

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

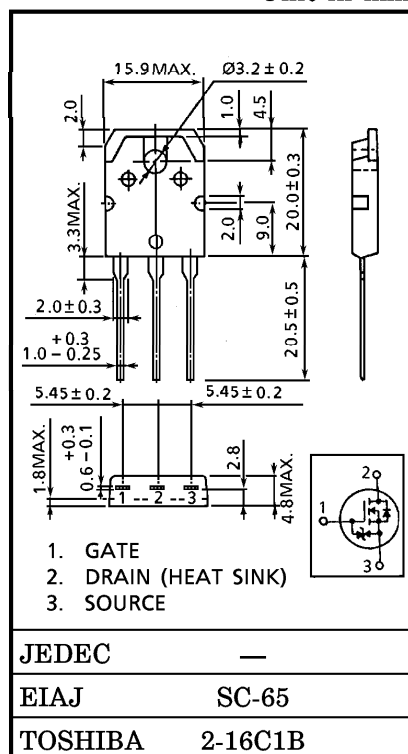
INDUSTRIAL APPLICATIONS

Unit in mm

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

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

CHARACTERISTIC		SYMBOL	RATING	UNIT
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 (T _c = 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	$R_{th(ch-c)}$	0.833	$^\circ\text{C/W}$
Thermal Resistance, Channel to Ambient	$R_{th(ch-a)}$	50.0	$^\circ\text{C/W}$

Note ;

* $V_{DD} = 50 \text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 1.66 \text{ mH}$, $I_{AR} = 30 \text{ A}$, $R_G = 25 \Omega$

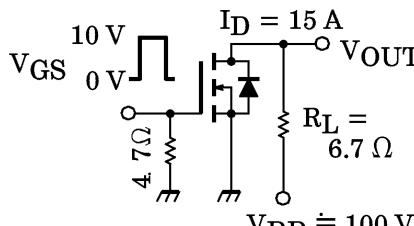
** Repetitive rating ; Pulse Width Limited by Max. junction temperature.

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

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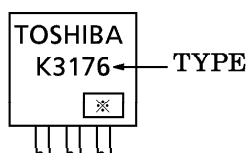
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I_{GSS}	$V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$	—	—	± 10	μA
Drain Cut-off Current		I_{DSS}	$V_{DS} = 200 \text{ V}, V_{GS} = 0 \text{ V}$	—	—	100	μA
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$	200	—	—	V
Gate Threshold Voltage		V_{th}	$V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$	1.5	—	3.5	V
Drain-Source ON Resistance		$R_{DS(ON)}$	$V_{GS} = 10 \text{ V}, I_D = 15 \text{ A}$	—	38	52	$\text{m}\Omega$
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS} = 10 \text{ V}, I_D = 15 \text{ A}$	15	30	—	S
Input Capacitance		C_{iss}	$V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}$ $f = 1 \text{ MHz}$	—	5400	—	pF
Reverse Transfer Capacitance		C_{rss}		—	580	—	
Output Capacitance		C_{oss}		—	1900	—	
Switching Time	Rise Time	t_r	 <p>V_{GS} 10 V 0 V $I_D = 15 \text{ A}$ $R_L = 6.7 \Omega$ $V_{DD} \approx 100 \text{ V}$</p>	—	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	$V_{DD} \approx 160 \text{ V}, V_{GS} = 10 \text{ V}$ $I_D = 30 \text{ A}$	—	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}	$I_{DR} = 30 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	−2.0	V
Reverse Recovery Time	t_{rr}	$I_{DR} = 30 \text{ A}, V_{GS} = 0 \text{ V}$	—	270	—	ns
Reverse Recovery Charge	Q_{rr}	$dI_{DR}/dt = 100 \text{ A}/\mu\text{s}$	—	3.0	—	μC

