



YOUSHANG SEMICONDUCTOR

**设计研发新型功率器件**

**各类小信号开关**

**中低压及高压大电流等场效应管**

0755-83047638  
ysbdt@szyoushang.cn  
www.szyoushang.cn



企业微信二维码



企业QQ二维码

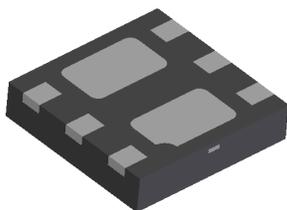
## Features

- Combination of PNP low  $V_{CE(sat)}$  Transistor and N-Channel MOSFET
- Very low collector-emitter saturation voltage  $V_{CE(sat)}$
- High Collector Current Capability  $I_C$  and  $I_{CM}$
- High Collector Current Gain ( $h_{FE}$ ) at high  $I_C$
- $P_D$  up to 2.47W for power demanding applications

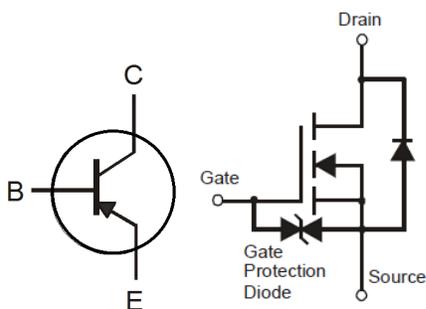
## Mechanical Data

- Case: U-DFN2020-6 (Type B)
- UL Flammability Rating 94V-0
- Case Material: Molded Plastic. "Green" Molding Compound.
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - NiPdAu, Solderable per MIL-STD-202, Method 208 (e4)
- Weight: 0.007 grams (Approximate)

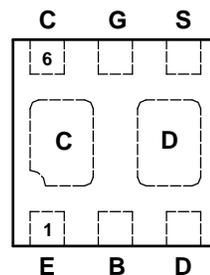
U-DFN2020-6  
(Type B)



Top View



Device Symbol



Top View  
Pin-Out

**BJT Absolute Maximum Ratings** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	$V_{CBO}$	-35	V
Collector-Emitter Voltage	$V_{CEO}$	-25	V
Emitter-Base Voltage	$V_{EBO}$	-7	V
Continuous Collector Current	$I_C$	-3	A
Peak Pulse Current	$I_{CM}$	-6	A
Base Current	$I_B$	-500	mA

**MOSFET Absolute Maximum Ratings** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Value	Units
Drain-Source Voltage	$V_{DSS}$	20	V
Gate-Source Voltage	$V_{GSS}$	$\pm 6$	V
Continuous Drain Current (Note 5) $V_{GS} = 10\text{ V}$	$I_D$	@ $T_A = +25^\circ\text{C}$ 0.63	A
		@ $T_A = +85^\circ\text{C}$ 0.45	
Pulsed Drain Current	$I_{DM}$	6	A

