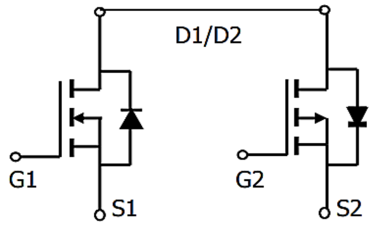
APM
A Power Microelectronics

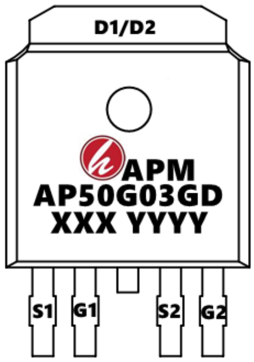
AP50G03GD

30V N+P-Channel Enhancement Mode MOSFET

Description

The AP50G03GD uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.





General Features

V_{DS} = 30V I_D =52A

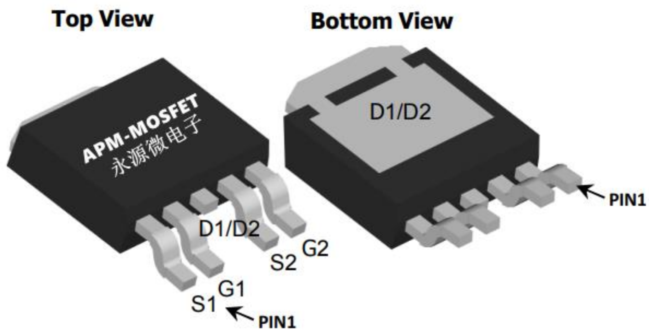
$R_{DS(ON)}$ < 10mΩ @ V_{GS}=10V （Type：7.2mΩ）

V_{DS} = -30V I_D =-48A

$R_{DS(ON)}$ < 13mΩ @ V_{GS}=-10V （Type：8.8mΩ）

Application

BLDC



Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP50G03GD	TO-252-4L	AP50G03GD XXX YYYY	2500

Absolute Maximum Ratings (T_C=25℃unless otherwise noted)

Symbol	Parameter	N-Ch	P-Ch	Units
V_{DS}	Drain-Source Voltage	30	-30	V
V_{GS}	Gate-Source Voltage	±20	±20	V
I_D@T_C=25℃	Continuous Drain Current, V_{GS} @ 10V[1]	52	-48	A
I_D@T_C=100℃	Continuous Drain Current, V_{GS} @ 10V[1]	38.5	-37.5	A
I_{DM}	Pulsed Drain Current[2]	150	-144	A
EAS	Single Pulse Avalanche Energy[3]	289	378	mJ
I_{AS}	Avalanche Current	28	29.5	A
P_D@T_C=25℃	Total Power Dissipation[4]	46	41.3	W
T_{STG}	Storage Temperature Range	-55 to 150	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	-55 to 150	℃
$R_{\theta JA}$	Thermal Resistance Junction-Ambient [1]	62.5		℃/W
$R_{\theta JC}$	Thermal Resistance Junction-Case[1]	2.3		℃/W

