TMP9N60/TMPF9N60
TMP9N60G/TMPF9N60G

Features

- Low gate charge
- 100% avalanche tested
- Improved dv/dt capability
- RoHS compliant
- Halogen free package
- JEDEC Qualification
- Fast reverse recovery

V_{DSS} = 660 V @T_{jmax}
I_D = 9A
$R_{DS(ON)}$ = 1.0 (max) @ V_{GS}= 10 V

Absolute Maximum Ratings

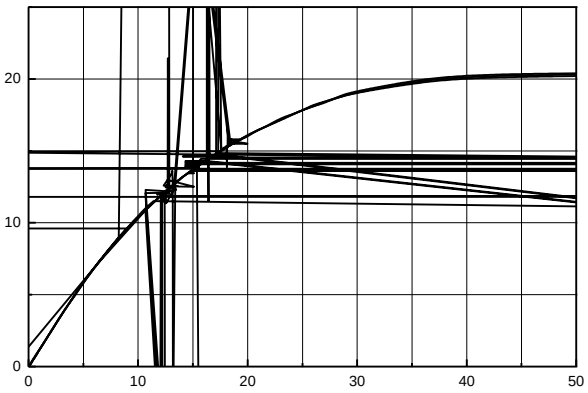
Parameter		Symbol	TMP9N60(G)	TMPF9N60(G)	Unit
Drain-Source Voltage		V_{DSS}	600		V
Gate-Source Voltage		V_{GS}	±30		V
Continuous Drain Current	T_C = 25 ℃	I_D	9	9 *	A
	T_C = 100 ℃		5	5 *	A
Pulsed Drain Current (Note 1)		I_{DM}	44	44*	A
Single Pulse Avalanche Energy (Note 2)		E_{AS}	662		mJ
Repetitive Avalanche Current (Note 1)		I_{AR}	9		A
Repetitive Avalanche Energy (Note 1)		E_{AR}	15.8		mJ
Power Dissipation	T_C = 25 ℃	P_D	158	51.4	W
	Derate above 25 ℃		1.26	0.41	W/℃
Peak Diode Recovery dv/dt (Note 3)		dv/dt	4.5		V/ns
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55~150		℃
Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		T_L	300		℃

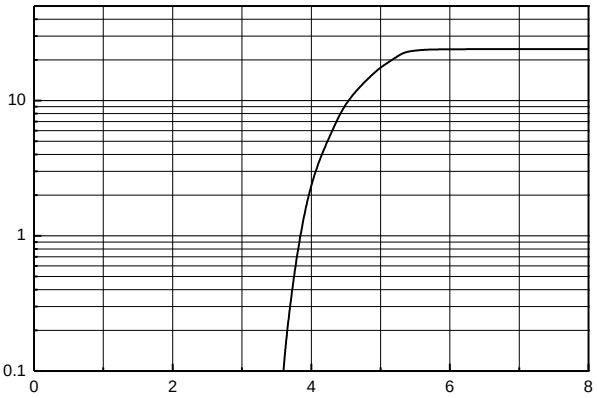
Thermal Characteristics

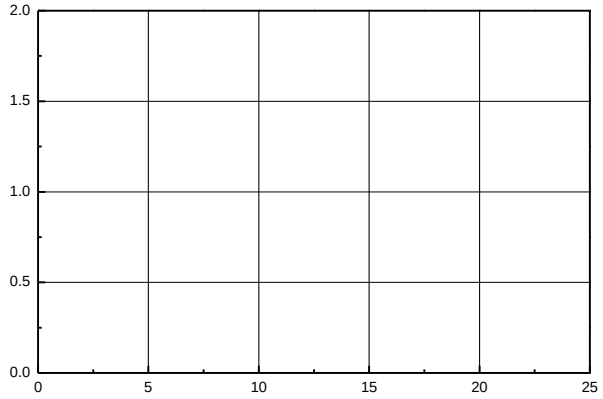
Electrical Characteristics : T_C=25℃, unless otherwise noted

