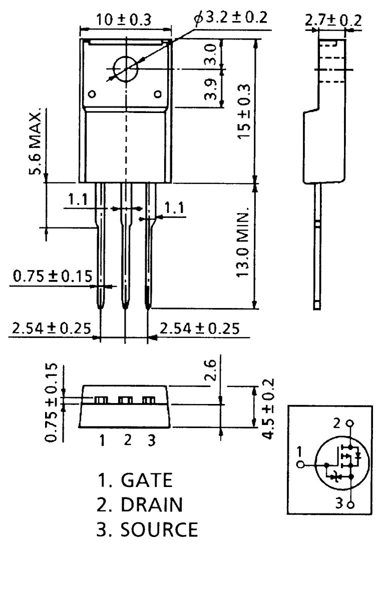
TOSHIBA Field Effect Transistor Silicon P Channel MOS Type ($L^2-\pi-$MOSV)

2SJ512

Chopper Regulator, DC−DC Converter and Motor Drive Applications

Unit: mm



JEDEC	―
JEITA	SC-67
TOSHIBA	2-10R1B

Weight: 1.9 g (typ.)

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

Maximum Ratings (Ta = 25°C)

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

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

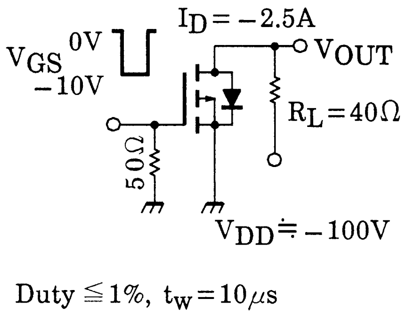
Note 1: Please use devices on condition that the channel temperature is below 150°C.

Note 2: V_{DD} = −50 V, T_{ch} = 25°C (initial), L = 10.5 mH, R_G = 25 Ω, 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.

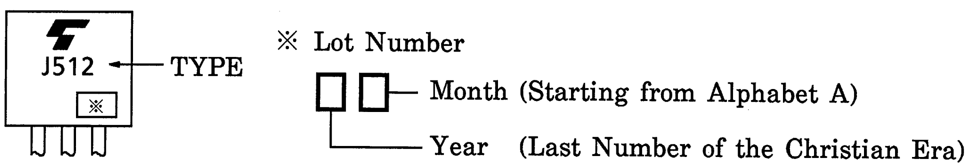
Electrical Characteristics (Ta = 25°C)

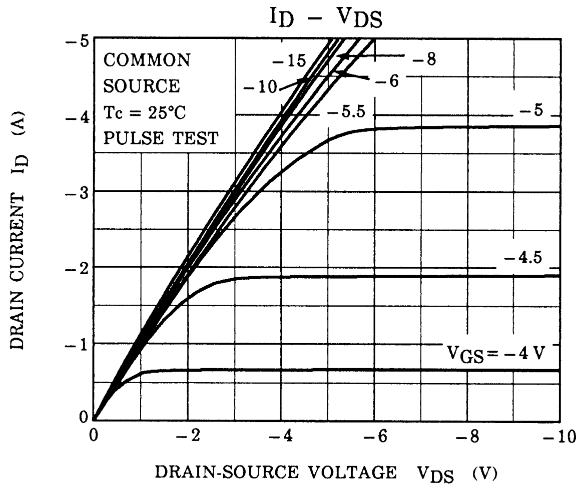
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±16 V, V_{DS} = 0 V	—	—	±10	μA
Drain cut−off current		I_{DSS}	V_{DS} = −250 V, V_{GS} = 0 V	—	—	−100	μA
Drain−source breakdown voltage		$V_{(BR)\ DSS}$	I_D = −10 mA, V_{GS} = 0 V	−250	—	—	V
Gate threshold voltage		V_{th}	V_{DS} = −10 V, I_D = −1 mA	−1.5	—	−3.5	V
Drain−source ON resistance		$R_{DS\ (ON)}$	V_{GS} = −10 V, I_D = −2.5 A	—	1.0	1.25	Ω
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = −10 V, I_D = −2.5 A	1.8	3.7	—	S
Input capacitance		C_{iss}	V_{DS} = −10 V, V_{GS} = 0 V, f = 1 MHz	—	800	—	pF
Reverse transfer capacitance		C_{rss}		—	80	—	
Output capacitance		C_{oss}		—	250	—	
Switching time	Rise time	t_r		—	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} ≈ −200 V, V_{GS} = −10 V, I_D = −5 A	—	22	—	nC
Gate−source charge		Q_{gs}		—	14	—	
Gate−drain (“miller”) charge		Q_{gd}		—	8	—	

