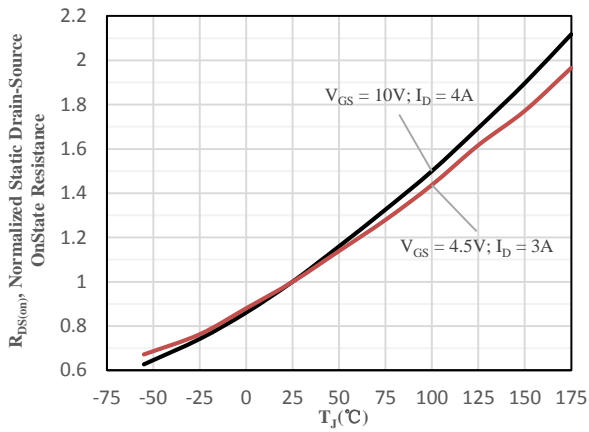


Fig 7 Normalized On-Resistance vs. Junction Temperature

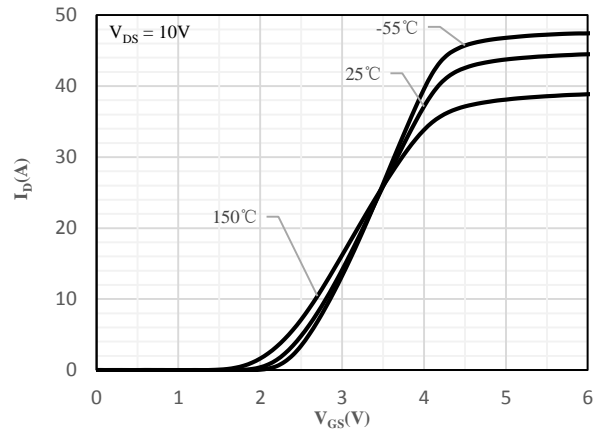


Fig 8 Transfer Characteristics

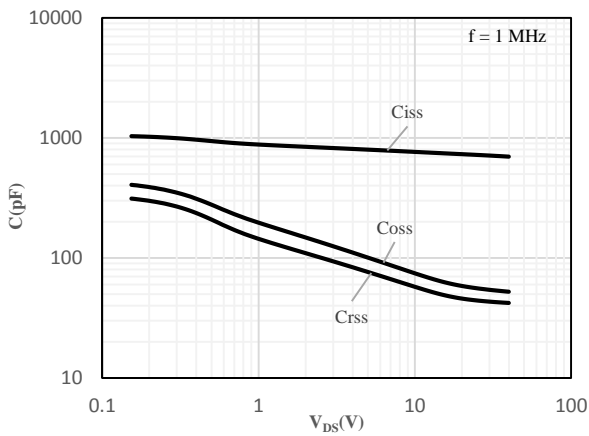


Fig 9 Capacitance Characteristics

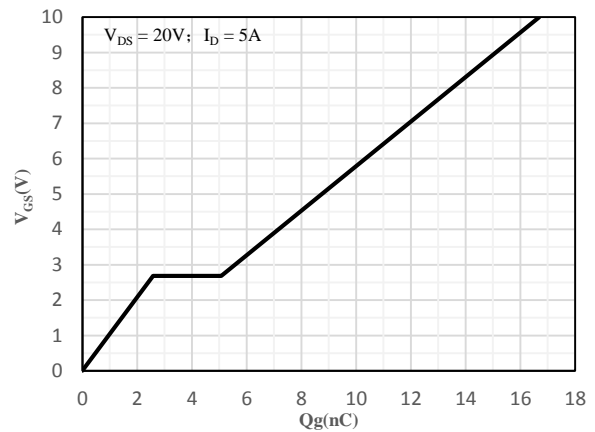


Fig 10 Gate-Charge Characteristics

