TOSHIBA FIELD EFFECT TRANSISTOR SILICON N CHANNEL MOS TYPE (π-MOSV)

2SK3176

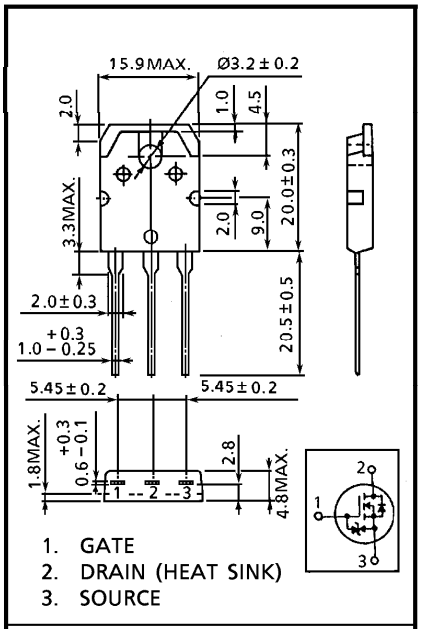
HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS

SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS

INDUSTRIAL APPLICATIONS

- Low Drain-Source ON Resistance : $R_{DS\,(ON)}$ = 38 mΩ (Typ.)
- High Forward Transfer Admittance : $|Y_{fs}|$ = 30 S (Typ.)
- Low Leakage Current : I_{DSS} = 100 μA (Max.) (V_{DS} = 200 V)
- Enhancement-Model : V_{th} = 1.5~3.5 V (V_{DS} = 10 V, I_D = 1 mA)

Unit in mm



JEDEC	—
EIAJ	SC-65
TOSHIBA	2-16C1B

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V_{DSS}	200	V
Drain-Gate Voltage (R_{GS} = 20 kΩ)		V_{DGR}	200	V
Gate-Source Voltage		V_{GSS}	±20	V
Drain Current	DC	I_D	30	A
	Pulse	I_{DP}	120	A
Drain Power Dissipation (Tc = 25°C)		P_D	150	W
Single Pulse Avalanche Energy*		E_{AS}	925	mJ
Avalanche Current		I_{AR}	30	A
Repetitive Avalanche Energy**		E_{AR}	15	mJ
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	$R_{th\,(ch\text{-}c)}$	0.833	°C / W
Thermal Resistance, Channel to Ambient	$R_{th\,(ch\text{-}a)}$	50.0	°C / W

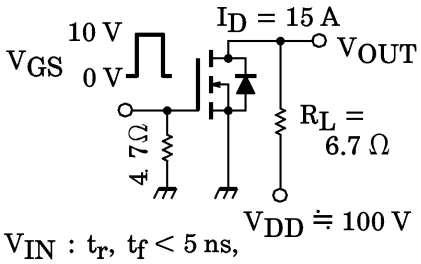
Note ;

* V_{DD} = 50 V, T_{ch} = 25°C (initial), L = 1.66 mH, I_{AR} = 30 A, R_G = 25 Ω

** Repetitive rating ; Pulse Width Limited by Max. junction temperature.

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

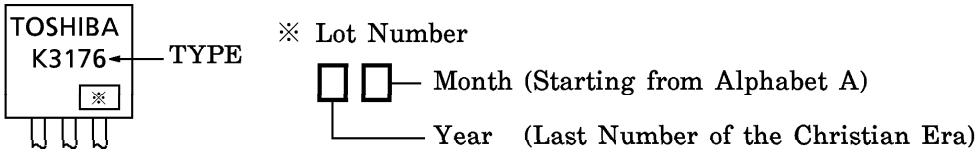
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I_{GSS}	V_{GS} = ±16 V, V_{DS} = 0 V	—	—	±10	μA
Drain Cut-off Current		I_{DSS}	V_{DS} = 200 V, V_{GS} = 0 V	—	—	100	μA
Drain-Source Breakdown Voltage		$V_{(BR)\ DSS}$	I_D = 10 mA, V_{GS} = 0 V	200	—	—	V
Gate Threshold Voltage		V_{th}	V_{DS} = 10 V, I_D = 1 mA	1.5	—	3.5	V
Drain-Source ON Resistance		$R_{DS\ (ON)}$	V_{GS} = 10 V, I_D = 15 A	—	38	52	mΩ
Forward Transfer Admittance		$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 15 A	15	30	—	S
Input Capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V f = 1 MHz	—	5400	—	pF
Reverse Transfer Capacitance		C_{rss}		—	580	—	
Output Capacitance		C_{oss}		—	1900	—	
Switching Time	Rise Time	t_r	 V_{IN} : t_r, t_f < 5 ns, Duty ≦ 1%, t_w = 10 μs	—	15	—	ns
	Turn-on Time	t_{on}		—	55	—	
	Fall Time	t_f		—	25	—	
	Turn-off Time	t_{off}		—	190	—	
Total Gate Charge (Gate-Source Plus Gate-Drain)		Q_g	V_{DD} ≒ 160 V, V_{GS} = 10 V I_D = 30 A	—	125	—	nC
Gate-Source Charge		Q_{gs}		—	80	—	
Gate-Drain ("Miller") Charge		Q_{gd}		—	45	—	

