



WANSEMI
万芯半导体

WP4024DP3

Enhancement Mode N+P-Channel Power MOSFET

PDFN3x3/N+PMOS/40V/ ± 20 V/1.65V/20A/13m Ω

-40V/ ± 20 V/-1.5V/-14A/31m Ω

Rev0.2

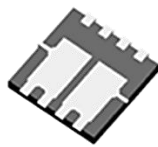
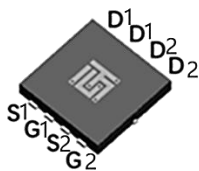
40V N+P-Channel MOSFET

1.Features

- ◆ High power and current handling capability
- ◆ Lead free product is acquired
- ◆ Fast switching
- ◆ Surface mount package

2.Applications

- ◆ BLDC Motor driver
- ◆ PWM applications



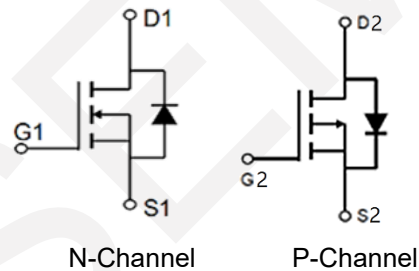
PDFN3x3
Pin Description

◆ N-Channel

V_{DS}	$R_{DS(on)}$ Typ.	I_D
40V	13m Ω @ 10V	20A
	18m Ω @ 4.5V	

◆ P-Channel

V_{DS}	$R_{DS(on)}$ Typ.	I_D
-40V	31m Ω @ -10V	-14A
	37m Ω @ -4.5V	



Schematic Diagram

3.Package Marking and Ordering Information

Part no.	Marking	Package	PCS/Tube	PCS/CTN.
WP4024DP3	4024D	PDFN3x3	5,000	50,000

4.Absolute Max Ratings at Ta=25°C (Note1)

Parameter	Symbol	N-channel	P-channel	Units
Drain to Source Voltage	V_{DSS}	40	-40	V
Gate to Source Voltage	V_{GSS}	± 20	± 20	V
Drain Current (DC)	I_D	20	-14	A
Drain Current (Pulse), $PW \leq 300\mu s$	I_{DM}	80	-56	A
Total Dissipation	P_D	43	54	W
Junction Temperature	T_j	-55 to +150		$^{\circ}C$
Storage Temperature	T_{stg}			

Note 1: Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

5. Thermal Resistance Ratings (Note 2)

Parameter	Symbol	N-channel	P-channel	Unit
Maximum Junction-to-Ambient	$R_{\theta JA}$	57	59	$^{\circ}\text{C}/\text{W}$

Note 2: When mounted on 1 inch square copper board $t \leq 10\text{sec}$ The value in any given application depends on the user's specific board design.

6. Electrical Characteristics at $T_a=25^{\circ}\text{C}$ (Note 3)
N-Channel

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Drain to Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	40	-	-	V
Zero-Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 40\text{V}, V_{GS} = 0\text{V}$	-	-	1	μA
Gate to Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$	-	-	± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_{DS}=250\mu\text{A}$	1.0	1.65	2.5	V
Static Drain to Source On-State Resistance	$R_{DS(on)}$	$I_D = 8\text{A}, V_{GS} = 10\text{V}$	-	13	18	$\text{m}\Omega$
		$I_D = 4\text{A}, V_{GS} = 4.5\text{V}$	-	18	28	$\text{m}\Omega$
Input Capacitance	C_{iss}	$V_{GS}=0\text{V},$ $V_{DS}=20\text{V},$ Frequency=1.0MHz	-	1114	-	pF
Output Capacitance	C_{oss}		-	75	-	pF
Reverse Transfer Capacitance	C_{rss}		-	61	-	pF
Turn-ON Delay Time	$t_{d(on)}$	$V_{DD} = 25\text{V}$ $V_{GS} = 10\text{V}$ $R_G = 2.7\Omega$ $I_D = 5\text{A}$	-	6.1	-	ns
Rise Time	t_r		-	6.2	-	ns
Turn-OFF Delay Time	$t_{d(off)}$		-	24	-	ns
Fall Time	t_f		-	3.0	-	ns
Total Gate Charge	Q_g	$V_{DS} = 20\text{V},$ $V_{GS} = 0 \text{ to } 10\text{V},$ $I_D = 5\text{A}$	-	22	-	nC
	Q_{gs}		-	4.2	-	nC
	Q_{gd}		-	3.9	-	nC
Diode Forward Voltage	V_{FSD}	$I_S = 8\text{A}, V_{GS} = 0\text{V}$	-	-	1.2	V

