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

2SK3117

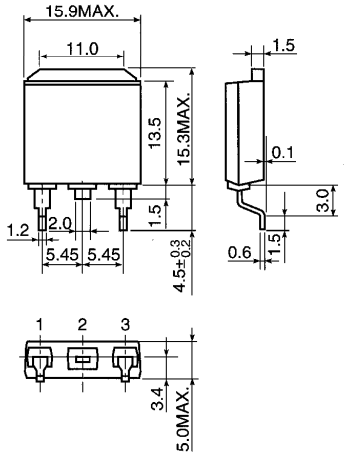
HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS

INDUSTRIAL APPLICATIONS

- Low Drain-Source ON Resistance : $R_{DS\,(ON)} = 0.21\ \Omega$ (Typ.)
- High Forward Transfer Admittance : $|Y_{fs}| = 17$ S (Typ.)
- Low Leakage Current : $I_{DSS} = 100\ \mu$A (Max.) ($V_{DSS} = 500$ V)
- Enhancement-Mode : $V_{th} = 2.0 \sim 4.0$ V ($V_{DS} = 10$ V, $I_D = 1$ mA)

Unit in mm



1. GATE
2. DRAIN (HEAT SINK)
3. SOURCE

JEDEC	—
EIAJ	—
TOSHIBA	2-16H1B

Weight : 4.6 g

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V_{DSS}	500	V
Drain-Gate Voltage ($R_{GS} = 20\ k\Omega$)		V_{DGR}	500	V
Gate-Source Voltage		V_{GSS}	±30	V
Drain Current	DC	I_D	20	A
	Pulse	I_{DP}	80	A
Drain Power Dissipation (Tc = 25°C)		P_D	150	W
Single Pulse Avalanche Energy**		E_{AS}	960	mJ
Avalanche Current		I_{AR}	20	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	°C / W

Note ;

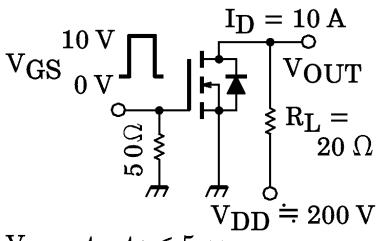
* Repetitive rating ; Pulse Width Limited by Max. junction temperature.

** $V_{DD} = 90$ V, Starting $T_{ch} = 25$°C, L = 4.08 mH
$R_G = 25\ \Omega$, $I_{AR} = 20$ A

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

961001EAA1

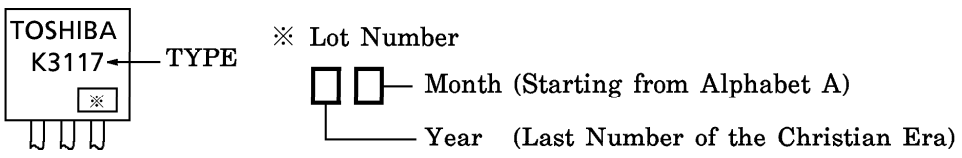
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I_{GSS}	V_{GS} = ±25 V, V_{DS} = 0 V	—	—	±10	μA
Gate-Source Breakdown Voltage		$V_{(BR)\,GSS}$	I_G = ±10 μA, V_{DS} = 0 V	±30	—	—	V
Drain Cut-off Current		I_{DSS}	V_{DS} = 500 V, V_{GS} = 0 V	—	—	100	μA
Drain-Source Breakdown Voltage		$V_{(BR)\,DSS}$	I_D = 10 mA, V_{GS} = 0 V	500	—	—	V
Gate Threshold Voltage		V_{th}	V_{DS} = 10 V, I_D = 1 mA	2.0	—	4.0	V
Drain-Source ON Resistance		$R_{DS\,(ON)}$	V_{GS} = 10 V, I_D = 10 A	—	0.21	0.27	Ω
Forward Transfer Admittance		$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 10 A	10	17	—	S
Input Capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	3720	—	pF
Reverse Transfer Capacitance		C_{rss}		—	340	—	
Output Capacitance		C_{oss}		—	1165	—	
Switching Time	Rise Time	t_r		—	30	—	ns
	Turn-on Time	t_{on}		—	70	—	
	Fall Time	t_f		—	50	—	
	Turn-off Time	t_{off}		—	290	—	
Total Gate Charge (Gate-Source Plus Gate-Drain)		Q_g	V_{DD} ≒ 400 V, V_{GS} = 10 V, I_D = 6 A	—	80	—	nC
Gate-Source Charge		Q_{gs}		—	48	—	
Gate-Drain ("Miller") Charge		Q_{gd}		—	32	—	

