

NP50P04SLG

R07DS0241EJ0100

Rev.1.00

Feb 09, 2011

MOS FIELD EFFECT TRANSISTOR

Description

The NP50P04SLG is P-channel MOS Field Effect Transistor designed for high current switching applications.

Features

- Super low on-state resistance
— $R_{DS(on)1} = 9.6 \text{ m}\Omega \text{ MAX.}$ ($V_{GS} = -10 \text{ V}$, $I_D = -25 \text{ A}$)
— $R_{DS(on)2} = 15 \text{ m}\Omega \text{ MAX.}$ ($V_{GS} = -4.5 \text{ V}$, $I_D = -25 \text{ A}$)
- Low input capacitance
- Gate to Source ESD protection diode built-in

Ordering Information

Part No.	LEAD PLATING	PACKING	Package
NP50P04SLG-E1-AY ^{*1}	Pure Sn (Tin)	Tape 2500 p/reel	TO-252 (MP-3ZK)
NP50P04SLG-E2-AY ^{*1}			

Note: ^{*1}. Pb-free (This product does not contain Pb in external electrode.)

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

Item	Symbol	Ratings	Unit
Drain to Source Voltage ($V_{GS} = 0 \text{ V}$)	V_{DSS}	-40	V
Gate to Source Voltage ($V_{DS} = 0 \text{ V}$)	V_{GSS}	± 20	V
Drain Current (DC) ($T_C = 25^\circ\text{C}$)	$I_{D(DC)}$	± 50	A
Drain Current (pulse) ^{*1}	$I_{D(pulse)}$	± 150	A
Total Power Dissipation ($T_C = 25^\circ\text{C}$)	P_{T1}	84	W
Total Power Dissipation ($T_A = 25^\circ\text{C}$)	P_{T2}	1.2	W
Channel Temperature	T_{ch}	175	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to +175	$^\circ\text{C}$
Single Avalanche Current ^{*2}	I_{AS}	37	A
Single Avalanche Energy ^{*2}	E_{AS}	136	mJ

Thermal Resistance

Channel to Case Thermal Resistance	$R_{th(ch-C)}$	1.78	$^\circ\text{C/W}$
Channel to Ambient Thermal Resistance ^{*2}	$R_{th(ch-A)}$	125	$^\circ\text{C/W}$

Notes: ^{*1}. $PW \leq 10 \mu\text{s}$, Duty Cycle $\leq 1\%$

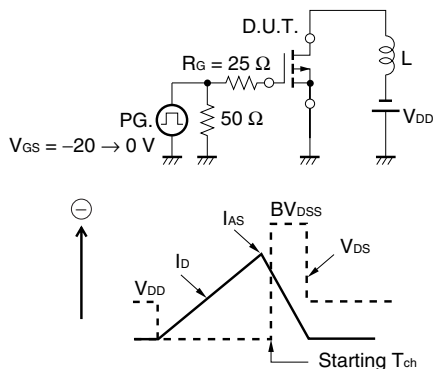
^{*2}. Starting $T_{ch} = 25^\circ\text{C}$, $V_{DD} = -20 \text{ V}$, $R_G = 25 \Omega$, $V_{GS} = -20 \rightarrow 0 \text{ V}$

Electrical Characteristics ($T_A = 25^\circ\text{C}$)