N-Electrical Characteristics (T_J=25 ℃, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BVDSS	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=250uA	30	33	---	V
△BVDSS/△TJ	BVDSS Temperature Coefficient	Reference to 25℃ , I_D=1mA	---	0.0193	---	V/℃
RDS(ON)	Static Drain-Source On-Resistance[2]	V_{GS}=10V , I_D=30A	---	7.2	10	mΩ
		V_{GS}=4.5V , I_D=15A	---	11	16	
VGS(th)	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =250uA	1.2	1.6	2.5	V
△$V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-3.97	---	mV/℃
IDSS	Drain-Source Leakage Current	V_{DS}=24V , V_{GS}=0V , T_J=25℃	---	---	1	uA
		V_{DS}=24V , V_{GS}=0V , T_J=55℃	---	---	5	
IGSS	Gate-Source Leakage Current	V_{GS}=±20V , V_{DS}=0V	---	---	±100	nA
gfs	Forward Transconductance	V_{DS}=5V , I_D=30A	---	34	---	S
R_g	Gate Resistance	V_{DS}=0V , V_{GS}=0V , f=1MHz	---	1.8	---	Ω
Q_g	Total Gate Charge (4.5V)	V_{DS}=15V , V_{GS}=4.5V , I_D=15A	---	9.8	---	nC
Q_{gs}	Gate-Source Charge		---	4.2	---	
Q_{gd}	Gate-Drain Charge		---	3.6	---	
Td(on)	Turn-On Delay Time	V_{DD}=15V , V_{GS}=10V , R_G=3.3Ω I_D=15A	---	4	---	ns
T_r	Rise Time		---	8	---	
Td(off)	Turn-Off Delay Time		---	31	---	
T_f	Fall Time		---	4	---	
C_{iss}	Input Capacitance	V_{DS}=15V , V_{GS}=0V , f=1MHz	---	940	---	pF
Coss	Output Capacitance		---	131	---	
Crss	Reverse Transfer Capacitance		---	109	---	
I_S	Continuous Source Current[1,5]	V_G=V_D=0V , Force Current	---	---	43	A
ISM	Pulsed Source Current[2,5]		---	---	112	A
VSD	Diode Forward Voltage[2]	V_{GS}=0V , I_S=1A , T_J=25℃	---	---	1	V
t_{rr}	Reverse Recovery Time	IF=30A , dI/dt=100A/µs , T_J=25℃	---	8.5	---	nS
Q_{rr}	Reverse Recovery Charge		---	2.2	---	nC

Note :

1、The data tested by surface mounted on a 1 inch2 FR-4 board with 2OZ copper.

2、The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%

3、The EAS data shows Max. rating . The test condition is VDD=25V, VGS=10V,L=0.1Mh, IAS=28A

4、The power dissipation is limited by 175℃ junction temperature

5、The data is theoretically the same as ID and IDM , in real applications , should be limited by total power dissipation.

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P-Electrical Characteristics (T_J=25℃, unless otherwise noted)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
V(BR)DSS	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D= -250μA	-30	-32.5	-	V
IDSS	Zero Gate Voltage Drain Current	V_{DS}= -30V, V_{GS}=0V,	-	-	-1	μA
IGSS	Gate to Body Leakage Current	V_{DS}=0V, V_{GS}= ±20V	-	-	±100	nA
VGS(th)	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D= -250μA	-1.2	-1.5	-2.5	V
RDS(on)	Static Drain-Source on-Resistance note3	V_{GS}= -10V, I_D= -10A	-	8.8	13	mΩ
		V_{GS}= -4.5V, I_D= -5A	-	16	20	
Rg	Gate Resistance	V_{DS}=0V , V_{GS}=0V , f=1MHz	4.9	7.0	9.1	Ω
C_{iss}	Input Capacitance	V_{DS}= -24V, V_{GS}=10V, f=1.0MHz	-	2130	-	pF
Coss	Output Capacitance		-	280	-	pF
Crss	Reverse Transfer Capacitance		-	252	-	pF
Q_g	Total Gate Charge	V_{DS}= -24V, I_D= -1A, V_{GS}= -10V	-	22	-	nC
Q_{gs}	Gate-Source Charge		-	4	-	nC
Q_{gd}	Gate-Drain("Miller") Charge		-	5.8	-	nC
td(on)	Turn-on Delay Time	V_{DD}= -24V, I_D= -1A, V_{GS}= -10V, R_{GEN}=7.0Ω	-	9	-	ns
t_r	Turn-on Rise Time		-	13	-	ns
td(off)	Turn-off Delay Time		-	48	-	ns
t_f	Turn-off Fall Time		-	20	-	ns
IS	Maximum Continuous Drain to Source Diode Forward Current		-	-	-29.5	A
ISM	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-44	A
VSD	Drain to Source Diode Forward Voltage	V_{GS}=0V, I_S= -1A	-	-0.74	-1.2	V

Note :

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

2、The data tested by pulsed , pulse width .The EAS data shows Max. rating .

3、The power dissipation is limited by 175℃ junction temperature

4、EAS condition: TJ=25℃, VDD= -24V, VG= -10V, RG=7Ω, L=0.1mH, IAS= -29.5A

5、The data is theoretically the same as ID and IDM , in real applications , should be limited by total power dissipation.

