



# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
 2 S K 6 9 3  
 SILICON N CHANNEL MOS TYPE  
 ( $\pi$ -MOS1)

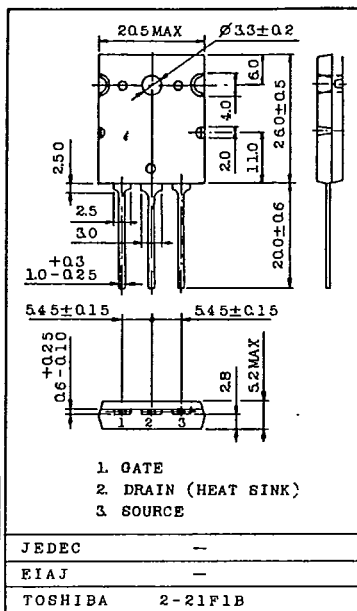
INDUSTRIAL APPLICATIONS

Unit in mm

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
 CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
 DRIVE APPLICATIONS.

### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.32\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=9.0S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$  (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=300\mu A$  (Max.) @  $V_{DS}=450V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=10V, I_D=1mA$



Weight : 9.75g

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

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	450	V
Drain-Gate Voltage ( $R_{GS}=20k\Omega$ )		$V_{DGR}$	450	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	13	A
	Pulse	$I_{DP}$	52	
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	150	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=450V, V_{GS}=0V$	-	-	300	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0V$	450	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1mA$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=7A$	6.0	9.0	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=7A, V_{GS}=10V$	-	0.32	0.40	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=13A, V_{GS}=10V$	-	4.8	6.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=10V, V_{GS}=0V, f=1MHz$	-	2300	3600	pF
Reverse Transfer Capacitance		$C_{rss}$		-	450	680	
Output Capacitance		$C_{oss}$		-	1000	1400	
Switching Time	Rise Time	$t_r$	<p><math>I_D=7A</math> <math>V_{IN}</math> <math>0</math> <math>10\mu s</math> <math>V_{IN}: t_r, t_f &lt; 5ns</math> <math>Duty \leq 1\%</math> <math>V_{DD} \approx 210V</math></p>	-	70	140	ns
	Turn-on Time	$t_{on}$		-	100	200	
	Fall Time	$t_f$		-	75	150	
	Turn-off Time	$t_{off}$		-	350	700	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$I_D=13A, V_{GS}=10V$ $V_{DD} \approx 360V$	-	82	110	nC
Gate-Source Charge		$Q_{gs}$		-	47	-	
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	35	-	

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

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	--	-	-	13	A
Pulse Drain Reverse Current	$I_{DRP}$	--	-	-	52	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR}=13A, V_{GS}=0V$	-	-	1.8	V
Reverse Recovery Time	$t_{rr}$	$I_{DR}=13A$	-	400	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_{DR}/dt=100A/\mu s$	-	4.0	-	$\mu C$