

TENTATIVE TOSHIBA FIELD EFFECT TRANSISTOR SILICON N, P CHANNEL MOS TYPE (U-MOSII)

TPC8401

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS

DC-DC CONVERTER, RELAY DRIVE AND MOTOR DRIVE APPLICATIONS

INDUSTRIAL APPLICATIONS

Unit in mm

- Low Drain-Source ON Resistance
: P CANNEL $R_{DS(ON)} = 23 \text{ m}\Omega$ (Typ.)
N CANNEL $R_{DS(ON)} = 15 \text{ m}\Omega$ (Typ.)
- High Forward Transfer Admittance
: P CANNEL $|Y_{fs}| = 7 \text{ S}$ (Typ.)
N CANNEL $|Y_{fs}| = 12 \text{ S}$ (Typ.)
- Low Leakage Current
: P CANNEL $I_{DSS} = -10 \mu\text{A}$ ($V_{DS} = -30 \text{ V}$)
N CANNEL $I_{DSS} = 10 \mu\text{A}$ ($V_{DS} = 30 \text{ V}$)
- Enhancement-Mode: P CANNEL $V_{th} = -0.8 \sim -2.5 \text{ V}$
($V_{DS} = -10 \text{ V}$, $I_D = -1 \text{ mA}$)
N CANNEL $V_{th} = 0.8 \sim 2.5 \text{ V}$
($V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$)

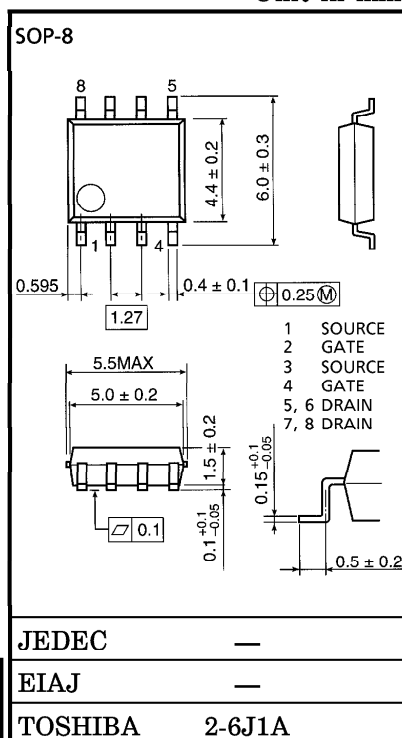
MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

CHARACTERISTIC		SYMBOL	RATING		UNIT
			P CANNEL	N CANNEL	
Drain-Source Voltage		V _{DSS}	−30	30	V
Drain-GateVoltage (R _{GS} = 20 kΩ)		V _{DGR}	−30	30	V
Gate-Source Voltage		V _{GSS}	±20	±20	V
Drain Current	DC	I _D	−4.5	4.5	A
	Pulse	I _{DP}	−18	18	A
Drain Power Dissipation (T _c = 25°C)		P _D	2.0		W
Channel Temperature		T _{ch}	150		°C
Storage Temperature Range		T _{stg}	−55~150		°C

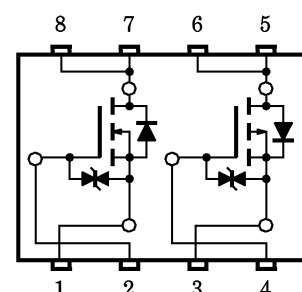
THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Channel to Ambient	$R_{th(ch-a)}$	62.5	$^\circ\text{C/W}$

This transistor is an electrostatic sensitive device. Please handle with caution.



CIRCUIT CONFIGURATION



961001EAA1

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ELECTRICAL CHARACTERISTICS (Ta = 25°C)

