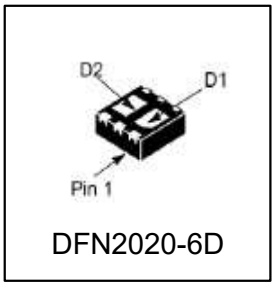
NP2010D

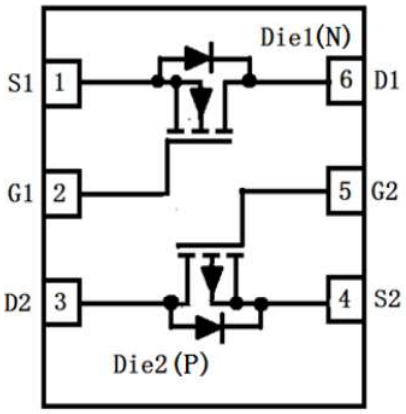
N- AND P-Channel Enhancement Mode MOSFET

1. FEATURES



DFN2020-6D

- P-Channel:VDS = -20V
  RDS(ON),VGS@-4.5V,IDS@-4.7A=70mΩ
  RDS(ON),VGS@-2.5V,IDS@-1.0A=110mΩ
- N-Channel:VDS = 20V
  RDS(ON), VGS@2.5V, IDS@5.2A = 50mΩ
  RDS(ON), VGS@4.5V, IDS@6A = 40mΩ
- Simple drive requirement.
- Low gate charge.
- Low on-resistance.
- Fast switching speed.
- We declare that the material of product compliance with RoHS requirements and Halogen Free.
- S- prefix for automotive and other applications requiring unique site and control change requirements; AEC-Q101 qualified and PPAP capable.



2. DEVICE MARKING AND ORDERING INFORMATION

Device	Marking	Shipping
NP2010D	T2	4000/Tape&Reel

3. MAXIMUM RATINGS(Ta = 25ºC)

Parameter (P-Channel)	Symbol	Limits	Unit
Drain–Source Voltage	VDSS	-20	V
Gate–to–Source Voltage – Continuous	VGS	±12	V
Drain Current – Continuous TA = 25°C – Pulsed(Note 1)	 ID IDM	 -4.7 -20	A

Parameter (N-Channel)	Symbol	Limits	Unit
Drain–Source Voltage	VDSS	20	V
Gate–to–Source Voltage – Continuous	VGS	±12	V
Drain Current – Continuous TA = 25°C – Pulsed(Note 1)	 ID IDM	 6 33	A

1. Repetitive Rating: Pulse width limited by the Maximum junction temperation.

4. THERMAL CHARACTERISTICS

Parameter	Symbol	Limits	Unit
Maximum Power Dissipation(Note 2)	PD	1.38	W
Thermal Resistance, Junction–to–Ambient	RΘJA	90	ºC/W
Junction and Storage temperature	TJ,Tstg	−55~+150	° C

2. Surface mounted on 1 in² copper pad of FR-4 board, t≤5 sec.

5. ELECTRICAL CHARACTERISTICS (Ta= 25ºC)

P-Channel

Characteristic		Symbol	Min.	Typ.	Max.	Unit
STATIC						
Drain–Source Breakdown Voltage (VGS = 0, ID = -250μA)		VBRDSS	-20	-	-	V
Gate Threshold Voltage (VDS = VGS, ID = -250μA)		VGS(th)	-0.6	-0.85	-1.4	V
Zero Gate Voltage Drain Current (VGS = 0, VDS = -20 V)		IDSS	-	-	-1	μA
Gate−to−Source Leakage Current (VDS = 0 V, VGS = ±12 V)		IGSS	-	-	±100	nA
Drain−to−Source On Resistance(Note 3) (VGS = -4.5V, ID = -4.7A) (VGS = -2.7V, ID = -3.8A) (VGS = -2.5V, ID = -1.0A)		RDS(on)	- - -	58 63 75	70 90 110	mΩ
Forward Voltage (VGS = 0 V, ISD = -1.7 A)		VSD	-	-	-1.2	V
DYNAMIC						
Total Gate Charge	(VGS =-10V,VDS = -4.7V,ID = -4.5A)	Qg	-	13.9	-	nC
Gate−to−Source Gate Charge		Qgs	-	1.02	-	
Gate−to−Drain Charge		Qgd	-	1.94	-	
Turn-On Delay Time	(VDD = -10V,RL=10Ω,ID = -1A, VGEN = -4.5V,RG = 6.2 Ω)	td(on)	-	16.5	-	ns
Rise Time		tr	-	23.4	-	
Turn-Off Delay Time		td(off)	-	66.5	-	
Fall Time		tf	-	33.3	-	
Input Capacitance (VDS = -8V, VGS = 0V,f = 1.0 MHz)		Ciss	-	751	-	pF
Output Capacitance (VDS = -8V, VGS = 0V,f = 1.0 MHz)		Coss	-	91	-	
Reverse Transfer Capacitance (VDS = -8V, VGS = 0V,f = 1.0 MHz)		Crss	-	84	-	
Forward Transconductance (VDS = -10V, ID = -4.7A)		gFS	-	9	-	S
Gate-Resistance (VGS = 0 V, VDS=0V,f=1MHz)		Rg	-	3.4	-	Ω

