

TOSHIBA Field Effect Transistor Silicon N-Channel MOS Type (MACH II π -MOS VI)

2SK3936

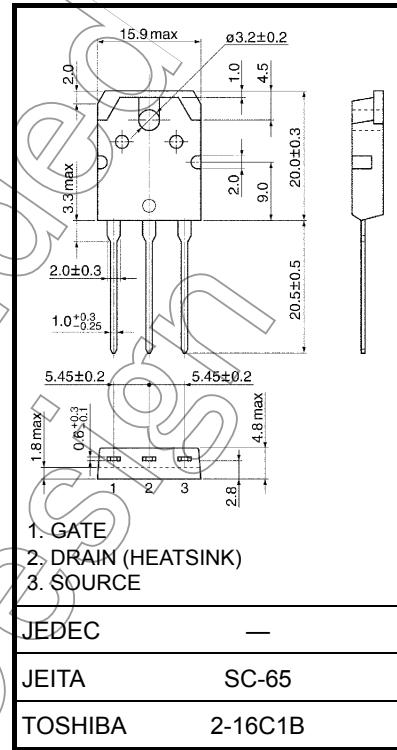
Switching Regulator Applications

Unit: mm

- Small gate charge: $Q_g = 60 \text{ nC}$ (typ.)
- Fast reverse recovery time: $t_{rr} = 380 \text{ ns}$ (typ.)
- Low drain-source ON-resistance: $R_{DS(\text{ON})} = 0.2 \Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 16.5 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = 500 \mu\text{A}$ ($V_{DS} = 500 \text{ V}$)
- Enhancement mode: $V_{th} = 2.0 \text{ to } 4.0 \text{ V}$ ($V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$)

Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristic	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	500	V
Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)	V_{DGR}	500	V
Gate-source voltage	V_{GSS}	± 30	V
Drain current	DC (Note 1)	I_D	A
	Pulse (Note 1)	I_{DP}	
Drain power dissipation ($T_c = 25^\circ\text{C}$)	P_D	150	W
Single-pulse avalanche energy (Note 2)	E_{AS}	759	mJ
Avalanche current	I_{AR}	23	A
Repetitive avalanche energy (Note 3)	E_{AR}	15	mJ
Channel temperature	T_{ch}	150	$^\circ\text{C}$
Storage temperature range	T_{stg}	-55 to 150	$^\circ\text{C}$



Weight: 4.6 g (typ.)

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings. Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).

Thermal Characteristics

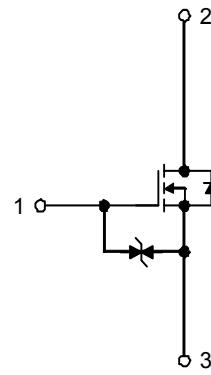
Characteristic	Symbol	Max	Unit
Thermal resistance, channel to case	R_{th} (ch-c)	0.833	$^\circ\text{C}/\text{W}$
Thermal resistance, channel to ambient	R_{th} (ch-a)	50	$^\circ\text{C}/\text{W}$

Note 1: Ensure that the channel temperature does not exceed 150°C .

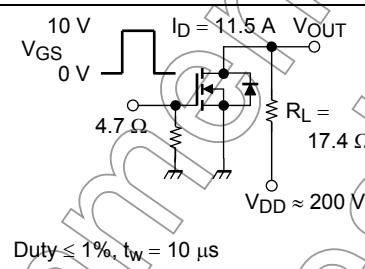
Note 2: $V_{DD} = 90 \text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 2.44 \text{ mH}$, $I_{AR} = 23 \text{ A}$, $R_G = 25 \Omega$

Note 3: Repetitive rating: pulse width limited by maximum channel temperature

This transistor is an electrostatic-sensitive device. Handle with care.