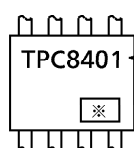
CHARACTERISTIC	SYMBOL	P / N	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current	I _{GSS}	P, N	V _{GS} = ±16 V, V _{DS} = 0 V	—	—	±10	μA
Drain Cut-Off Current	I _{DSS}	P	V _{DS} = -30 V, V _{GS} = 0 V	—	—	-10	μA
		N	V _{DS} = 30 V, V _{GS} = 0 V	—	—	10	
Drain-Source Breakdown Voltage	V _(BR) DSS	P	I _D = -10 mA, V _{GS} = 0 V	-30	—	—	V
		N	I _D = 10 mA, V _{GS} = 0 V	30	—	—	
	V _(BR) DSX	P	I _D = 10 mA, V _{GS} = 20 V	15	—	—	
		N	I _D = -10 mA, V _{GS} = -20 V	-15	—	—	
Gate Threshold Voltage	V _{th}	P	V _{DS} = -10 V, I _D = -1 mA	-0.8	—	-2.5	V
		N	V _{DS} = 10 V, I _D = 1 mA	0.8	—	2.5	
Drain-Source ON Resistance	R _{DS} (ON)	P	V _{GS} = -4 V, I _D = -1.8 A	—	40	65	mΩ
			V _{GS} = -10 V, I _D = -1.8 A	—	23	39	
		N	V _{GS} = 4 V, I _D = 1.8 A	—	21	37	
			V _{GS} = 10 V, I _D = 1.8 A	—	15	21	
Forward Transfer Admittance	Y _{fs}	P	V _{DS} = -10 V, I _D = -1.8 A	3.5	7	—	S
		N	V _{DS} = 10 V, I _D = 1.8 A	6	12	—	
Input Capacitance	C _{iss}	P	V _{DS} = -10 V, V _{GS} = 0 V, f = 1 MHz	—	970	—	pF
		N	V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz	—	1700	—	
Reverse Transfer Capacitance	C _{rss}	P	V _{DS} = -10 V, V _{GS} = 0 V, f = 1 MHz	—	180	—	
		N	V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz	—	260	—	
Output Capacitance	C _{oss}	P	V _{DS} = -10 V, V _{GS} = 0 V, f = 1 MHz	—	370	—	
		N	V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz	—	380	—	
Switching Time	t _r	P	V _{GS} = -10 V, I _D = -1.8 A R _L = 8.3 Ω	—	17	—	ns
		N	V _{GS} = 10 V, I _D = 1.8 A R _L = 8.3 Ω	—	10	—	
	t _{on}	P	V _{GS} = -10 V, I _D = -1.8 A R _L = 8.3 Ω	—	20	—	
		N	V _{GS} = 10 V, I _D = 1.8 A R _L = 8.3 Ω	—	20	—	
	t _f	P	V _{GS} = -10 V, I _D = -1.8 A R _L = 8.3 Ω	—	75	—	
		N	V _{GS} = 10 V, I _D = 1.8 A R _L = 8.3 Ω	—	35	—	
	t _{off}	P	V _{GS} = -10 V, I _D = -1.8 A R _L = 8.3 Ω	—	160	—	ns
		N	V _{GS} = 10 V, I _D = 1.8 A R _L = 8.3 Ω	—	120	—	

CHARACTERISTIC	SYMBOL	P / N	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Switching Time	t_r	P	$V_{GS} = -10\text{ V}$, $I_D = -1.8\text{ A}$ $R_L = 8.3\ \Omega$	—	17	—	ns
		N	$V_{GS} = 10\text{ V}$, $I_D = 1.8\text{ A}$ $R_L = 8.3\ \Omega$	—	10	—	
	t_{on}	P	$V_{GS} = -10\text{ V}$, $I_D = -1.8\text{ A}$ $R_L = 8.3\ \Omega$	—	20	—	
		N	$V_{GS} = 10\text{ V}$, $I_D = 1.8\text{ A}$ $R_L = 8.3\ \Omega$	—	20	—	
	t_f	P	$V_{GS} = -10\text{ V}$, $I_D = -1.8\text{ A}$ $R_L = 8.3\ \Omega$	—	75	—	
		N	$V_{GS} = 10\text{ V}$, $I_D = 1.8\text{ A}$ $R_L = 8.3\ \Omega$	—	35	—	
	t_{off}	P	$V_{GS} = -10\text{ V}$, $I_D = -1.8\text{ A}$ $R_L = 8.3\ \Omega$	—	160	—	ns
		N	$V_{GS} = 10\text{ V}$, $I_D = 1.8\text{ A}$ $R_L = 8.3\ \Omega$	—	120	—	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS ($T_a = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	P / N	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	I_{DR}	P	—	—	—	-4.5	A
		N	—	—	—	4.5	
Pulse Drain Reverse Current	I_{DRP}	P	—	—	—	-18	A
		N	—	—	—	18	
Diode Forward Voltage	V_{DSF}	P	$I_{DR} = -4.5\text{ A}$, $V_{GS} = 0\text{ V}$	—	—	1.2	V
		N	$I_{DR} = 4.5\text{ A}$, $V_{GS} = 0\text{ V}$	—	—	-1.2	

