

TOSHIBA Field Effect Transistor Silicon P Channel MOS Type (L<sup>2</sup>-π-MOSV)

# 2SJ512

Chopper Regulator, DC-DC Converter and Motor Drive Applications

- Low drain-source ON resistance :  $R_{DS(ON)} = 1.0 \Omega$  (typ.)
- High forward transfer admittance :  $|Y_{fs}| = 3.7 S$  (typ.)
- Low leakage current :  $I_{DSS} = -100 \mu A$  (max) ( $V_{DS} = -250 V$ )
- Enhancement mode :  $V_{th} = -1.5 \sim -3.5 V$  ( $V_{DS} = -10 V, I_D = -1 mA$ )

## Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Drain-source voltage	$V_{DSS}$	-250	V
Drain-gate voltage ( $R_{GS} = 20 k\Omega$ )	$V_{DGR}$	-250	V
Gate-source voltage	$V_{GSS}$	$\pm 20$	V
Drain current	DC (Note 1)	$I_D$	-5 A
	Pulse (Note 1)	$I_{DP}$	-20 A
Drain power dissipation ( $T_c = 25^\circ C$ )	$P_D$	30	W
Single pulse avalanche energy (Note 2)	$E_{AS}$	155	mJ
Avalanche current	$I_{AR}$	-5	A
Repetitive avalanche energy (Note 3)	$E_{AR}$	3.0	mJ
Channel temperature	$T_{ch}$	150	°C
Storage temperature range	$T_{stg}$	-55~150	°C

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

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	4.16	°C / W
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	62.5	°C / W

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

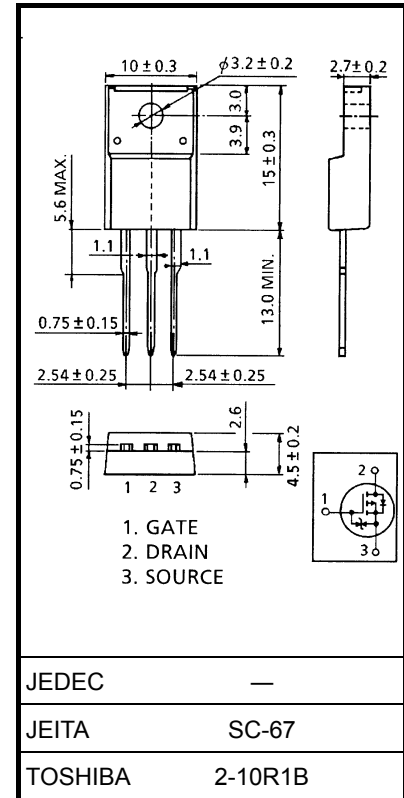
Note 2:  $V_{DD} = -50 V, T_{ch} = 25^\circ C$  (initial),  $L = 10.5 mH, R_G = 25 \Omega, I_{AR} = -5 A$

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

This transistor is an electrostatic-sensitive device.

Please handle with caution.

Unit: mm



Weight: 1.9 g (typ.)

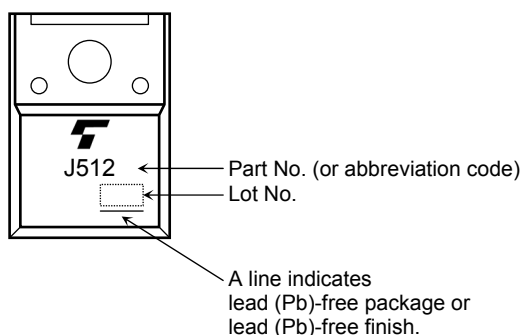
## Electrical Characteristics (Ta = 25°C)