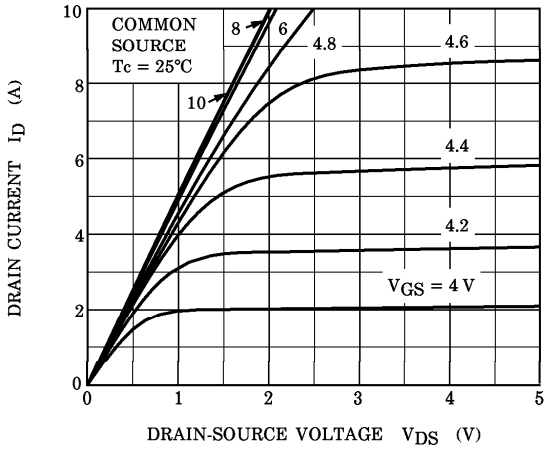
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	I_{DR}	—	—	—	20	A
Pulse Drain Reverse Current	I_{DRP}	—	—	—	80	A
Diode Forward Voltage	V_{DSF}	I_{DR} = 20 A, V_{GS} = 0 V	—	—	−1.7	V
Reverse Recovery Time	t_{rr}	I_{DR} = 20 A, V_{GS} = 0 V, dI_{DR}/dt = 100 A/μs	—	540	—	ns
Reverse Recovery Charge	Q_{rr}		—	5.4	—	μC

