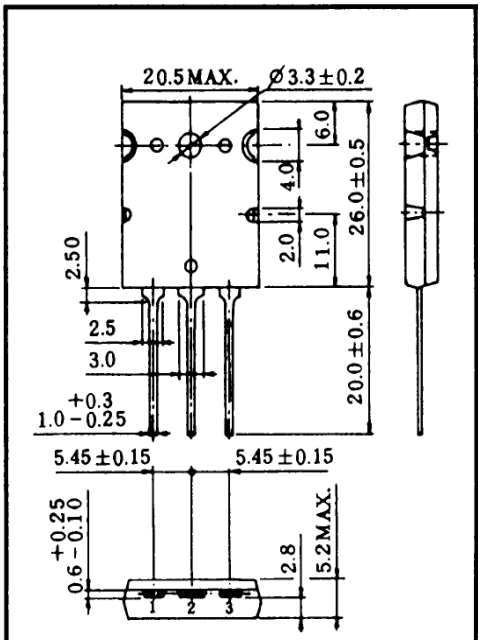
Field Effect Transistor

Silicon N Channel MOS Type (π-MOS III.5)

High Speed, High Current DC-DC Converter, Relay Drive and Motor Drive Applications

Industrial Applications **Unit in mm**



1. GATE
2. DRAIN (HEAT SINK)
3. SOURCE

JEDEC	—
EIAJ	—
TOSHIBA	2-21F1B

Weight : 9.75g

Features

- Low Drain-Source ON Resistance
  - $R_{DS(ON)}$ = 0.15Ω (Typ.)
- High Forward Transfer Admittance
  - $|Y_{fs}|$ = 21S (Typ.)
- Low Leakage Current
  - I_{DSS} = 300μA (Max.) @ V_{DS} = 500V
- Enhancement-Mode
  - V_{th} = 1.5 ~ 3.5V @ V_{DS} = 10V, I_D = 1mA

Absolute Maximum Ratings (Ta = 25°C)

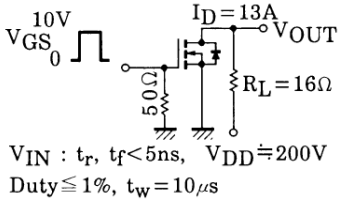
CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V_{DSS}	500	V
Drain-Gate Voltage (R_{GS} = 20kΩ)		V_{DGR}	500	V
Gate-Source Voltage		V_{GSS}	±30	V
Drain Current	DC	I_D	25	A
	Pulse	I_{DP}	100	
Drain Power Dissipation (Tc = 25°C)		P_D	200	W
Channel Temperature		T_{ch}	150	°C
Storage Temperature Range		T_{stg}	-55 ~ 150	°C

Thermal Characteristics

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Channel to Case	$R_{th(ch-c)}$	0.625	°C/W
Thermal Resistance, Channel to Ambient	$R_{th(ch-a)}$	35.7	°C/W