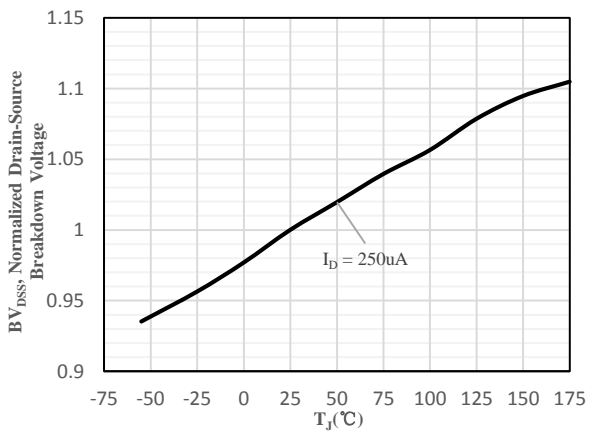


Fig 11 Normalized Breakdown Voltage vs. Junction Temperature

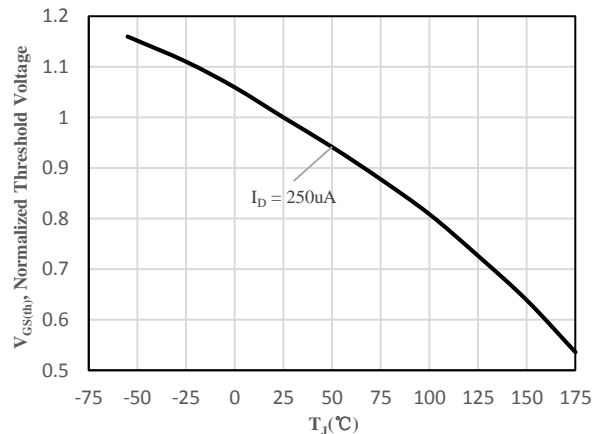


Fig 12 Normalized  $V_{GS(th)}$  vs. Junction Temperature

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

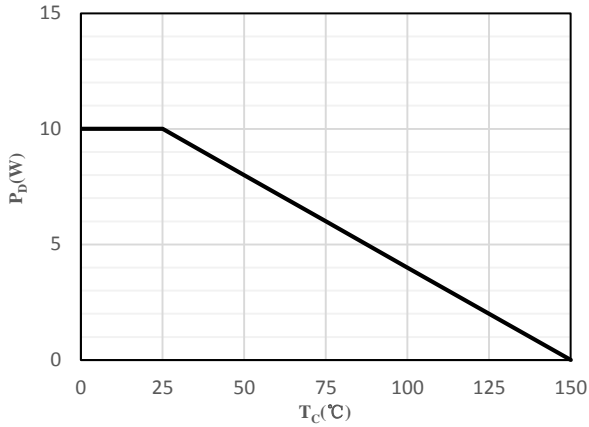


Fig 1 Power Dissipation

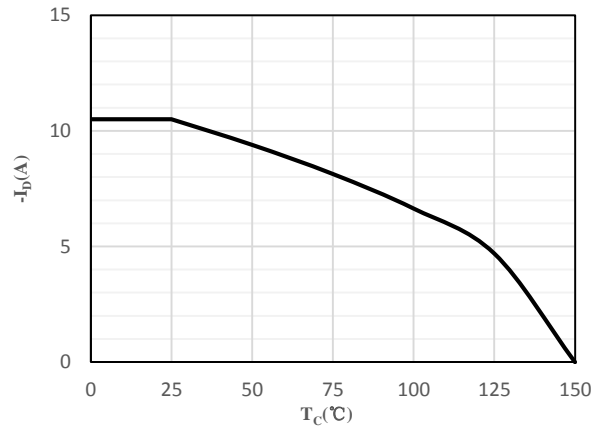