N-Typical Characteristics

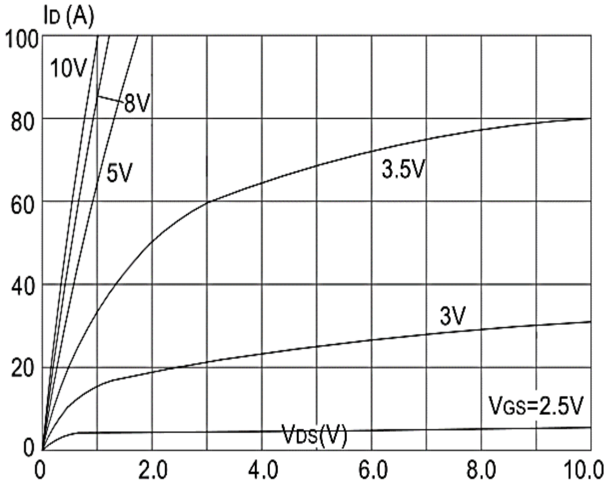


Figure1: Output Characteristics

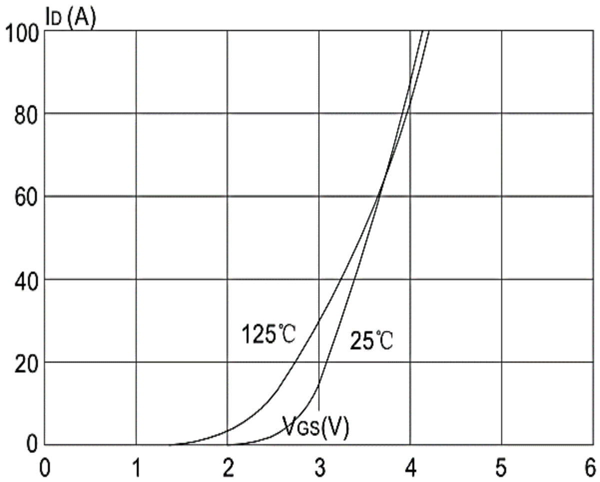


Figure 2: Typical Transfer Characteristics

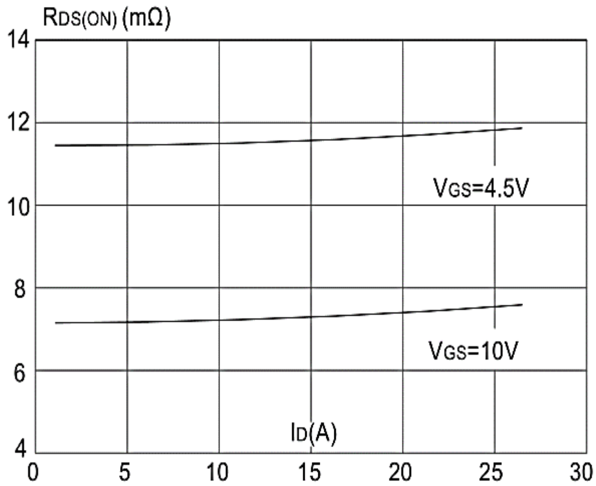


Figure 3:On-resistance vs. Drain Current

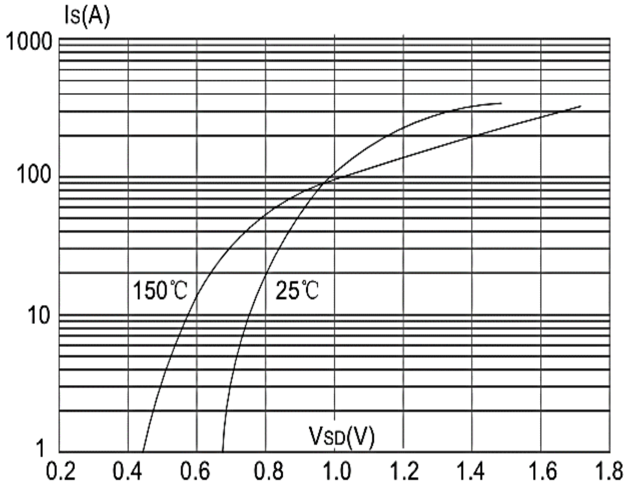


Figure 4: Body Diode Characteristics

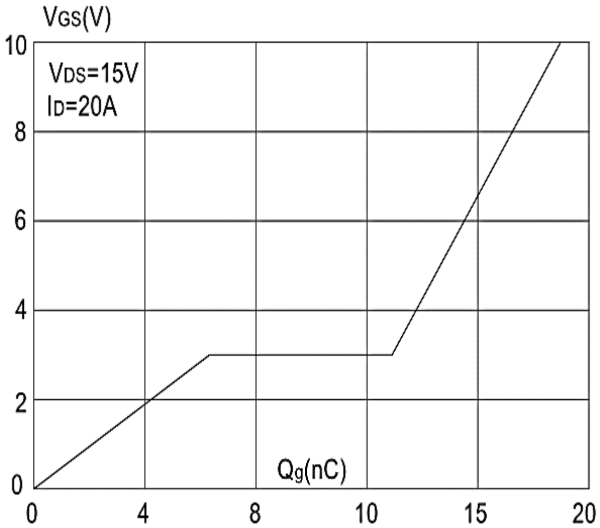


Figure 5: Gate Charge Characteristics

