

TOSHIBA POWER MOS FET MODULE SILICON N & P CHANNEL MOS TYPE (L²-π-MOS^{IV} 6 IN 1)

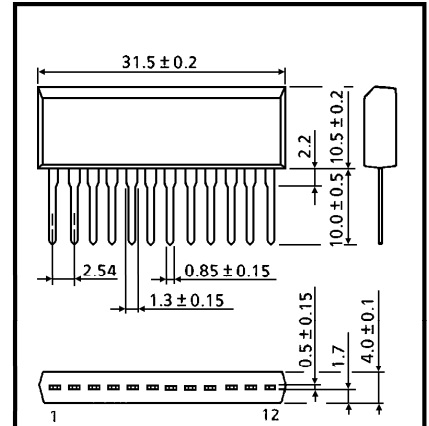
MP6403

HIGH POWER SWITCHING APPLICATION.
3-PHASE MOTOR DRIVE AND BIPOlar DRIVE OF PULSE MOTOR.

INDUSTRIAL APPLICATIONS

Unit in mm

- 4-Volt Gate Drive Available
- Small Package by Full Molding (SIP 12 Pin)
- High Drain Power Dissipation (6 Devices Operation)
: $P_T = 36W$ ($T_a = 25^\circ C$)
- Low Drain-Source ON Resistance
: $R_{DS(ON)} = 90m\Omega$ (Typ.) (N-ch)
170mΩ (Typ.) (P-ch)
- Low Leakage Current: $I_{GSS} = \pm 10\mu A$ (Max.) ($V_{GS} = \pm 16V$)
 $I_{DSS} = 100\mu A$ (Max.) ($V_{DS} = 60V$)
- Enhancement-Mode : $V_{th} = 0.8 \sim 2.0V$ ($I_D = 1mA$)



CHARACTERISTIC	SYMBOL	RATING		UNIT
		N ch	P ch	
Drain-Source Voltage	V_{DSS}	60	-60	V
Gate-Source Voltage	V_{GSS}	±20	±20	V
Drain Current	I_D	5	-5	A
Peak Drain Current	I_{DP}	20	-20	A
Collector Power Dissipation (1 Device Operation)	P_D	2.2		W
Collector Power Dissipation (6 Devices Operation)	P_T	$T_a = 25^\circ C$		W
		$T_c = 25^\circ C$		
Channel Temperature	T_{ch}	150		°C
Storage Temperature Range	T_{stg}	-55~150		°C

2, 4, 6, 8, 9, 11 GATE
3, 7, 10 DRAIN
1, 5, 12 SOURCE

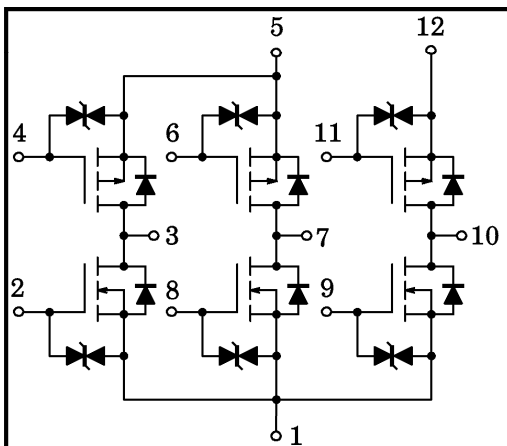
JEDEC	—
EIAJ	—
TOSHIBA	2-32C1K

Weight : 3.9g

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

CHARACTERISTIC	SYMBOL	RATING		UNIT
		N ch	P ch	
Drain-Source Voltage	V_{DSS}	60	-60	V
Gate-Source Voltage	V_{GSS}	±20	±20	V
Drain Current	I_D	5	-5	A
Peak Drain Current	I_{DP}	20	-20	A
Collector Power Dissipation (1 Device Operation)	P_D	2.2		W
Collector Power Dissipation (6 Devices Operation)	P_T	$T_a = 25^\circ C$		W
		$T_c = 25^\circ C$		
Channel Temperature	T_{ch}	150		°C
Storage Temperature Range	T_{stg}	-55~150		°C

ARRAY CONFIGURATION



THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance of Channel to Ambient (6 Devices Operation, $T_a=25^{\circ}\text{C}$)	$\Sigma R_{th(ch-a)}$	28.4	$^{\circ}\text{C} / \text{W}$
Thermal Resistance of Channel to Case (6 Devices Operation, $T_c=25^{\circ}\text{C}$)	$\Sigma R_{th(ch-c)}$	3.47	$^{\circ}\text{C} / \text{W}$
Maximum Lead Temperature for Soldering Purposes (3.2mm from Case for 10s)	T_L	260	$^{\circ}\text{C}$

This Transistor is an Electrostatic Sensitive Device. Please Handle with Caution.