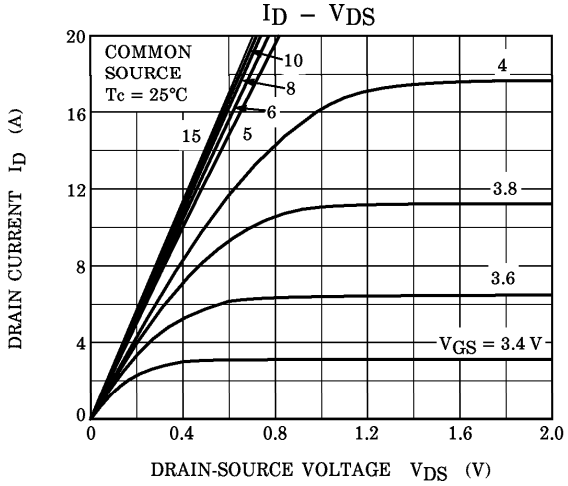
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	I_{DR}	—	—	—	30	A
Pulse Drain Reverse Current	I_{DRP}	—	—	—	90	A
Diode Forward Voltage	V_{DSF}	I_{DR} = 30 A, V_{GS} = 0 V	—	—	−2.0	V
Reverse Recovery Time	t_{rr}	I_{DR} = 30 A, V_{GS} = 0 V dI_{DR} / dt = 100 A / μs	—	270	—	ns
Reverse Recovery Charge	Q_{rr}		—	3.0	—	μC