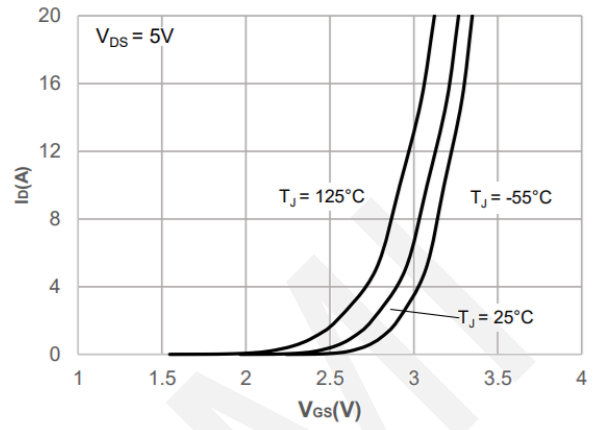
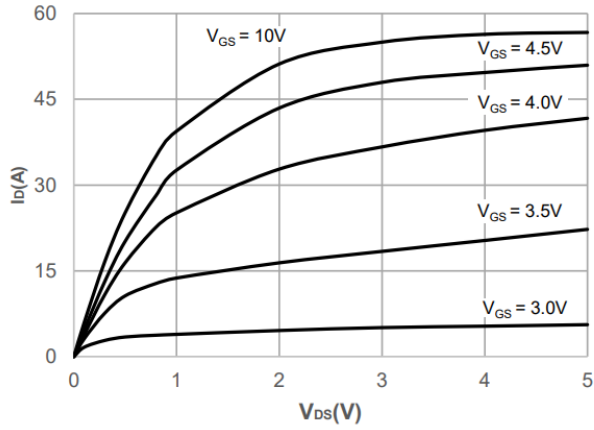
P-Channel

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Drain to Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D = -250\mu A, V_{GS} = 0V$	-40	-	-	V
Zero-Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -40V, V_{GS} = 0V$	-	-	-1	μA
Gate to Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$	-	-	± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_{DS}=-250\mu A$	-1.2	-1.5	-2.3	V
Static Drain to Source On-State Resistance	$R_{DS(on)}$	$I_D = -5A, V_{GS} = -10V$	-	31	41	m Ω
		$I_D = -3A, V_{GS} = -4.5V$	-	37	52	m Ω
Input Capacitance	C_{iss}	$V_{GS}=0V,$ $V_{DS}=-20V,$ Frequency=1.0MHz	-	1157	-	pF
Output Capacitance	C_{oss}		-	89	-	pF
Reverse Transfer Capacitance	C_{rss}		-	73	-	pF
Turn-ON Delay Time	$t_{d(on)}$	$V_{DD} = -20V$ $V_{GS} = -10V$ $R_{GEN} = 2.7\Omega,$ $I_D = -5A,$	-	4.6	-	ns
Rise Time	t_r		-	1.8	-	ns
Turn-OFF Delay Time	$t_{d(off)}$		-	50	-	ns
Fall Time	t_f		-	27	-	ns
Total Gate Charge	Q_g	$V_{DS} = -20V,$ $V_{GS} = 0 \text{ to } -10V,$ $I_D = -5A$	-	22	-	nC
	Q_{gs}		-	3.7	-	nC
	Q_{gd}		-	4.0	-	nC
Diode Forward Voltage	V_{FSD}	$I_S = -5A, V_{GS} = 0V$	-	-	-1.2	V