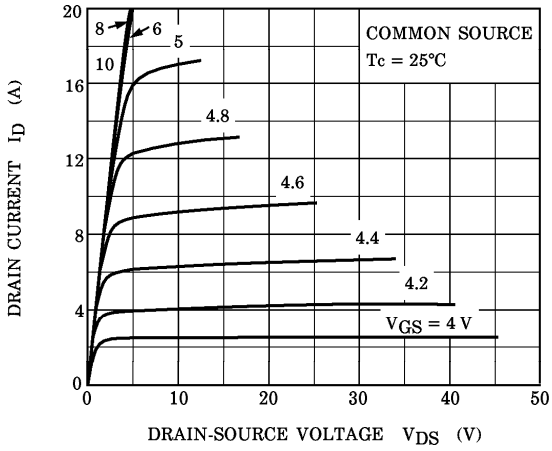
MARKING



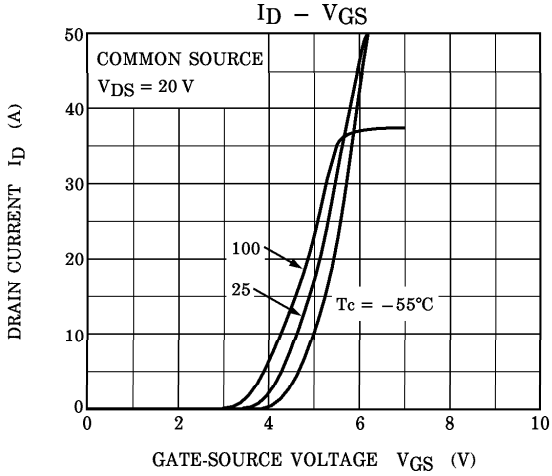
$I_D - V_{DS}$



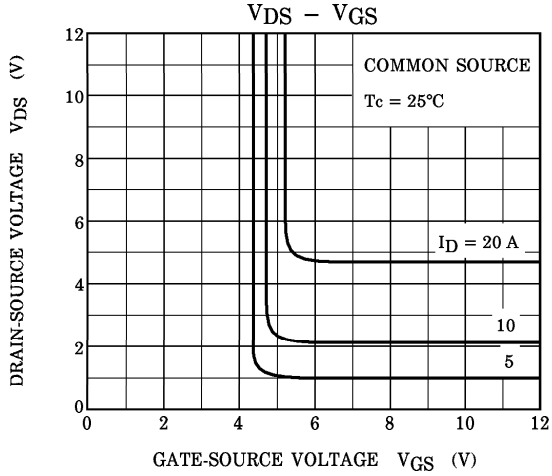
$I_D - V_{DS}$



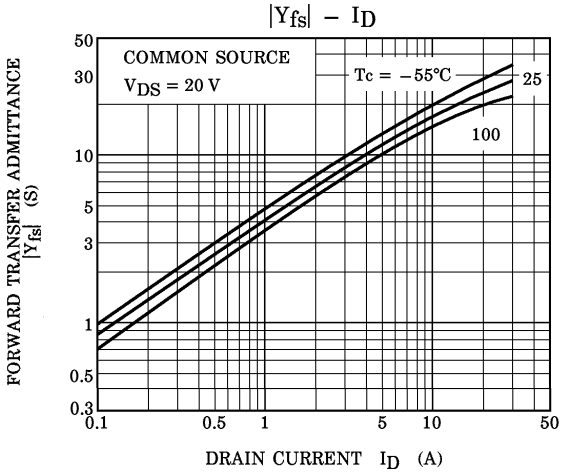
$I_D - V_{GS}$



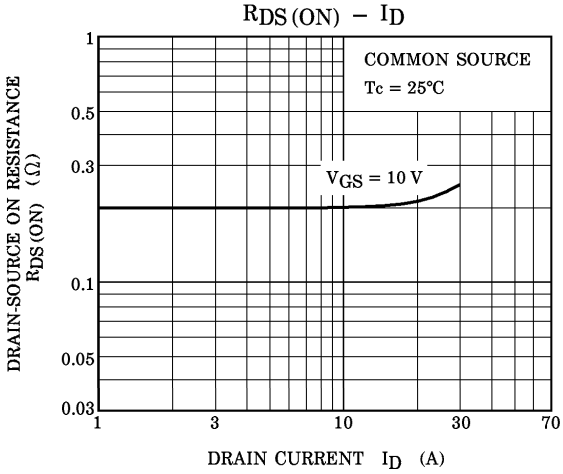
$V_{DS} - V_{GS}$



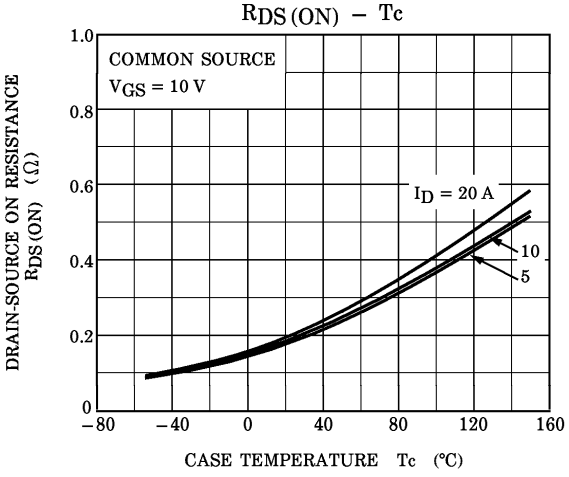
$|Y_{fs}| - I_D$



