

TOSHIBA POWER MOS FET MODULE SILICON N & P CHANNEL MOS TYPE (L<sup>2</sup>-π-MOSIV 6 IN 1)

# MP6403

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

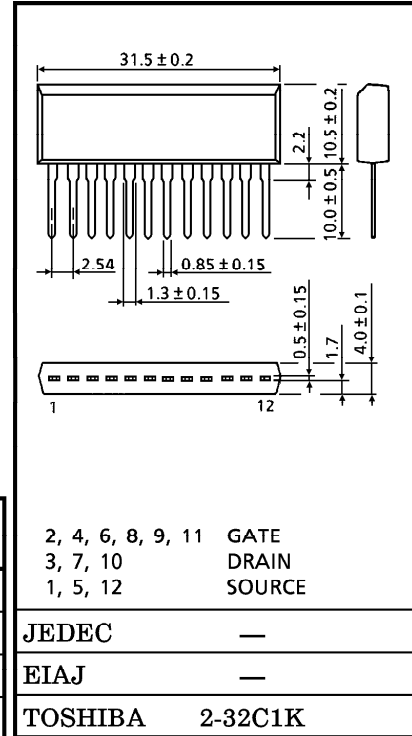
- 4-Volt Gate Drive Available
- Small Package by Full Molding (SIP 12 Pin)
- High Drain Power Dissipation (6 Devices Operation)  
: P<sub>T</sub>=36W (Ta=25°C)
- Low Drain-Source ON Resistance  
: R<sub>DS(ON)</sub>=90mΩ (Typ.) (N-ch)  
170mΩ (Typ.) (P-ch)
- Low Leakage Current: I<sub>GSS</sub>=±10μA (Max.) (V<sub>GS</sub>=±16V)  
I<sub>DSS</sub>=100μA (Max.) (V<sub>DS</sub>=60V)
- Enhancement-Mode : V<sub>th</sub>=0.8~2.0V (I<sub>D</sub>=1mA)

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING		UNIT
		N ch	P ch	
Drain-Source Voltage	V <sub>DSS</sub>	60	-60	V
Gate-Source Voltage	V <sub>GSS</sub>	±20	±20	V
Drain Current	I <sub>D</sub>	5	-5	A
Peak Drain Current	I <sub>DP</sub>	20	-20	A
Collector Power Dissipation (1 Device Operation)	P <sub>D</sub>	2.2		W
Collector Power Dissipation (6 Devices Operation)	Ta=25°C	4.4		W
	Tc=25°C	36		
Channel Temperature	T <sub>ch</sub>	150		°C
Storage Temperature Range	T <sub>stg</sub>	-55~150		°C

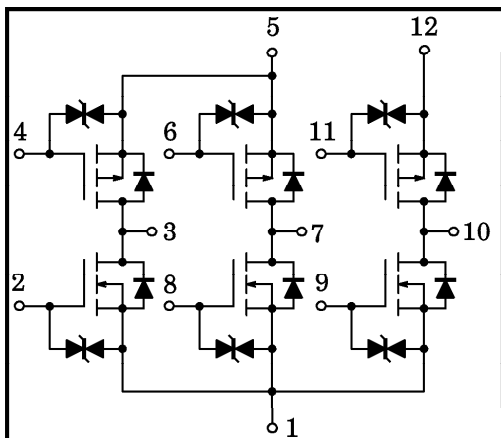
INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 3.9g

ARRAY CONFIGURATION



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THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance of Channel to Ambient (6 Devices Operation, Ta=25°C)	$\Sigma R_{th(ch-a)}$	28.4	°C / W
Thermal Resistance of Channel to Case (6 Devices Operation, Tc=25°C)	$\Sigma R_{th(ch-c)}$	3.47	°C / W
Maximum Lead Temperature for Soldering Purposes (3.2mm from Case for 10s)	T <sub>L</sub>	260	°C