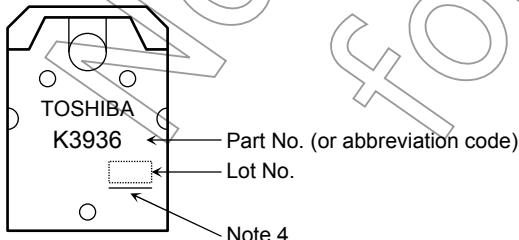
Electrical Characteristics (Ta = 25°C)

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 cutoff current	I _{DSS}	V _{DS} = 500 V, V _{GS} = 0 V	—	—	500	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 = 11.5 A	—	0.2	0.25	Ω
Forward transfer admittance	Y _{fs}	V _{DS} = 10 V, I _D = 11.5 A	8	16.5	—	S
Input capacitance	C _{iss}	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz	—	4250	—	pF
Reverse transfer capacitance	C _{rss}		—	10	—	
Output capacitance	C _{oss}		—	420	—	
Switching time	Rise time	t _r		—	12	—
	Turn-on time	t _{on}		—	45	—
	Fall time	t _f		—	10	—
	Turn-off time	t _{off}		—	80	—
Total gate charge	Q _g	V _{DD} ≈ 400 V, V _{GS} = 10 V, I _D = 23 A	—	60	—	nC
Gate-source charge	Q _{gs}		—	50	—	
Gate-drain charge	Q _{gd}		—	10	—	

Source-Drain Ratings and Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I _{DR}	—	—	—	23	A
Pulse drain reverse current (Note 1)	I _{DRP}	—	—	—	92	A
Forward voltage (diode)	V _{DSF}	I _{DR} = 23 A, V _{GS} = 0 V	—	—	-1.7	V
Reverse recovery time	t _{rr}	I _{DR} = 23 A, V _{GS} = 0 V, dI _{DR} /dt = 100 A/μs	—	380	—	ns
Reverse recovery charge	Q _{rr}		—	2.4	—	μC