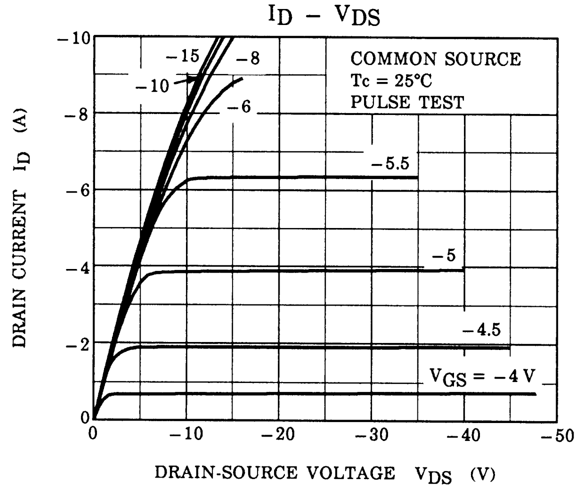
Source−Drain Ratings and Characteristics (Ta = 25°C)

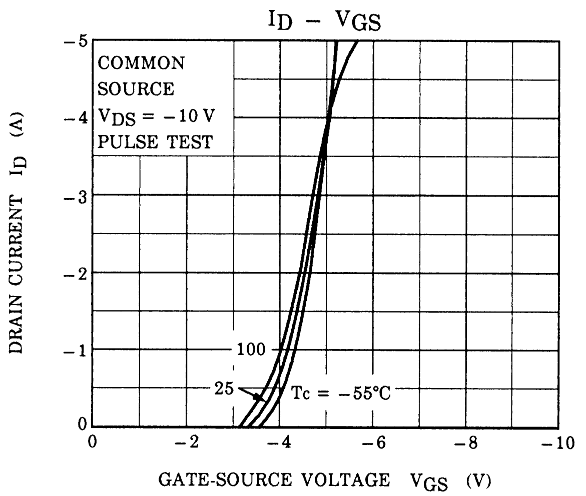
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	−5	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	−20	A
Forward voltage (diode)	V_{DSF}	I_{DR} = −5 A, V_{GS} = 0 V	—	—	2.0	V
Reverse recovery time	t_{rr}	I_{DR} = −5 A, V_{GS} = 0 V,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