MARKING



TYPE

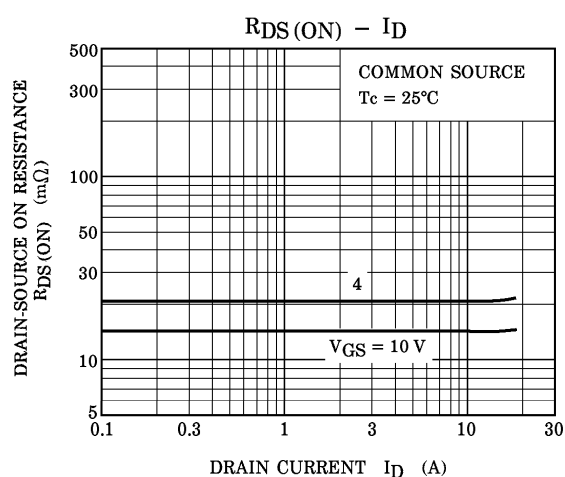
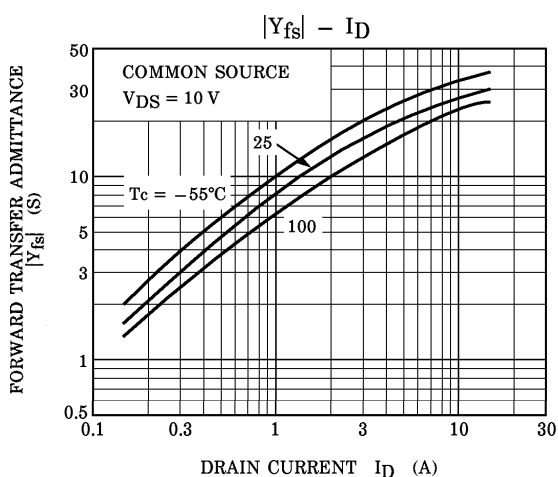
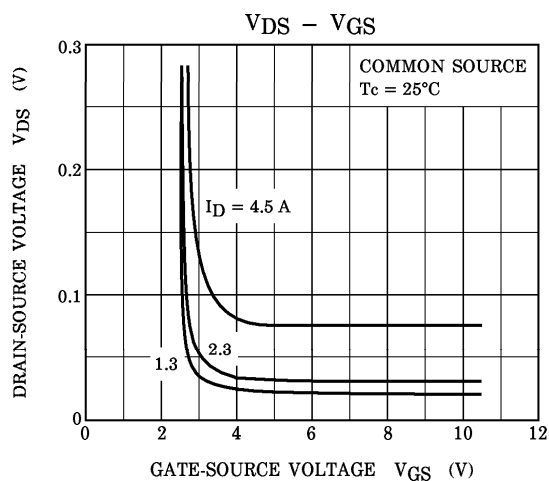
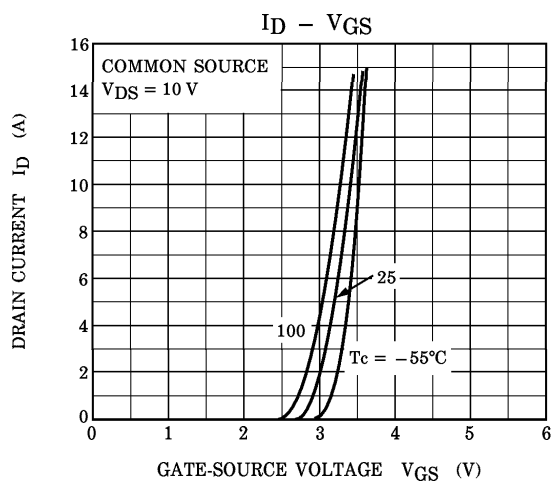
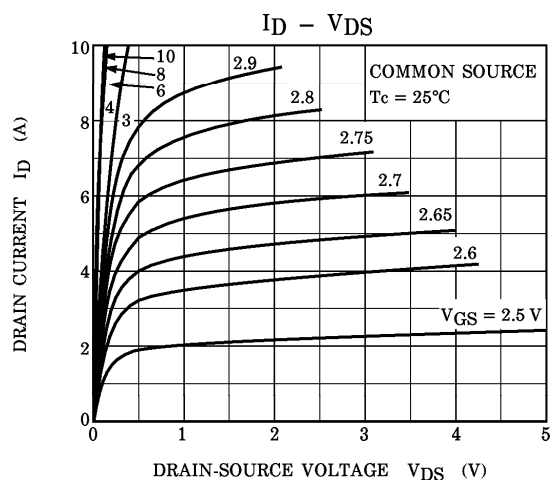
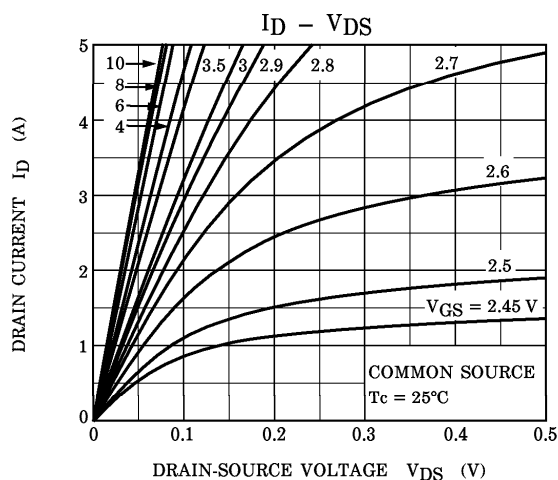
※ Lot Number