Fig 2 Drain Current

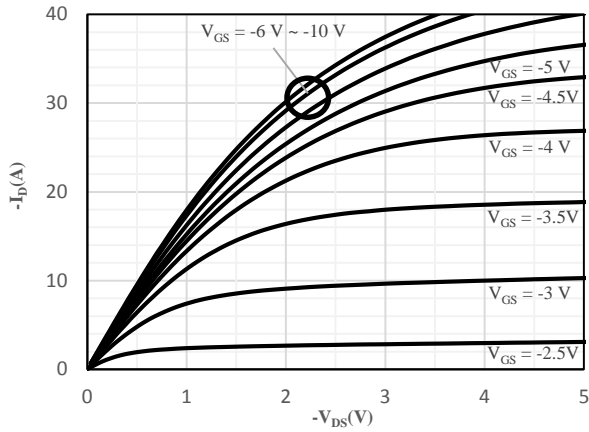


Fig 3 Typical Output Characteristics

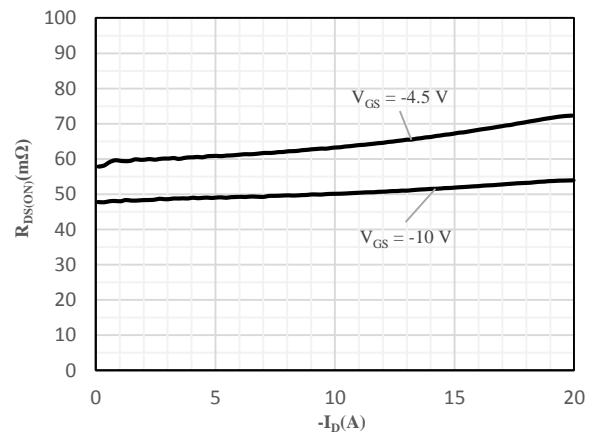


Fig 4 On-Resistance vs. Drain Current and Gate Voltage

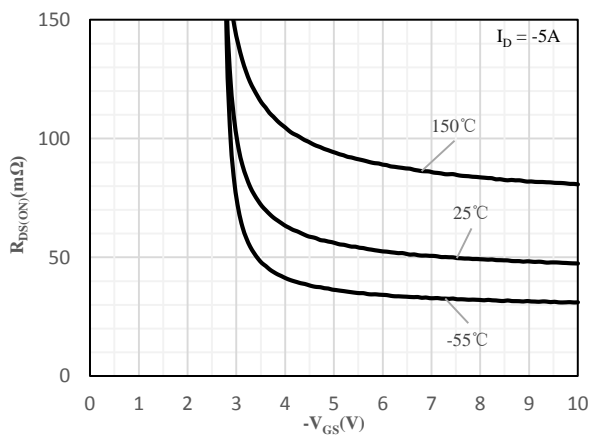


Fig 5 On-Resistance vs. Gate-Source Voltage

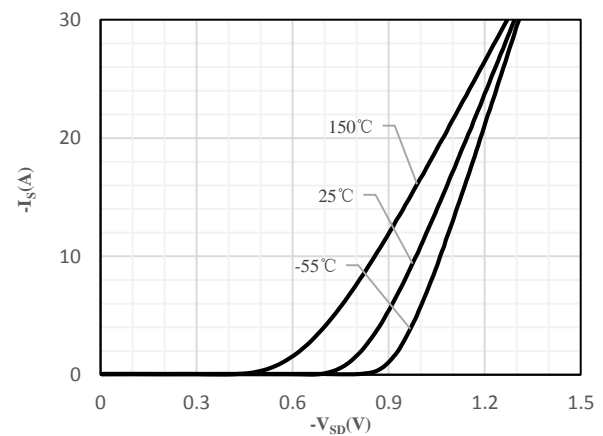