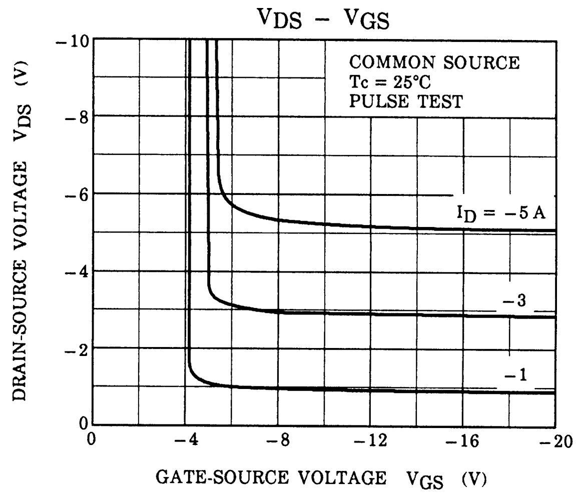
Marking

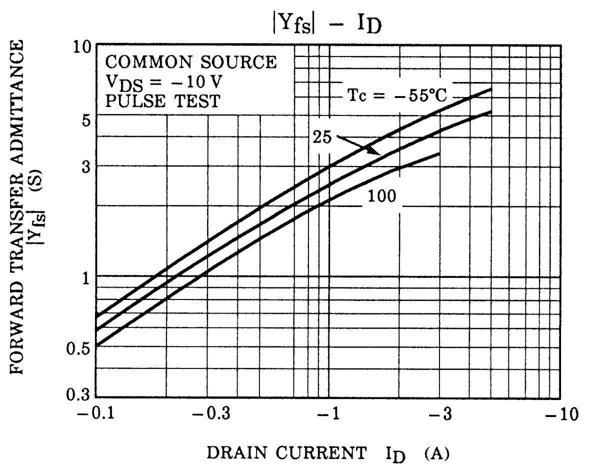


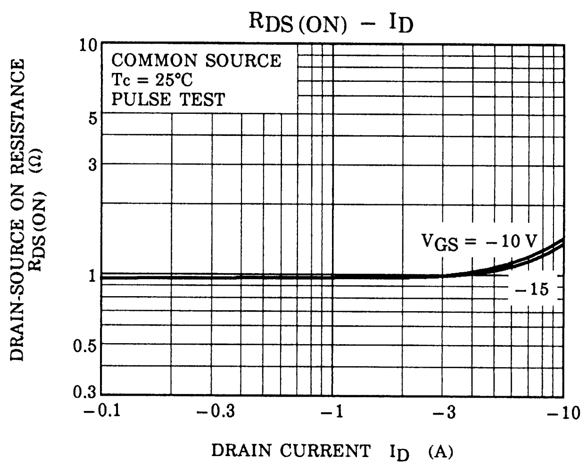

ID – VDS
COMMON SOURCE
Tc = 25°C
PULSE TEST
–15
–8
–10
–6
–5.5
–5
–4.5
VGS = –4 V
DRAIN CURRENT ID (A)
DRAIN-SOURCE VOLTAGE VDS (V)

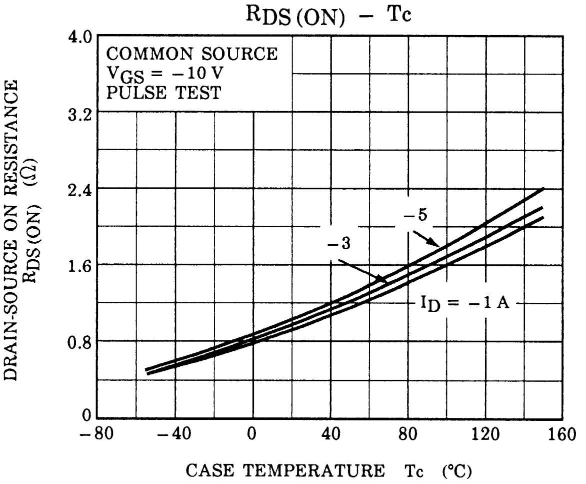

ID – VDS
COMMON SOURCE
Tc = 25°C
PULSE TEST
–15
–8
–10
–6
–5.5
–5
–4.5
VGS = –4 V
DRAIN CURRENT ID (A)
DRAIN-SOURCE VOLTAGE VDS (V)