ELECTRICAL CHARACTERISTICS (Ta = 25°C) (Nch MOS FET)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I_{GSS}	$V_{GS} = \pm 16V, V_{DS} = 0$	—	—	± 10	μA
Drain Cut-off Current		I_{DSS}	$V_{DS} = 60V, V_{GS} = 0$	—	—	100	μA
Drain-Source Breakdown Voltage		$V_{(BR) DSS}$	$I_D = 10mA, V_{GS} = 0$	60	—	—	V
Gate Threshold Voltage		V_{th}	$V_{DS} = 10V, I_D = 1mA$	0.8	—	2.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS} = 10V, I_D = 2.5A$	3.0	6.0	—	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D = 2.5A, V_{GS} = 4V$	—	135	200	m Ω
		$R_{DS(ON)}$	$I_D = 2.5A, V_{GS} = 10V$	—	90	125	
Input Capacitance		C_{iss}	$V_{DS} = 10V, V_{GS} = 0, f = 1MHz$	—	500	—	pF
Reverse Transfer Capacitance		C_{rss}		—	90	—	
Output Capacitance		C_{oss}		—	290	—	
Switching Time	Rise Time	t_r	<p>$I_D = 2.5A$ $V_{IN} : t_r, t_f < 5ns$ $Du. \leq 1\% (Z_{OUT} = 50\Omega)$ $V_{DD} = 30V$</p>	—	20	—	ns
	Turn-on Time	t_{on}		—	60	—	
	Fall Time	t_f		—	80	—	
	Turn-off Time	t_{off}		—	300	—	
Total Gate Charge (Gate-Source Plus Gate-Drain)		Q_g	$I_D = 5A, V_{GS} = 10V$ $V_{DD} = 48V$	—	20	—	nC
Gate-Source Charge		Q_{gs}		—	14	—	
Gate-Drain (“Miller”) Charge		Q_{gd}		—	6	—	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Drain Reverse Current	I_{DR}	—	—	—	5	A
Peak Drain Reverse Current	I_{DRP}	—	—	—	20	A
Diode Forward Voltage	V_{DSF}	$I_{DR} = 5A, V_{GS} = 0$	—	—	-1.5	V
Reverse Recovery Time	t_{rr}	$I_{DR} = 5A, V_{GS} = 0$	—	140	—	ns
Reverse Recovery Charge	Q_{rr}	$dI_{DR} / dt = -50A / \mu s$	—	0.4	—	μC