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

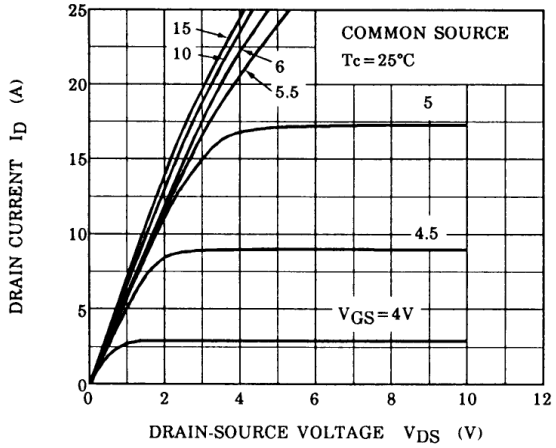
Electrical Characteristics (Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I_{GSS}	V_{GS} = ±25V, V_{DS} = 0V	–	–	±100	nA
Drain Cut-off Current		I_{DSS}	V_{DS} = 500V, V_{GS} = 0V	–	–	300	μA
Drain-Source Breakdown Voltage		$V_{(BR)\ DSS}$	I_D = 10mA, V_{GS} = 0V	500	–	–	V
Gate Threshold Voltage		V_{th}	V_{DS} = 10V, I_D = 1mA	1.5	–	3.5	V
Drain-Source ON Resistance		$R_{DS\ (ON)}$	I_D = 13A, V_{GS} = 10V	–	0.15	0.20	Ω
Forward Transfer Admittance		$\|Y_{fs}\|$	V_{DS} = 10V, I_D = 13A	10	21	–	S
Input Capacitance		C_{iss}	V_{DS} = 10V, V_{GS} = 0V, f = 1MHz	–	3700	5000	pF
Reverse Transfer Capacitance		C_{rss}		–	400	750	
Output Capacitance		C_{oss}		–	920	1300	
Switching Time	Rise Time	t_r		–	185	370	ns
	Turn-on Time	t_{on}		–	240	480	
	Fall Time	t_f		–	250	500	
	Turn-off Time	t_{off}		–	590	1180	
Total Gate Charge (Gate-Source Plus Gate-Drain)		Q_g	V_{DD} = 400V, V_{GS} = 10V, I_D = 25A	–	150	250	nC
Gate-Source Charge		Q_{gs}		–	70	–	
Gate-Drain ("Miller") Charge		Q_{gd}		–	80	–	

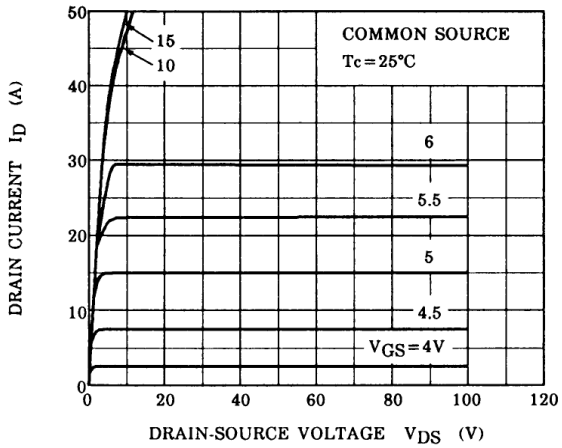
Source-Drain Diode Ratings and Characteristics (Ta = 25°C)

CHARACTERISTICS	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	I_{DR}	–	–	–	25	A
Pulse Drain Reverse Current	I_{DRP}	–	–	–	100	A
Diode Forward Voltage	V_{DSF}	I_{DR} = 25A, V_{GS} = 0V	–	–	-1.6	V
Reverse Recovery Time	t_{rr}	I_{DR} = 25A, V_{GS} = 0V, dI_{DR}/dt = 100A/μs	–	780	–	ns
Reverse Recovered Charge	Q_{rr}		–	9.8	–	μC