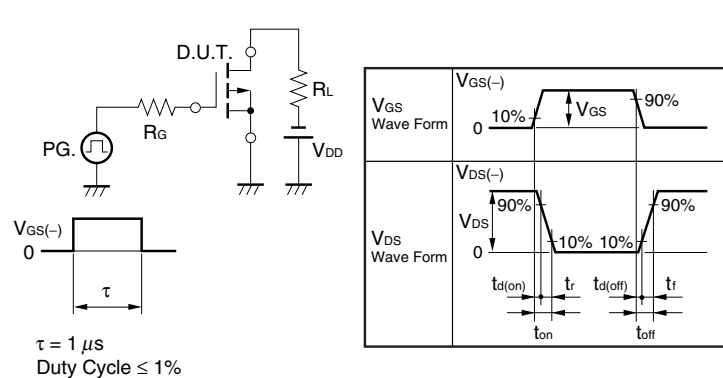
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Zero Gate Voltage Drain Current	I_{DSS}			-1	μA	$V_{DS} = -40\text{ V}$, $V_{GS} = 0\text{ V}$
Gate Leakage Current	I_{GSS}			± 10	μA	$V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0\text{ V}$
Gate to Source Threshold Voltage	$V_{GS(th)}$	-1.0	-1.4	-2.5	V	$V_{DS} = V_{GS}$, $I_D = -250\text{ }\mu\text{A}$
Forward Transfer Admittance ^{*1}	$ y_{fs} $	12	44		S	$V_{DS} = -10\text{ V}$, $I_D = -25\text{ A}$
Drain to Source On-state Resistance ^{*1}	$R_{DS(on)1}$		8.2	9.6	$\text{m}\Omega$	$V_{GS} = -10\text{ V}$, $I_D = -25\text{ A}$
	$R_{DS(on)2}$		9.8	15	$\text{m}\Omega$	$V_{GS} = -4.5\text{ V}$, $I_D = -25\text{ A}$
Input Capacitance	C_{iss}		3800	5700	pF	$V_{DS} = -10\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$
Output Capacitance	C_{oss}		740	1120	pF	
Reverse Transfer Capacitance	C_{rss}		500	905	pF	
Turn-on Delay Time	$t_{d(on)}$		11	24	ns	$V_{DD} = -20\text{ V}$, $I_D = -25\text{ A}$, $V_{GS} = -10\text{ V}$, $R_G = 0\text{ }\Omega$
Rise Time	t_r		15	39	ns	
Turn-off Delay Time	$t_{d(off)}$		250	505	ns	
Fall Time	t_f		150	380	ns	$V_{DD} = -32\text{ V}$, $V_{GS} = -10\text{ V}$, $I_D = -50\text{ A}$
Total Gate Charge	Q_G		100	150	nC	
Gate to Source Charge	Q_{GS}		13		nC	
Gate to Drain Charge	Q_{GD}		30		nC	$I_F = -50\text{ A}$, $V_{GS} = 0\text{ V}$, $di/dt = -100\text{ A}/\mu\text{s}$
Body Diode Forward Voltage ^{*1}	$V_{F(S-D)}$		0.96	1.5	V	
Reverse Recovery Time	t_{rr}		50		ns	
Reverse Recovery Charge	Q_{rr}		63		nC	

Note: *1. Pulsed test $PW \leq 350\text{ }\mu\text{s}$, Duty Cycle $\leq 2\%$

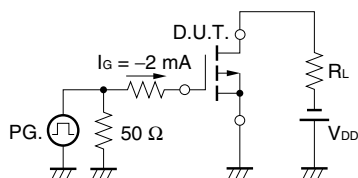
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