**Thermal Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

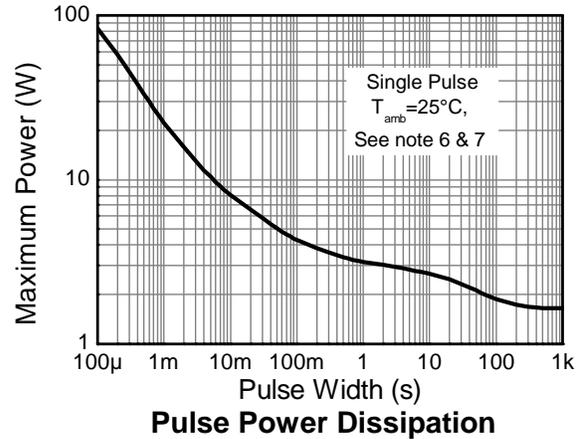
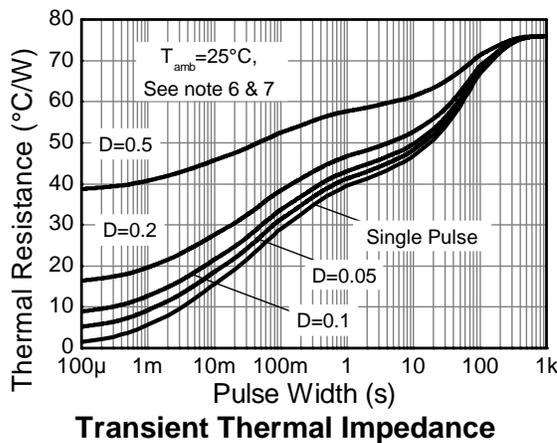
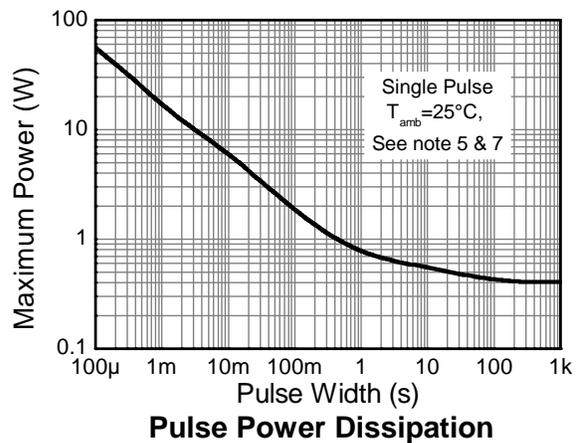
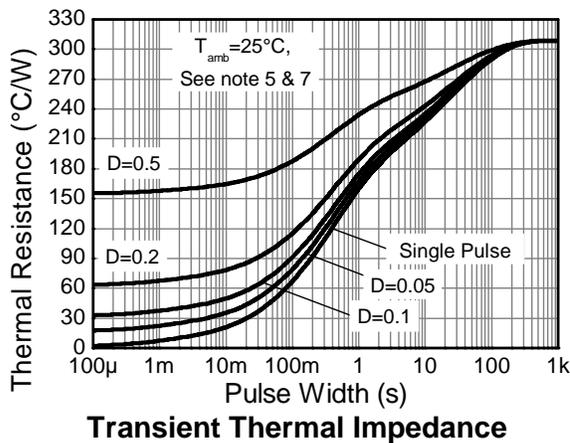
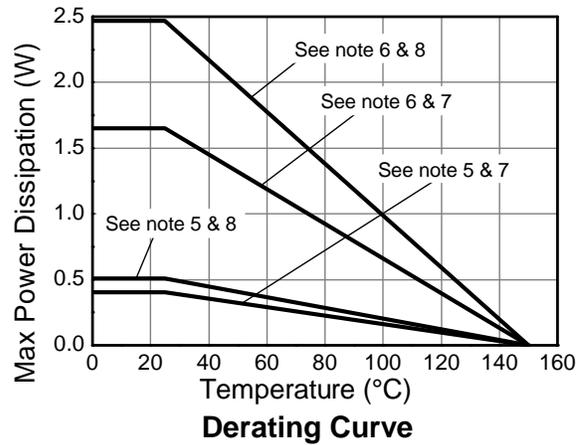
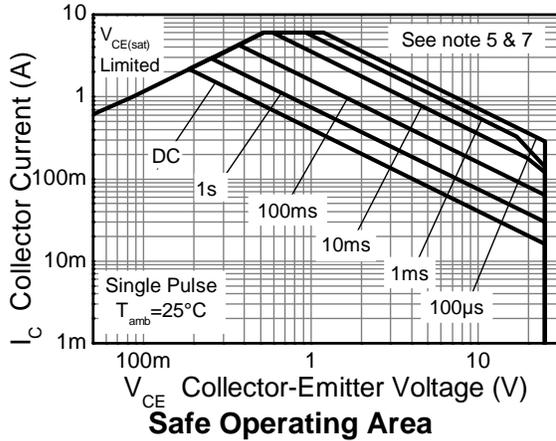
Characteristic	Symbol	Value	Unit
Power Dissipation	$P_D$	(Notes 5 & 7) 405	mW
		(Notes 5 & 8) 510	
		(Notes 6 & 7) 1,650	
		(Notes 6 & 8) 2,470	
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	(Notes 5 & 7) 308	$^\circ\text{C/W}$
		(Notes 5 & 8) 245	
		(Notes 6 & 7) 76	
		(Notes 6 & 8) 51	
Thermal Resistance, Junction to Lead	(Note 9) $R_{\theta JL}$	18	$^\circ\text{C/W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