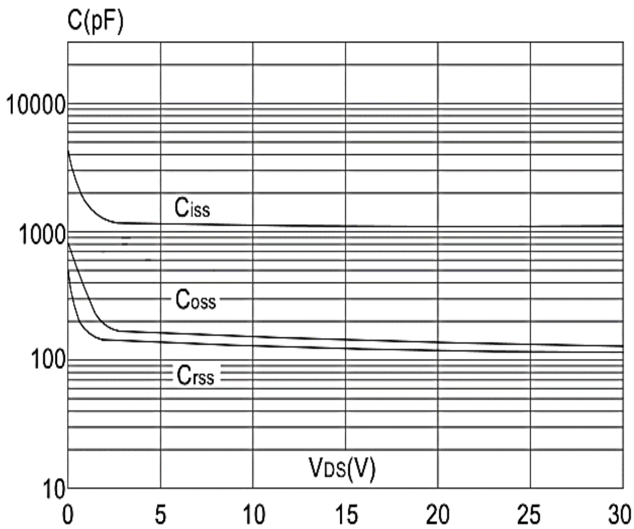


Figure 6: Capacitance Characteristics

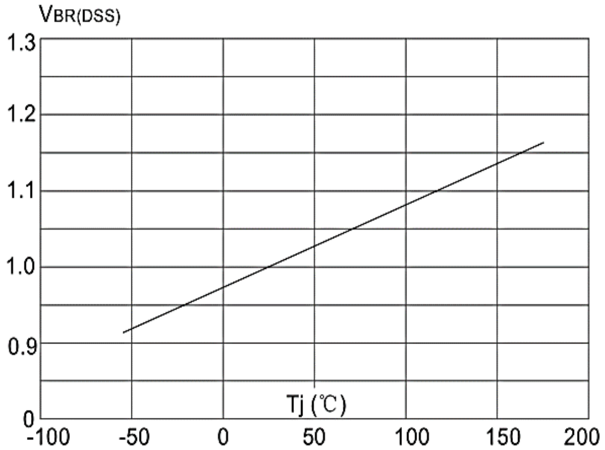


Figure 7: Normalized Breakdown Voltage vs Junction Temperature

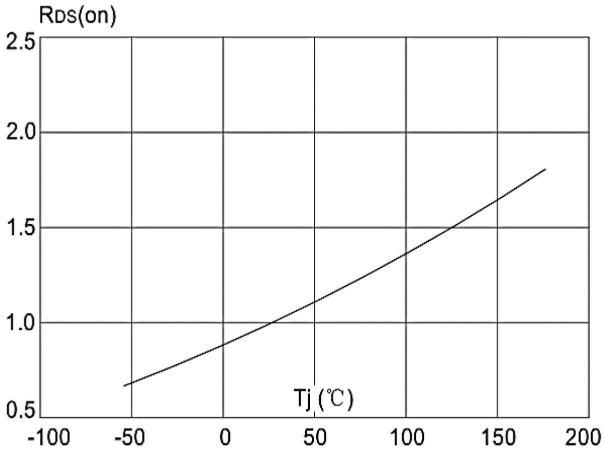


Figure 8: Normalized on Resistance vs. Junction Temperature

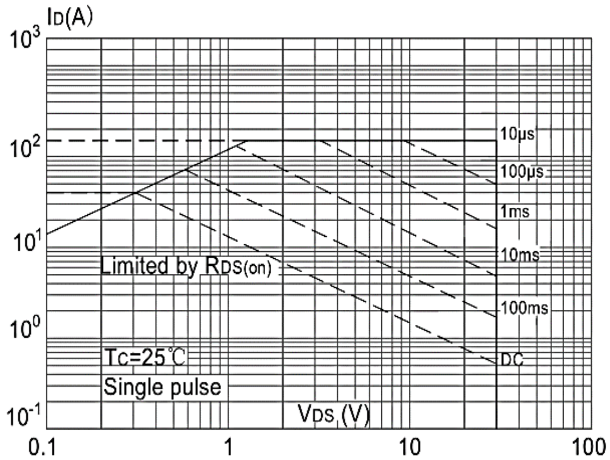


Figure 9: Maximum Safe Operating Area Temperature