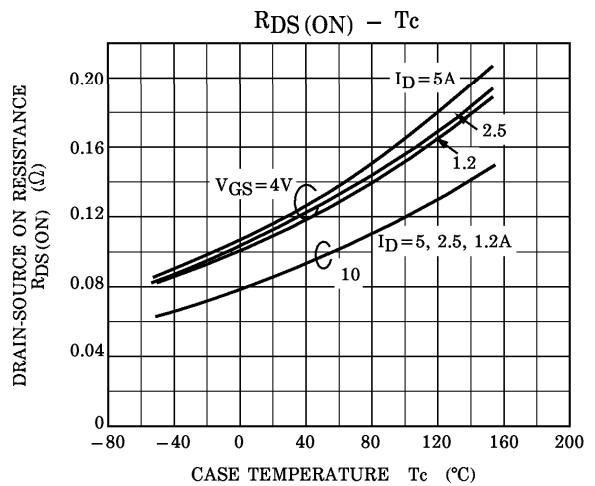
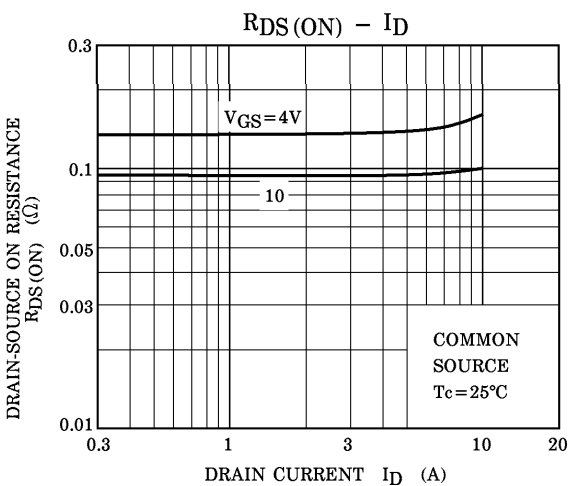
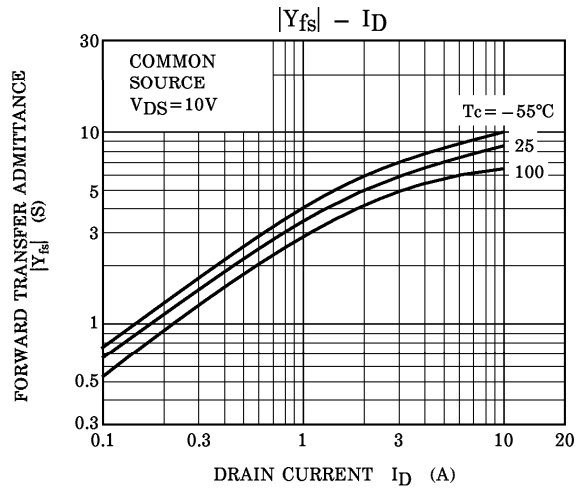
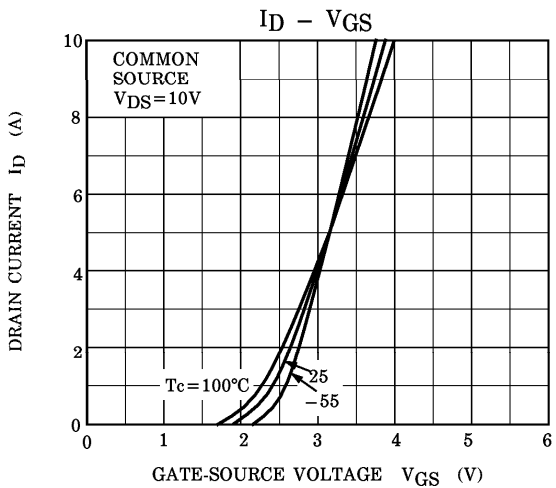
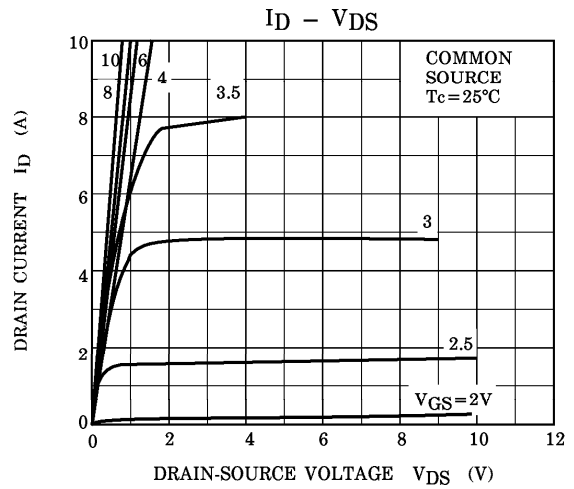
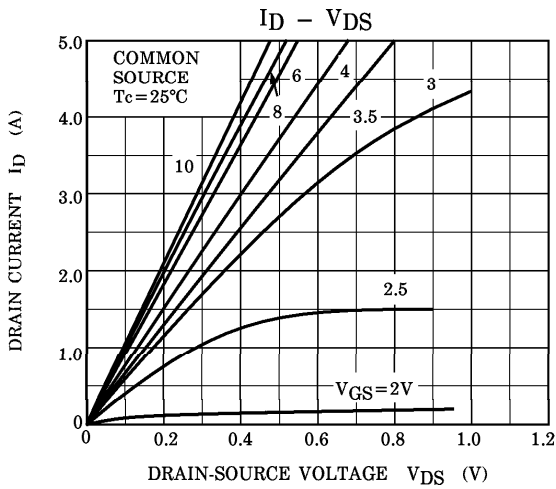
ELECTRICAL CHARACTERISTICS (Ta = 25°C) (Pch MOS FET)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I_{GSS}	$V_{GS} = \pm 16V, V_{DS} = 0$	—	—	± 10	μA
Drain Cut-off Current		I_{DSS}	$V_{DS} = -60V, V_{GS} = 0$	—	—	-100	μA
Drain-Source Breakdown Voltage		$V_{(BR) DSS}$	$I_D = -10mA, V_{GS} = 0$	-60	—	—	V
Gate Threshold Voltage		V_{th}	$V_{DS} = -10V, I_D = -1mA$	-0.8	—	-2.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS} = -10V, I_D = -2.5A$	1.0	2.0	—	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D = -2.5A, V_{GS} = -4V$	—	250	400	m Ω
		$R_{DS(ON)}$	$I_D = -2.5A, V_{GS} = -10V$	—	170	245	
Input Capacitance		C_{iss}	$V_{DS} = -10V, V_{GS} = 0, f = 1MHz$	—	500	—	pF
Reverse Transfer Capacitance		C_{rss}		—	90	—	
Output Capacitance		C_{oss}		—	290	—	
Switching Time	Rise Time	t_r	<p>$I_D = -2.5A$ $V_{IN} : t_r, t_f < 5ns$ $Du. \leq 1\% (Z_{OUT} = 50\Omega)$ $V_{DD} = -30V$</p>	—	120	—	ns
	Turn-on Time	t_{on}		—	130	—	
	Fall Time	t_f		—	80	—	
	Turn-off Time	t_{off}		—	200	—	
Total Gate Charge (Gate-Source Plus Gate-Drain)		Q_g	$I_D = -5A, V_{GS} = -10V$ $V_{DD} = -48V$	—	22	—	nC
Gate-Source Charge		Q_{gs}		—	14	—	
Gate-Drain ("Miller") Charge		Q_{gd}		—	8	—	