Marking

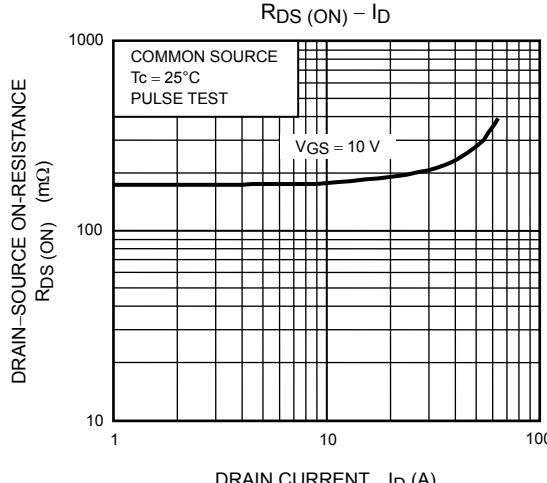
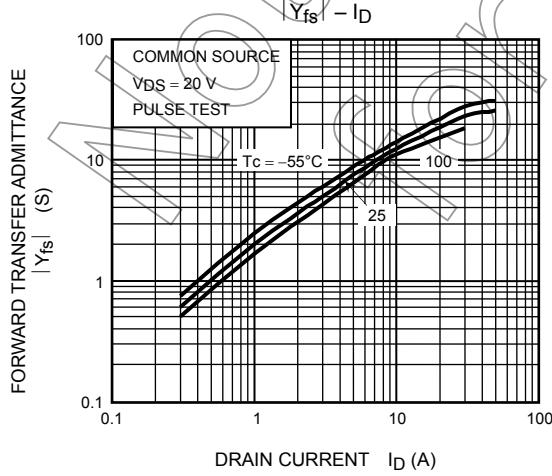
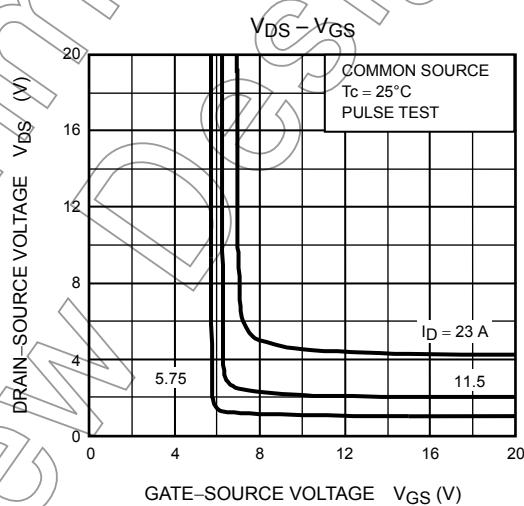
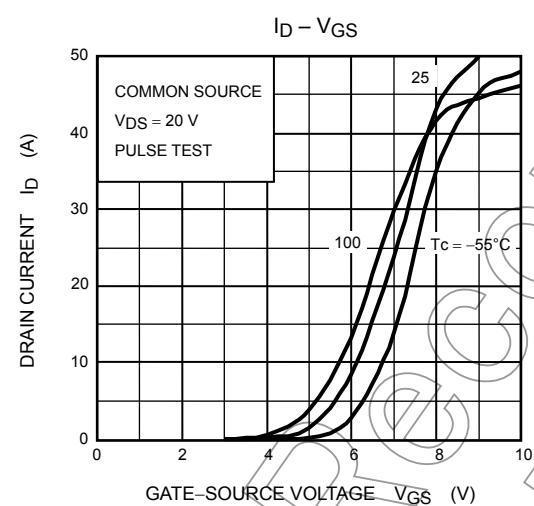
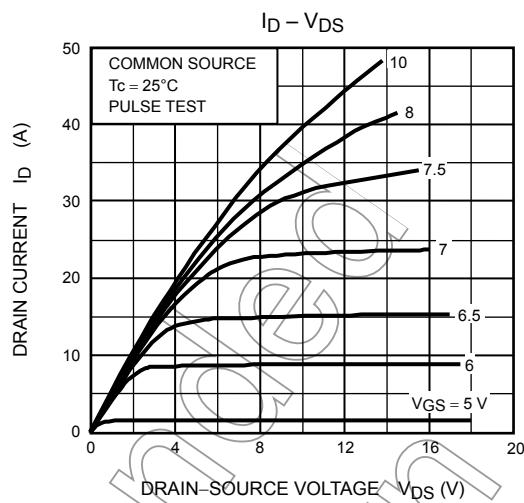
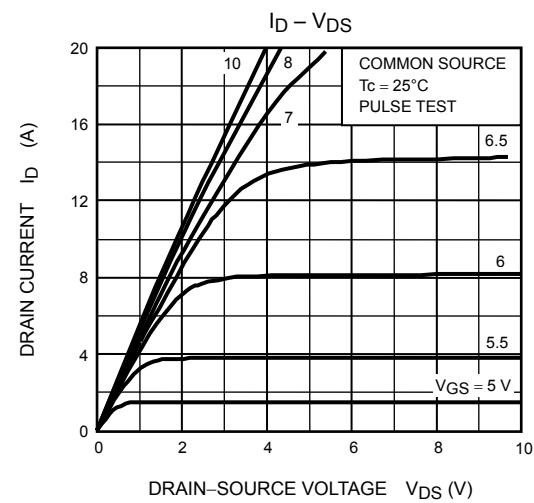