Note 3: Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

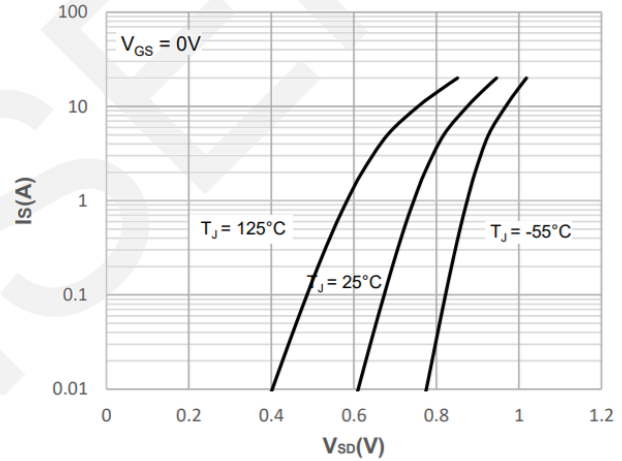
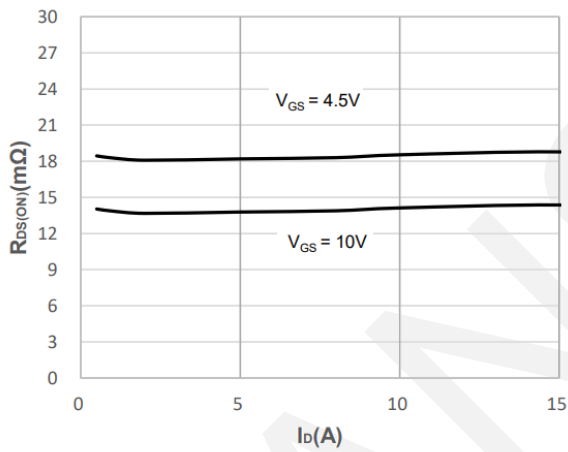
7. Typical electrical and thermal characteristics

N-Channel



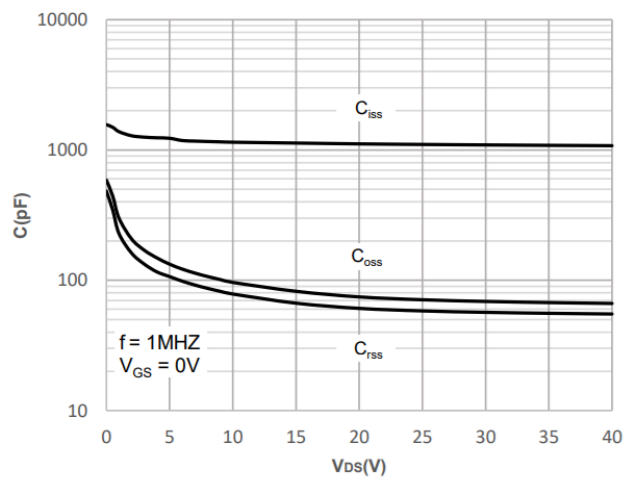
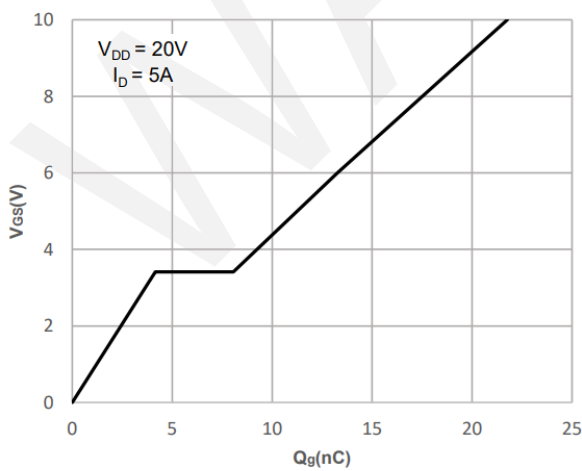
Output Characteristics