**ESD Ratings** (Note 10)

Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge – Human Body Model	ESD HBM	3,000	V	3A
Electrostatic Discharge – Machine Model	ESD MM	200	V	C

- Notes:
- For a device mounted with the exposed collector pads on minimum recommended pad layout that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in a steady-state.
  - Same as note (5), except the device is mounted with the collector pad on 28mm x 28mm (8cm<sup>2</sup>) 2oz copper.
  - For a dual device with one active die.
  - For dual device with 2 active die running at equal power.
  - Thermal resistance from junction to solder-point (on the exposed collector pads).
  - Refer to JEDEC specification JESD22-A114 and JESD22-A115.

**Thermal Characteristics and Derating information**

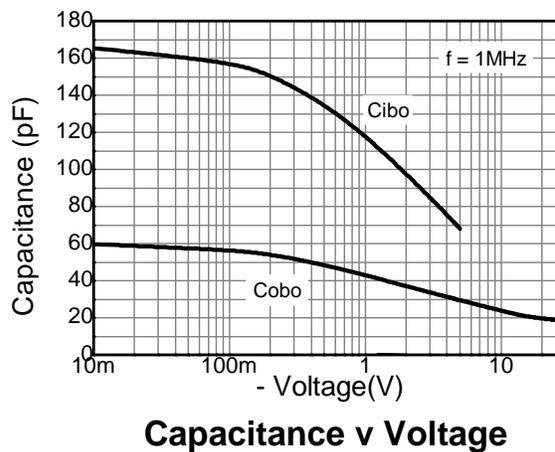
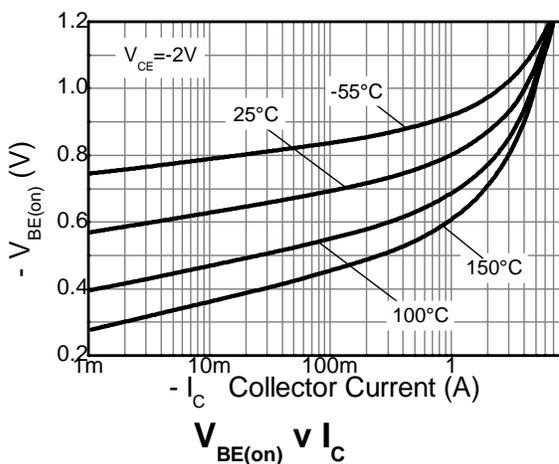
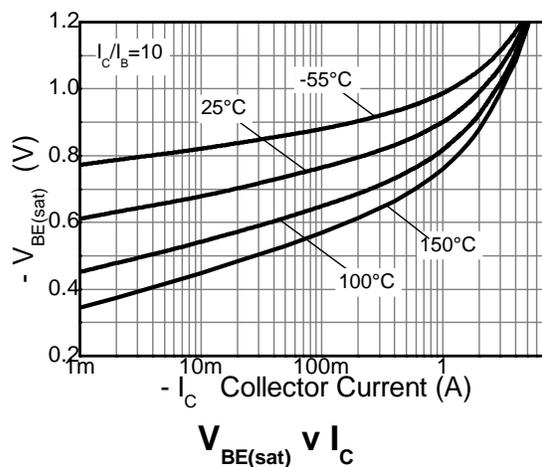
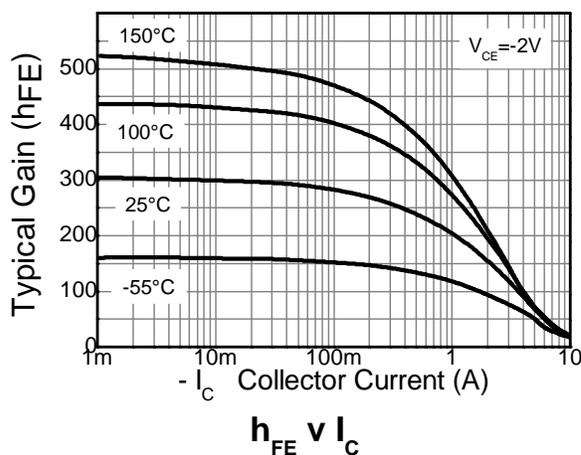
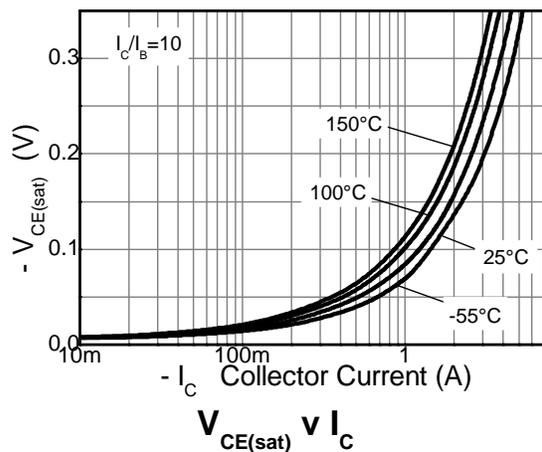
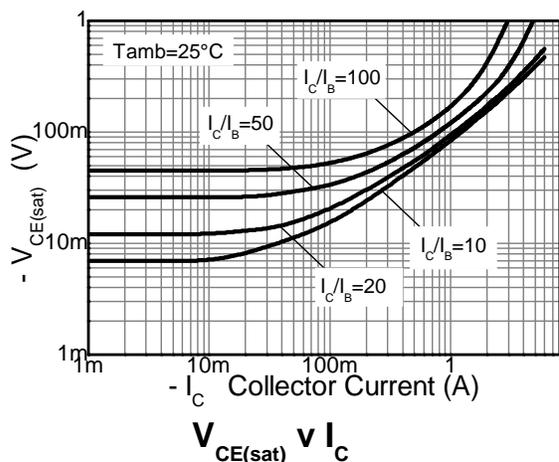