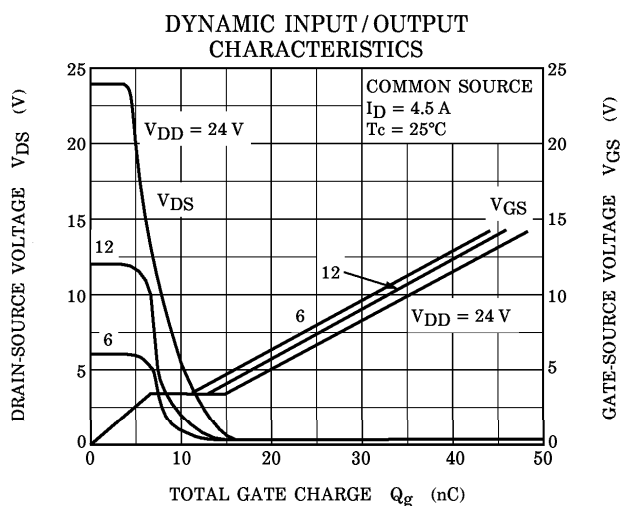
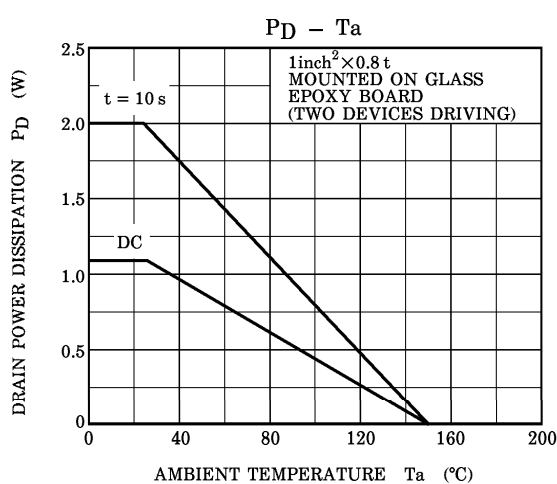
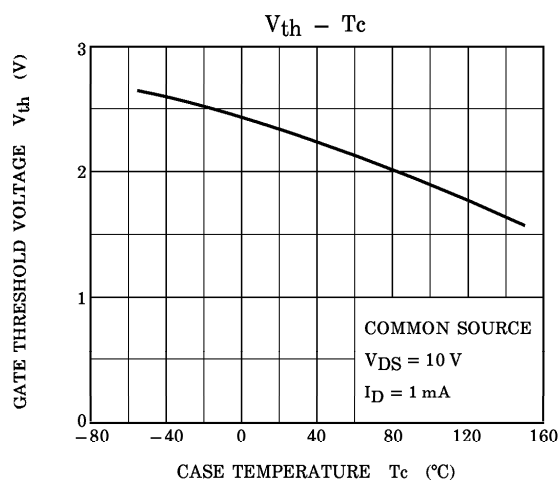
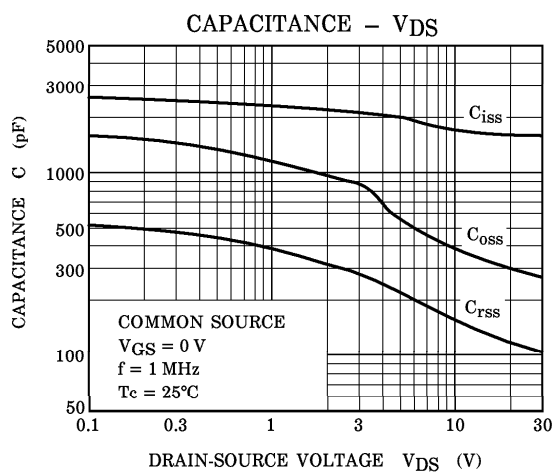
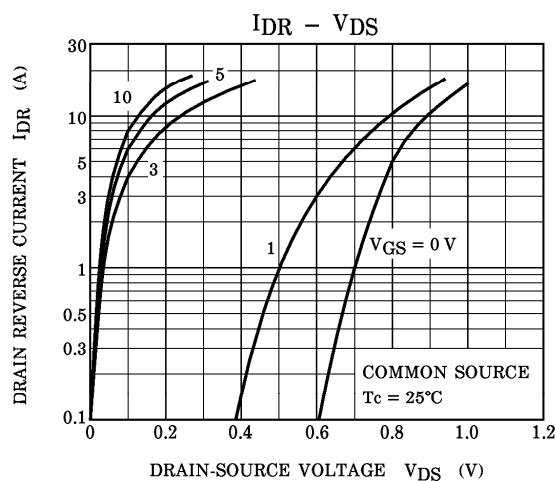
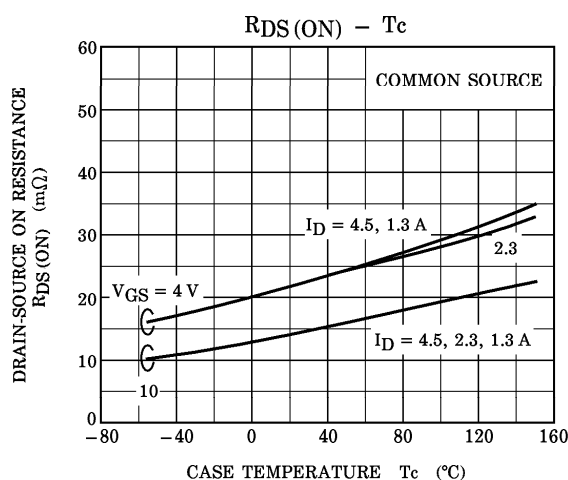
Month (Starting from Alphabet A)

Year (Last Number of the Christian Era)