Transfer Characteristics



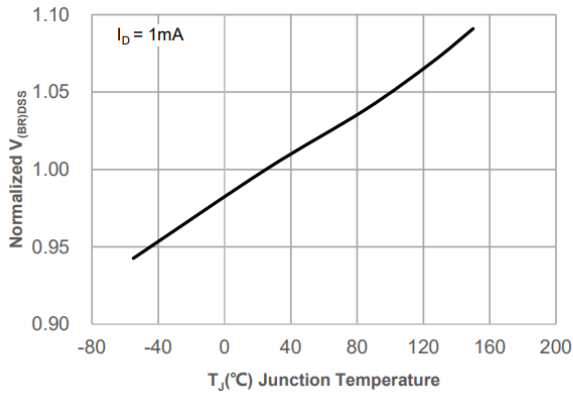
On-resistance vs. Drain Current

Body Diode Characteristics

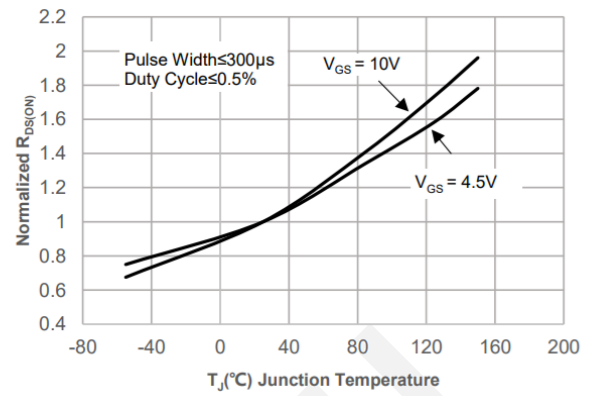


Gate Charge Characteristics

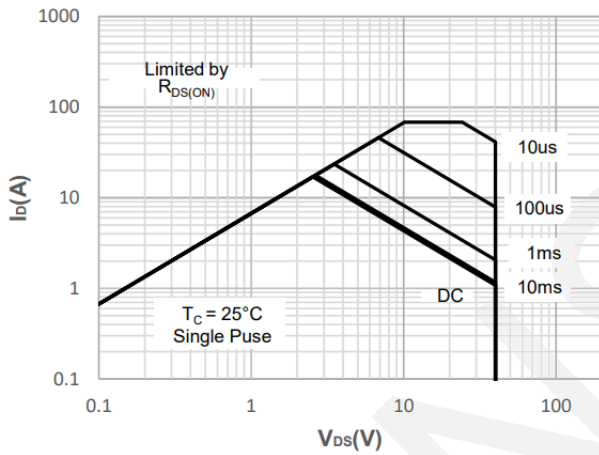
Capacitance Characteristics



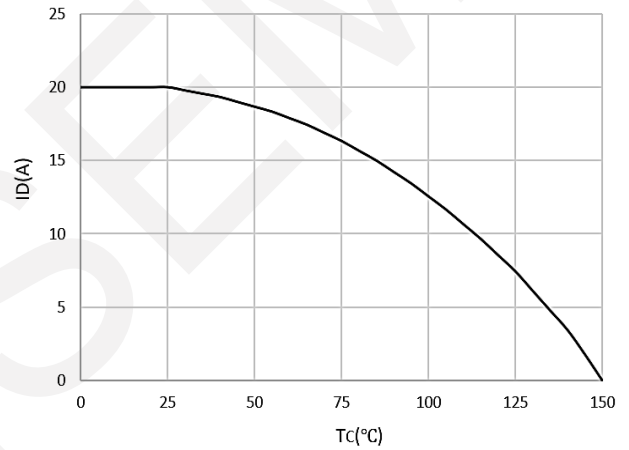
Normalized Breakdown Voltage vs. Junction Temperature