**Typical Electrical Characteristics - BJT PNP** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	$BV_{CBO}$	-35	-60	-	V	$I_C = -100\mu\text{A}$
Collector-Emitter Breakdown Voltage (Note 11)	$BV_{CEO}$	-25	-40	-	V	$I_C = -10\text{mA}$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	-7	-8.4	-	V	$I_E = -100\mu\text{A}$
Collector Cutoff Current	$I_{CBO}$	-	<1	-50 -0.5	nA $\mu\text{A}$	$V_{CB} = -28\text{V}$ $V_{CB} = -28\text{V}, T_A = +100^\circ\text{C}$
Emitter Cutoff Current	$I_{EBO}$	-	<1	-50	nA	$V_{EB} = -5.6\text{V}$
Collector Emitter Cutoff Current	$I_{CES}$	-	-	-100	nA	$V_{CE} = -32\text{V}$
Static Forward Current Transfer Ratio (Note 11)	$h_{FE}$	200 130 100 25	320 230 180 50	500 -	-	$I_C = -100\text{mA}, V_{CE} = -2\text{V}$ $I_C = -1\text{A}, V_{CE} = -2\text{V}$ $I_C = -2\text{A}, V_{CE} = -2\text{V}$ $I_C = -6\text{A}, V_{CE} = -2\text{V}$
Collector-Emitter Saturation Voltage (Note 11)	$V_{CE(sat)}$	-	-85 -229	-150 -350	mV	$I_C = -1\text{A}, I_B = -100\text{mA}$ $I_C = -3\text{A}, I_B = -300\text{mA}$
Base-Emitter Turn-On Voltage (Note 11)	$V_{BE(on)}$	-	-786	-850	mV	$I_C = -1\text{A}, V_{CE} = -5\text{V}$
Base-Emitter Saturation Voltage (Note 11)	$V_{BE(sat)}$	-	-895	-1,000	mV	$I_C = -1\text{A}, I_B = -100\text{mA}$