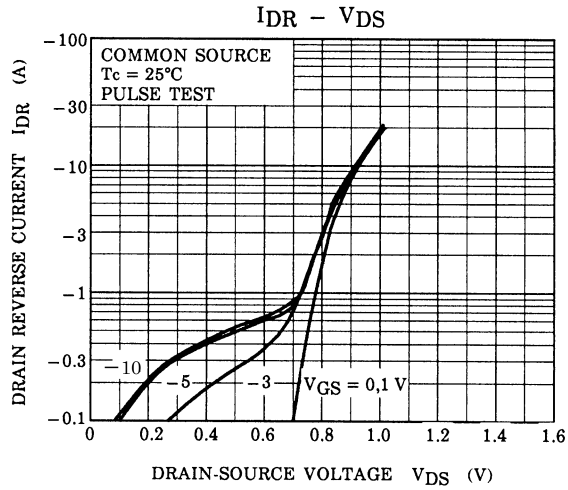

ID – VGS
COMMON SOURCE
VDS = –10 V
PULSE TEST
100
25
Tc = –55°C
DRAIN CURRENT ID (A)
GATE-SOURCE VOLTAGE VGS (V)

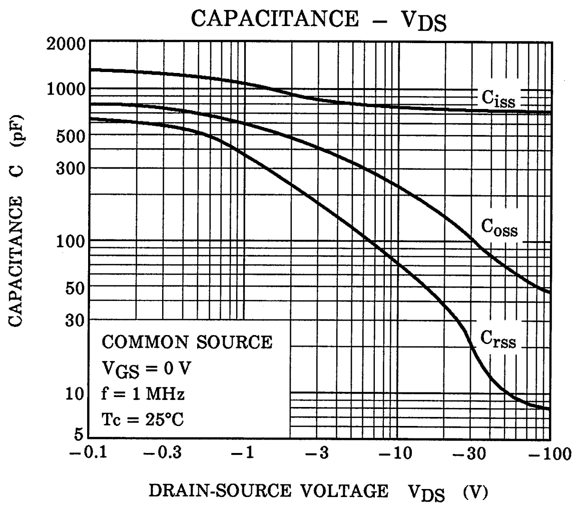

VDS – VGS
COMMON SOURCE
Tc = 25°C
PULSE TEST
ID = –5 A
–3
–1
DRAIN-SOURCE VOLTAGE VDS (V)
GATE-SOURCE VOLTAGE VGS (V)

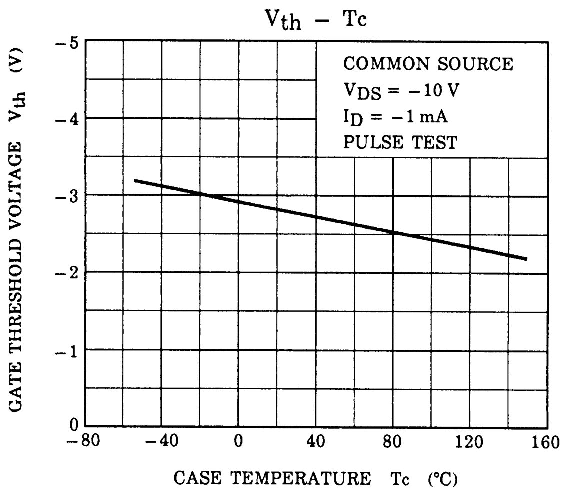

|Yfs| – ID
COMMON SOURCE
VDS = –10 V
PULSE TEST
Tc = –55°C
25
100
FORWARD TRANSFER ADMITTANCE |Yfs| (S)
DRAIN CURRENT ID (A)

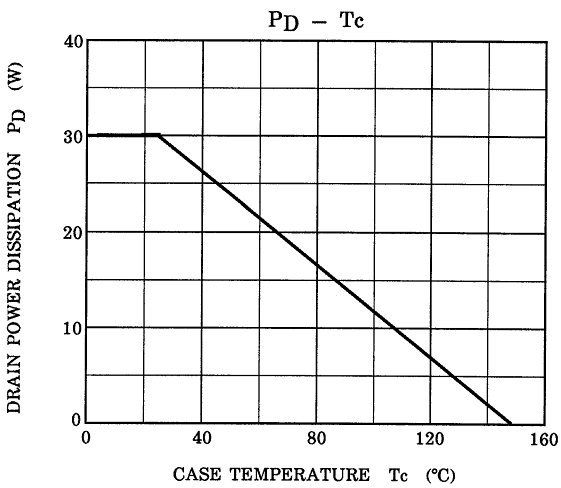

RDS (ON) – ID
COMMON SOURCE
Tc = 25°C
PULSE TEST
VGS = –10 V
–15
DRAIN-SOURCE ON RESISTANCE RDS (ON) (Ω)
DRAIN CURRENT ID (A)