5. ELECTRICAL CHARACTERISTICS (Ta= 25ºC)(Con.)

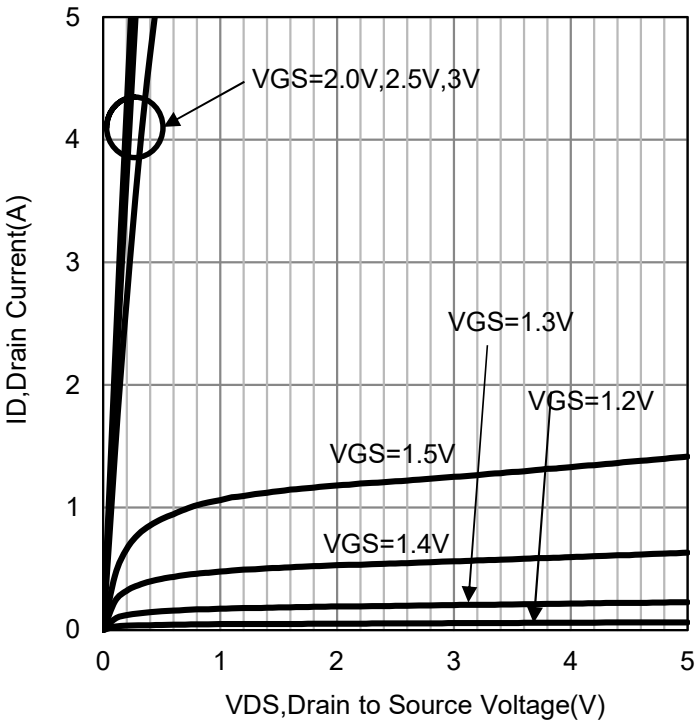
N-Channel

Characteristic		Symbol	Min.	Typ.	Max.	Unit
Static						
Drain–Source Breakdown Voltage (VGS = 0, ID = 250μA)		V(BR)DSS	20	-	-	V
Drain-Source On-State Resistance (VGS = 2.5V, ID= 5.2A) (VGS = 4.5 V, ID = 6 A)		RDS(on)	- -	42 33	50 40	mΩ
Gate Threshold Voltage (VDS = VGS, ID = 250μA)		VGS(th)	0.4	-	1	V
Zero Gate Voltage Drain Current (VDS=20V, VGS=0V)		IDSS	-	-	1	μA
Gate Body Leakage (VDS = 0 V, VGS = ±12 V)		IGSS	-	-	±100	nA
Forward Transconductance (VDS = 10 V, ID = 6 A)		gfs	-	9.4	-	S
DYNAMIC(Note 3)						
Total Gate Charge	(VDS = 10V, ID = 6A,VGS = 4.5V)	Qg	-	6.8	-	nC
Gate–to–Source Gate Charge		Qgs	-	1	-	
Gate–to–Drain Charge		Qgd	-	2	-	
Turn-On Delay Time	(VDD = 10V, ID = 1A,VGS =4.5 V,RG = 6.2Ω)	td(on)	-	10.8	-	ns
Rise Time		tr	-	15.3	-	
Turn-Off Delay Time		td(off)	-	76.7	-	
Fall Time		tf	-	23.8	-	
Input Capacitance (VDS = 8V, VGS = 0V,f = 1.0 MHz)		Ciss	-	636	-	pF
Output Capacitance (VDS = 8V, VGS = 0V,f = 1.0 MHz)		Coss	-	62.8	-	
Reverse Transfer Capacitance (VDS = 8V, VGS = 0V,f = 1.0 MHz)		Crss	-	59.6	-	
Gate-Resistance (VGS = 0 V, VDS=0V,f=1MHz)		Rg	-	2.4	-	Ω
SOURCE–DRAIN DIODE						
Max. Diode Forward Current		IS	-	-	1.7	A
Forward Voltage (VGS = 0 V, IS = 1.7 A)		VSD	-	-	1.2	V