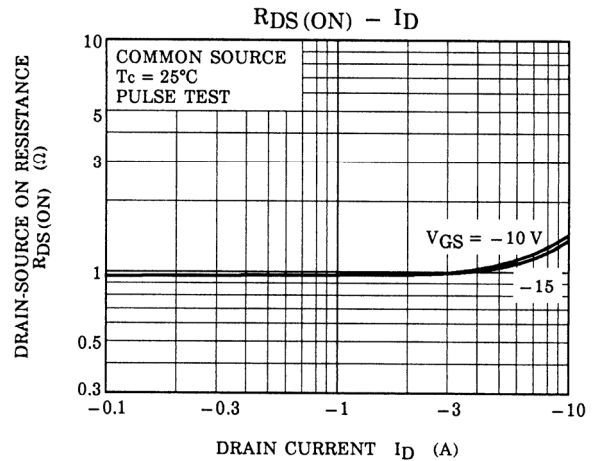
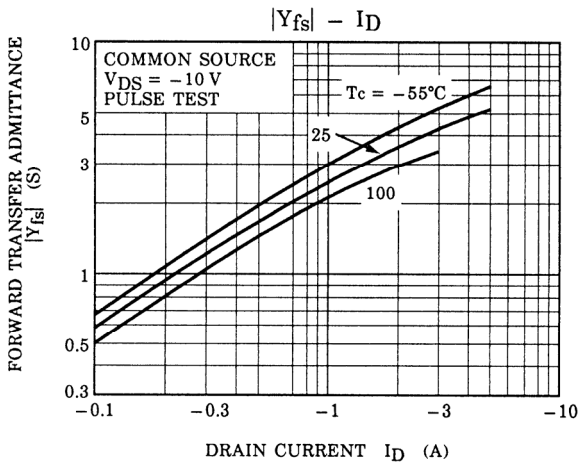
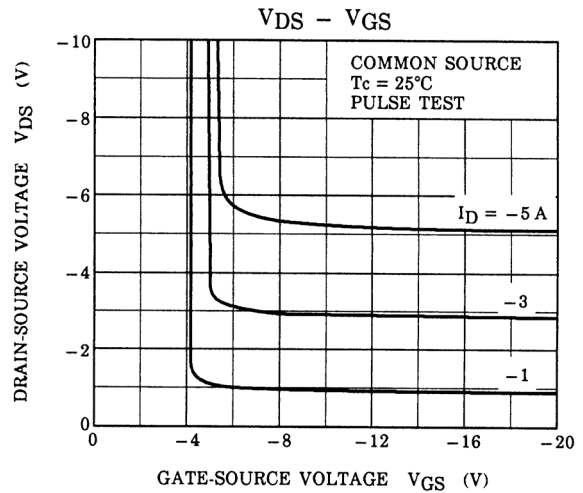
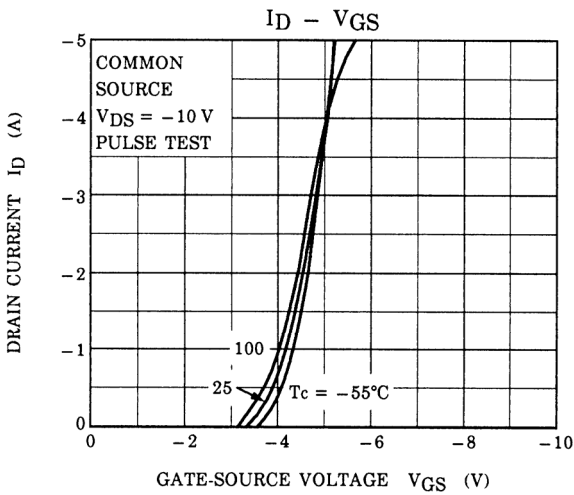
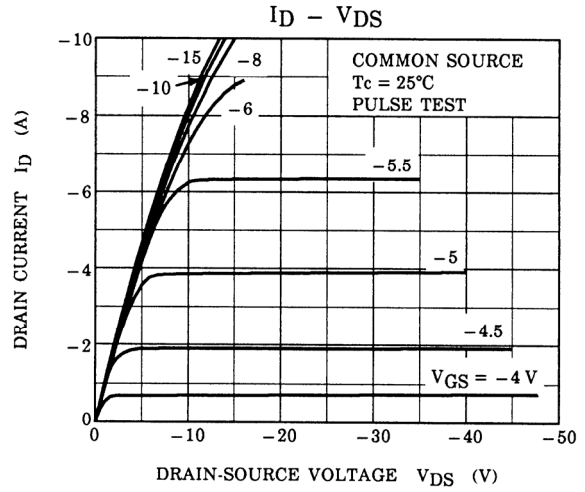
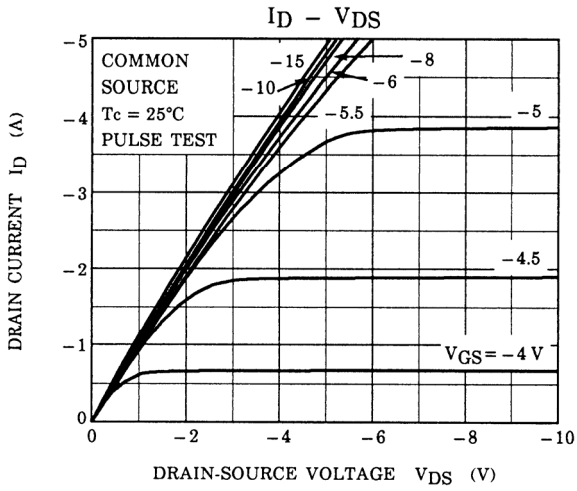
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cut-off current		$I_{DSS}$	$V_{DS} = -250\text{ V}, V_{GS} = 0\text{ V}$	—	—	-100	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = -10\text{ mA}, V_{GS} = 0\text{ V}$	-250	—	—	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		$R_{DS(ON)}$	$V_{GS} = -10\text{ V}, I_D = -2.5\text{ A}$	—	1.0	1.25	$\Omega$
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = -10\text{ V}, I_D = -2.5\text{ A}$	1.8	3.7	—	S
Input capacitance		$C_{iss}$	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	800	—	pF
Reverse transfer capacitance		$C_{rss}$		—	80	—	
Output capacitance		$C_{oss}$		—	250	—	
Switching time	Rise time	$t_r$	<p><math>I_D = -2.5\text{ A}</math>  <math>V_{GS} = 0\text{ V}, -10\text{ V}</math>  <math>V_{DS} = -100\text{ V}</math>  <math>R_L = 40\ \Omega</math>  <math>50\ \Omega</math>  <math>V_{DD} = -100\text{ V}</math>                      Duty <math>\leq 1\%</math>, <math>t_w = 10\ \mu\text{s}</math></p>	—	16	—	ns
	Turn-on time	$t_{on}$		—	35	—	
	Fall time	$t_f$		—	9	—	
	Turn-off time	$t_{off}$		—	70	—	
Total gate charge (Gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx -200\text{ V}, V_{GS} = -10\text{ V}, I_D = -5\text{ A}$	—	22	—	nC
Gate-source charge		$Q_{gs}$		—	14	—	
Gate-drain ("miller") charge		$Q_{gd}$		—	8	—	

