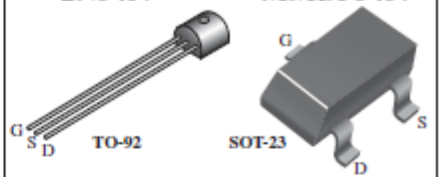
1. Define the region of operation for the 2N5457 JFET using the range of I_{DSS} and V_P provided. That is, sketch the transfer curve defined by the maximum I_{DSS} and V_P and the transfer curve for the minimum I_{DSS} and V_P. Then, shade in the resulting area between the two curves.

2. For the 2N5457 JFET, what is the power rating at a typical operating temperature of 45°C using the 5.0 mW/°C derating factor.

FAIRCHILD
SEMICONDUCTOR ™

2N5457 **MMBF5457**



NOTE: Source & Drain are interchangeable

N-Channel General Purpose Amplifier

This device is a low-level audio amplifier and switching transistor, and can be used for analog switching applications.

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Units
V_{DS}	Drain-Source Voltage	25	V
V_{DG}	Drain-Gate Voltage	25	V
V_{GS}	Gate-Source Voltage	–25	V
I_{GF}	Forward Gate Current	10	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	–55 to +150	°C

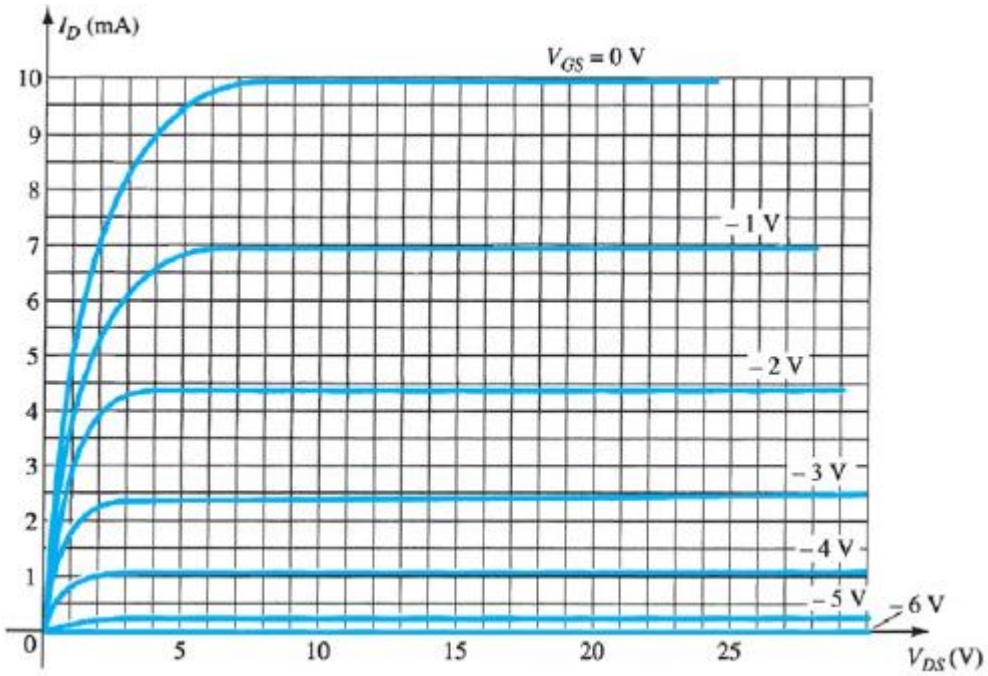
THERMAL CHARACTERISTICS

Symbol	Characteristic	Max		Units
		2N5457	*MMBF5457	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	350 2.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	125		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	357	556	°C/W

ELECTRICAL CHARACTERISTICS $T_A = 25°C$ unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
OFF CHARACTERISTICS							
$V_{(BR)GSS}$	Gate-Source Breakdown Voltage	$I_G = 10\ \mu A$, $V_{DS} = 0$		–25			V
I_{GSS}	Gate Reverse Current	$V_{GS} = -15$ V, $V_{DS} = 0$ $V_{GS} = -15$ V, $V_{DS} = 0$, $T_A = 100°C$				–1.0 –200	nA nA
$V_{GS(off)}$	Gate-Source Cutoff Voltage	$V_{DS} = 15$ V, $I_D = 10$ nA	5457	–0.5		–6.0	V
V_{GS}	Gate-Source Voltage	$V_{DS} = 15$ V, $I_D = 100\ \mu A$	5457		–2.5		V
ON CHARACTERISTICS							
I_{DSS}	Zero-Gate Voltage Drain Current	$V_{DS} = 15$ V, $V_{GS} = 0$	5457	1.0	3.0	5.0	mA
SMALL SIGNAL CHARACTERISTICS							
g_{fs}	Forward Transfer Conductance	$V_{DS} = 15$ V, $V_{GS} = 0$, f = 1.0 kHz	5457	1000		5000	μmhos
g_{os}	Output Conductance	$V_{DS} = 15$ V, $V_{GS} = 0$, f = 1.0 MHz			10	50	μmhos
C_{iss}	Input Capacitance	$V_{DS} = 15$ V, $V_{GS} = 0$, f = 1.0 MHz			4.5	7.0	pF
C_{rss}	Reverse Transfer Capacitance	$V_{DS} = 15$ V, $V_{GS} = 0$, f = 1.0 MHz			1.5	3.0	pF
NF	Noise Figure	$V_{DS} = 15$ V, $V_{GS} = 0$, f = 1.0 kHz, $R_G = 1.0$ megohm, BW = 1.0 Hz				3.0	dB

3. Define the region of operation for the JFET below, if $V_{DSmax} = 30$ V and $P_{Dmax} = 100$ mW.



4.