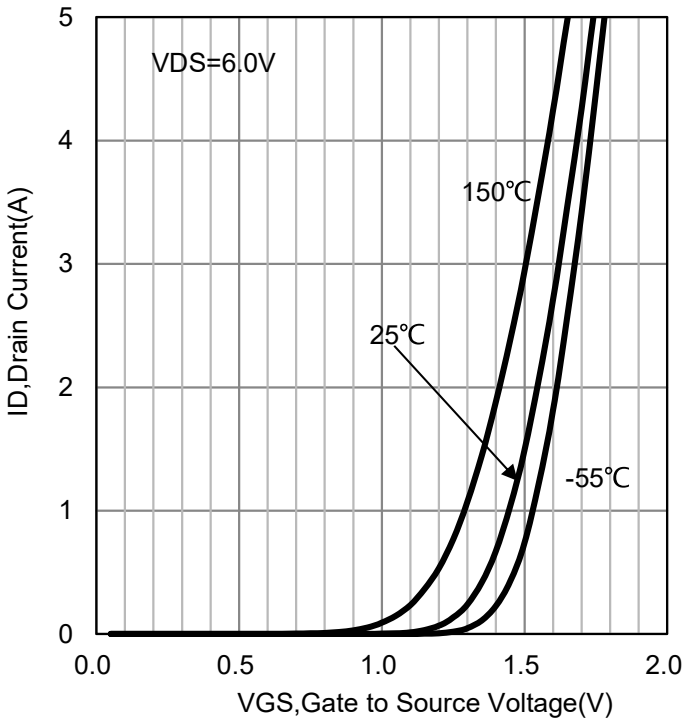
3.Pulse Test: Pulse Width ≤300 μs, Duty Cycle ≤2.0%.