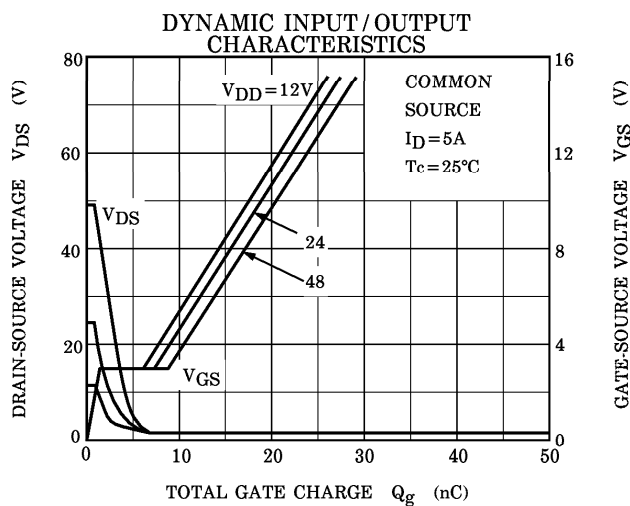
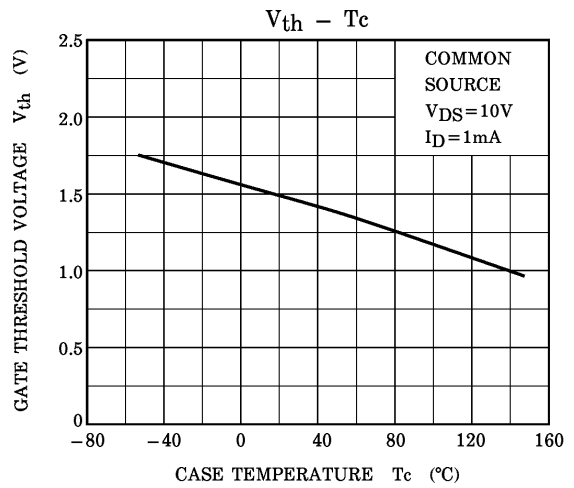
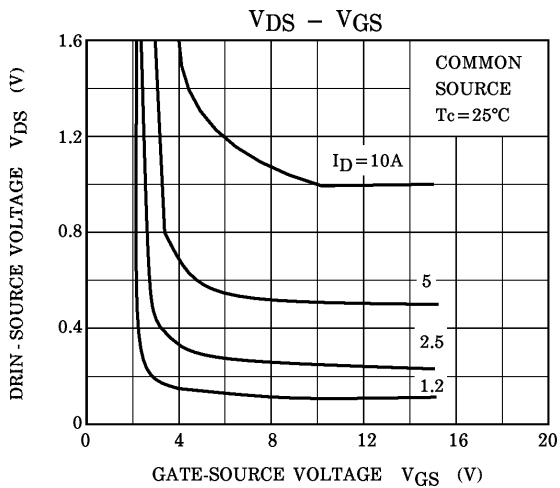
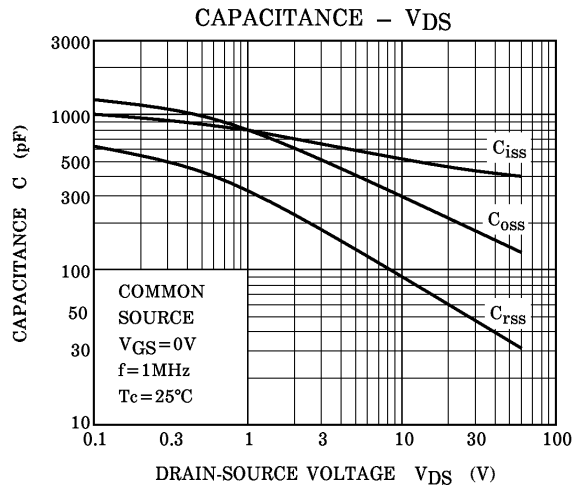
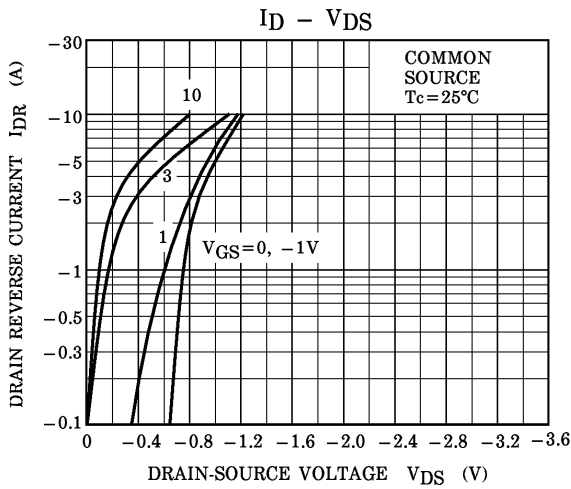
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Drain Reverse Current	I_{DR}	—	—	—	-5	A
Peak Drain Reverse Current	I_{DRP}	—	—	—	-20	A
Diode Forward Voltage	V_{DSF}	$I_{DR} = -5A, V_{GS} = 0$	—	—	1.5	V
Reverse Recovery Time	t_{rr}	$I_{DR} = -5A, V_{GS} = 0$	—	120	—	ns
Reverse Recovery Charge	Q_{rr}	$dI_{DR} / dt = -50A / \mu s$	—	0.24	—	μC