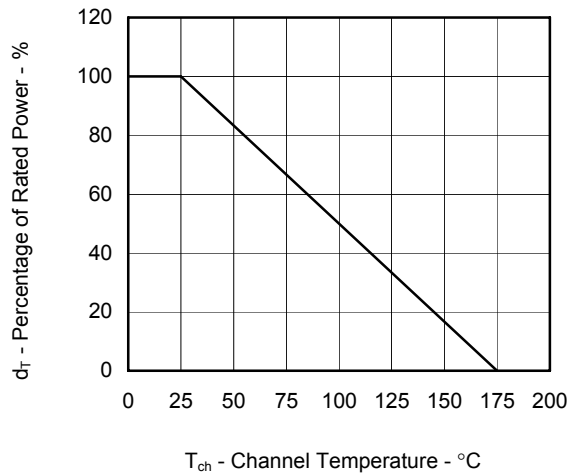


TEST CIRCUIT 3 GATE CHARGE

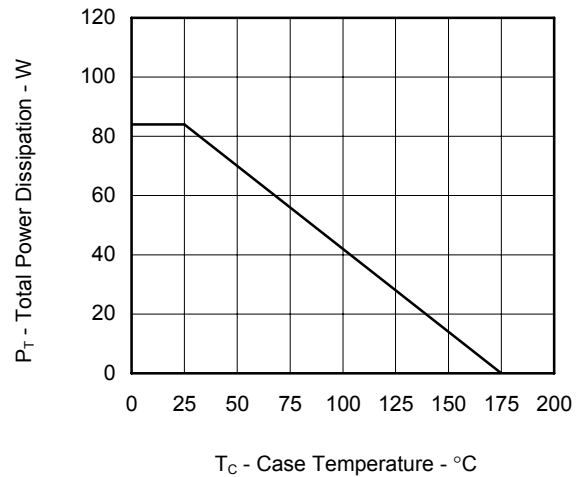


Typical Characteristics ($T_A = 25^\circ\text{C}$)

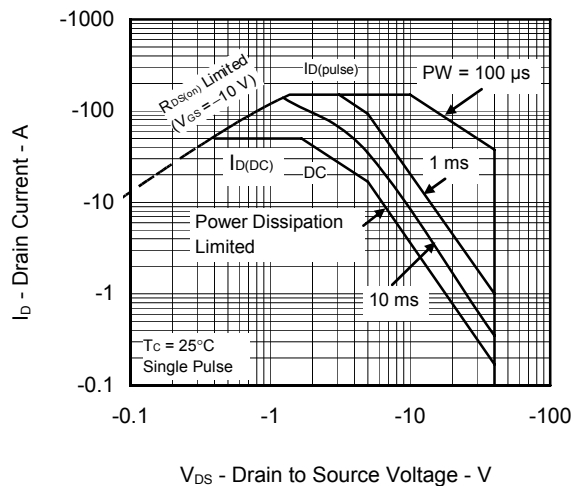
DERATING FACTOR OF FORWARD BIAS
SAFE OPERATING AREA



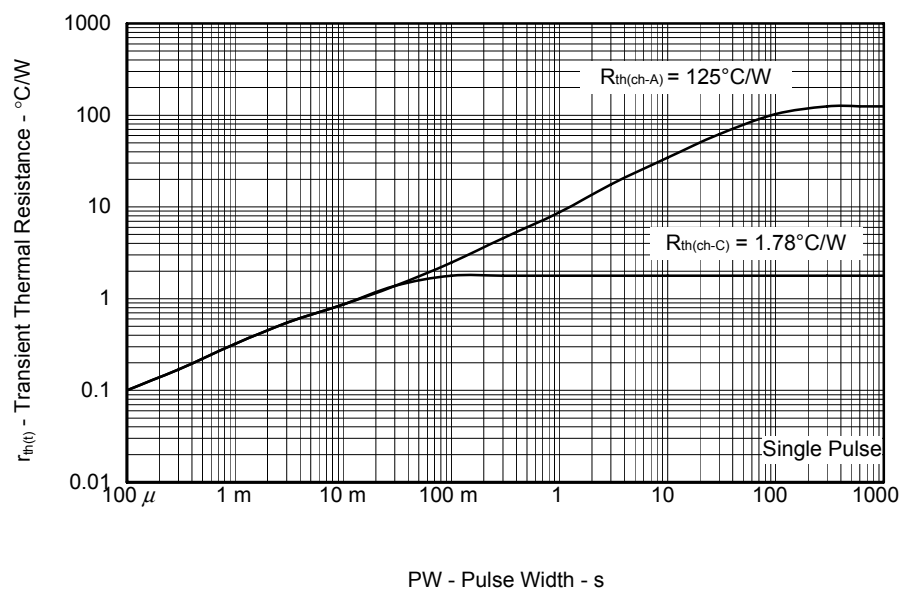
TOTAL POWER DISSIPATION vs.
CASE TEMPERATURE