6. ELECTRICAL CHARACTERISTICS CURVES

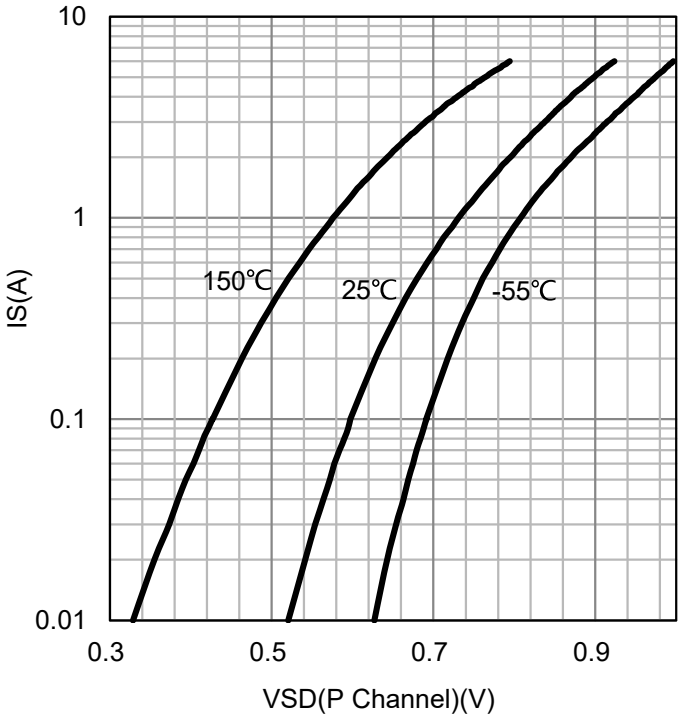
P-Channel



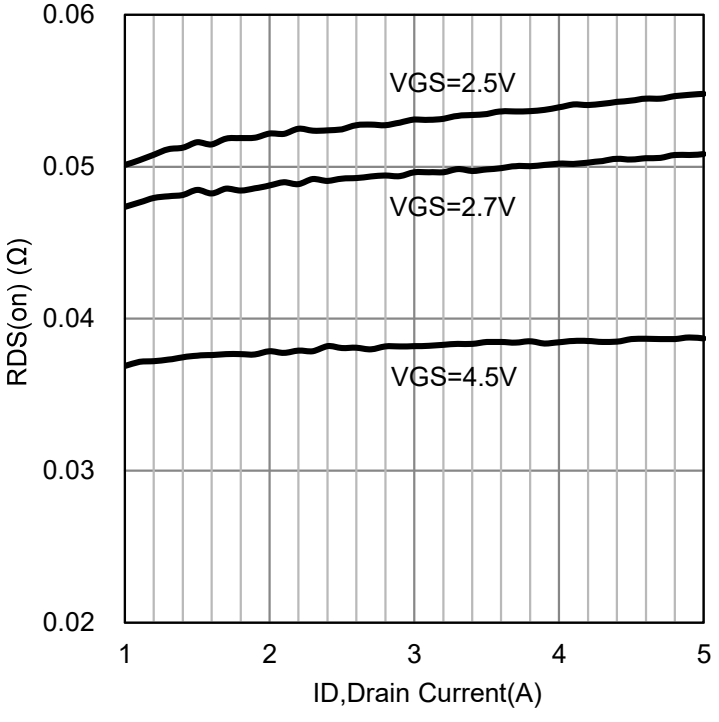
ID vs. VDS



ID vs. VGS



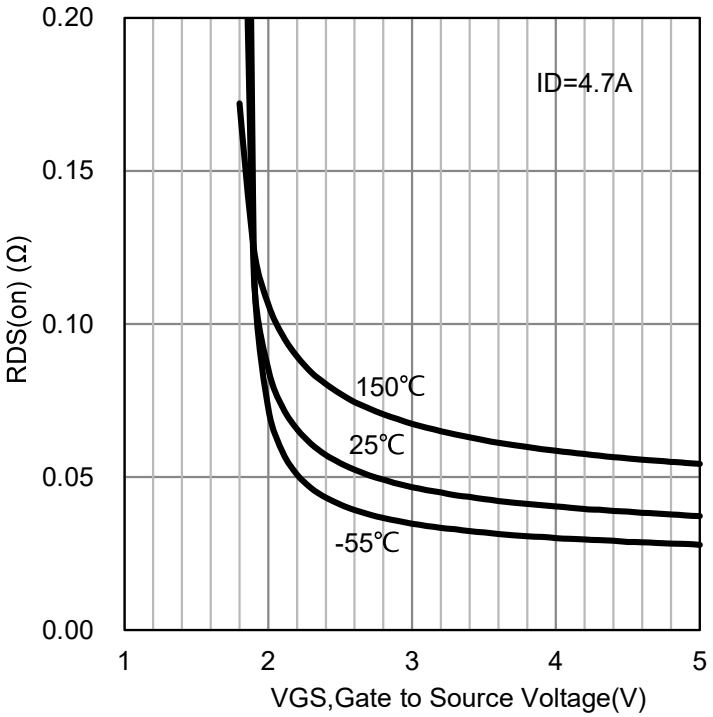
IS vs. VSD



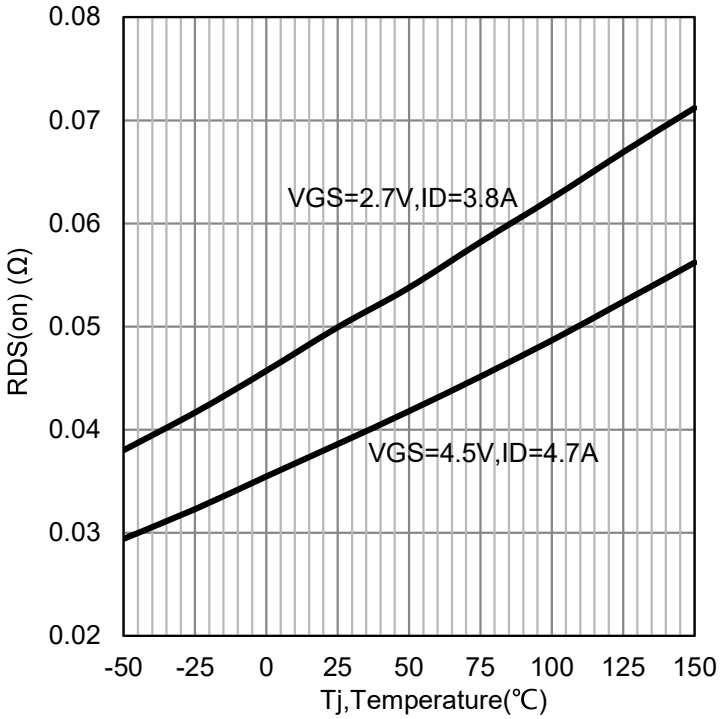
RDS(on) vs. ID