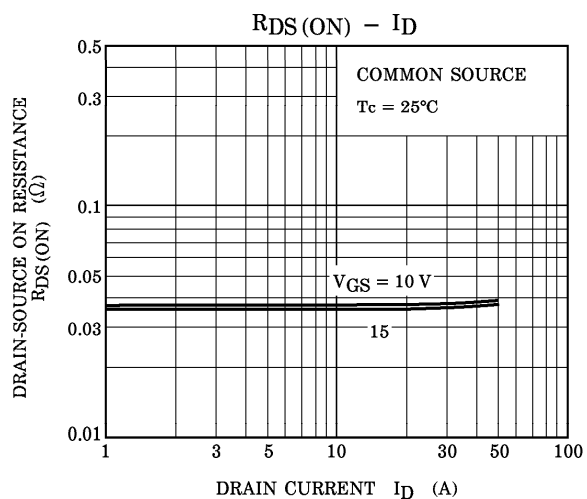
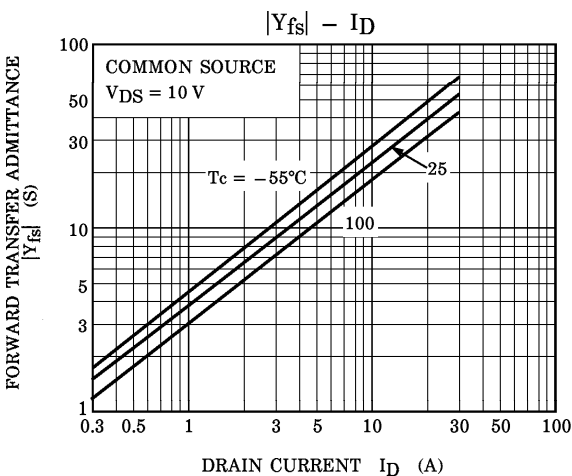
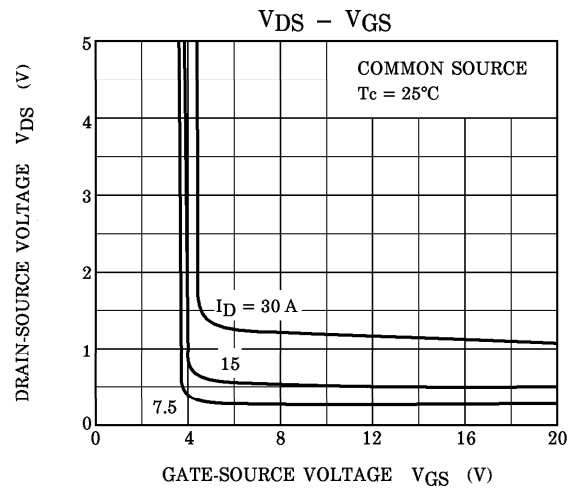
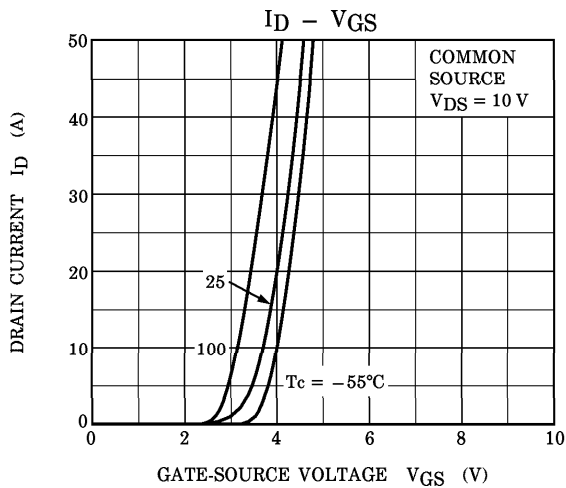
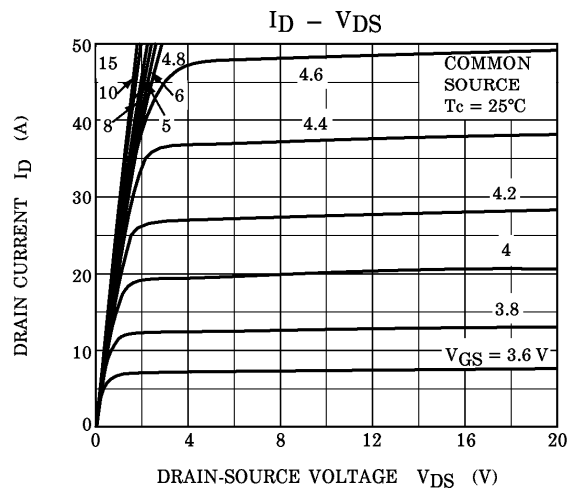
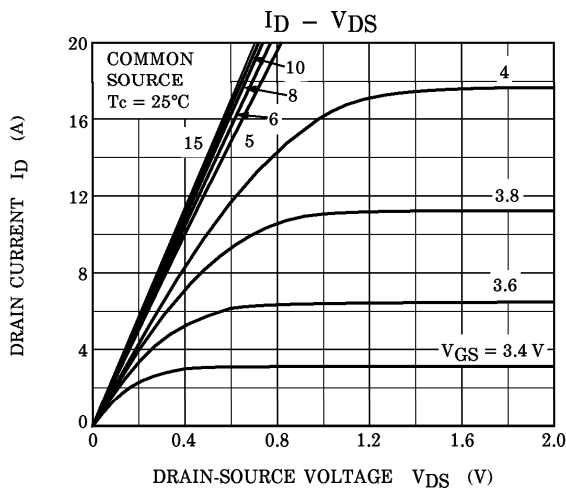
MARKING