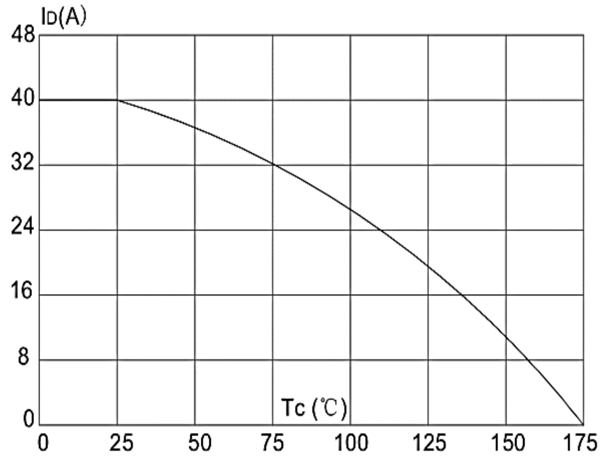


Figure 10: Maximum Continuous Drain Current vs. Ambient

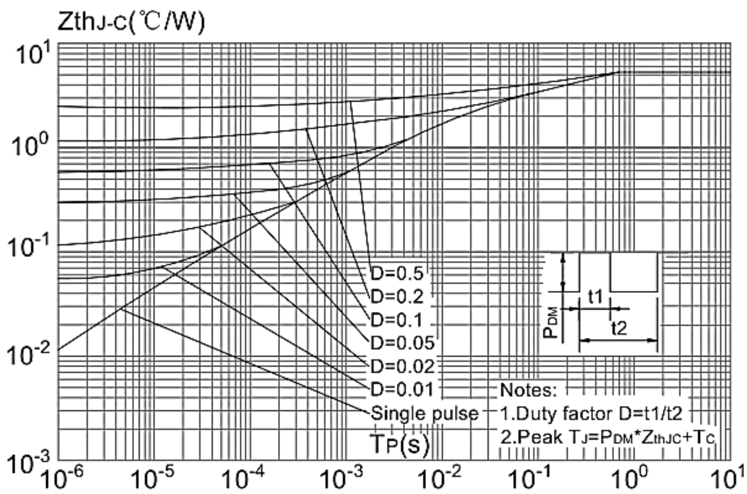


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambien

P-Typical Characteristics

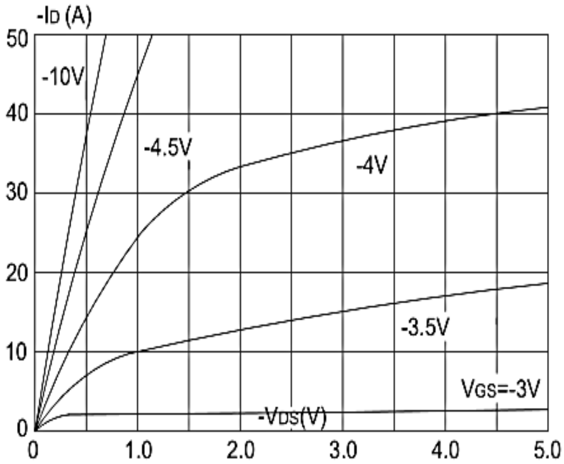


Figure1: Output Characteristics Figure

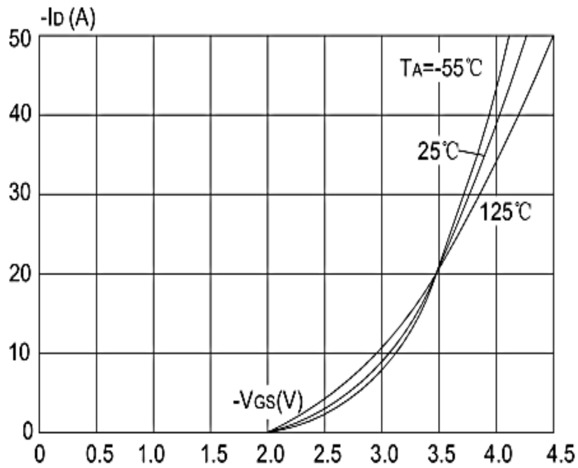


Figure2: Typical Transfer Characteristics

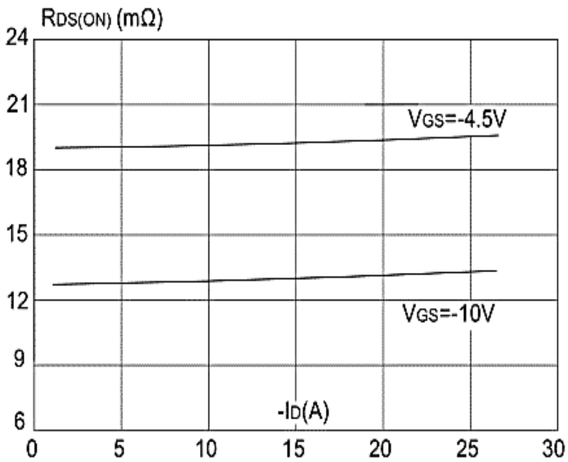