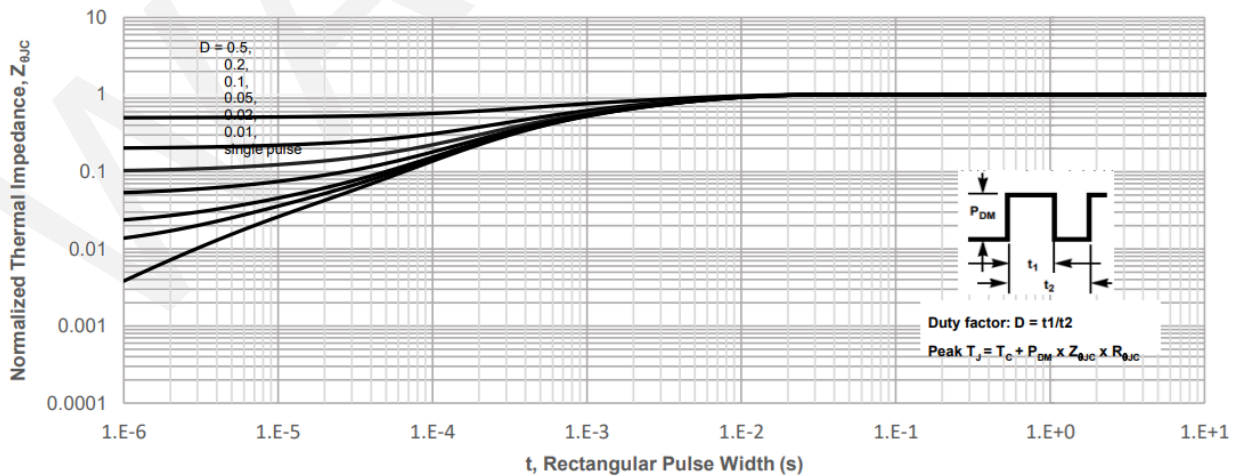
Normalized on Resistance vs. Junction Temperature



Maximum Safe Operating Area



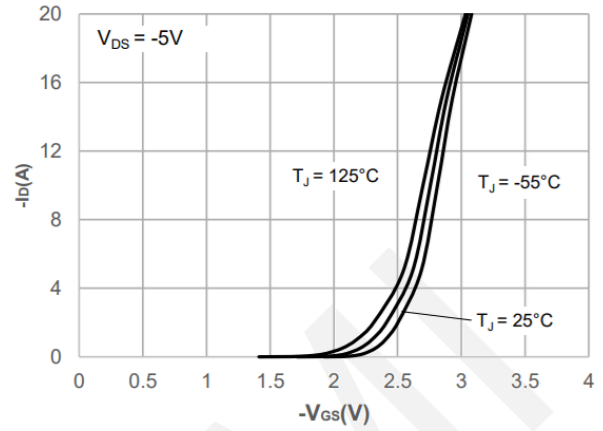
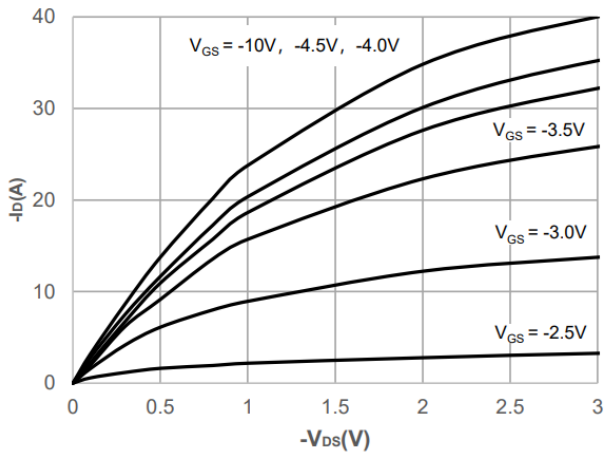
Maximum Continuous Drain Current vs. Case Temperature



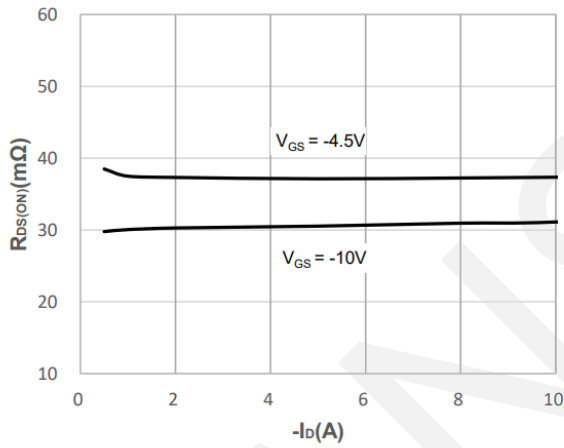
Normalized Maximum Transient Thermal Impedance