 Note: 11. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

**Typical Electrical Characteristics - BJT PNP** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



**Typical Electrical Characteristics – MOS N-Channel** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 12)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	20	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
Zero Gate Voltage Drain Current T <sub>J</sub> = +25°C	I <sub>DSS</sub>	—	—	100	nA	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±1.0	μA	V <sub>GS</sub> = ±4.5V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 12)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	0.5	—	1.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	—	0.3	0.4	Ω	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 600mA
			0.4	0.5		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 500mA
			0.5	0.7		V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 350mA
Forward Transfer Admittance	Y <sub>FS</sub>	—	1.4	—	S	V <sub>DS</sub> = 10V, I <sub>D</sub> = 400mA
Diode Forward Voltage	V <sub>SD</sub>	—	0.7	1.2	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 150mA
<b>DYNAMIC CHARACTERISTICS (Note 13)</b>						
Input Capacitance	C <sub>iss</sub>	—	60.67	—	pF	V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	9.68	—	pF	
Reverse Transfer Capacitance	C <sub>riss</sub>	—	5.37	—	pF	
Total Gate Charge	Q <sub>G</sub>	—	736.6	—	pC	V <sub>GS</sub> = 4.5V, V <sub>DS</sub> = 10V, I <sub>D</sub> = 250mA
Gate-to-Source Charge	Q <sub>GS</sub>	—	93.6	—	pC	
Gate-to-Drain Charge	Q <sub>GD</sub>	—	116.6	—	pC	
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	t <sub>d(on)</sub>	—	5.1	—	ns	V <sub>DD</sub> = 10V, V <sub>GS</sub> = 4.5V, R <sub>L</sub> = 47Ω, R <sub>G</sub> = 10Ω, I <sub>D</sub> = 200mA
Rise Time	t <sub>r</sub>	—	7.4	—		
Turn-Off Delay Time	t <sub>d(off)</sub>	—	26.7	—		
Fall Time	t <sub>f</sub>	—	12.3	—		

Notes: 12. Short duration pulse test used to minimize self-heating effect.  
 13. Guaranteed by design. Not subject to production testing.

Typical Electrical Characteristics – MOS N-Channel (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