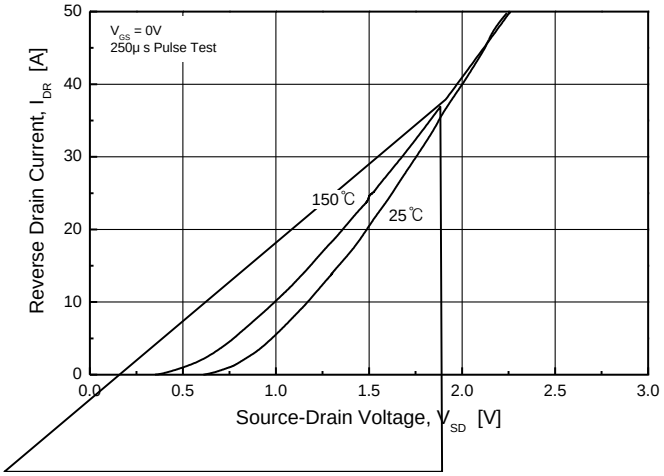
Parameter	Symbol	Test condition	Min	Typ	Max	Units
OFF						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS} = 0 V, I_D = 250 μA	600	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 600 V, V_{GS} = 0 V	--	--	1	μA
		V_{DS} = 480 V, T_C = 125°C	--	--	10	μA
Forward Gate-Source Leakage Current	I_{GSSF}	V_{GS} = 30 V, V_{DS} = 0 V	--	--	100	nA
Reverse Gate-Source Leakage Current	I_{GSSR}	V_{GS} = -30 V, V_{DS} = 0 V	--	--	-100	nA
ON						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA	2	--	4	V
Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 4.5 A	--	0.83	1.0	
Forward Transconductance (Note 4)	g_{FS}	V_{DS} = 30 V, I_D = 4.5 A	--	10	--	S
DYNAMIC						
Input Capacitance	C_{iss}	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	1440	--	pF
Output Capacitance	C_{oss}		--	123	--	pF
Reverse Transfer Capacitance	C_{rss}		--	8.1	--	pF
SWITCHING						
Turn-On Delay Time (Note 4,5)	$t_{d(on)}$	V_{DD} = 250 V, I_D = 9 A, R_G = 25 Ω	--	50	--	ns
Turn-On Rise Time (Note 4,5)	t_r		--	39	--	ns
Turn-Off Delay Time (Note 4,5)	$t_{d(off)}$		--	133	--	ns
Turn-Off Fall Time (Note 4,5)	t_f		--	532	--	ns
Total Gate Charge (Note 4,5)	Q_g	V_{DS} = 400V, I_D = 9 A, V_{GS} = 10 V	--	27	--	nC
Gate-Source Charge (Note 4,5)	Q_{gs}		--	6.3	--	nC
Gate-Drain Charge (Note 4,5)	Q_{gd}		--	6.9	--	nC
SOURCE DRAIN DIODE						
Maximum Continuous Drain-Source Diode Forward Current	I_S	----	--	--	9	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}	----	--	--	36	A
Drain-Source Diode Forward Voltage	V_{SD}	V_{GS} = 0 V, I_S = 9 A	--	--	1.5	V
Reverse Recovery Time (Note 4)	t_{rr}	V_{GS} = 0 V, I_S = 9 A, dI_F / dt = 100 A/μs	--	350	--	ns
Reverse Recovery Charge (Note 4)	Q_{rr}		--	3.2	--	C

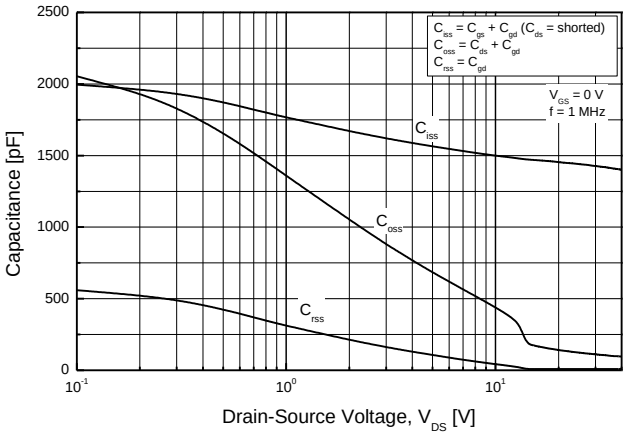
Note :
1. Repeated rating : Pulse width limited by safe operating area
2. L=15mH, I_{AS} = 9A, V_{DD} = 50V, R_G = 25Ω, Starting T_J= 25 ℃
3 I_{SD} ≤ 9A, di/dt ≤ 200A/μs , V_{DD} ≤ BV_{DS}, Starting T_J= 25 ℃
4. Pulse Test :Pulse width ≤ 300μs, Duty Cycle ≤ 2%
5. Essentially Independent of Operating Temperature Typical Characteristics