Figure 3:On-resistance vs. Drain Current

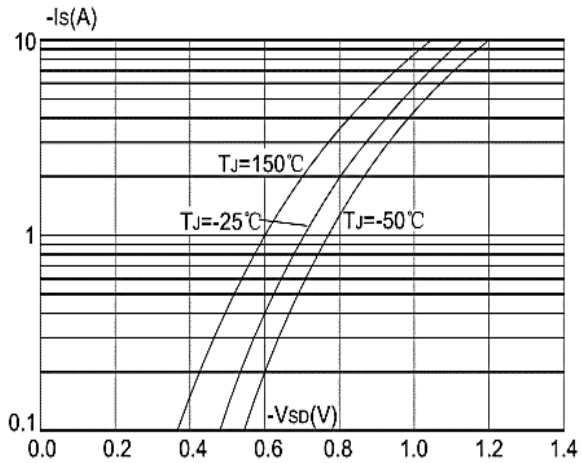


Figure 4: Body Diode Characteristics

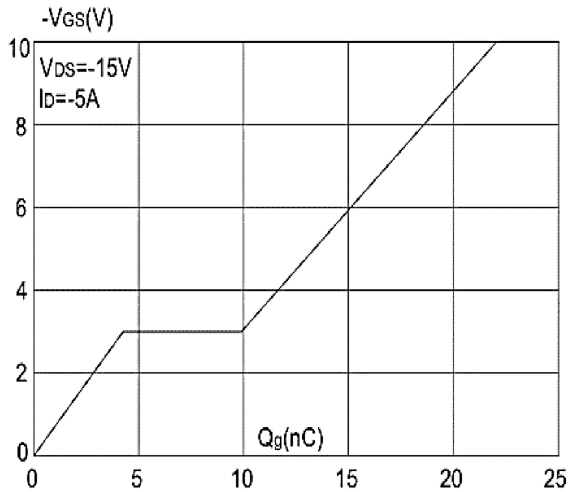


Figure 5: Gate Charge Characteristics

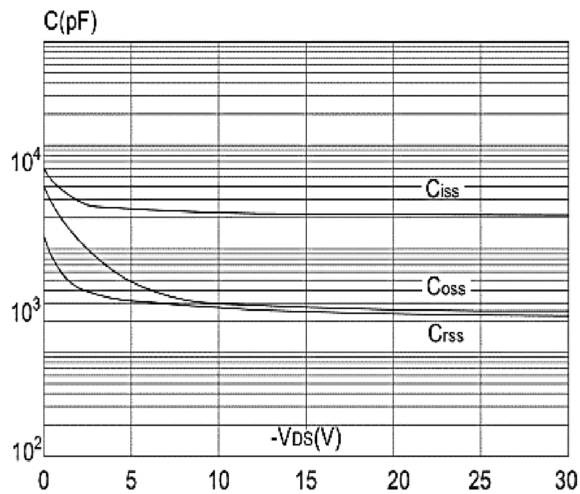


Figure 6: Capacitance Characteristics

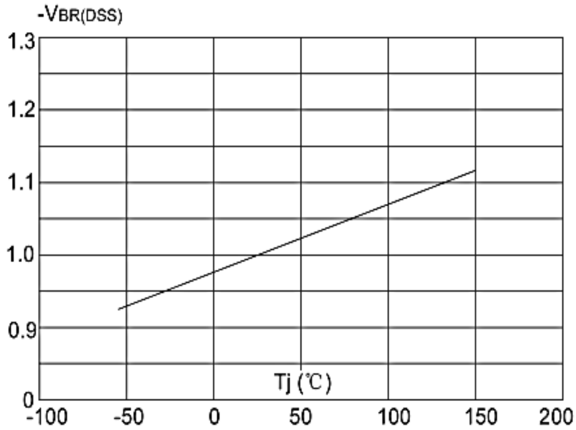


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

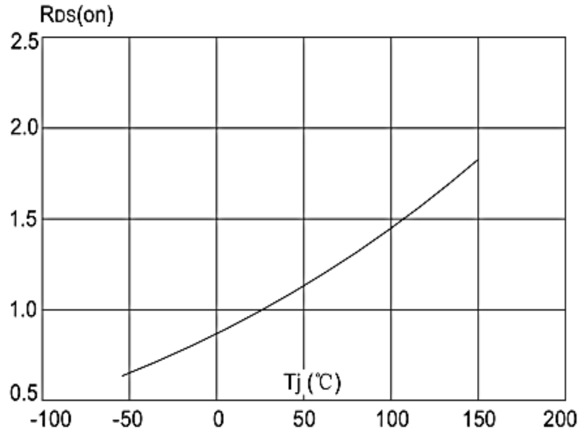