6. ELECTRICAL CHARACTERISTICS CURVES(Con.)

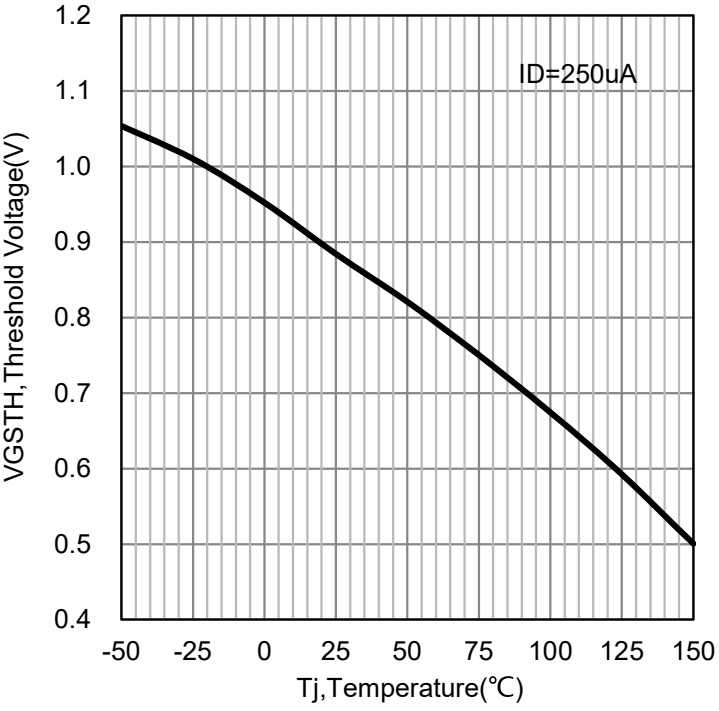
P-Channel



RDS(on) vs. VGS



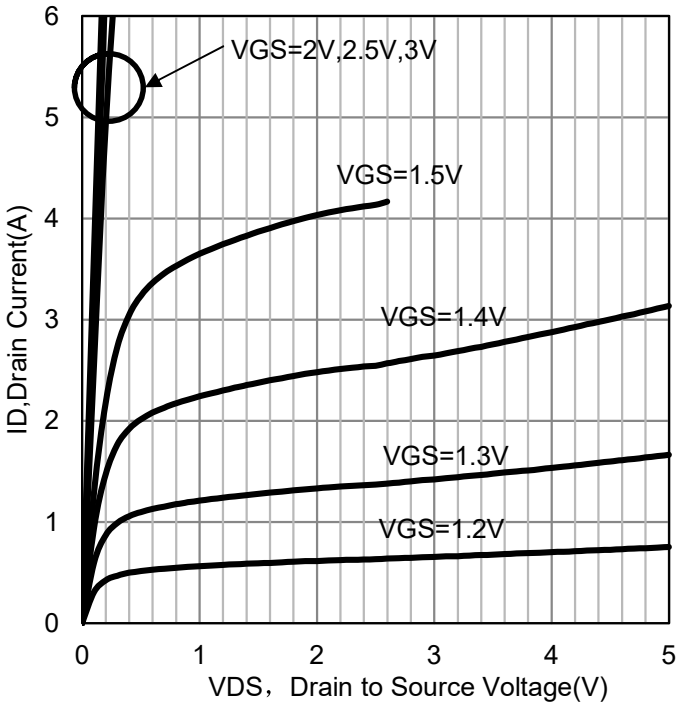
RDS(on) vs. Tj



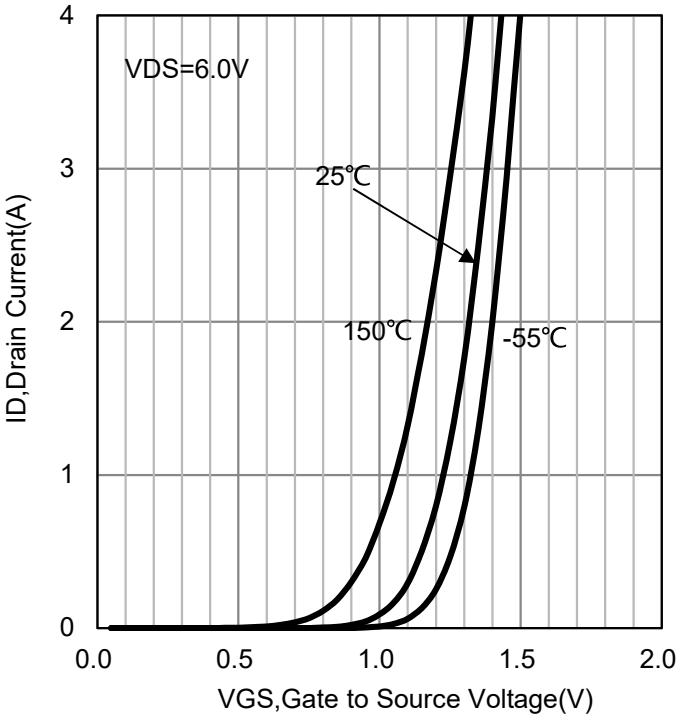
VGSTH vs. Tj

6. ELECTRICAL CHARACTERISTICS CURVES(Con.)