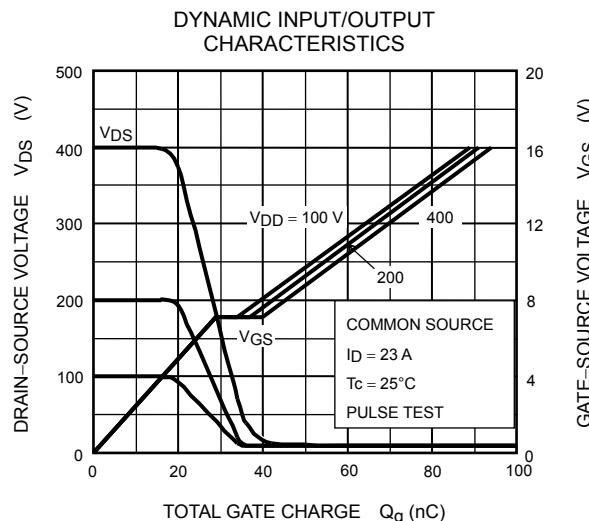
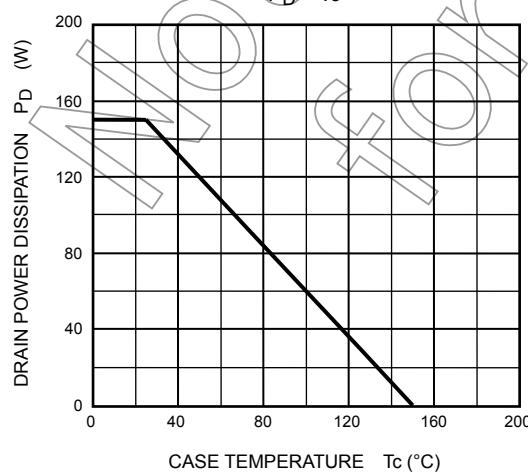
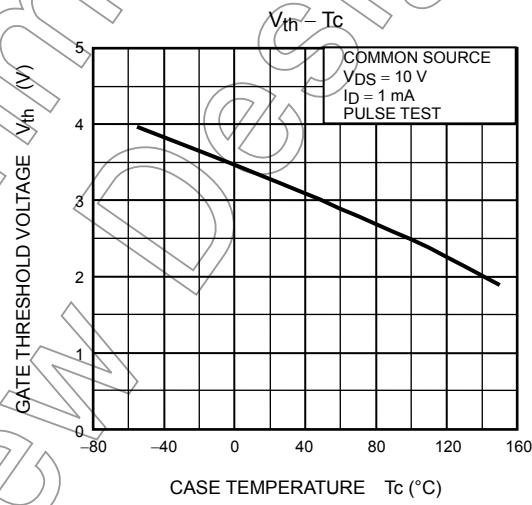
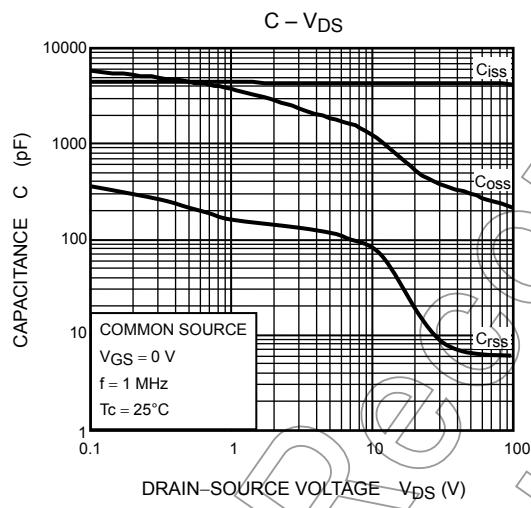
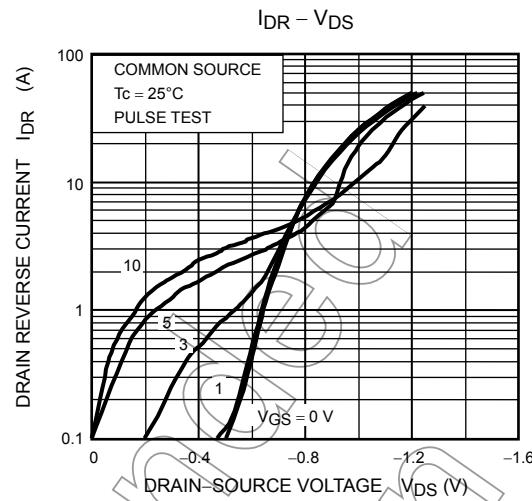
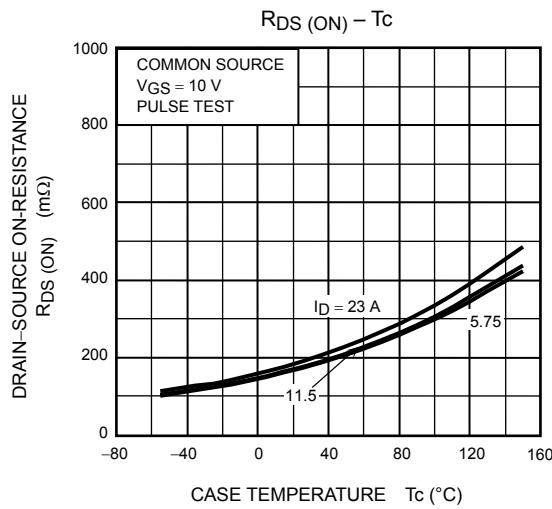
Note 4: A line under a Lot No. identifies the indication of product Labels.