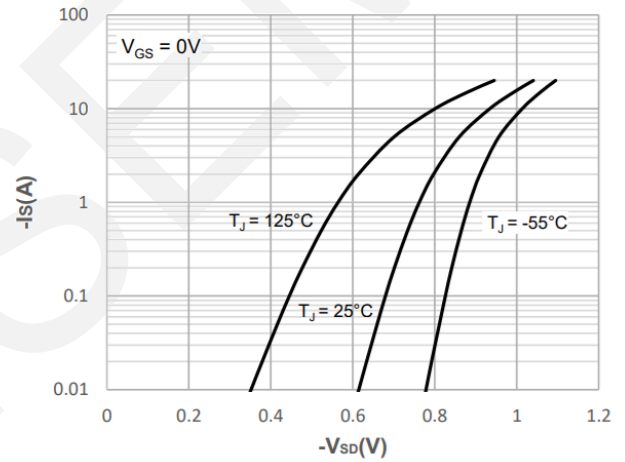
P-Channel



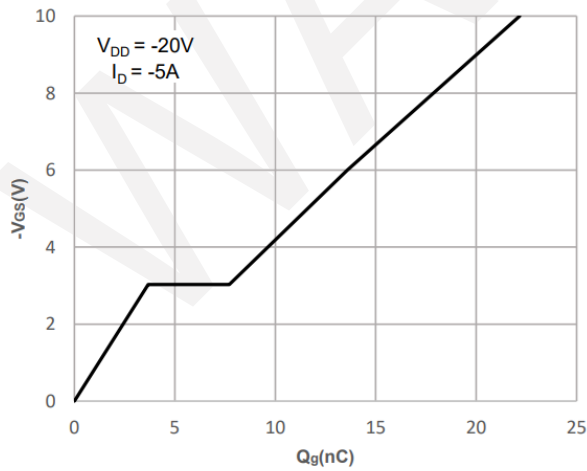
Output Characteristics



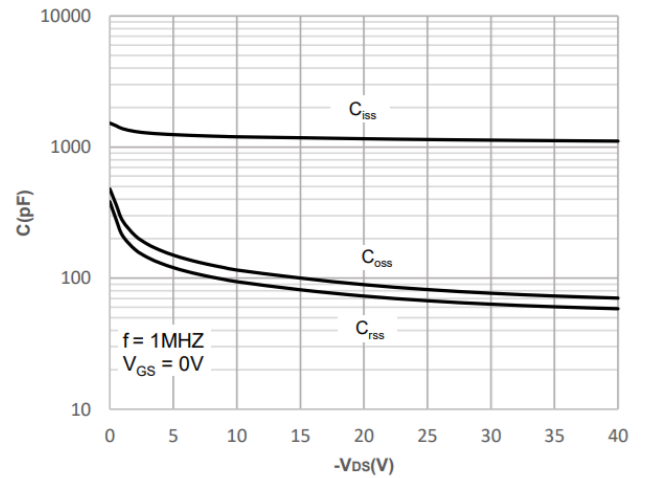
Transfer Characteristics



On-resistance vs. Drain Current

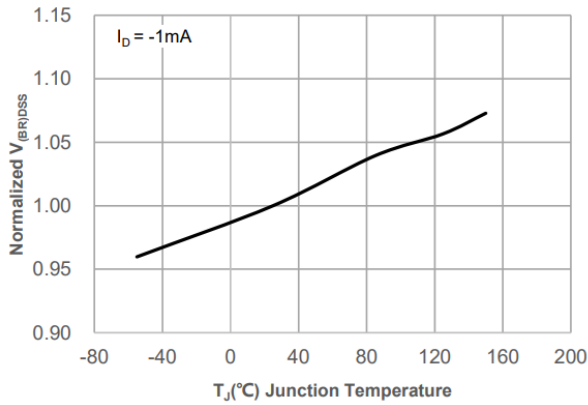