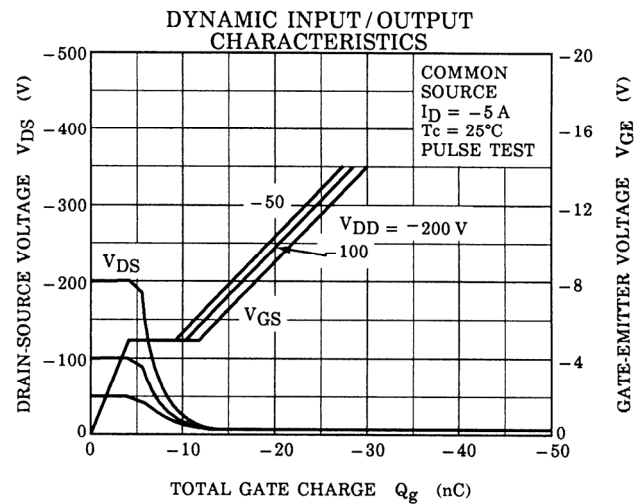
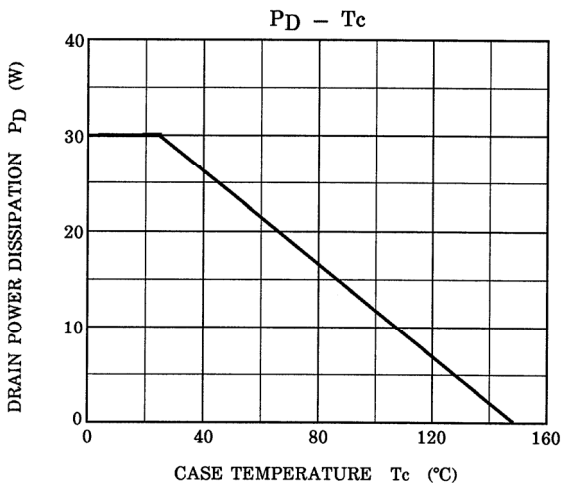
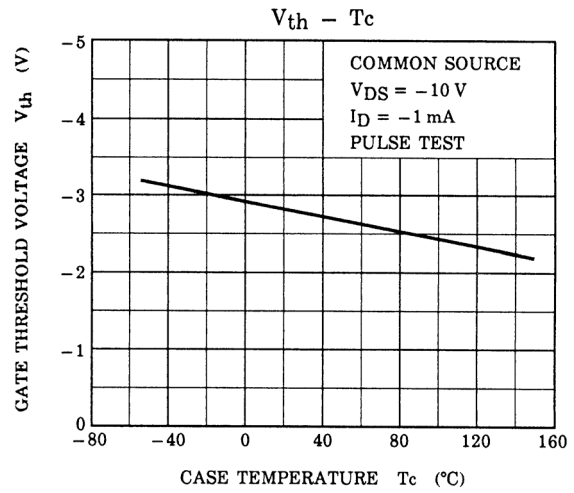
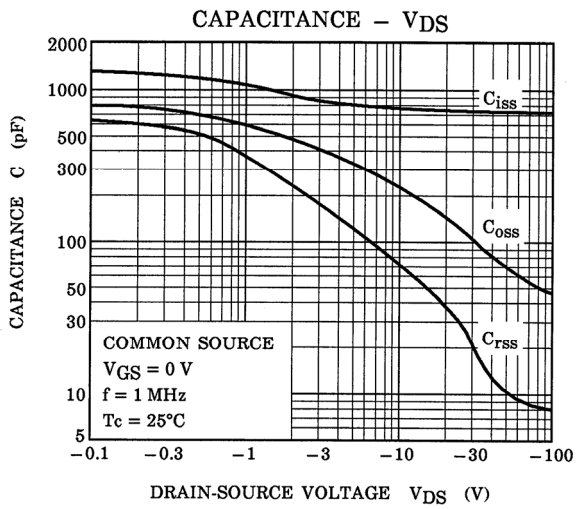
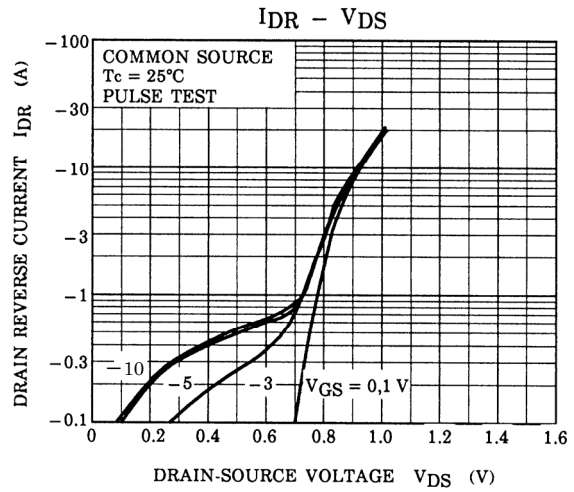
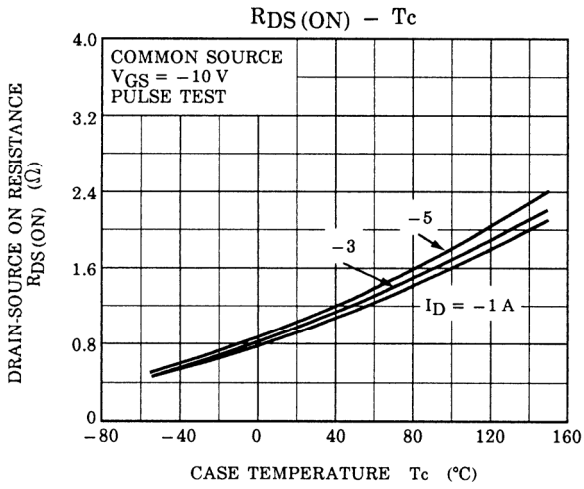
## Source-Drain Ratings and Characteristics (Ta = 25°C)