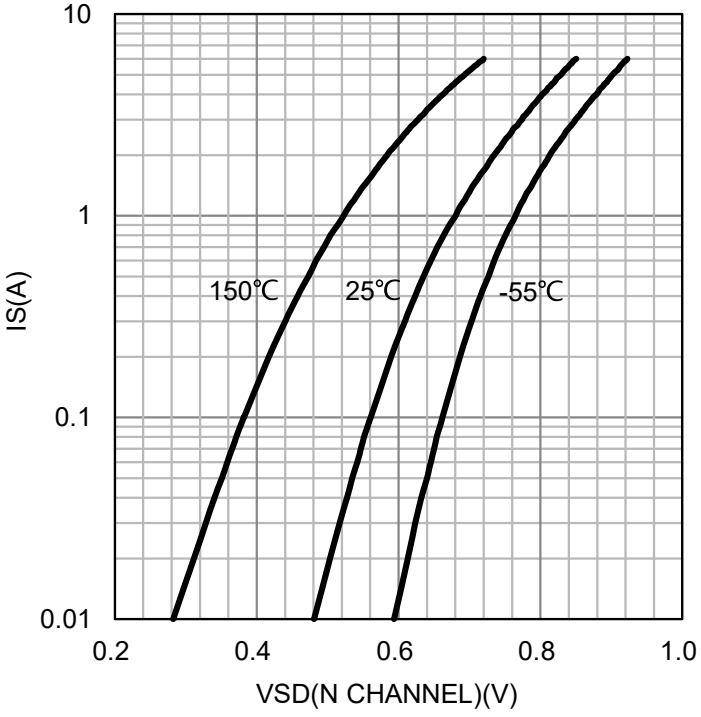
N-Channel



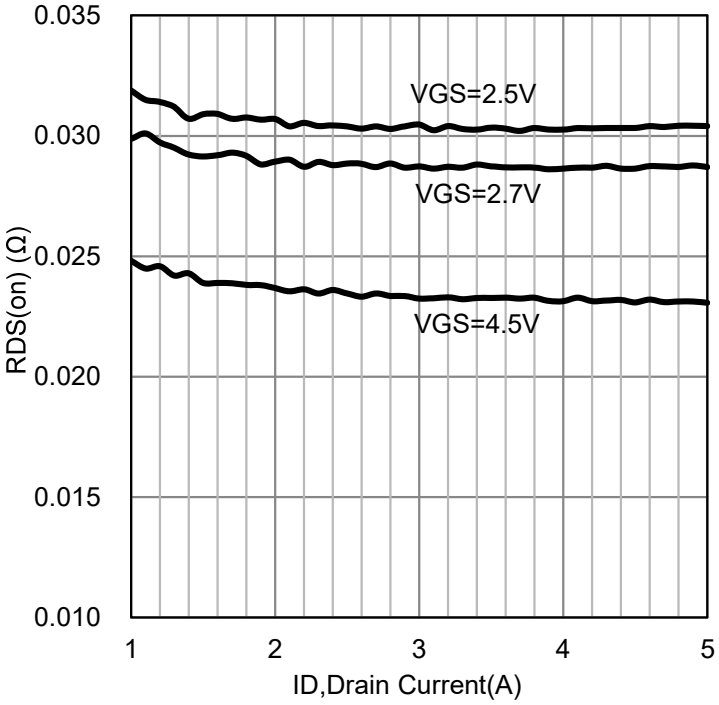
ID vs. VDS



ID vs. VGS



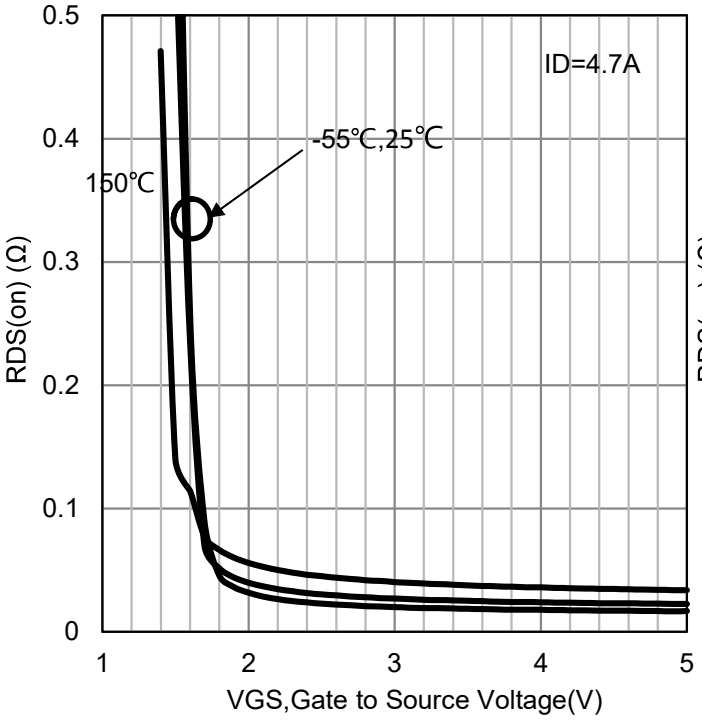
IS vs. VSD



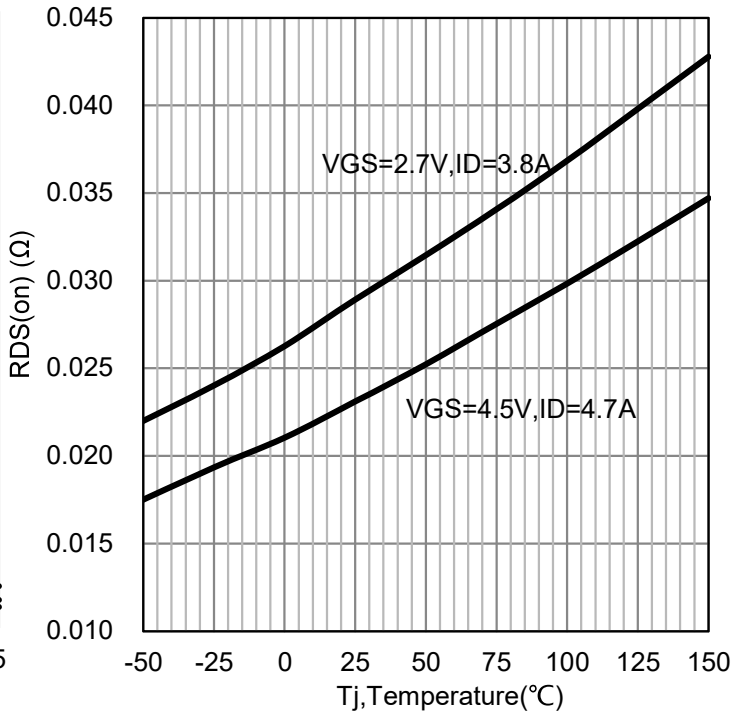
RDS(on) vs. ID

6. ELECTRICAL CHARACTERISTICS CURVES(Con.)