Fig 6 Body-Diode Characteristics

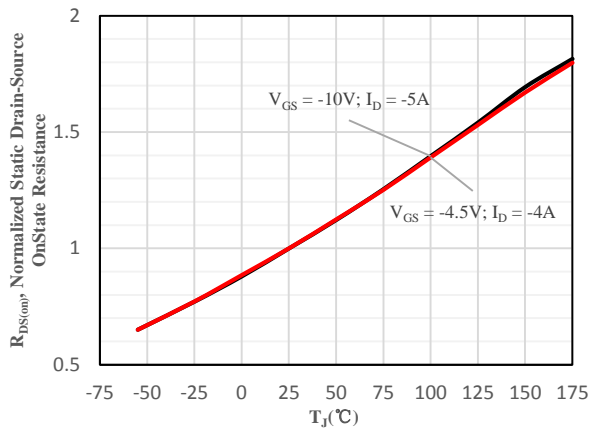


Fig 7 Normalized On-Resistance vs. Junction Temperature

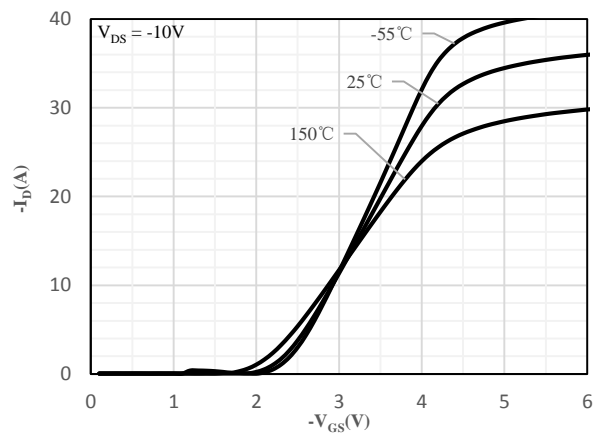


Fig 8 Transfer Characteristics

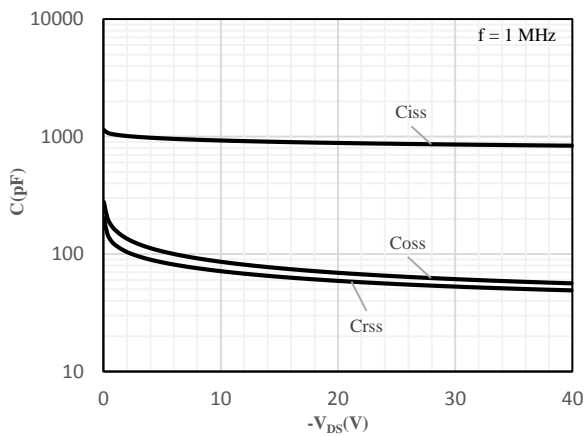


Fig 9 Capacitance Characteristics

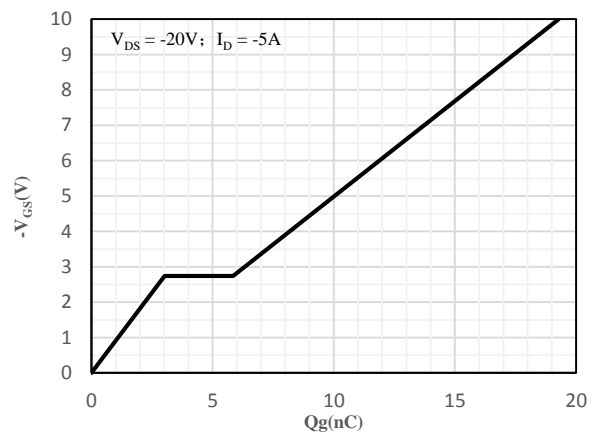


Fig 10 Gate-Charge Characteristics