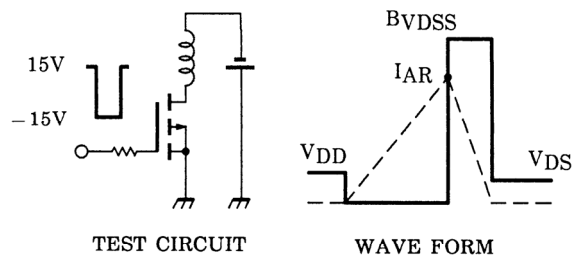
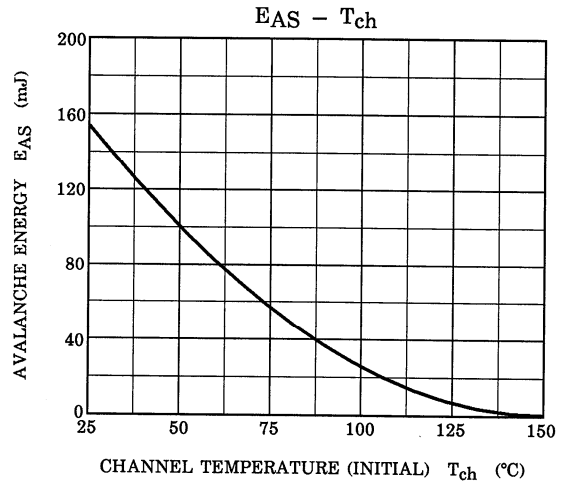
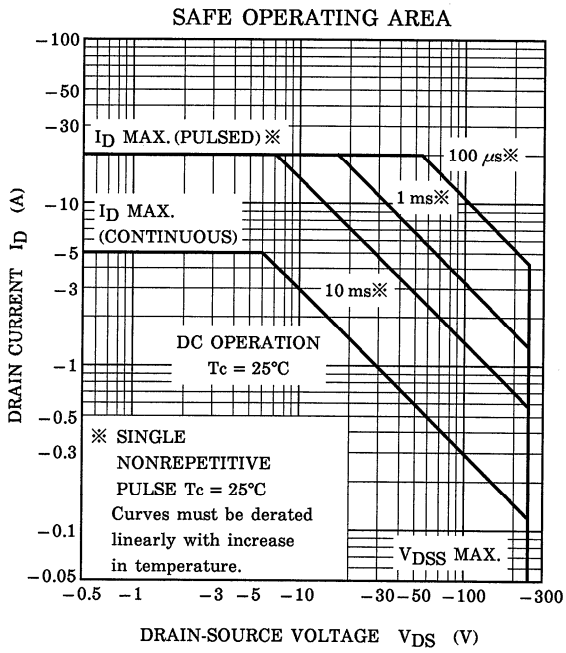
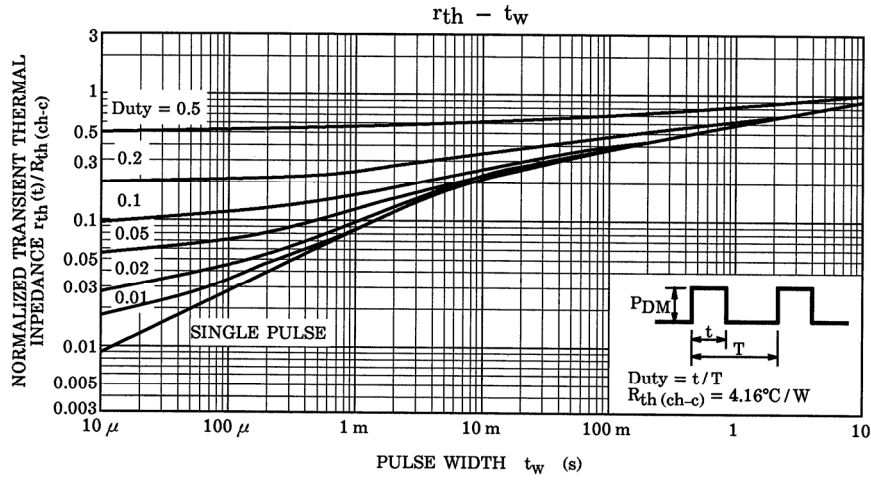
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	$I_{DR}$	—	—	—	-5	A
Pulse drain reverse current (Note 1)	$I_{DRP}$	—	—	—	-20	A
Forward voltage (diode)	$V_{DSF}$	$I_{DR} = -5\text{ A}, V_{GS} = 0\text{ V}$	—	—	2.0	V
Reverse recovery time	$t_{rr}$	$I_{DR} = -5\text{ A}, V_{GS} = 0\text{ V}$	—	205	—	ns
Reverse recovery charge	$Q_{rr}$	$dI_{DR} / dt = 100\text{ A} / \mu\text{s}$	—	2.1	—	$\mu\text{C}$

## Marking









$R_G = 25\Omega$   
 $V_{DD} = -50V, L = 10.5mH$

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

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