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

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

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS} = \pm 16V, V_{DS} = 0$	—	—	$\pm 10$	$\mu A$
Drain Cut-off Current		$I_{DSS}$	$V_{DS} = 60V, V_{GS} = 0$	—	—	100	$\mu A$
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 $\Omega$
		$R_{DS(ON)}$	$I_D = 2.5A, V_{GS} = 10V$	—	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><math>I_D = 2.5A</math> <math>V_{DD} = 30V</math></p>	—	20	—	ns
	Turn-on Time	$t_{on}$		—	60	—	
	Fall Time	$t_f$		—	80	—	
	Turn-off Time	$t_{off}$		$V_{IN} : t_r, t_f < 5ns$ $Du. \leq 1\% (Z_{OUT} = 50\Omega)$	—	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	$t_{rr}$	$I_{DR} = 5A, V_{GS} = 0$ $dI_{DR} / dt = -50A / \mu s$	—	140	—	ns
Reverse Recovery Charge	$Q_{rr}$		—	0.4	—	$\mu C$

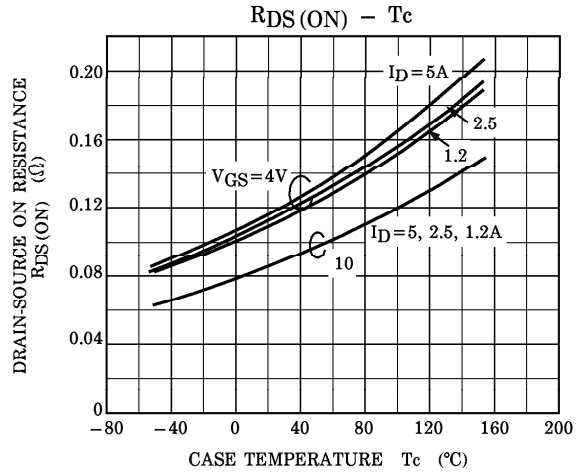
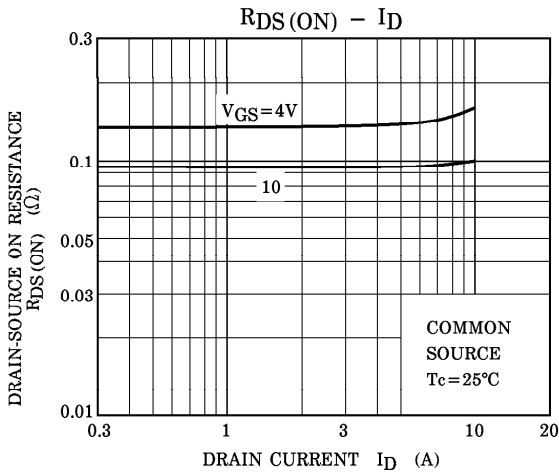
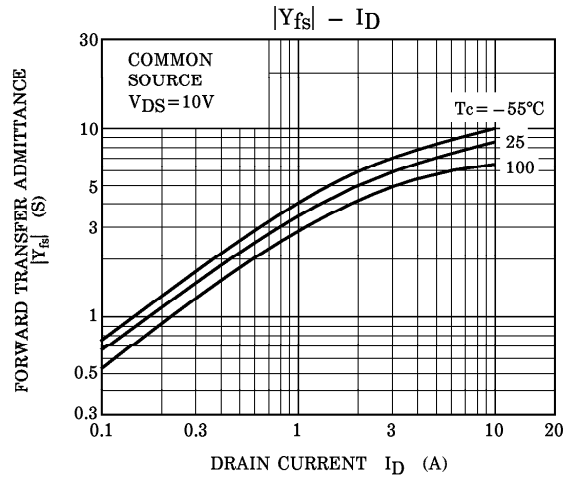
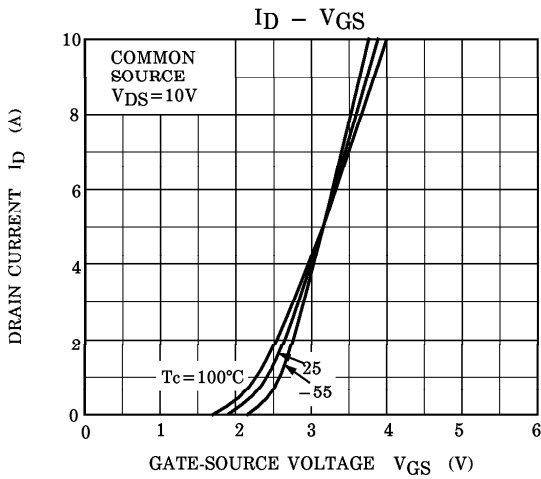
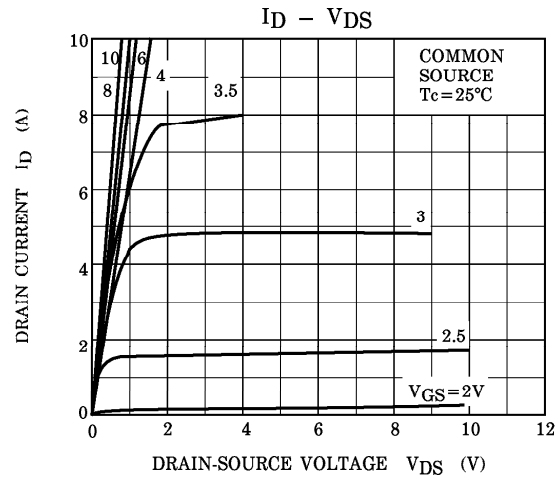
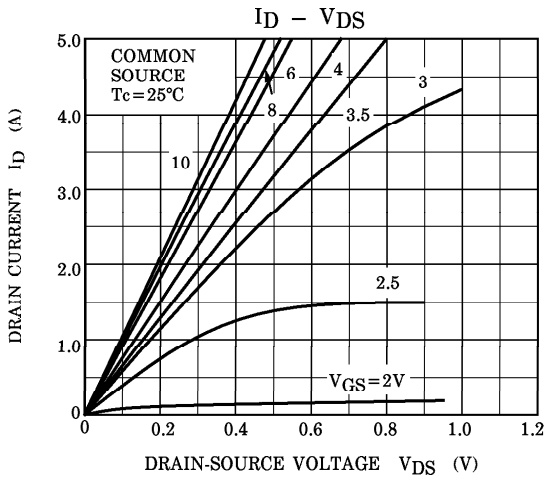
ELECTRICAL CHARACTERISTICS (Ta = 25°C) (Pch MOS FET)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS} = \pm 16V, V_{DS} = 0$	—	—	$\pm 10$	$\mu A$
Drain Cut-off Current		$I_{DSS}$	$V_{DS} = -60V, V_{GS} = 0$	—	—	-100	$\mu A$
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 $\Omega$
		$R_{DS(ON)}$	$I_D = -2.5A, V_{GS} = -10V$	—	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><math>I_D = -2.5A</math> <math>V_{IN} : t_r, t_f &lt; 5ns</math> <math>Du. \leq 1\% (Z_{OUT} = 50\Omega)</math> <math>V_{DD} = -30V</math></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	—	