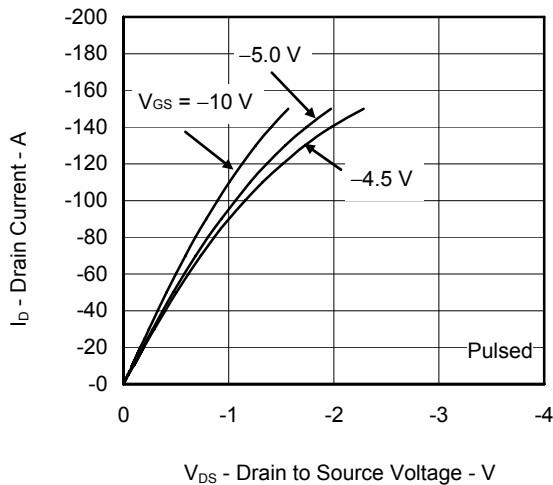


FORWARD BIAS SAFE OPERATING AREA

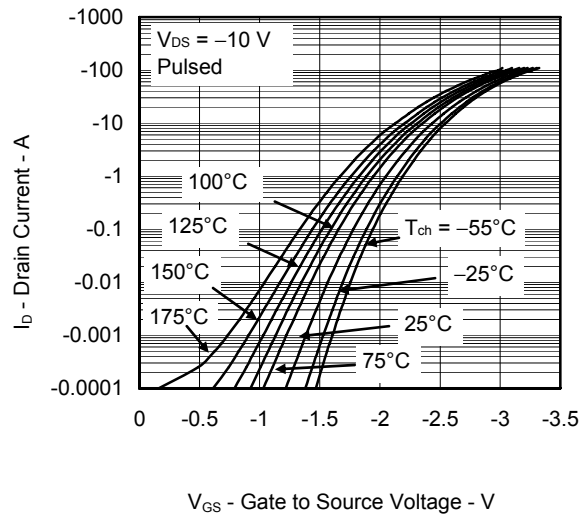
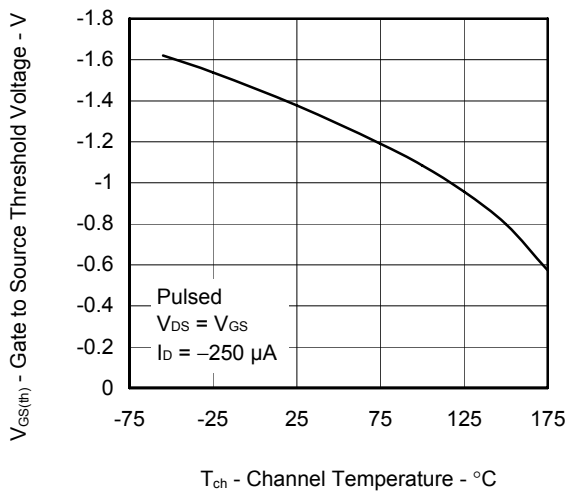
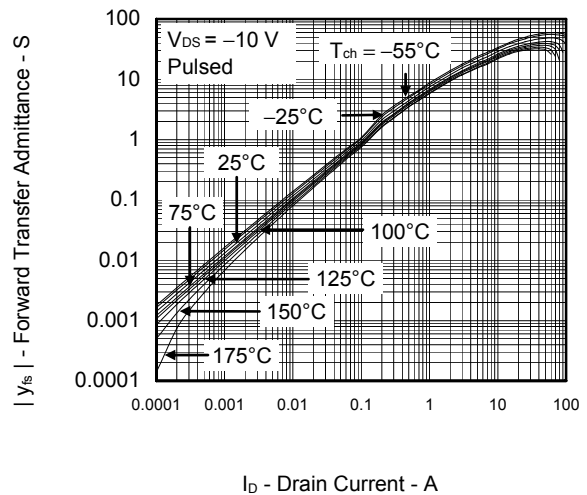
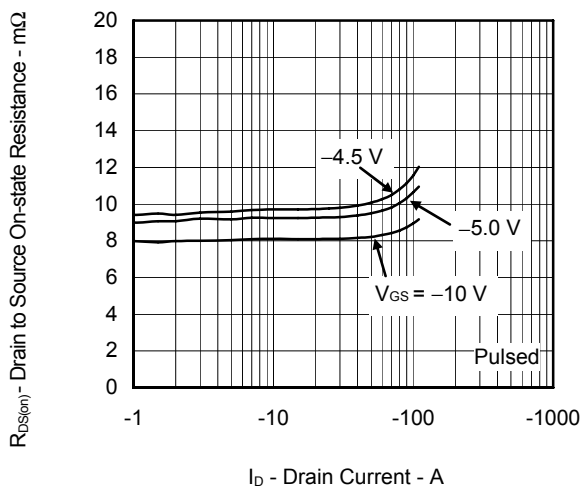
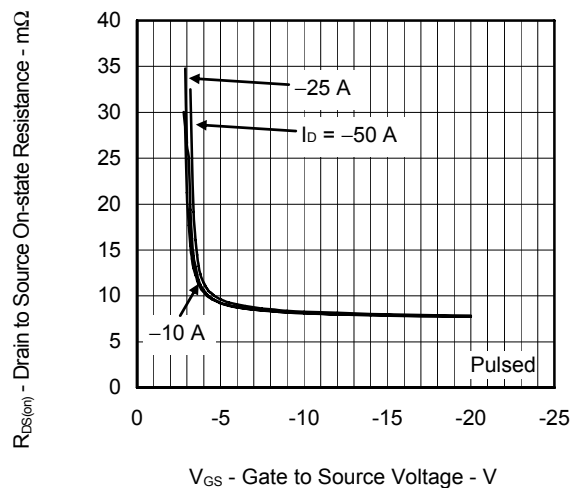