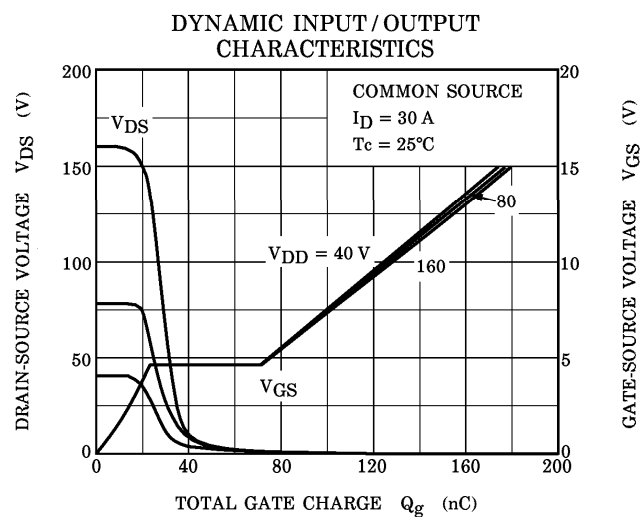
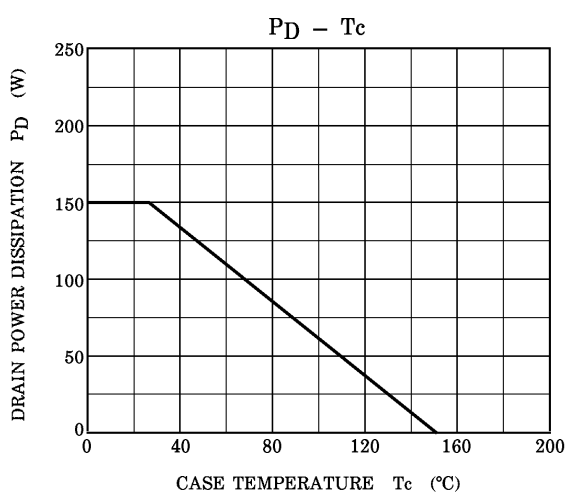
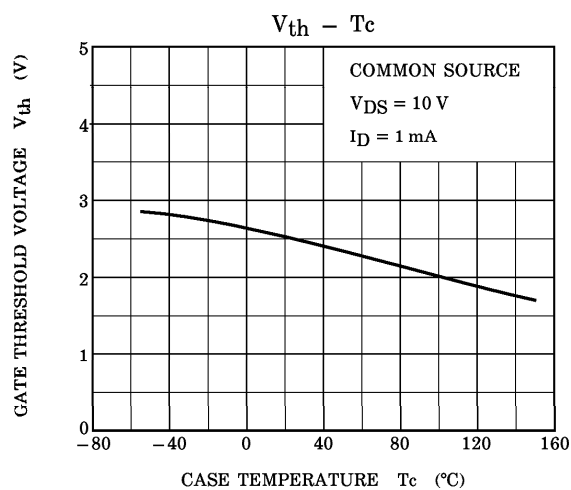