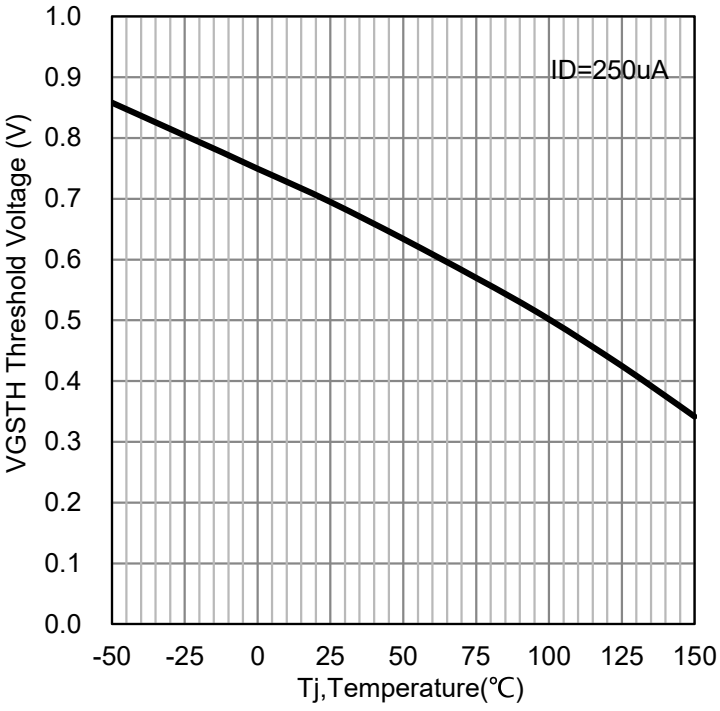
N-Channel



RDS(on) vs. VGS

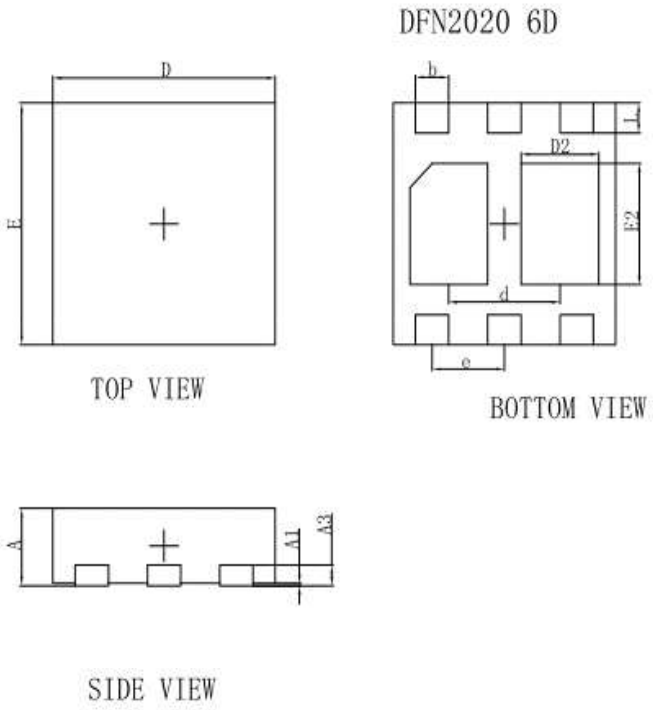


RDS(on) vs. Tj



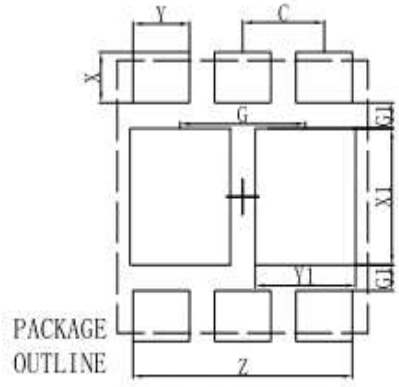
VGSTH vs. Tj

7.OUTLINE AND DIMENSIONS



DFN2020-6D			
Dim	Min	Typ	Max
D	1.95	2	2.05
E	1.95	2	2.05
e	-	0.65	-
L	0.20	0.25	0.30
b	0.25	0.3	0.35
d	-	1	-
A	0.60	0.65	0.70
A1	0.00	0.02	0.05
A3	-	0.152	-
E2	0.95	1	1.05
D2	0.65	0.7	0.75
All Dimensions in mm			

8.SOLDERING FOOTPRINT



Dimensions	(mm)
X	0.37
Y	0.45
X1	1.00
Y1	0.80
C	0.65
G	1.00
G1	0.19
Z	1.75
C	0.65