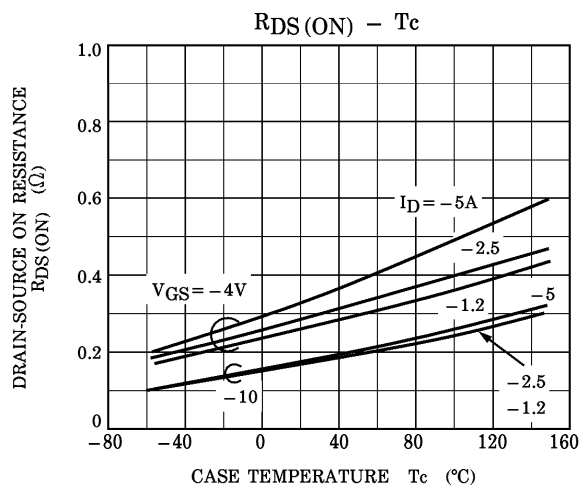
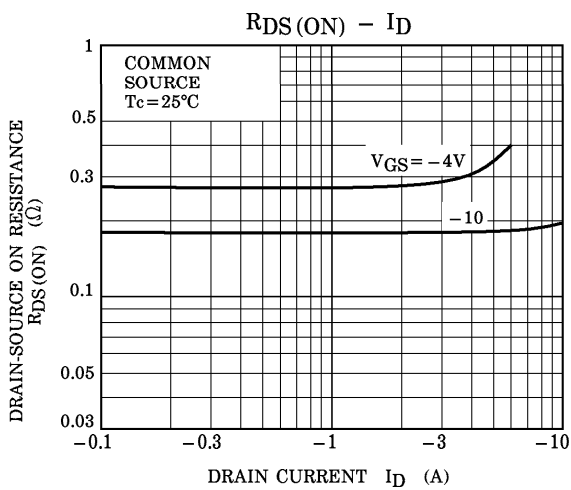
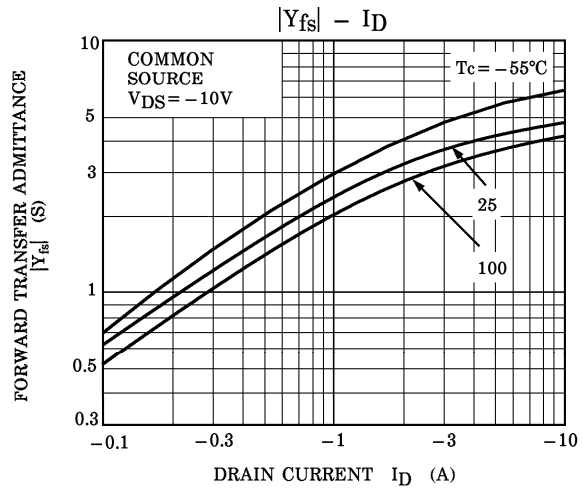
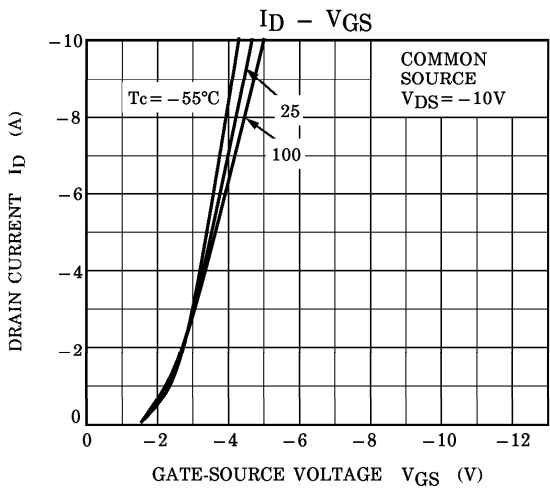
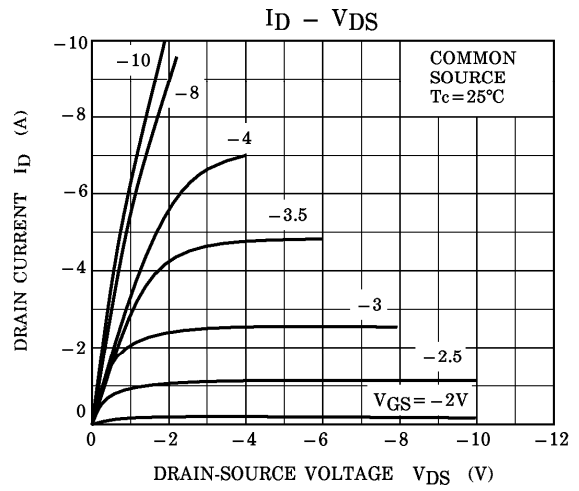
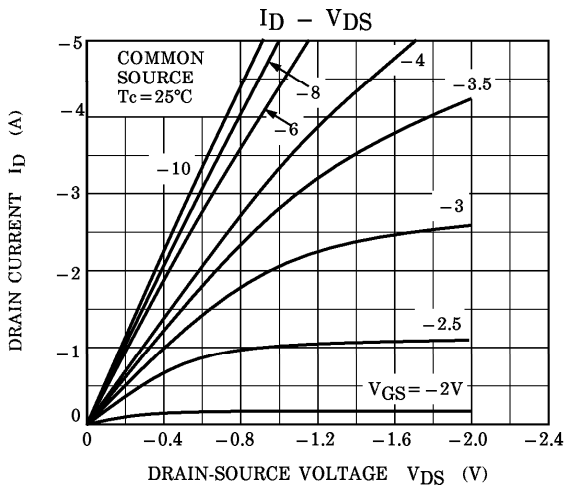
Nch FET