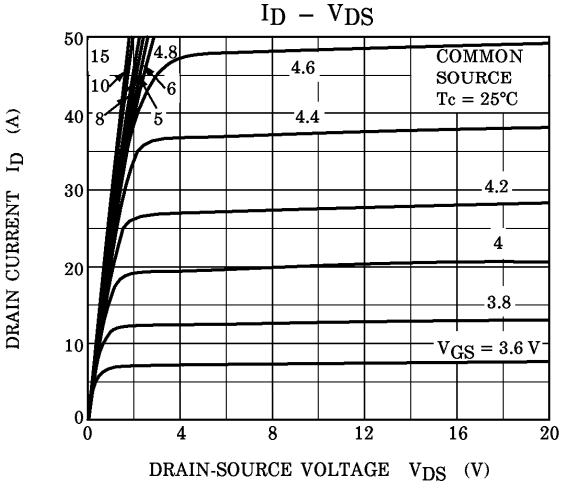
MARKING



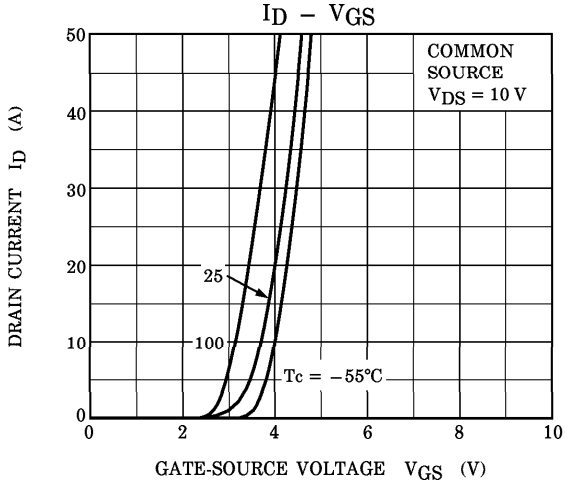
$I_D - V_{DS}$



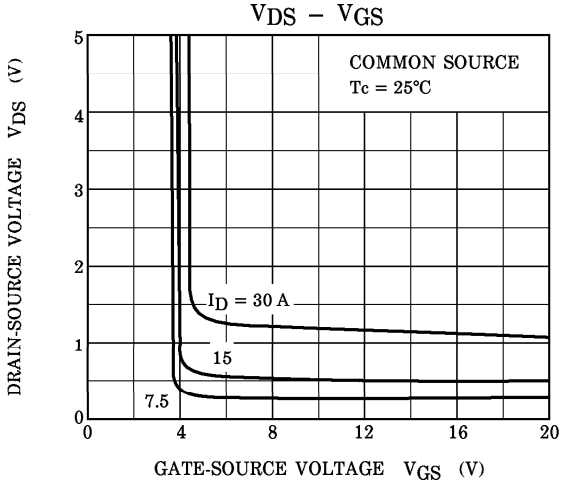
$I_D - V_{DS}$



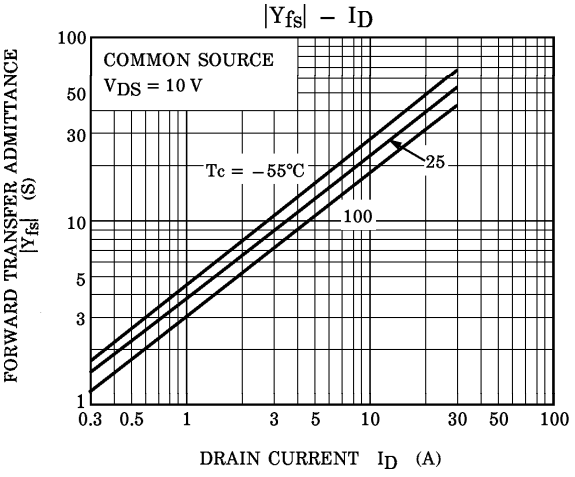
$I_D - V_{GS}$



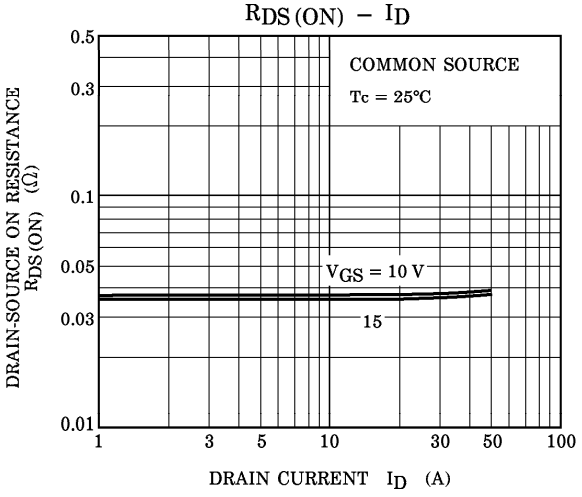
$V_{DS} - V_{GS}$



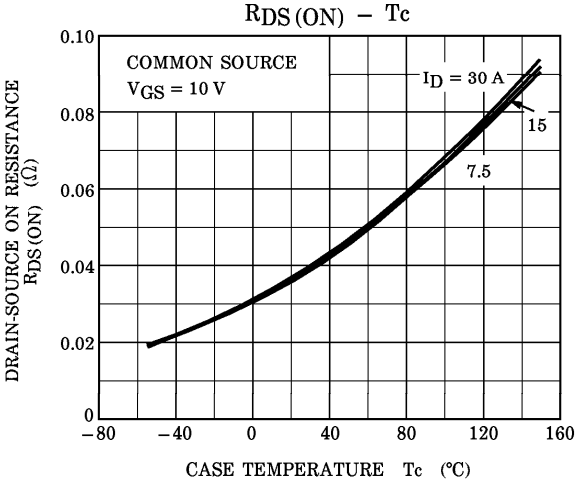
$|Y_{fs}| - I_D$