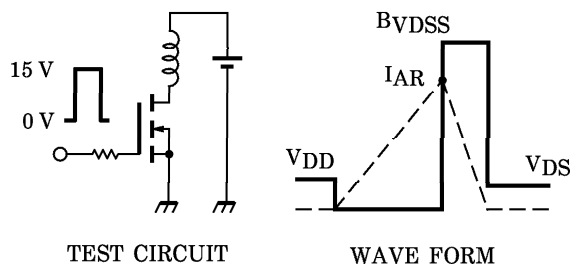
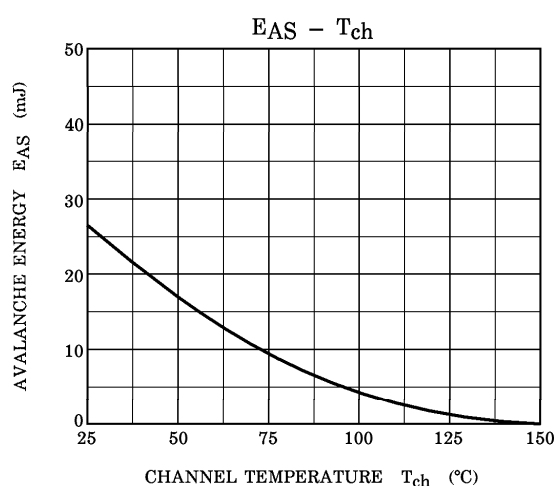
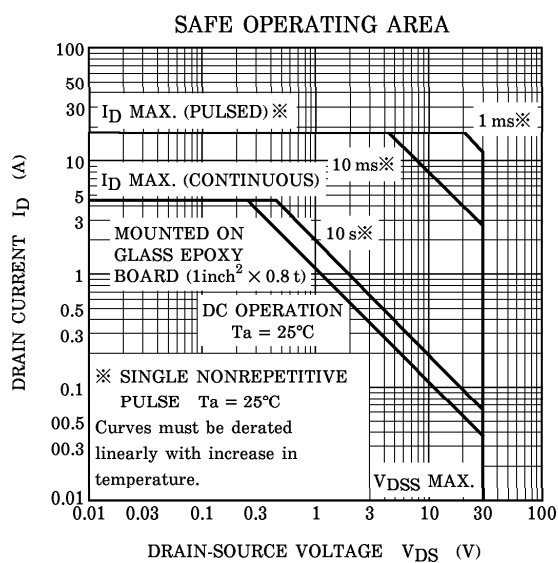
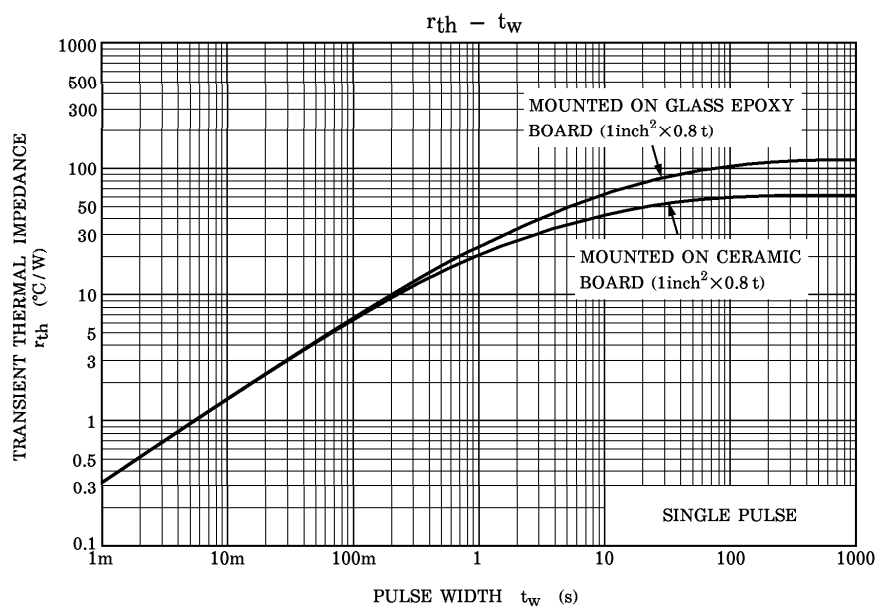
N-ch