Body Diode Characteristics

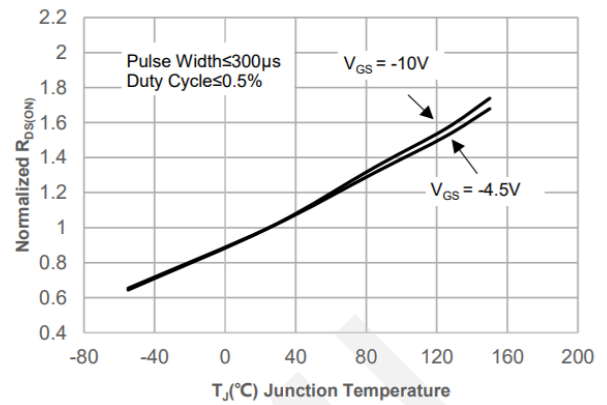


Gate Charge Characteristics

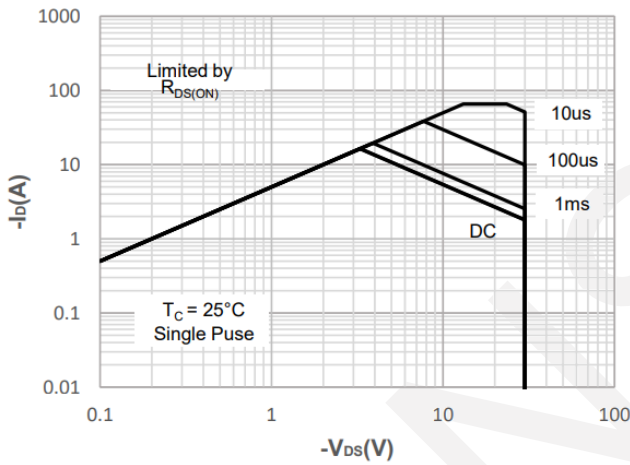
Capacitance Characteristics



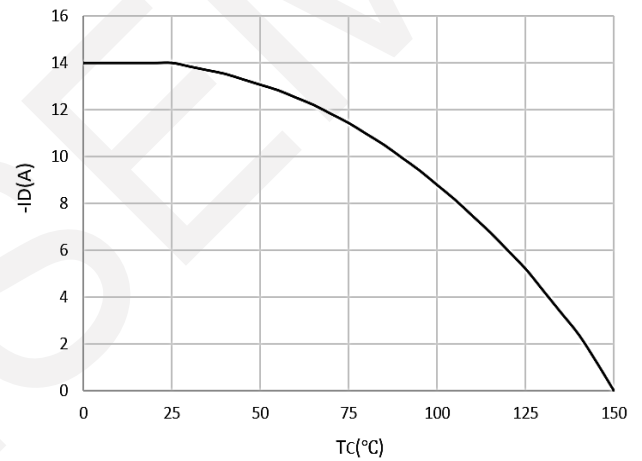
Normalized Breakdown Voltage vs.
Junction Temperature