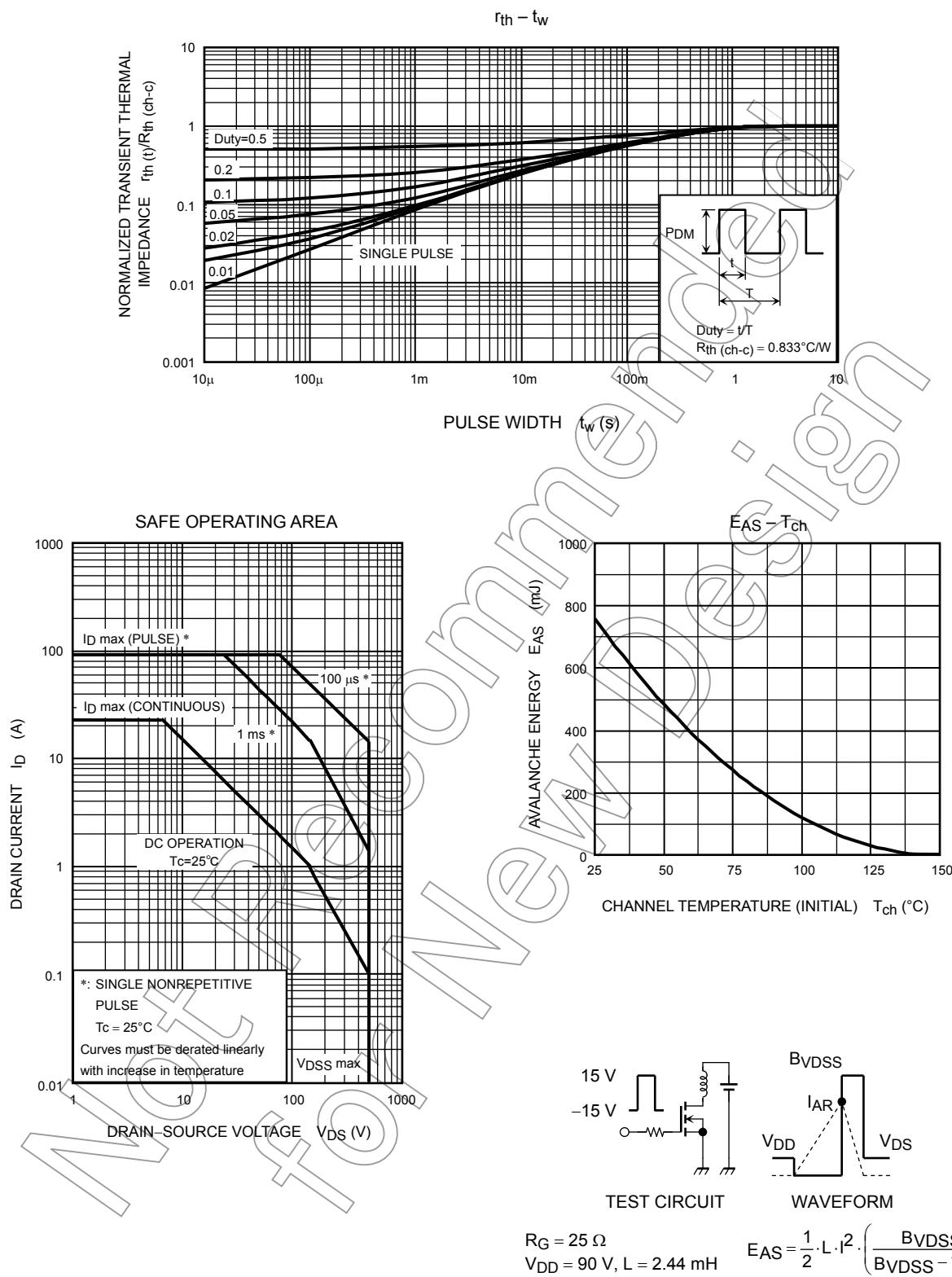
Not underlined: [[Pb]]/INCLUDES > MCV

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