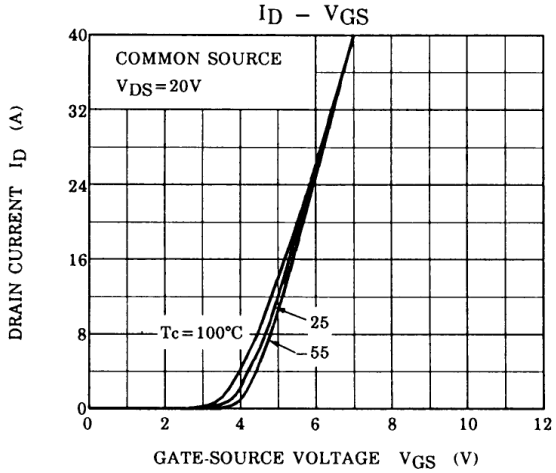
$I_D - V_{DS}$



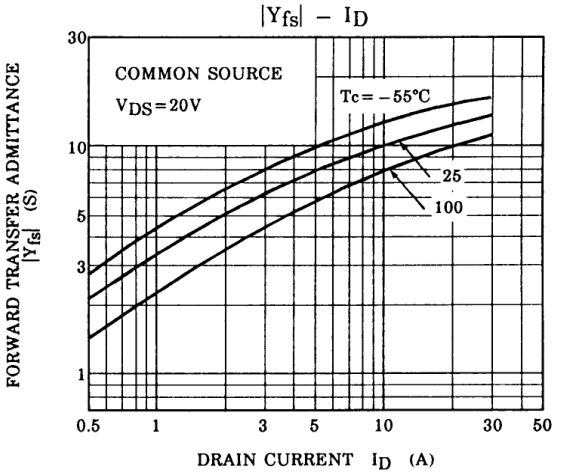
$I_D - V_{DS}$



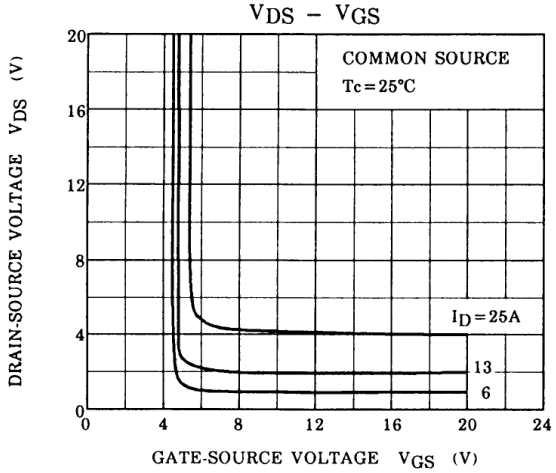
$I_D - V_{GS}$



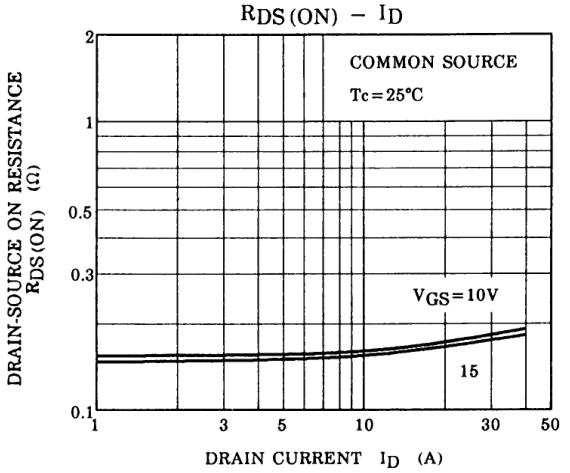
$|Y_{fs}| - I_D$



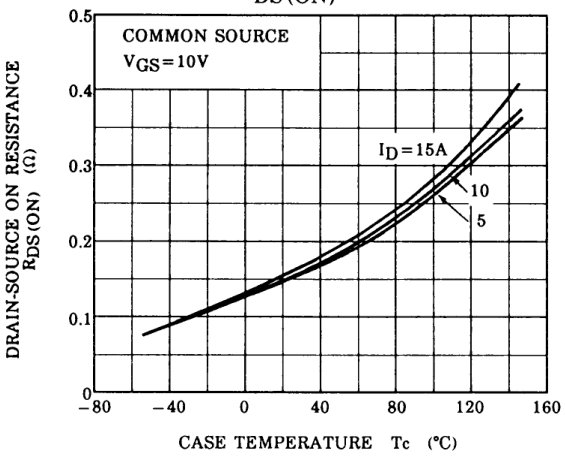
$V_{DS} - V_{GS}$



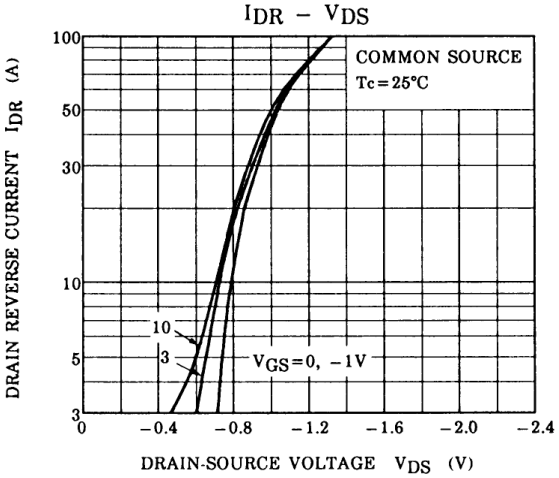
$R_{DS(ON)} - I_D$



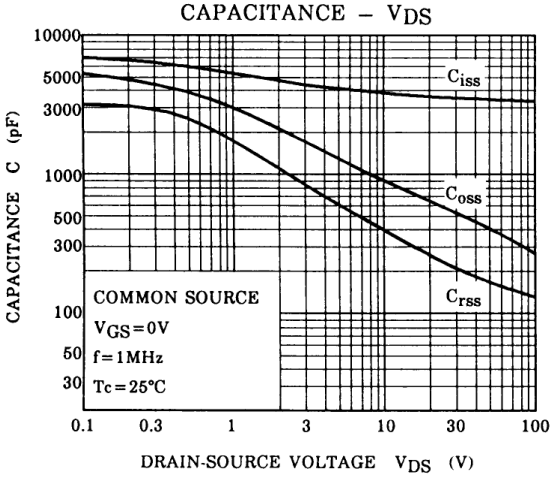