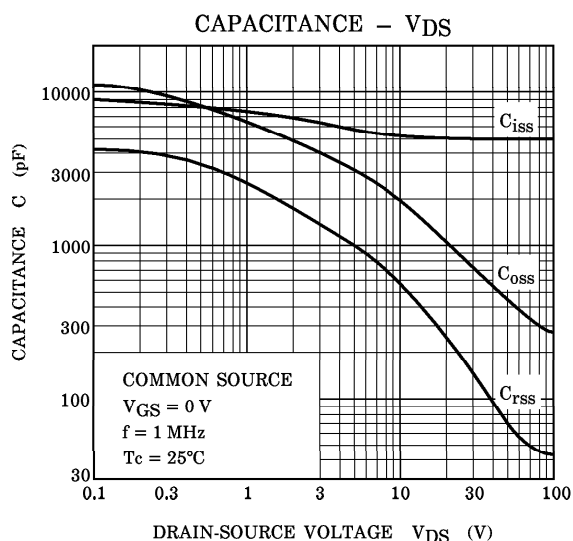
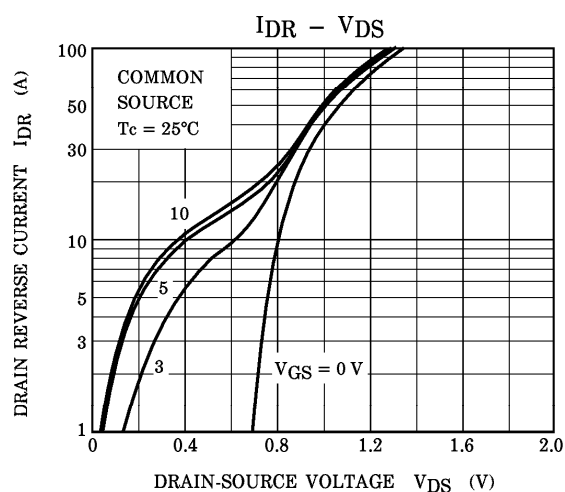
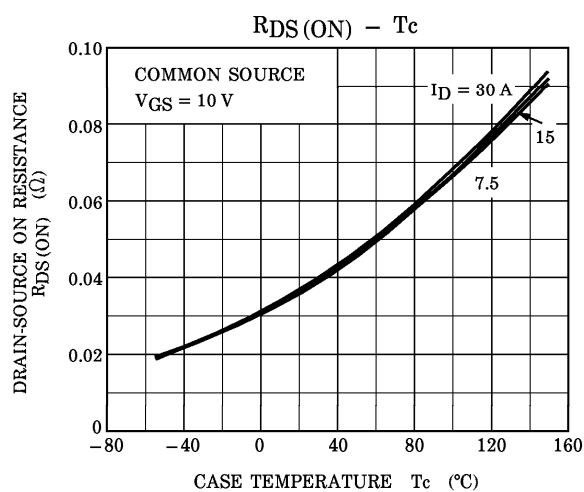