Figure 8: Normalized on Resistance vs. Junction Temperature

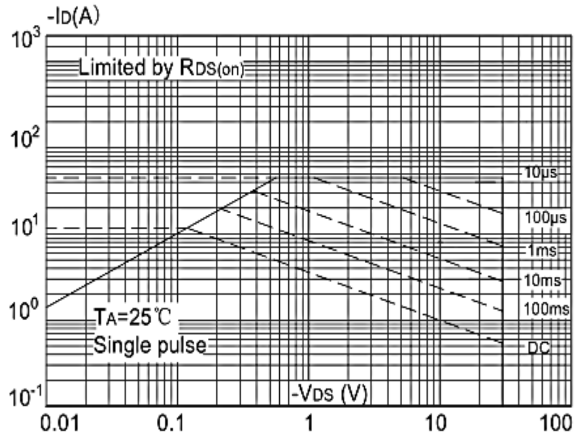


Figure 9: Maximum Safe Operating Area

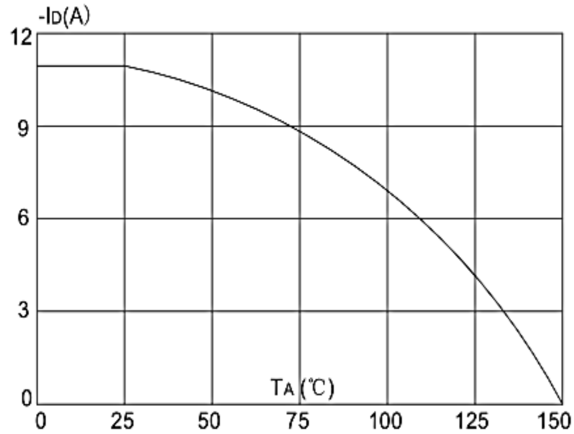


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

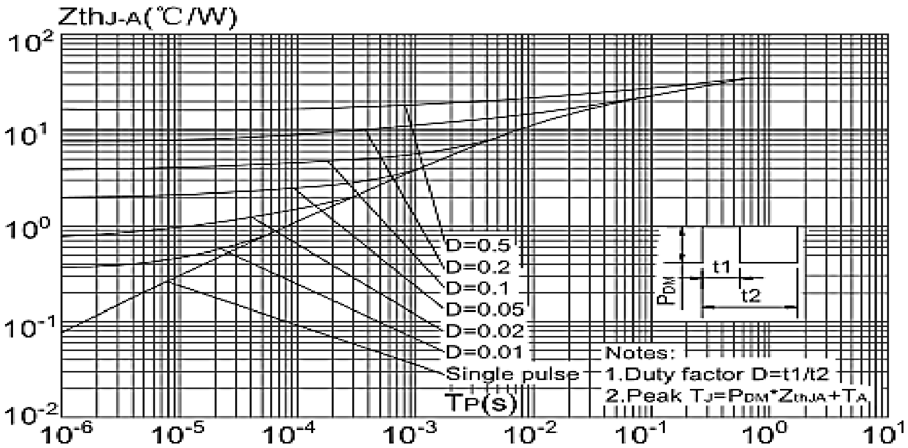
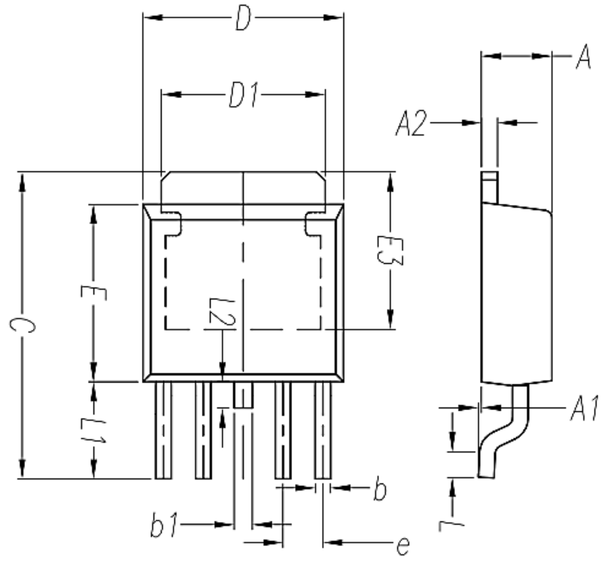


Figure.11: Maximum Effective
Transient Thermal Impedance, Junction-to-Ambient

Package Mechanical Data-TO-252-4L-Duble-DX



Symbol	Common		
	mm		
	Mim	Nom	Max
D	6.30	6.55	6.80
D1	4.80	5.35	5.90
C	9.70	10.00	10.30
E	5.90	6.10	6.30
E3	4.50	5.15	5.80
L	0.90	1.35	1.80
L1	2.60	2.85	3.05
L2	0.50	0.85	1.20
b	0.30	0.50	0.70
b1	0.40	0.60	0.80
A	2.10	2.30	2.50
A2	0.40	0.53	0.65
A1	0.00	0.10	0.20
e	1.17	1.27	1.37

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Edition	Date	Change
Rve1.0	2021/4/30	Initial release