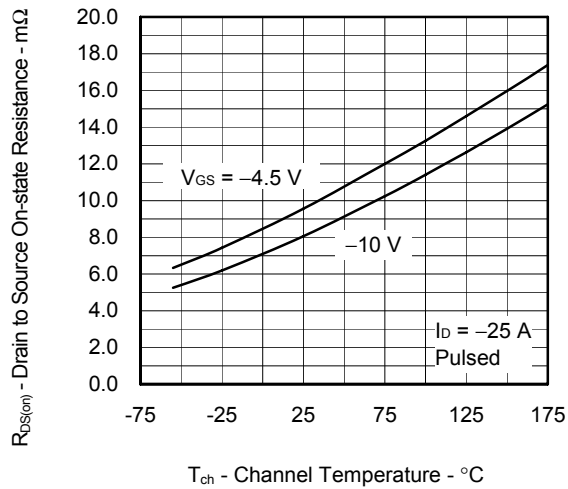
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



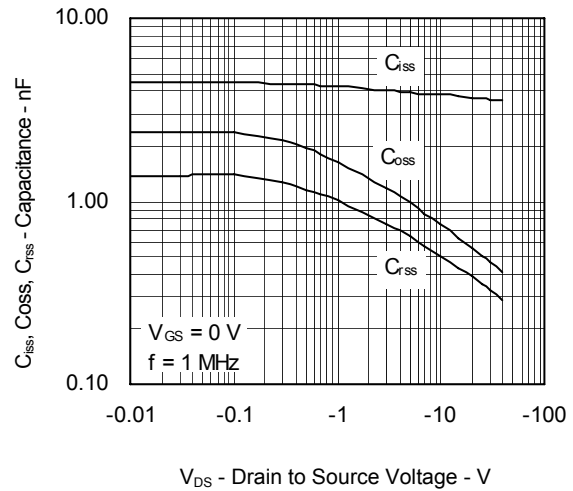
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE