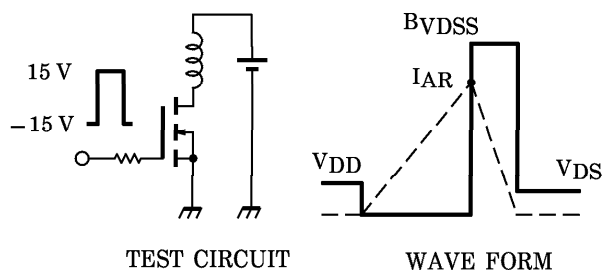
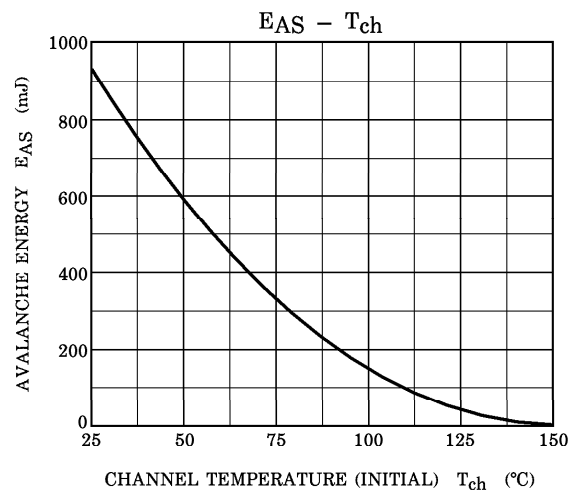
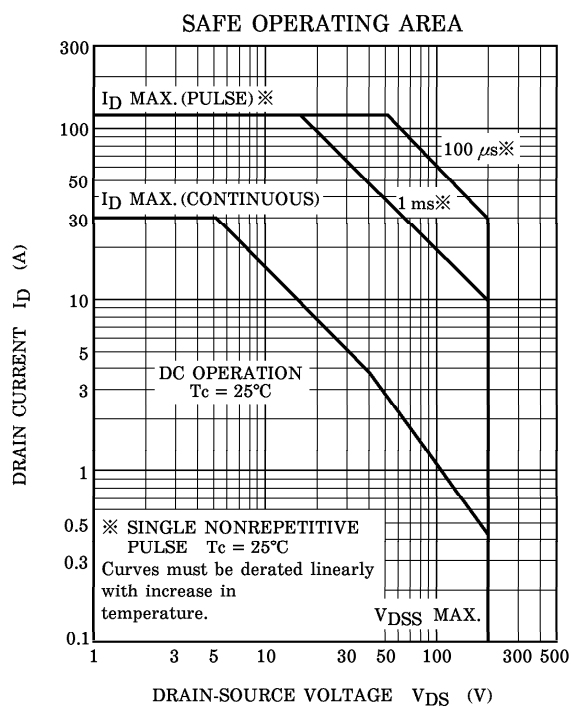
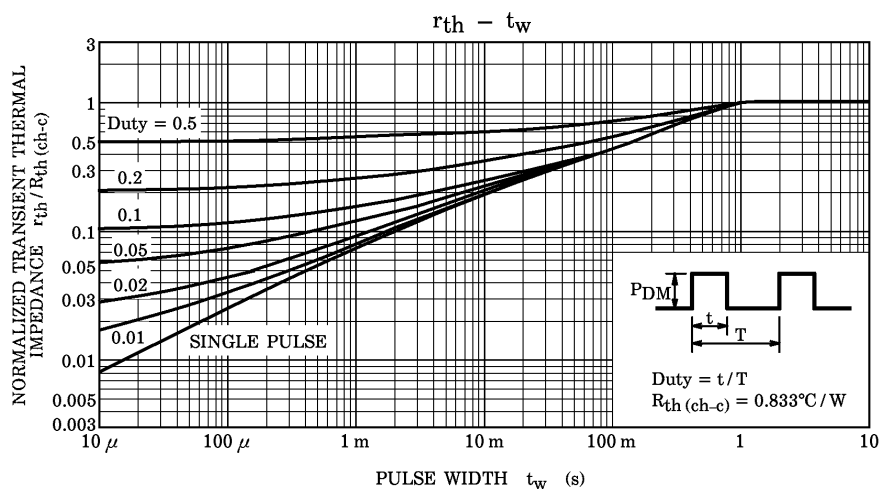
※ Lot Number

□ □ — Month (Starting from Alphabet A)

— Year (Last Number of the Christian Era)







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

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