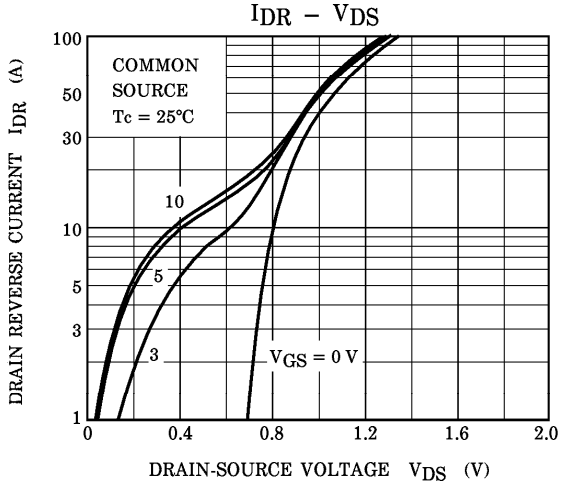
$R_{DS(ON)} - I_D$



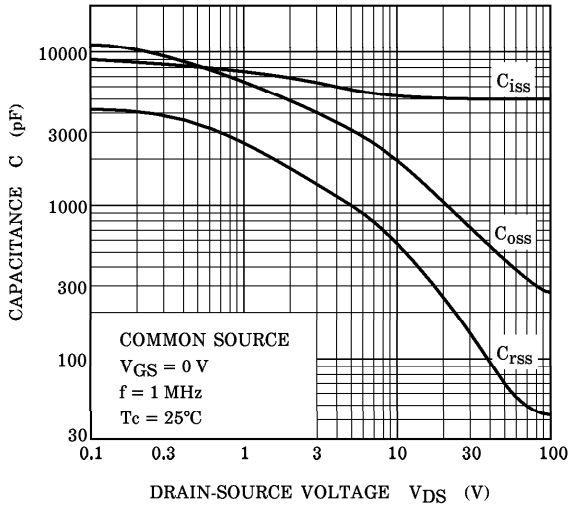
$R_{DS(ON)}$ – Tc



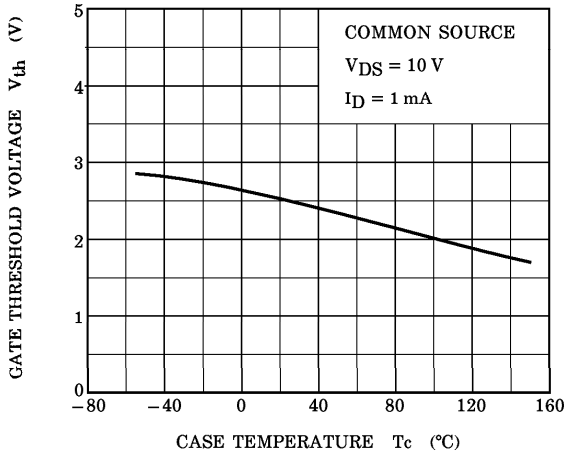
I_{DR} – V_{DS}



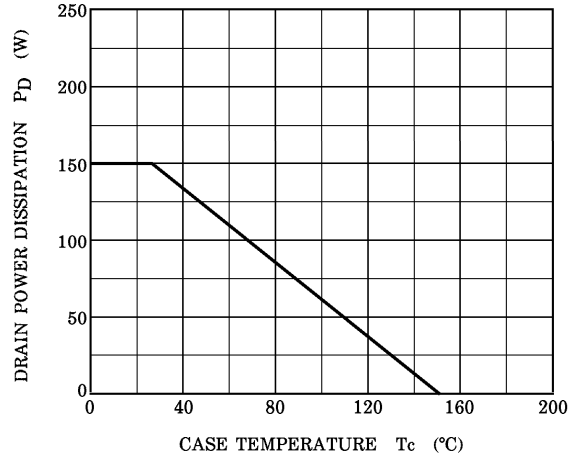
CAPACITANCE – V_{DS}



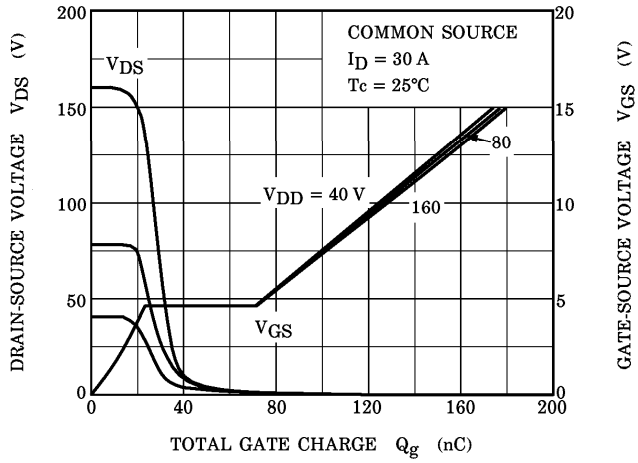
V_{th} – Tc



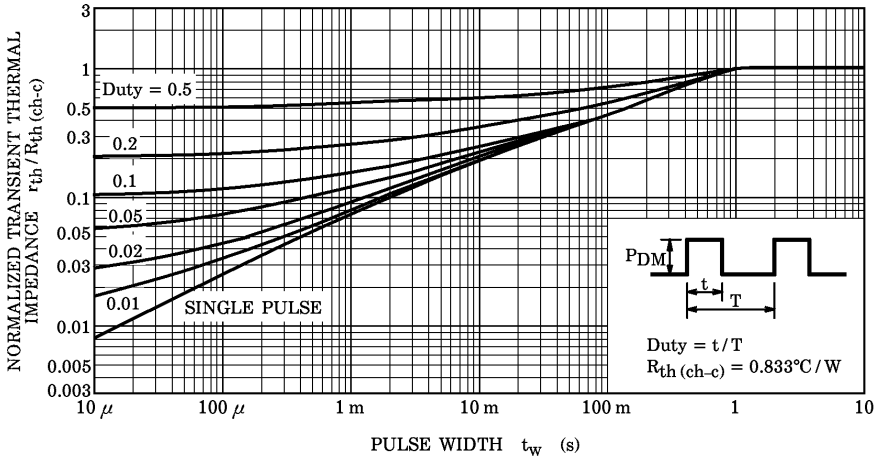
P_D – Tc