$R_{DS(ON)}$ – Tc



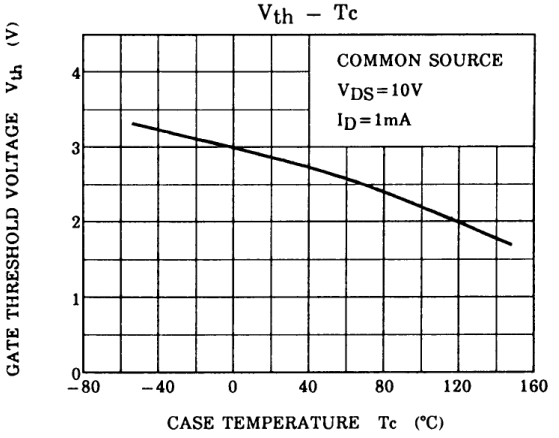
I_{DR} – V_{DS}



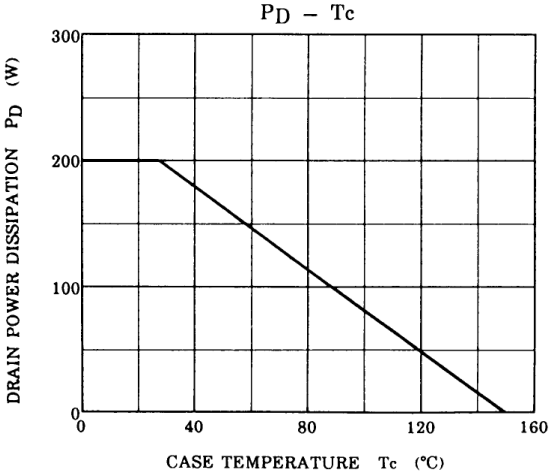
CAPACITANCE – V_{DS}



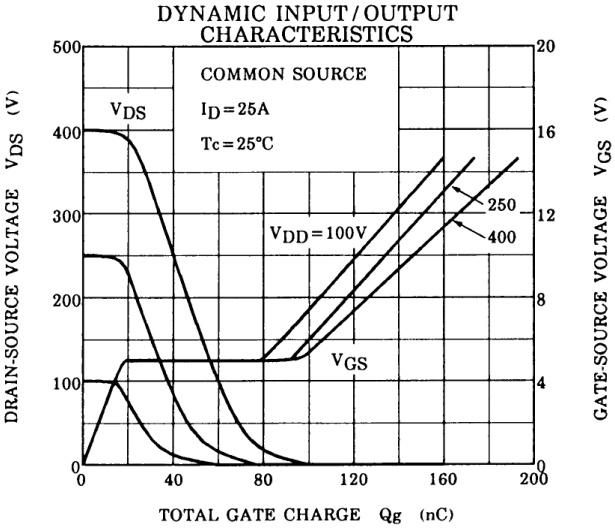
V_{th} – Tc

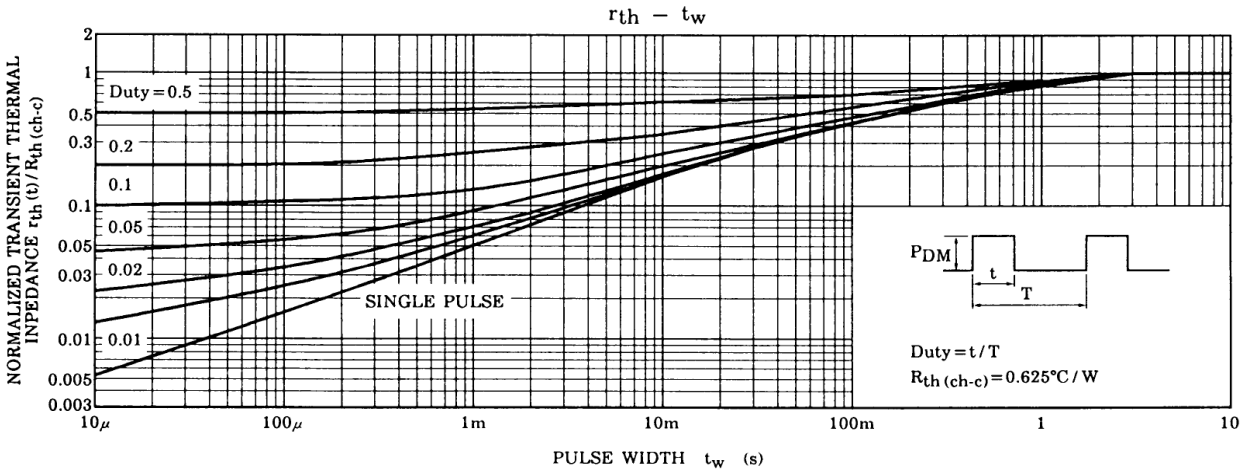


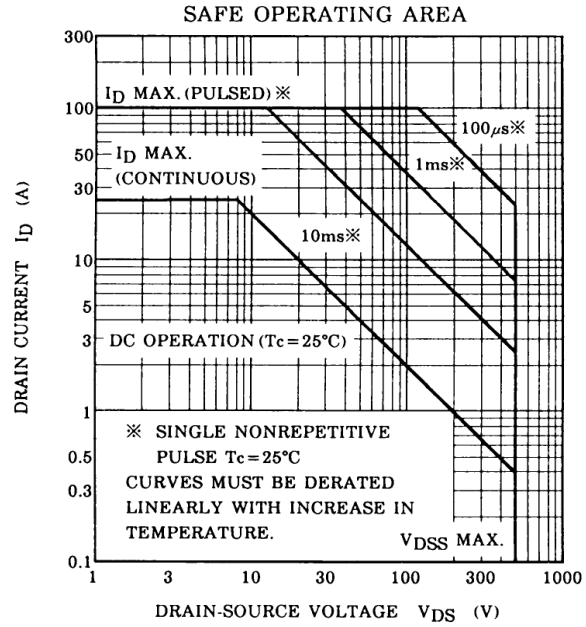
P_D – Tc



DYNAMIC INPUT / OUTPUT CHARACTERISTICS




r_{th} – t_w
NORMALIZED TRANSIENT THERMAL INPEDANCE r_{th} (t)/R_{th} (ch-c)
Duty = 0.5
0.2
0.1
0.05
0.02
0.01
SINGLE PULSE
P_{DM}
t
T
Duty = t / T
R_{th} (ch-c) = 0.625°C / W
PULSE WIDTH t_w (s)


SAFE OPERATING AREA
I_D MAX. (PULSED) ※
100μs※
1ms※
I_D MAX. (CONTINUOUS)
10ms※
DC OPERATION (Tc = 25°C)
※ SINGLE NONREPETITIVE PULSE Tc = 25°C
CURVES MUST BE DERATED LINEARLY WITH INCREASE IN TEMPERATURE.
V_{DSS} MAX.
DRAIN CURRENT I_D (A)
DRAIN-SOURCE VOLTAGE V_{DS} (V)

Notes