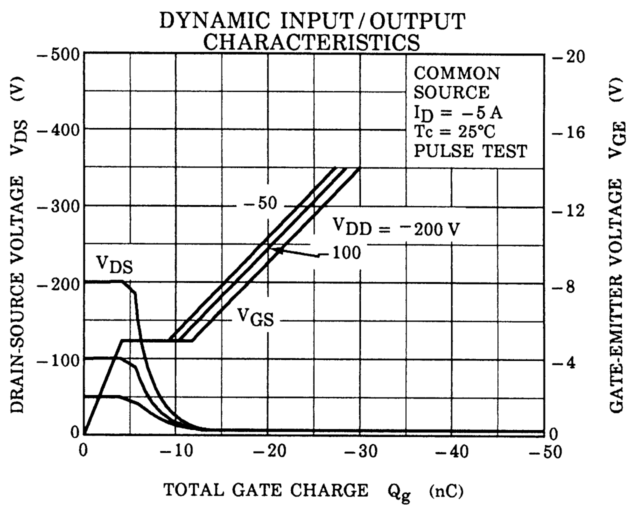

RDS (ON) – Tc
COMMON SOURCE
VGS = –10 V
PULSE TEST
–5
–3
ID = –1 A
DRAIN-SOURCE ON RESISTANCE RDS (ON) (Ω)
4.0
3.2
2.4
1.6
0.8
0
–80
–40
0
40
80
120
160
CASE TEMPERATURE Tc (°C)

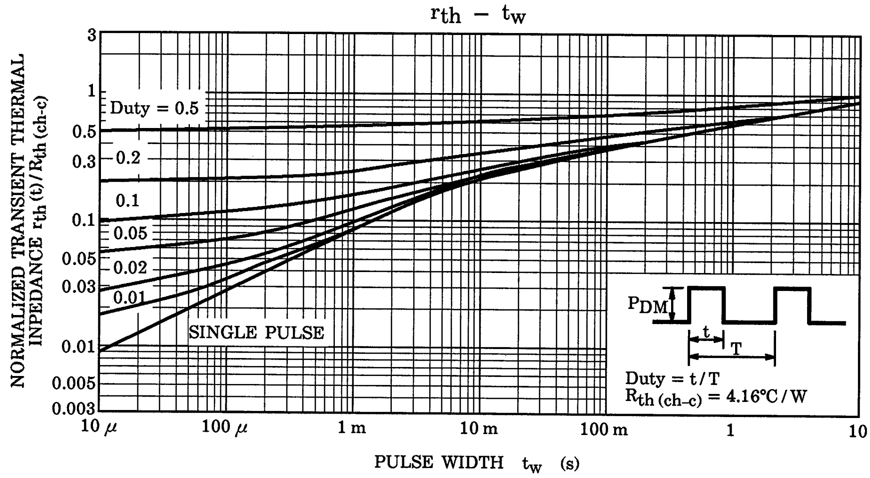

IDR – VDS
COMMON SOURCE
Tc = 25°C
PULSE TEST
–10
–5
–3
VGS = 0,1 V
DRAIN REVERSE CURRENT IDR (A)
–100
–30
–10
–3
–1
–0.3
–0.1
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
DRAIN-SOURCE VOLTAGE VDS (V)