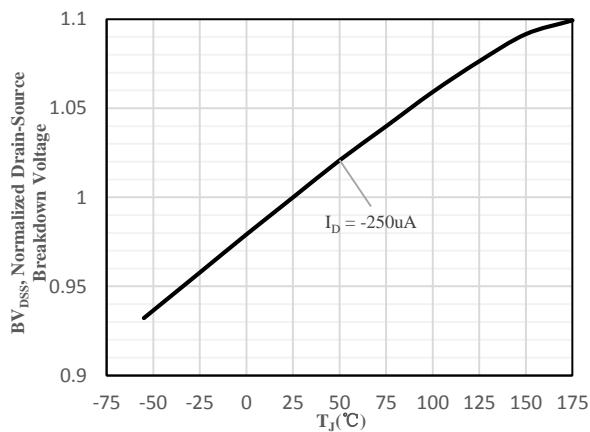


Fig 11 Normalized Breakdown Voltage vs. Junction Temperature

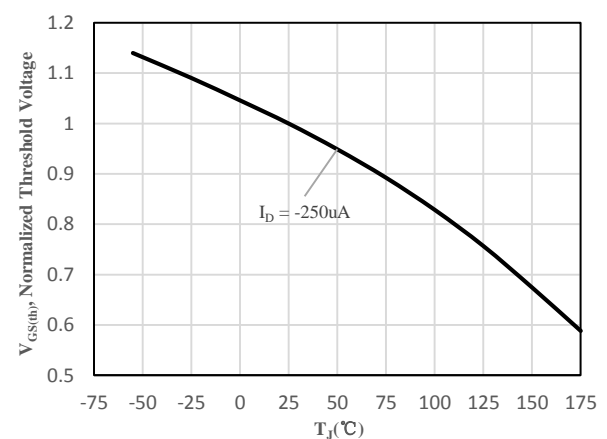
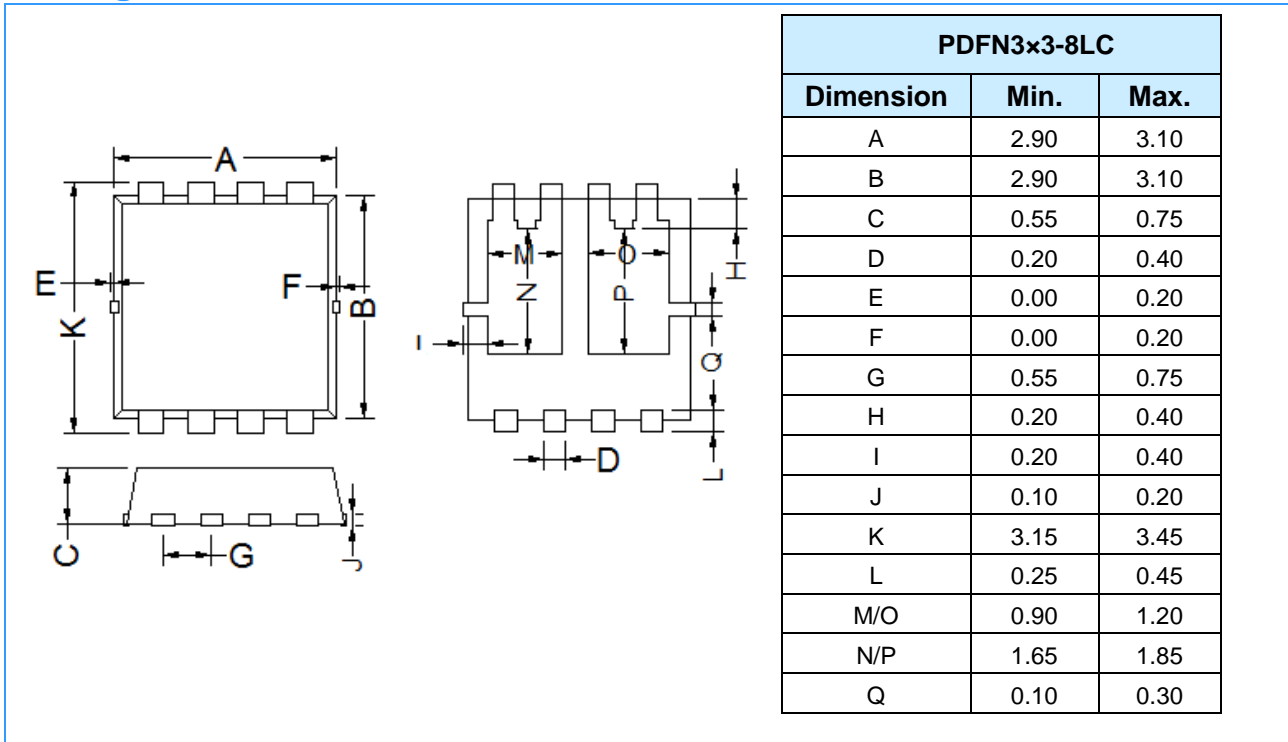


Fig 12 Normalized  $V_{GS(th)}$  vs. Junction Temperature

### Package Outline Dimensions (Unit: mm)



### Mounting Pad Layout (Unit: mm)