N-ch



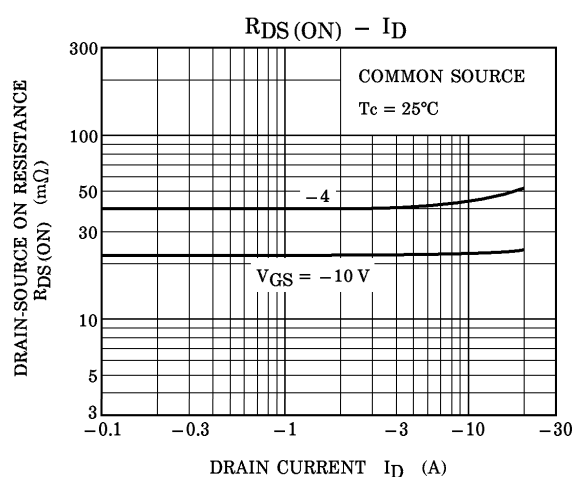
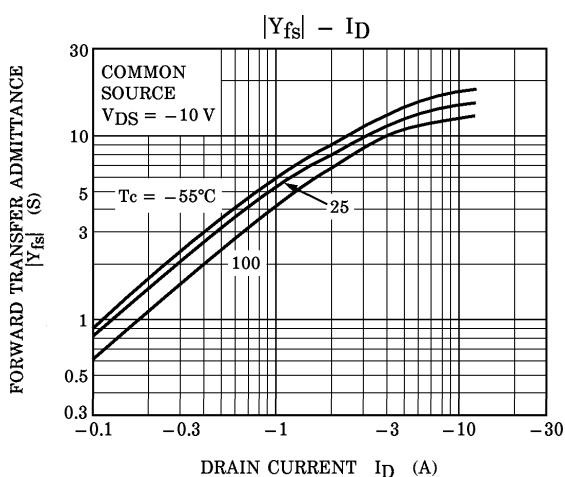
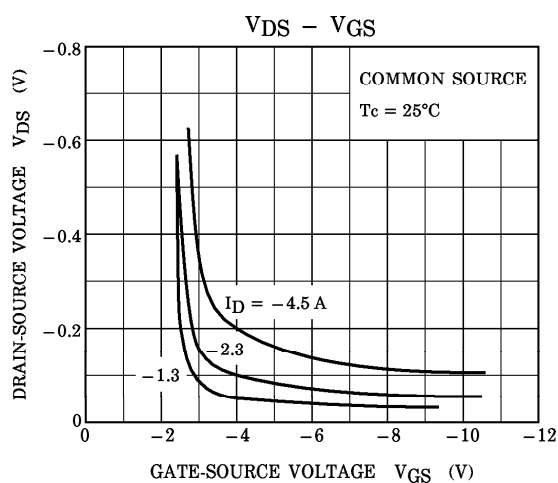
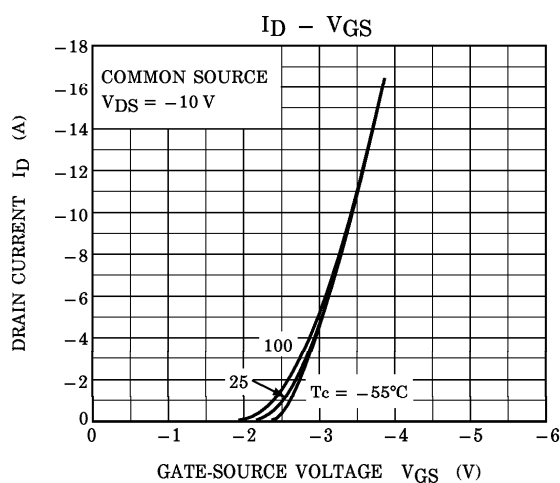
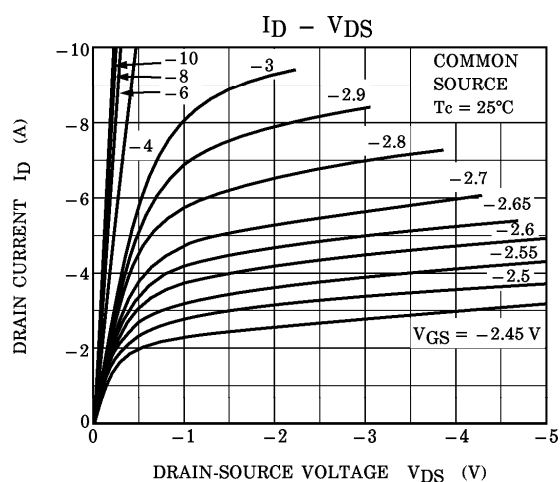
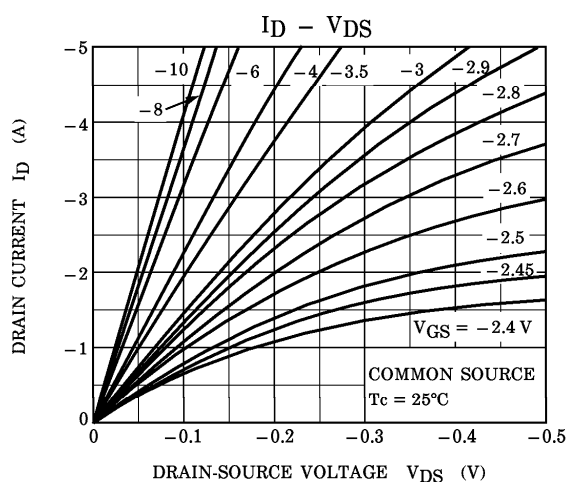
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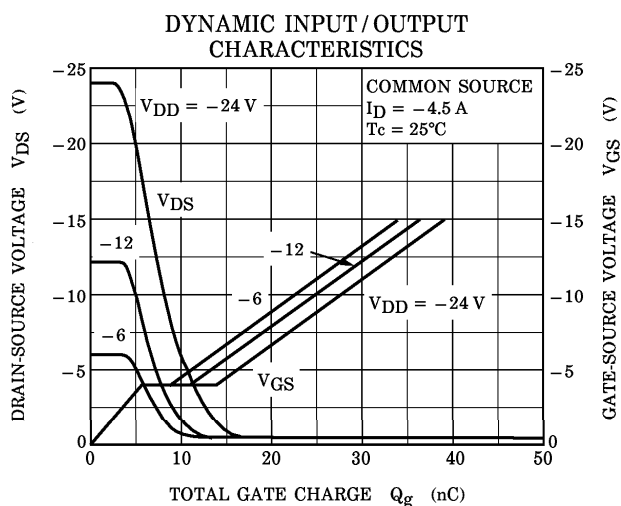