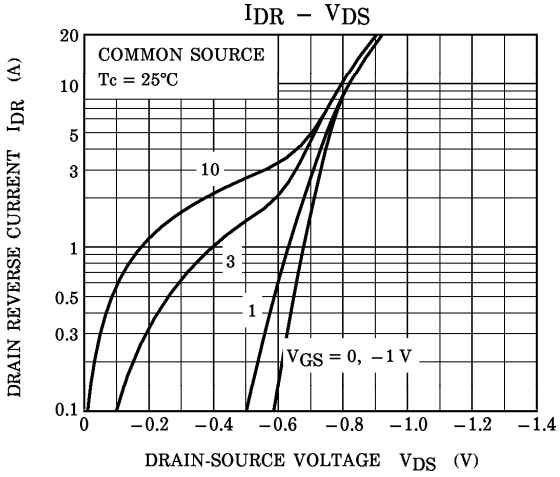
$R_{DS\,(ON)} - I_D$



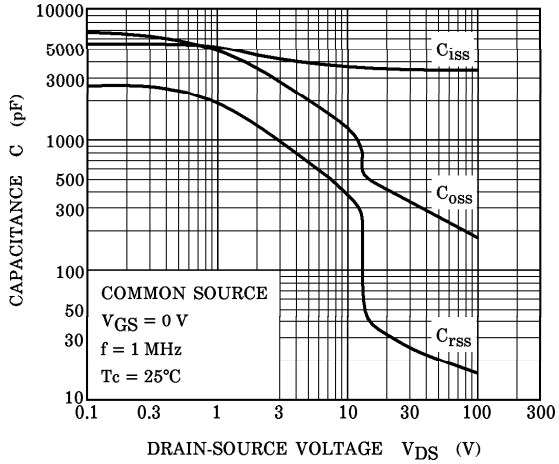
$R_{DS\,(ON)}$ – Tc



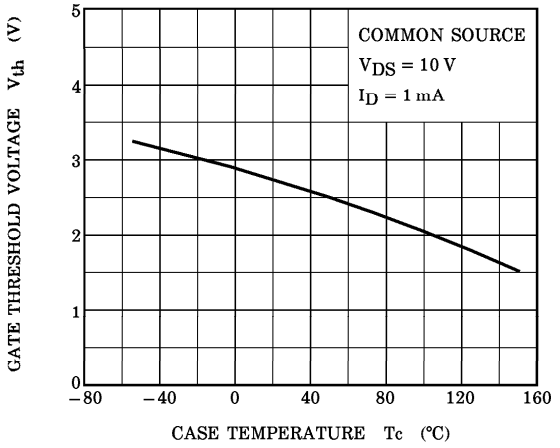
I_{DR} – V_{DS}



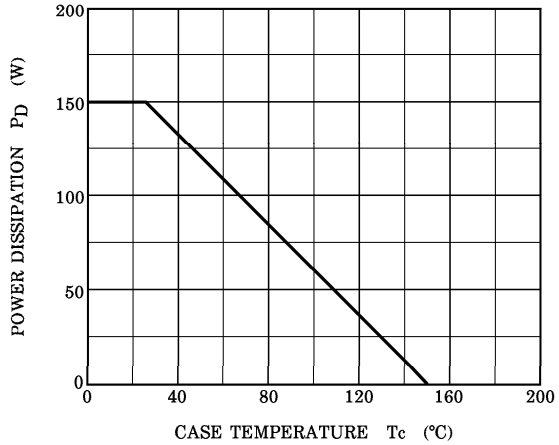
CAPACITANCE – V_{DS}



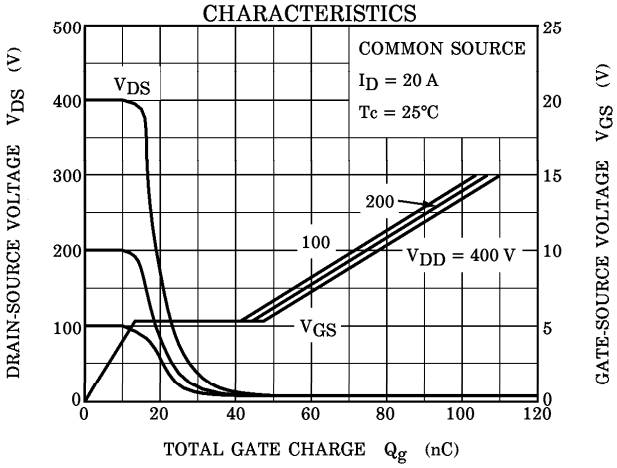
V_{th} – Tc



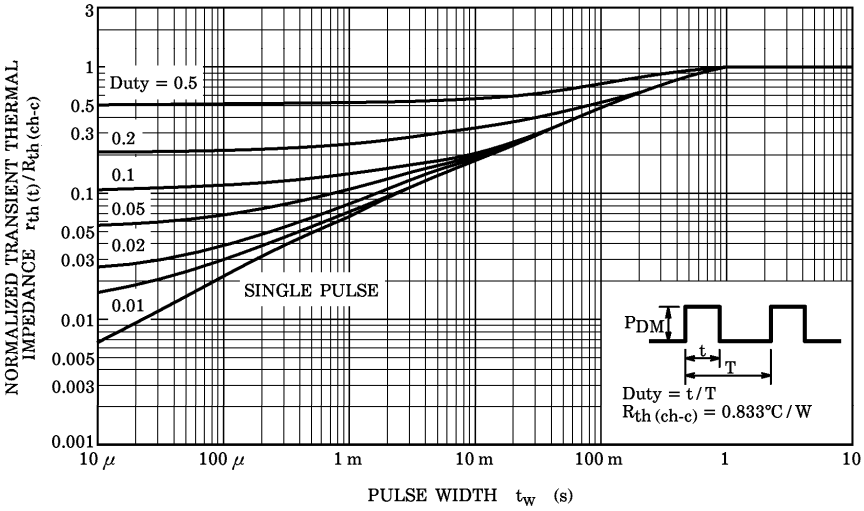
P_D – Tc