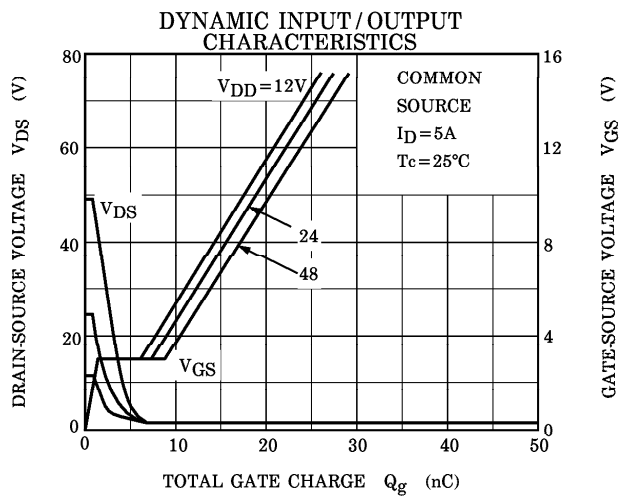
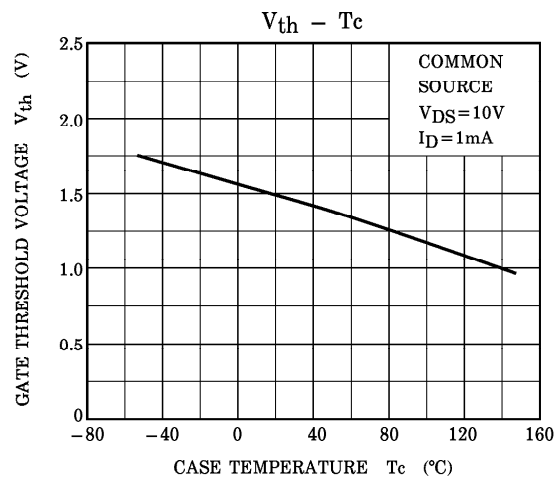
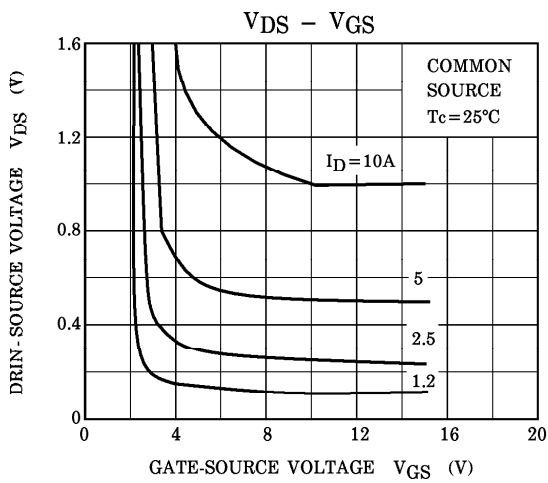
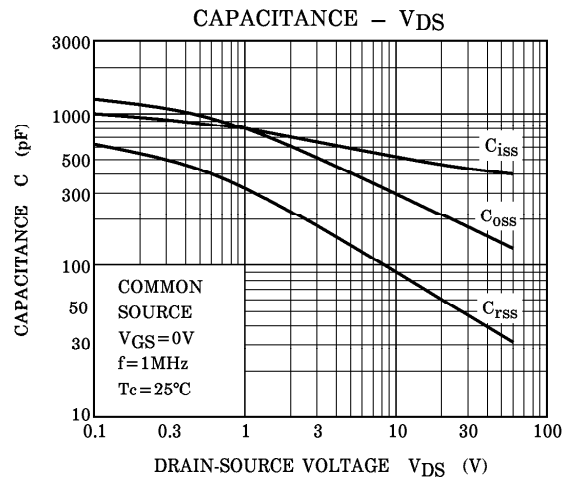
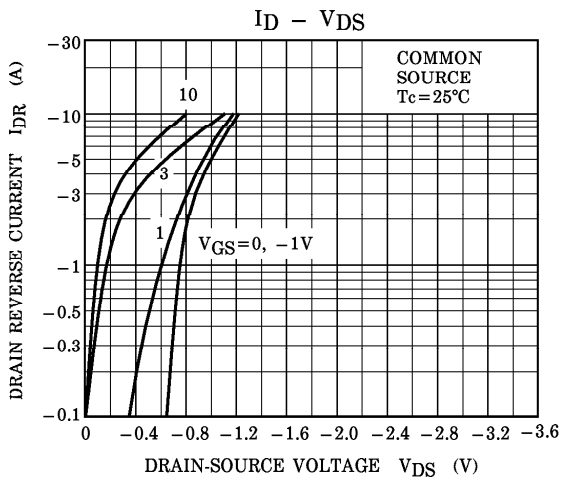
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