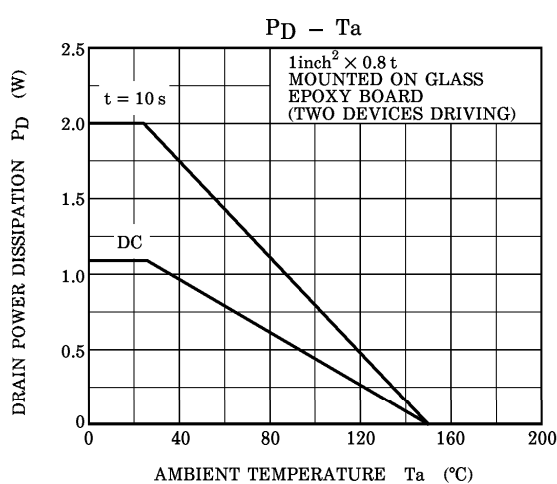
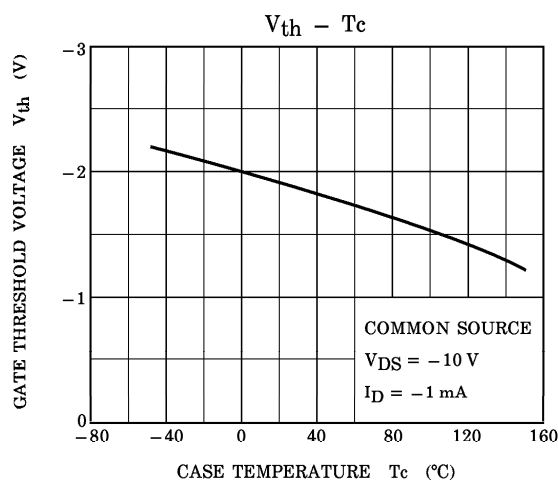
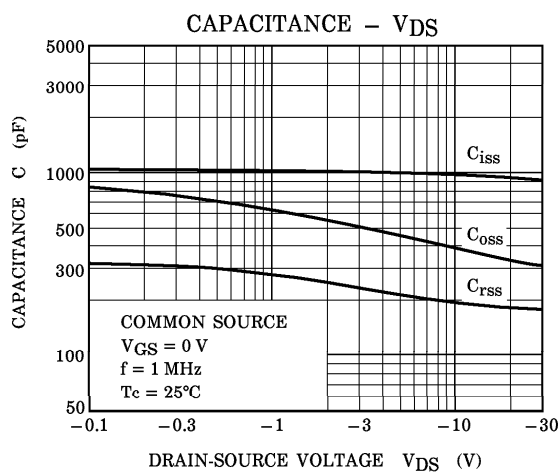
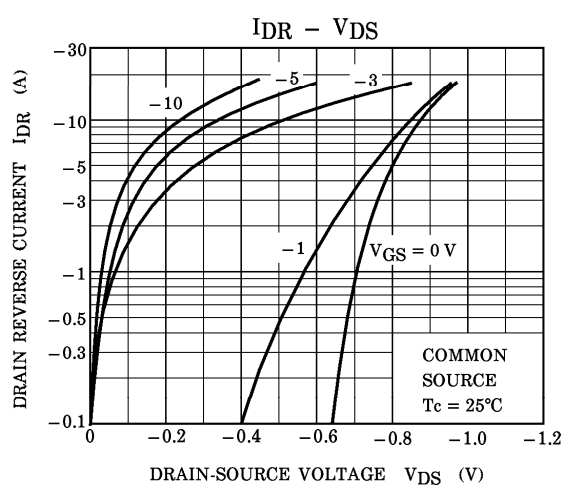
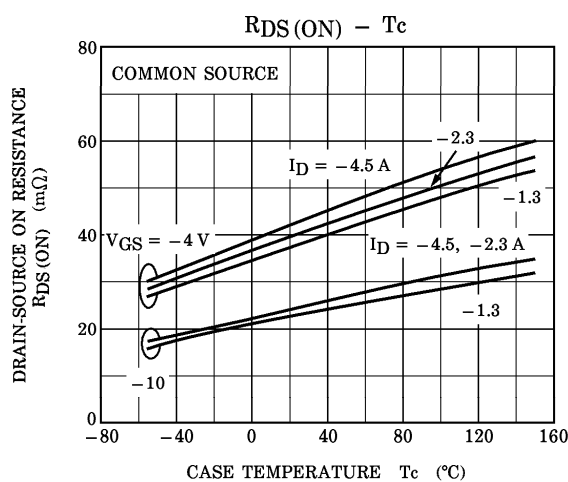
Peak $I_{AR} = 4.5 \text{ A}$, $R_G = 25 \Omega$
 $V_{DD} = 24 \text{ V}$, $L = 1.0 \text{ mH}$