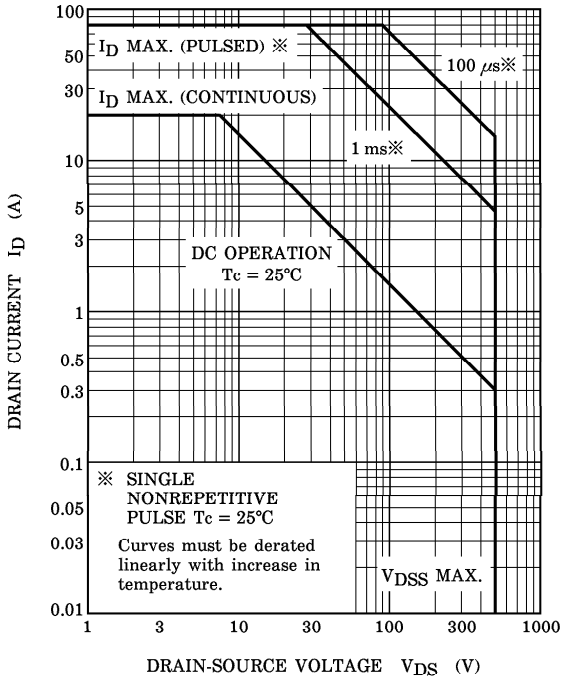
DYNAMIC INPUT / OUTPUT CHARACTERISTICS



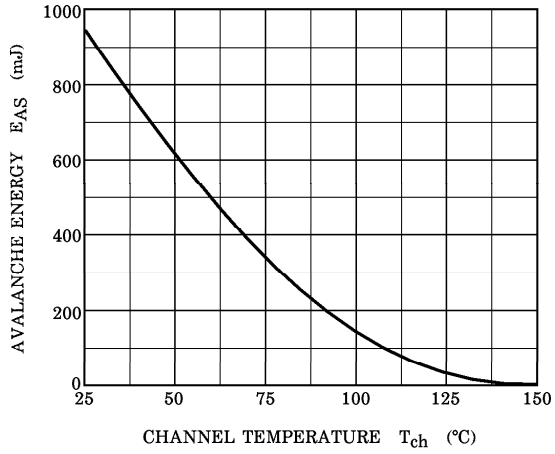
r_{th} – t_w

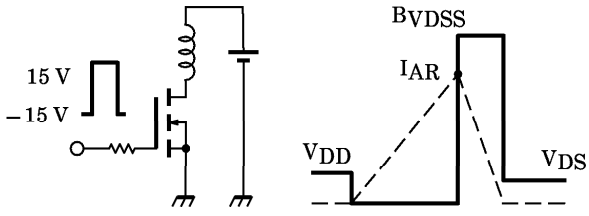


SAFE OPERATING AREA



E_{AS} – T_{ch}





TEST CIRCUIT WAVE FORM

Peak I_{AR} = 20 A, R_G = 25 Ω
V_{DD} = 90 V, L = 4.08 mH

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