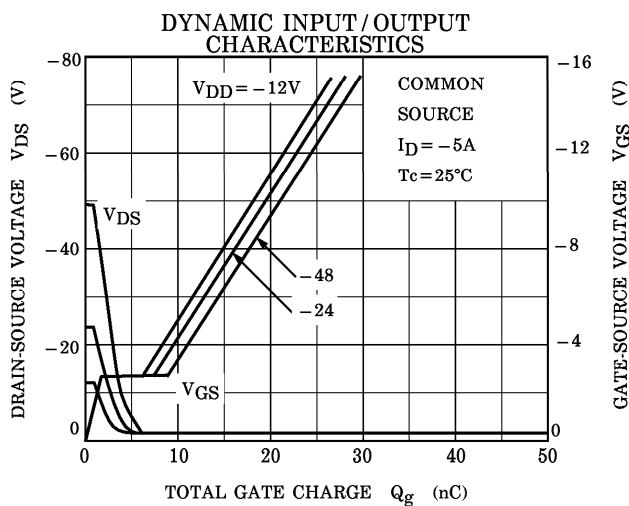
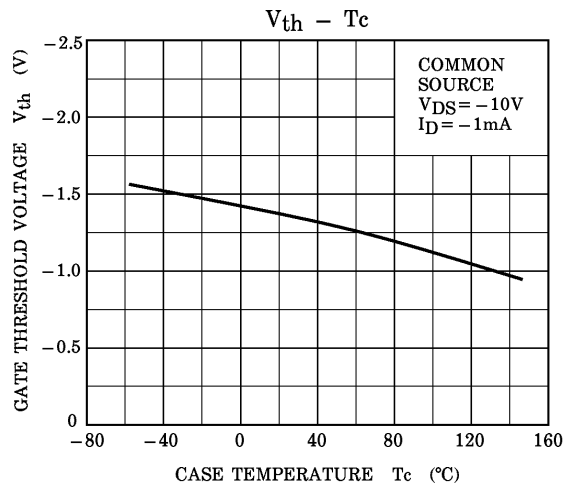
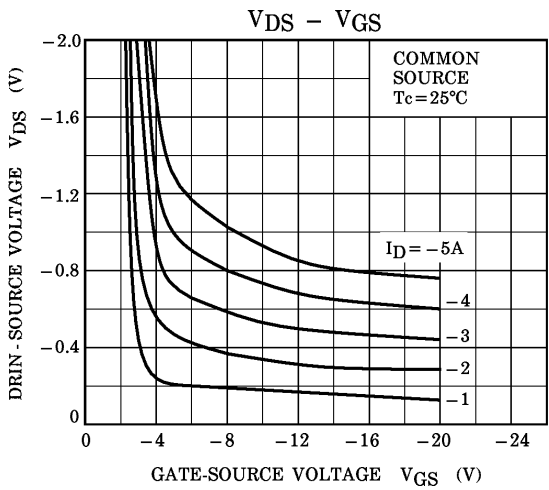
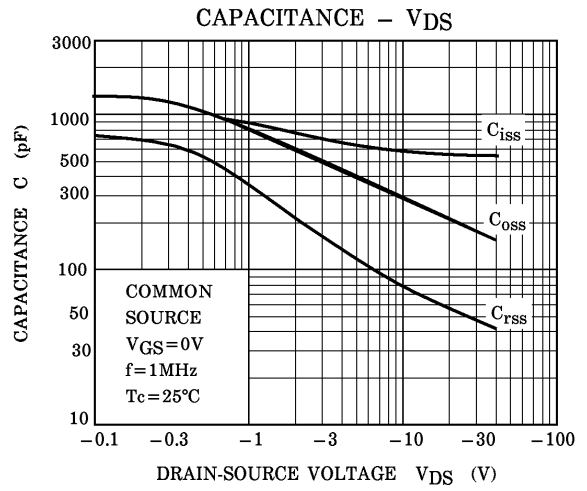
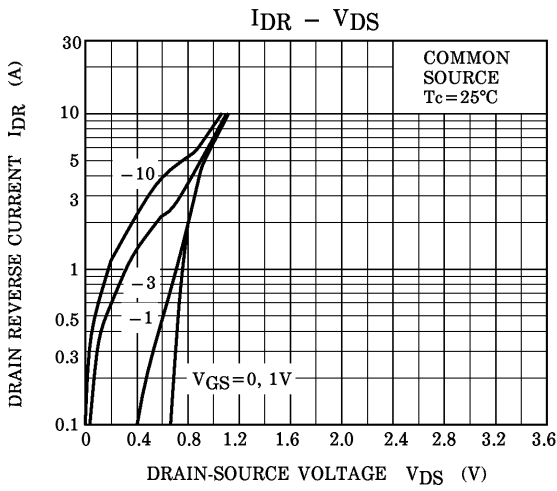
Nch FET