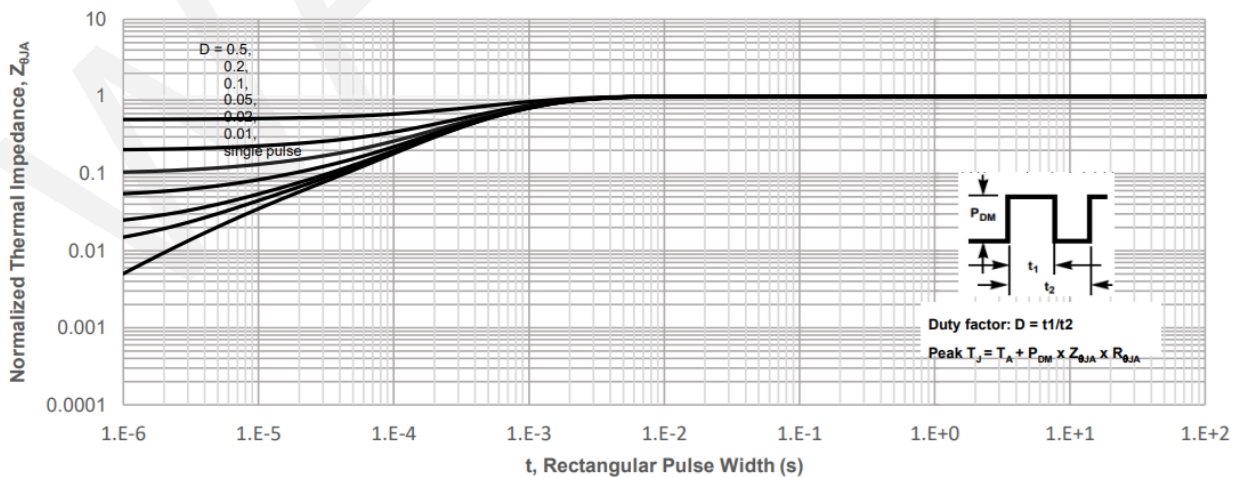
Normalized on Resistance vs.
Junction Temperature



Maximum Safe Operating Area



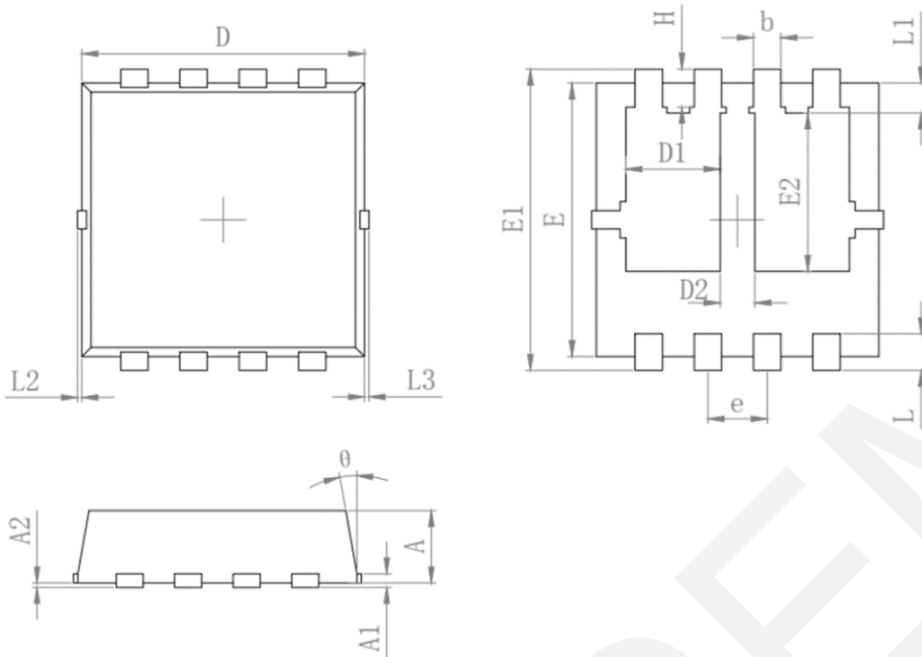
Maximum Continuous Drain Current vs.
Case Temperature



Normalized Maximum Transient
Thermal Impedance



8.Package Dimensions



SYMBOL	MILLIMETER	
	MIN	MAX
A	0.700	0.900
A1	0.152 REF.	
A2	0~0.05	
D	3.000	3.200
D1	0.935	1.135
D2	0.280	0.480
E	2.900	3.100
E1	3.150	3.450
E2	1.535	1.935
b	0.200	0.400
e	0.550	0.750
L	0.300	0.500
L1	0.180	0.480
L2	0~0.100	
L3	0~0.100	
H	0.315	0.515
θ	8°	12°

9. Important Notice

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