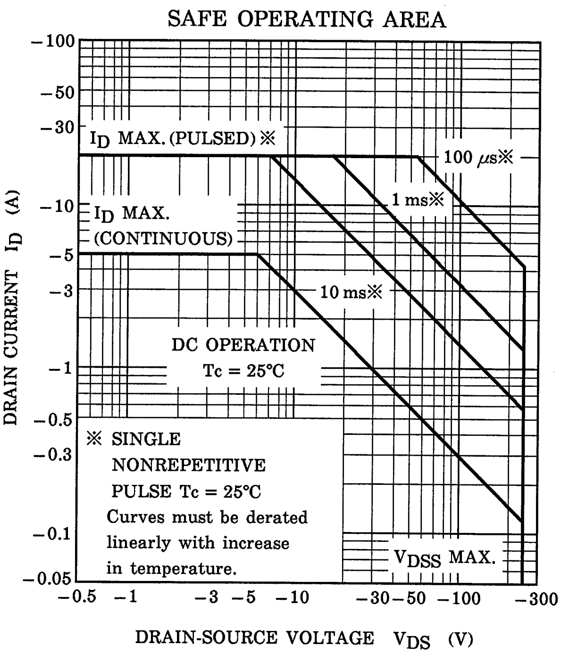

CAPACITANCE – VDS
Ciss
Coss
Crss
COMMON SOURCE
VGS = 0 V
f = 1 MHz
Tc = 25°C
CAPACITANCE C (pF)
2000
1000
500
300
100
50
30
10
5
–0.1
–0.3
–1
–3
–10
–30
–100
DRAIN-SOURCE VOLTAGE VDS (V)

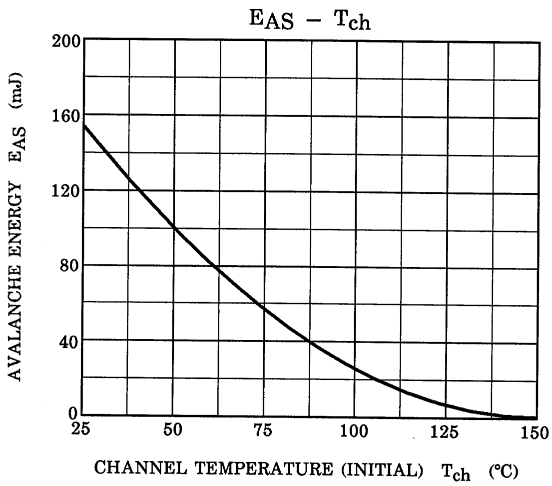

Vth – Tc
COMMON SOURCE
VDS = –10 V
ID = –1 mA
PULSE TEST
GATE THRESHOLD VOLTAGE Vth (V)
–5
–4
–3
–2
–1
0
–80
–40
0
40
80
120
160
CASE TEMPERATURE Tc (°C)

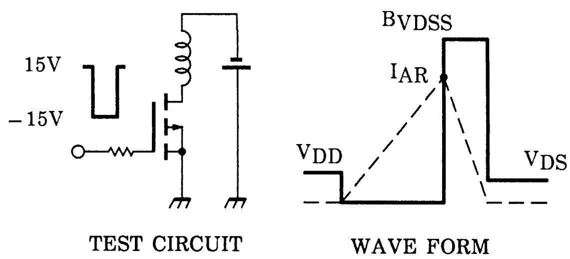

PD – Tc
DRAIN POWER DISSIPATION PD (W)
40
30
20
10
0
0
40
80
120
160
CASE TEMPERATURE Tc (°C)


DYNAMIC INPUT / OUTPUT CHARACTERISTICS
COMMON SOURCE
ID = –5 A
Tc = 25°C
PULSE TEST
–50
VDD = –200 V
–100
VDS
VGS
DRAIN-SOURCE VOLTAGE VDS (V)
–500
–400
–300
–200
–100
0
GATE-EMITTER VOLTAGE VGE (V)
–20
–16
–12
–8
–4
0
0
–10
–20
–30
–40
–50
TOTAL GATE CHARGE Qg (nC)









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

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

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