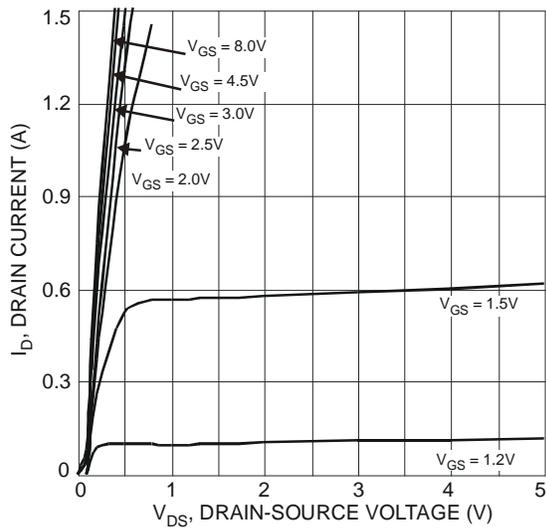


Fig. 1 Typical Output Characteristics

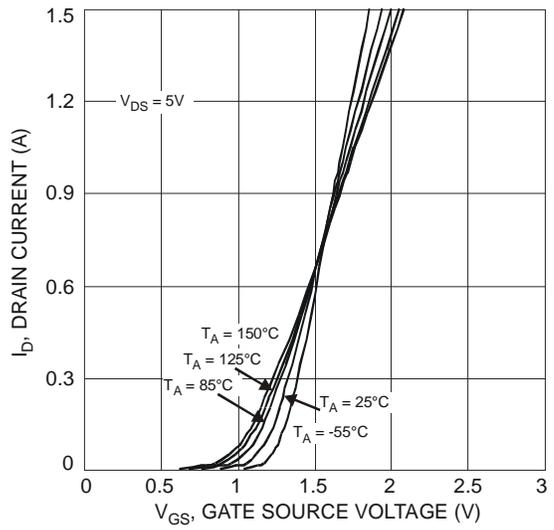


Fig. 2 Typical Transfer Characteristics

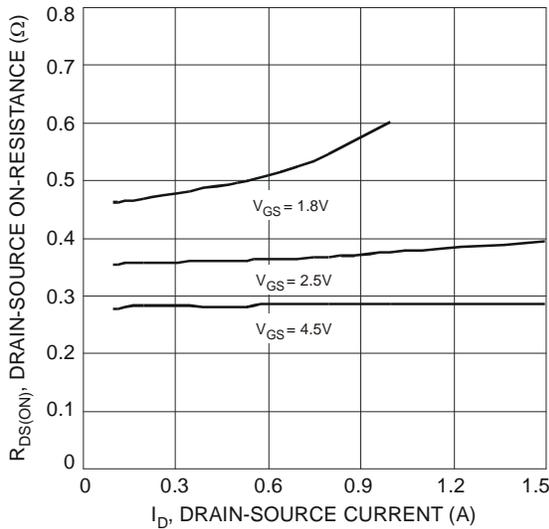


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

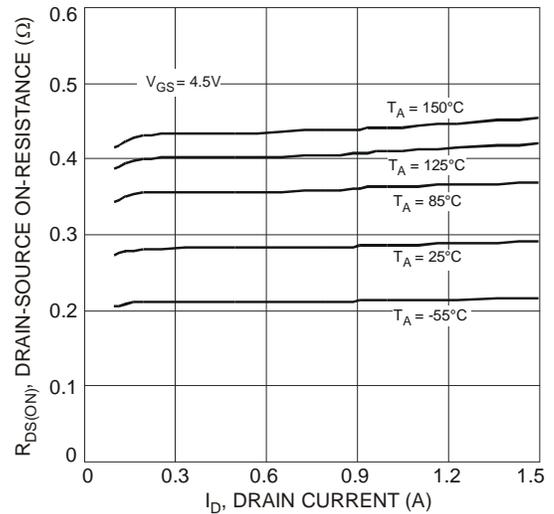


Fig. 4 Typical Drain-Source On-Resistance vs. Drain Current and Temperature

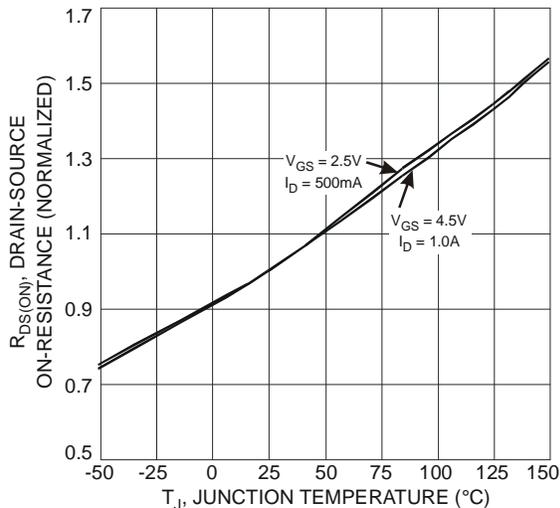


Fig. 5 On-Resistance Variation with Temperature

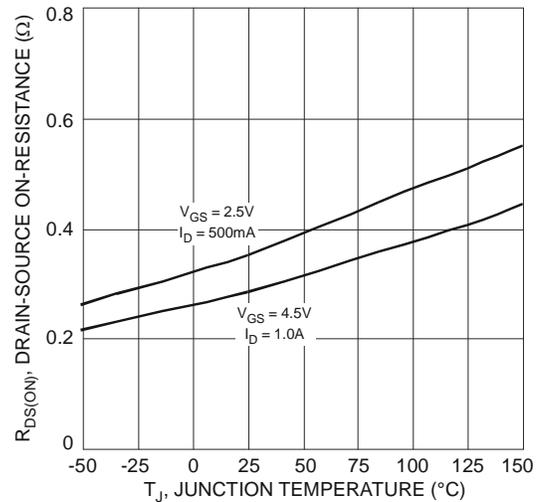