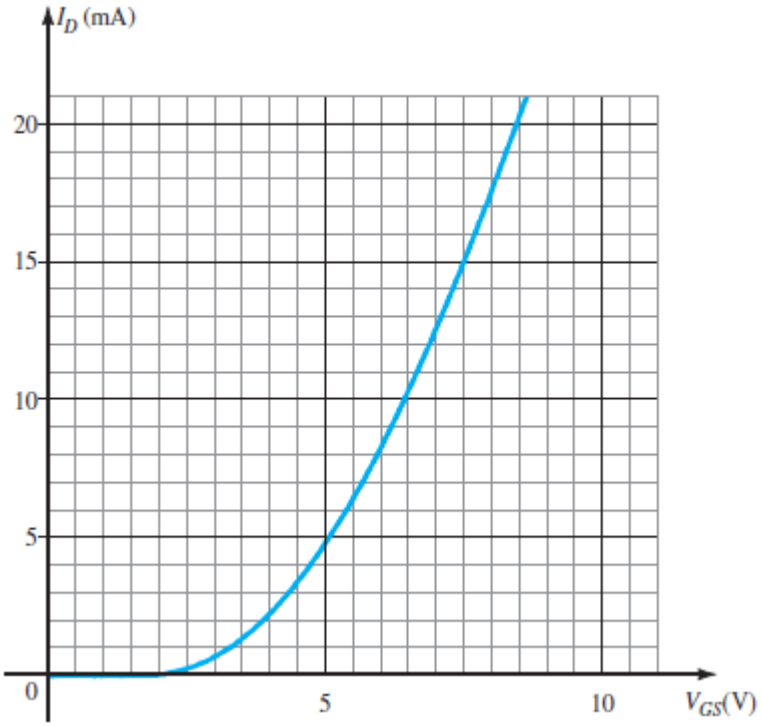
a. Given $V_{GS(Th)} = 4$ V and $I_{D(on)} = 4$ mA at $V_{GS(on)} = 6$ V, determine k and write the general expression for I_D in the format of

$$I_D = k(V_{GS} - V_T)^2$$

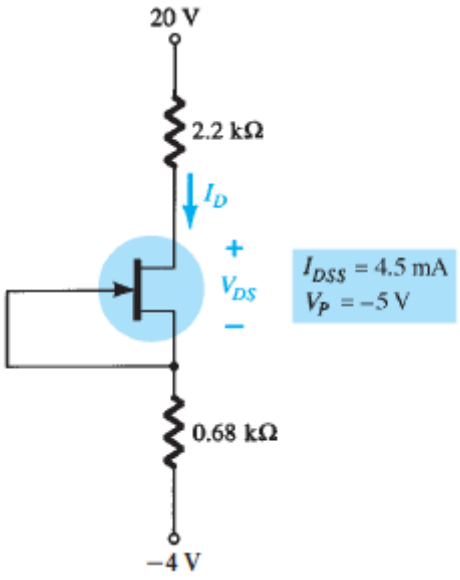
b. Sketch the transfer characteristics for the device of part (a).

c. Determine I_D for the device of part (a) at $V_{GS} = 2$, 5, and 10 V.

5. Given the transfer characteristics of Fig. 6.55 , determine V_T and k and write the general equation for I_D .



6. For the network determine:
   - **a.** I_D.
   - **b.** V_{DS}.
   - **c.** V_D.
   - **d.** V_S.



7. Determine the value of R_S for the network to establish V_D = 10 V.

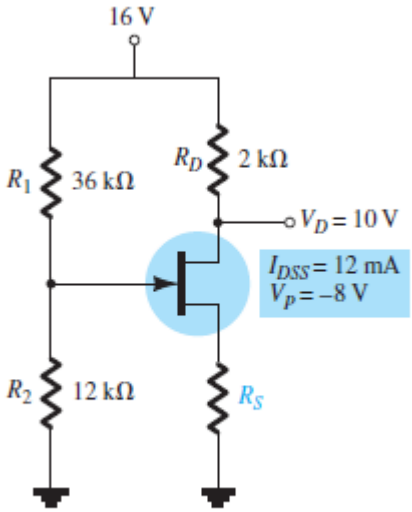


FIG. 7.87

8. For the combination network of, determine:

a. V_B and V_G.
b. V_E.
c. I_E, I_C, and I_D.
d. I_B.
e. V_C, V_S, and V_D.
f. V_{CE}.
g. V_{DS}.