FORWARD TRANSFER CHARACTERISTICS

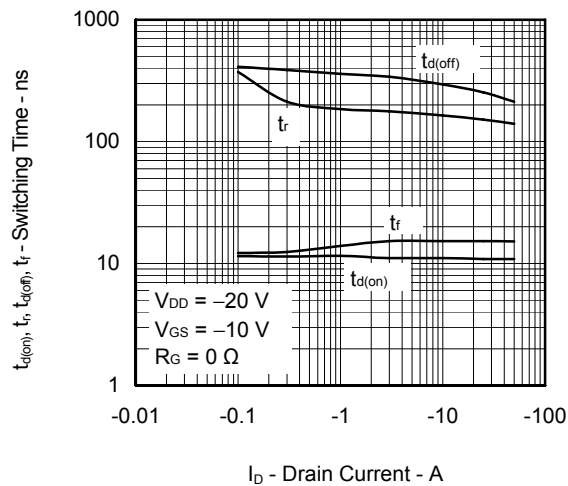
GATE TO SOURCE THRESHOLD VOLTAGE vs.
CHANNEL TEMPERATUREFORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENTDRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENTDRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE

DRAIN TO SOURCE ON-STATE RESISTANCE vs.
CHANNEL TEMPERATURE

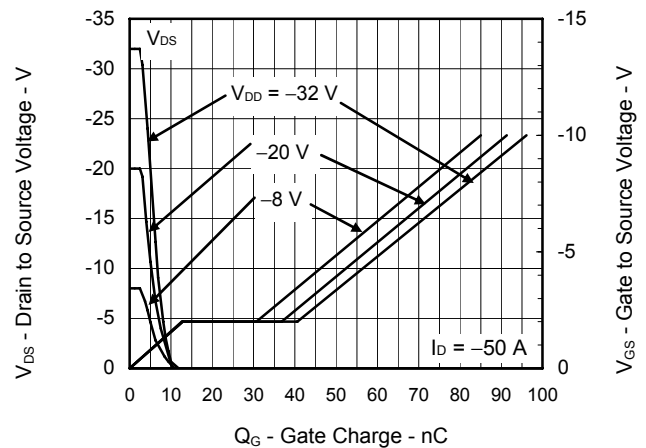
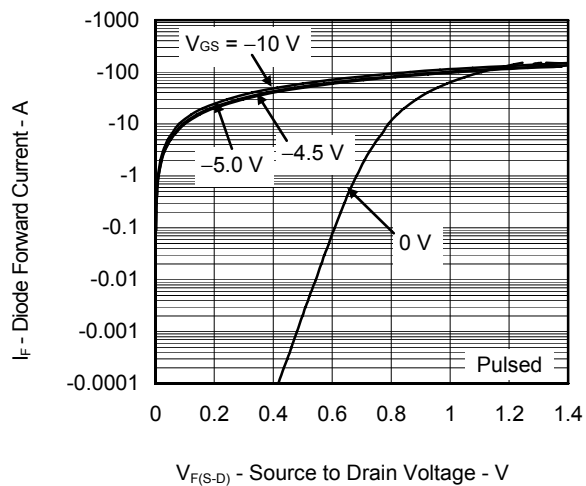
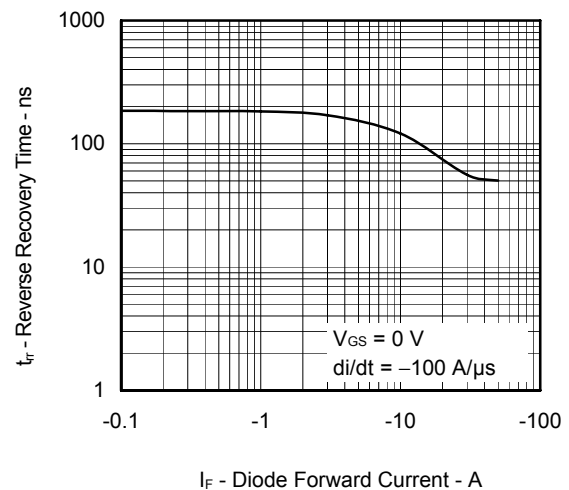
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



SWITCHING CHARACTERISTICS



DYNAMIC INPUT/OUTPUT CHARACTERISTICS

SOURCE TO DRAIN DIODE
FORWARD VOLTAGEREVERSE RECOVERY TIME vs.
DIODE FORWARD CURRENT

Revision History	NP50P04SLG Data Sheet
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Rev.	Date	Description	
		Page	Summary
1.00	Feb 09, 2011	–	First Edition Issued

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