Fig. 6 On-Resistance Variation with Temperature

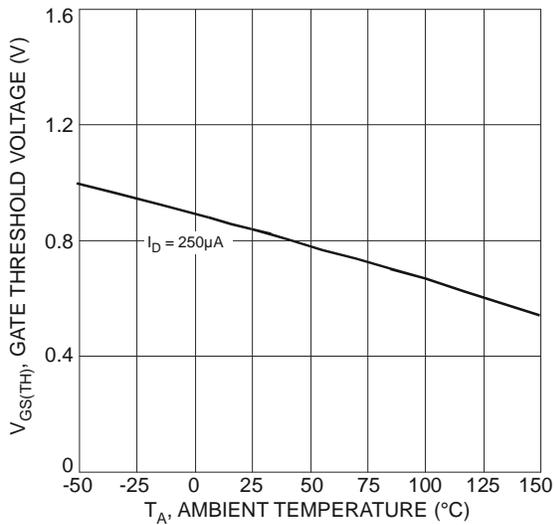


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

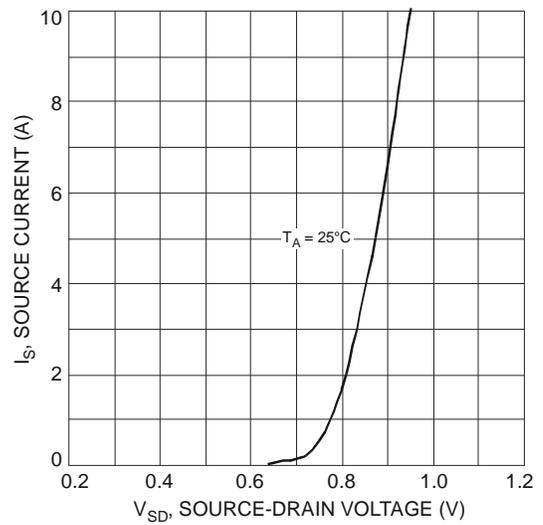


Fig. 8 Diode Forward Voltage vs. Current

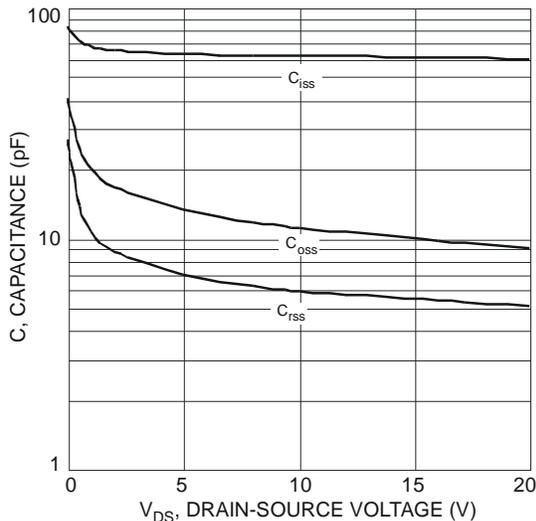


Fig. 9 Typical Capacitance

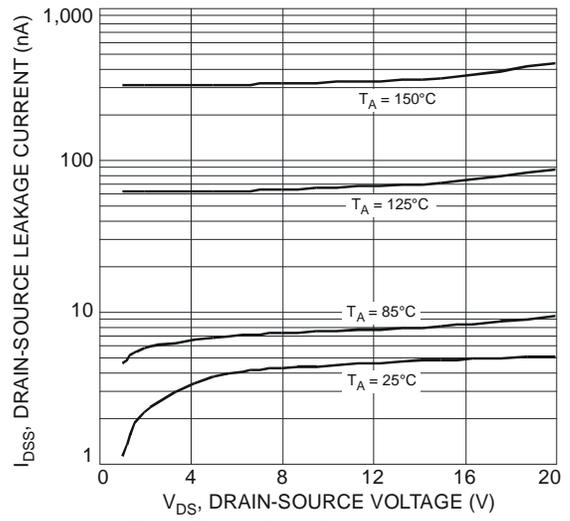


Fig. 10 Typical Drain-Source Leakage Current vs. Drain-Source Voltage

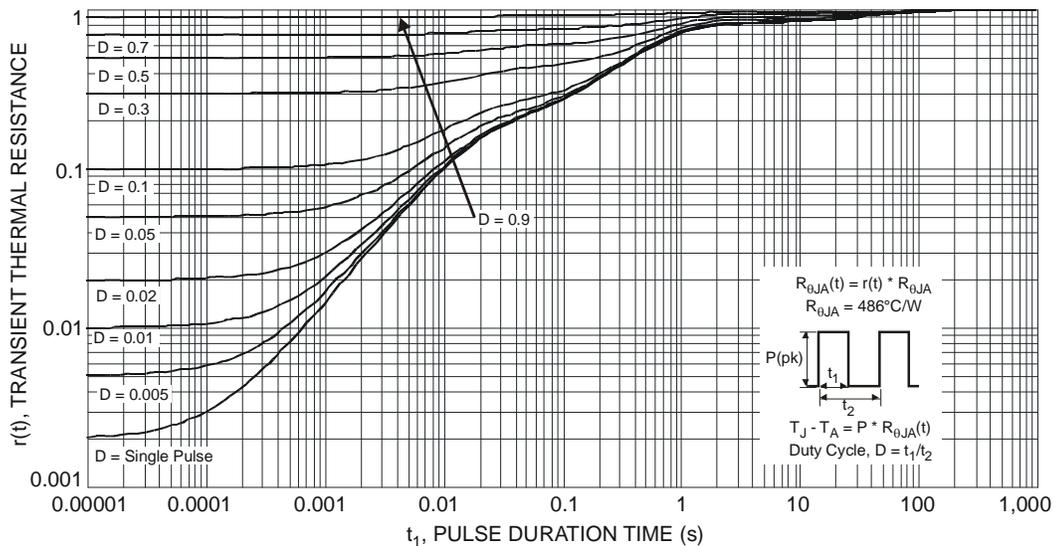
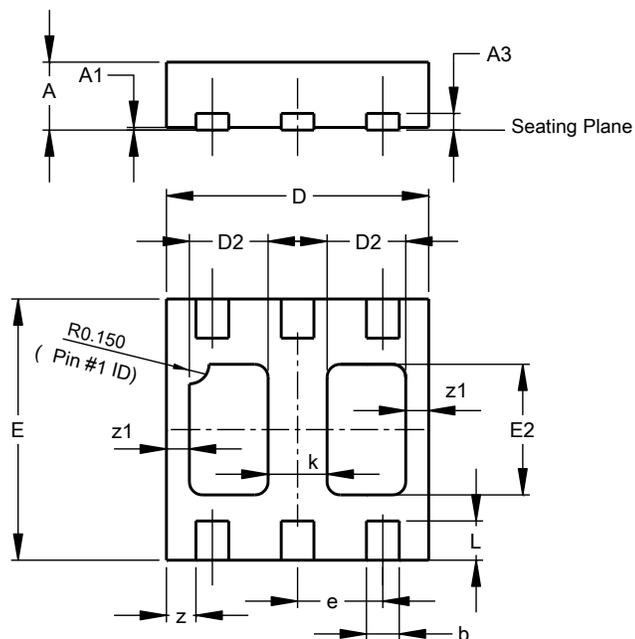