$$E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left(\frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$$

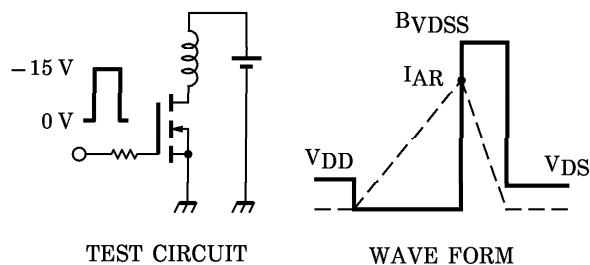
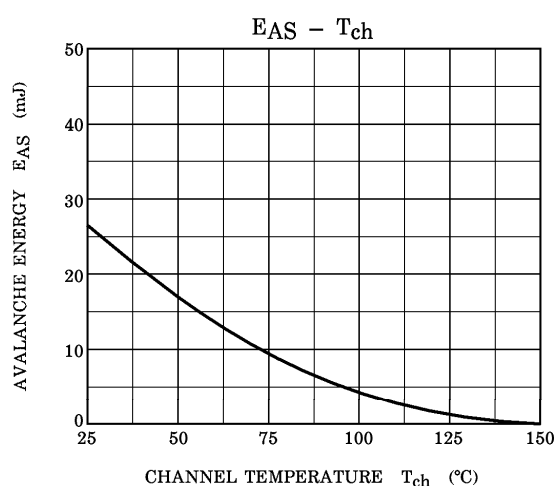
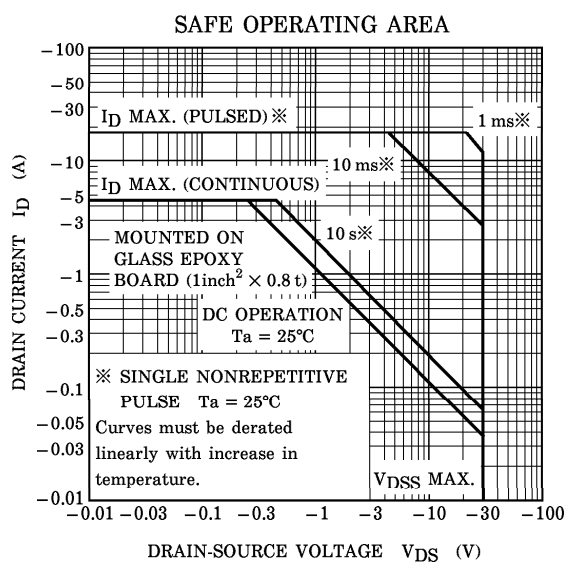
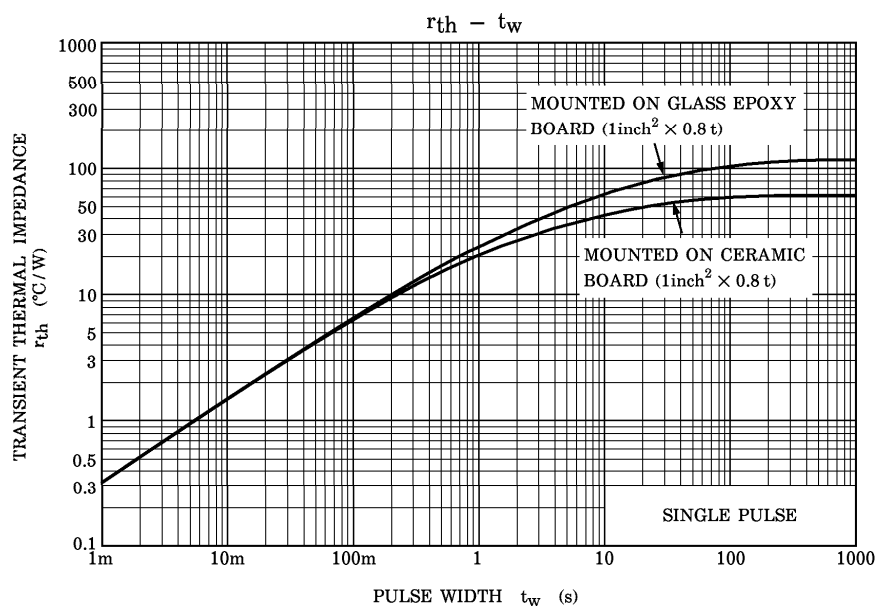
P-ch



P-ch



P-ch



Peak $I_{AR} = -4.5 \text{ A}$, $R_G = 25 \Omega$ $E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left(\frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$
 $V_{DD} = -24 \text{ V}$, $L = 1.0 \text{ mH}$