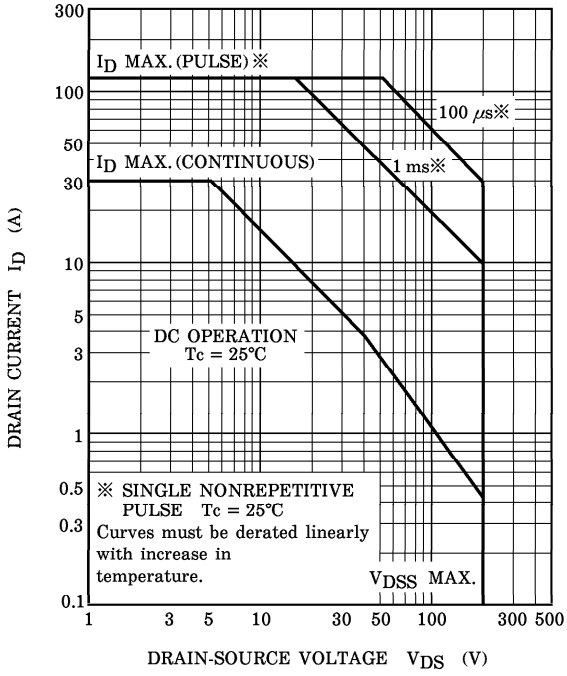
DYNAMIC INPUT / OUTPUT CHARACTERISTICS



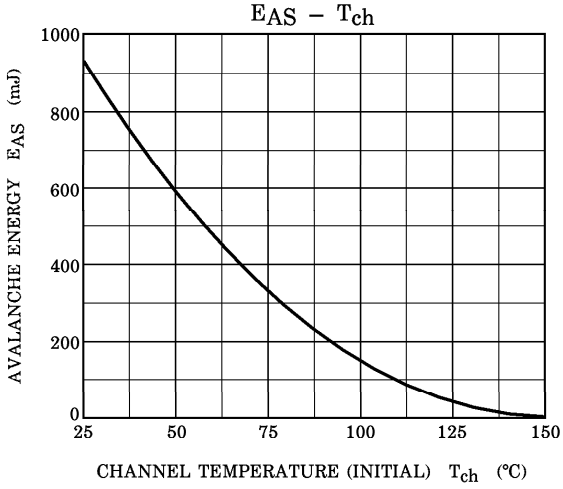
$r_{th} - t_w$

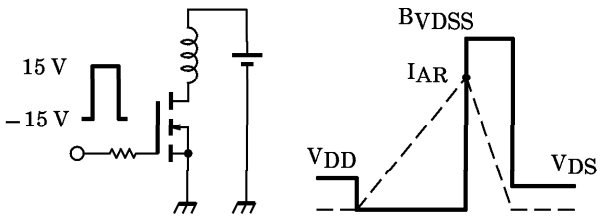


SAFE OPERATING AREA



$E_{AS} - T_{ch}$





TEST CIRCUIT WAVE FORM

Peak $I_{AR} = 30$ A, $R_G = 25\ \Omega$
$V_{DD} = 50$ V, L = 1.66 mH

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