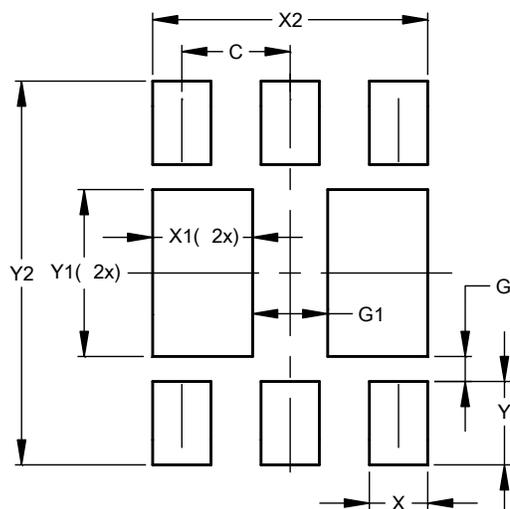
Fig. 11 Transient Thermal Response

## Package Outline Dimensions



U-DFN2020-6 Type B			
Dim	Min	Max	Typ
A	0.545	0.605	0.575
A1	0.00	0.05	0.02
A3	-	-	0.13
b	0.20	0.30	0.25
D	1.95	2.075	2.00
D2	0.50	0.70	0.60
e	-	-	0.65
E	1.95	2.075	2.00
E2	0.90	1.10	1.00
k	-	-	0.45
L	0.25	0.35	0.30
z	-	-	0.225
z1	-	-	0.175
All Dimensions in mm			

## Suggested Pad Layout



Dimensions	Value (in mm)
C	0.650
G	0.150
G1	0.450
X	0.350
X1	0.600
X2	1.650
Y	0.500
Y1	1.000
Y2	2.300