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	$t_{rr}$	$I_{DR} = -5A, V_{GS} = 0$ $dI_{DR} / dt = -50A / \mu s$	—	120	—	ns
Reverse Recovery Charge	$Q_{rr}$		—	0.24	—	$\mu C$

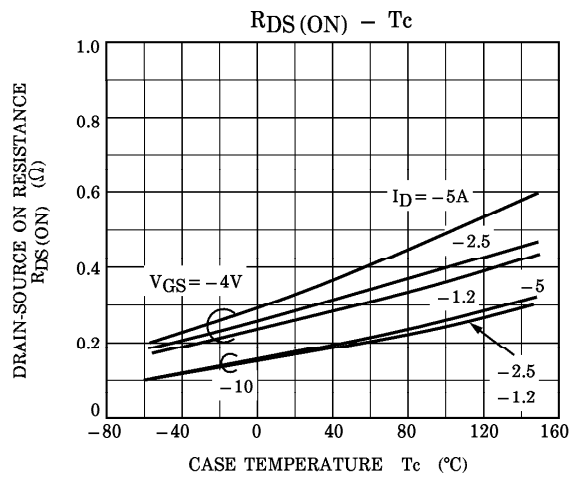
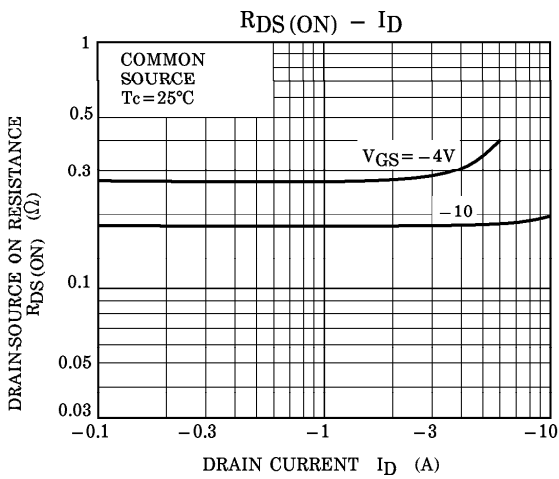
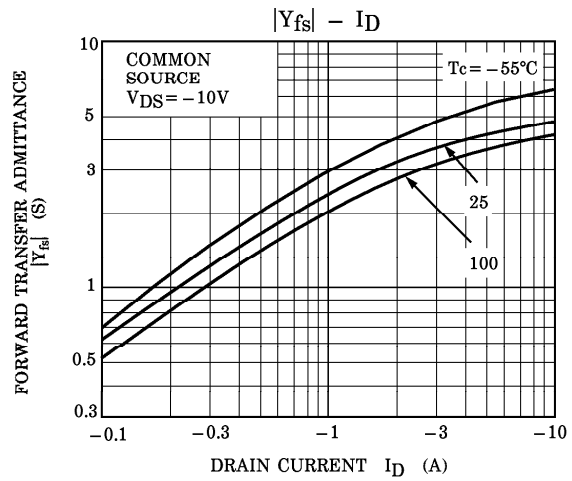
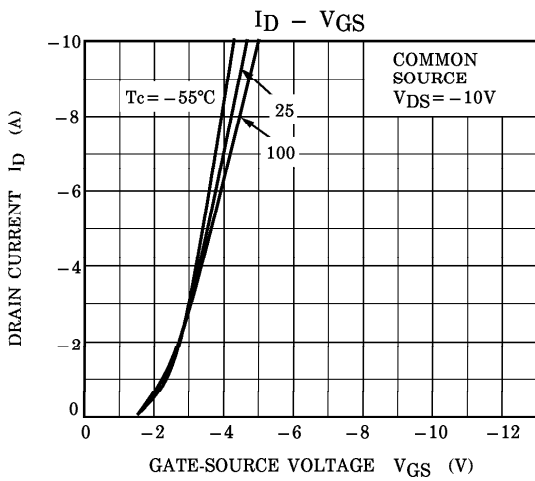
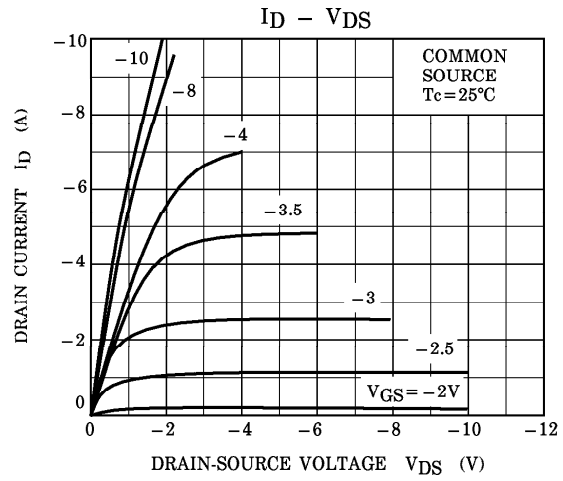
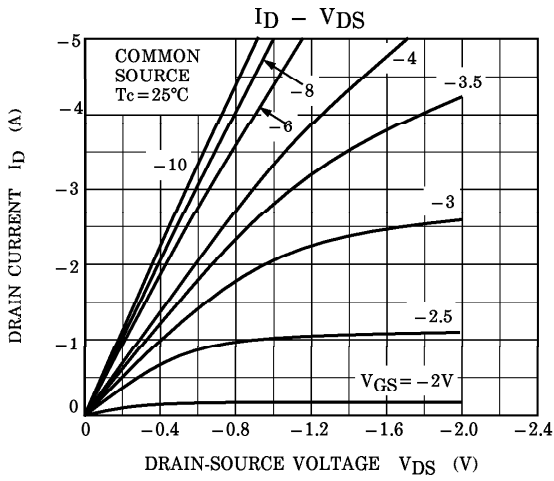
Nch FET



Nch FET



Pch FET



Pch FET