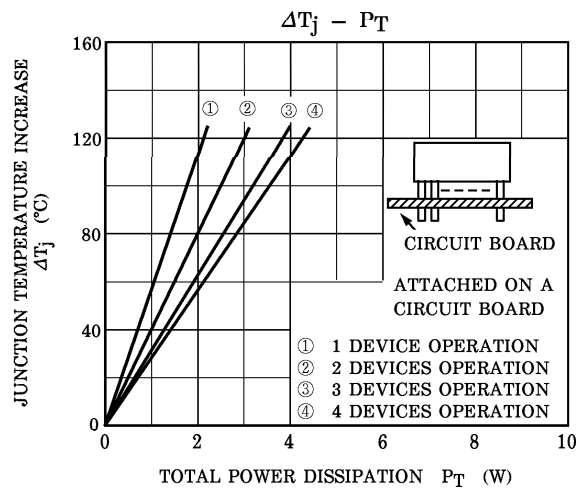
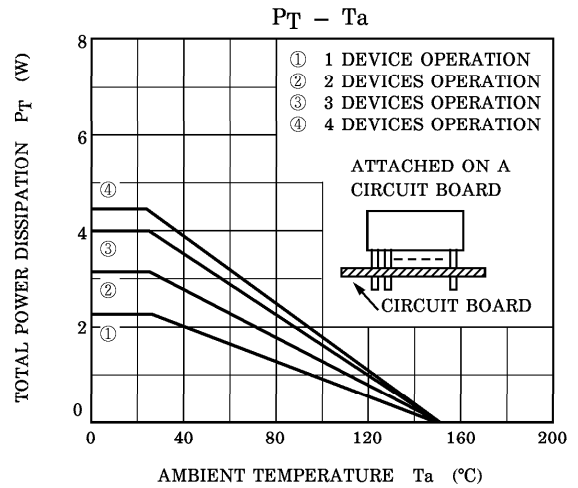
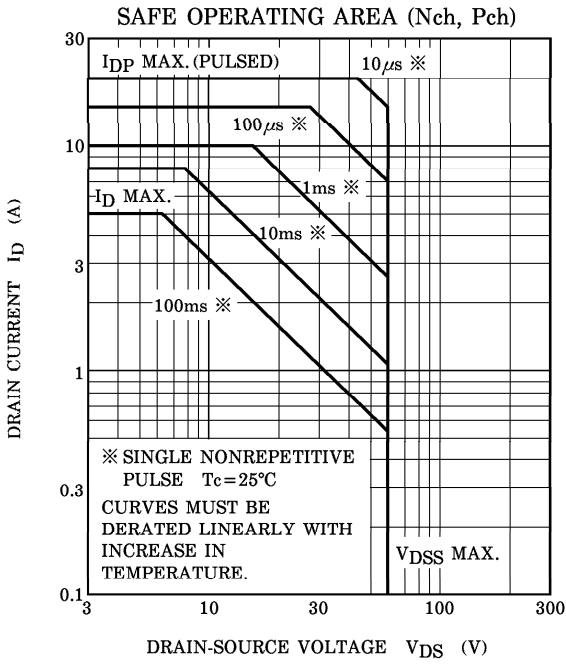
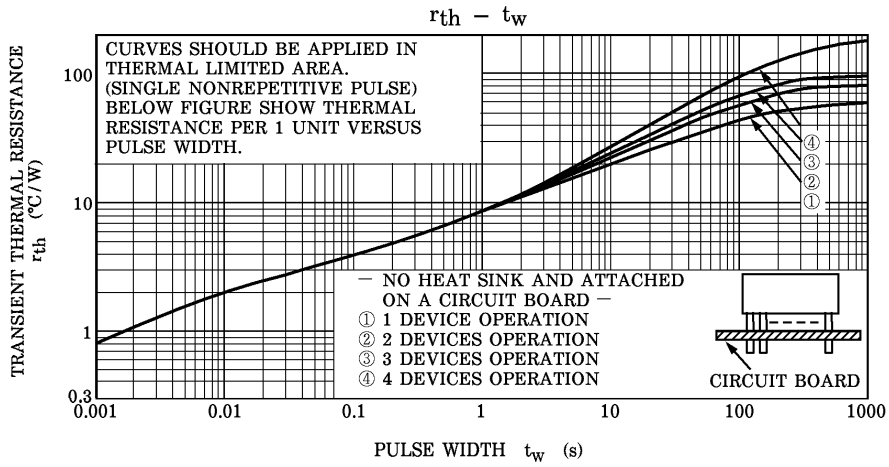


Pch FET



Pch FET





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