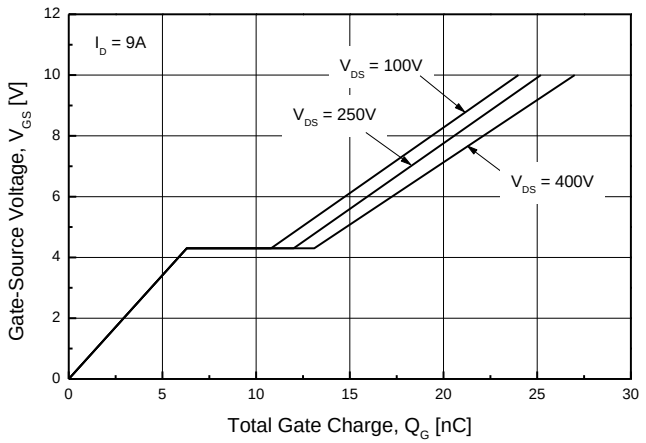

20
10
0
0
10
20
30
40
50

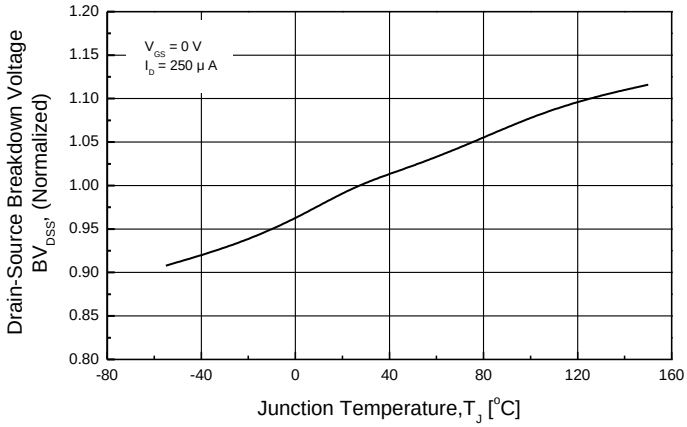

10
1
0.1
0
2
4
6
8

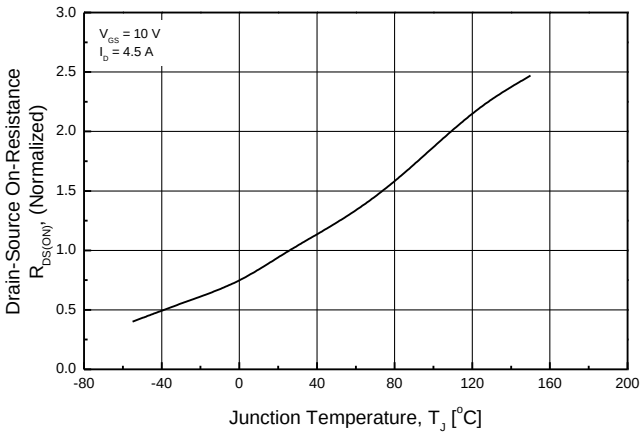

2.0
1.5
1.0
0.5
0.0
0
5
10
15
20
25

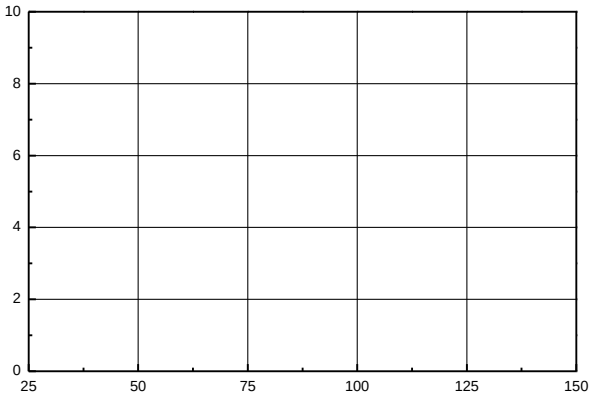

V_{GS} = 0V
250μ s Pulse Test
150℃
25℃
Reverse Drain Current, I_{DR} [A]
Source-Drain Voltage, V_{SD} [V]
50
40
30
20
10
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0


C_{iss} = C_{gs} + C_{gd} (C_{ds} = shorted)
C_{oss} = C_{ds} + C_{gd}
C_{rss} = C_{gd}
V_{GS} = 0 V
f = 1 MHz
C_{iss}
C_{oss}
C_{rss}
Capacitance [pF]
Drain-Source Voltage, V_{DS} [V]
2500
2000
1500
1000
500
0
10^{-1}
10^{0}
10^{1}

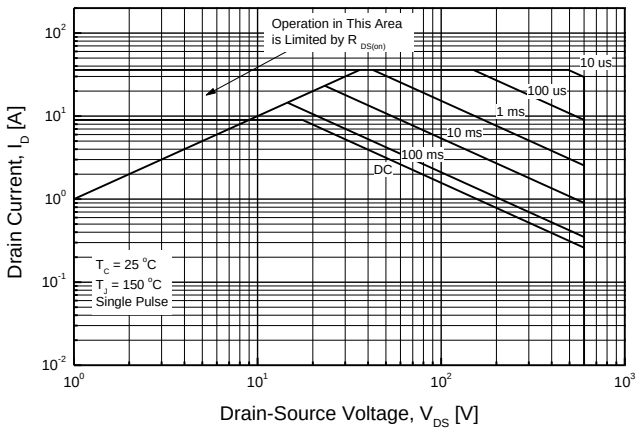

I_D = 9A
V_{DS} = 100V
V_{DS} = 250V
V_{DS} = 400V
Gate-Source Voltage, V_{GS} [V]
Total Gate Charge, Q_G [nC]
12
10
8
6
4
2
0
0
5
10
15
20
25
30







TMP9N60(G)



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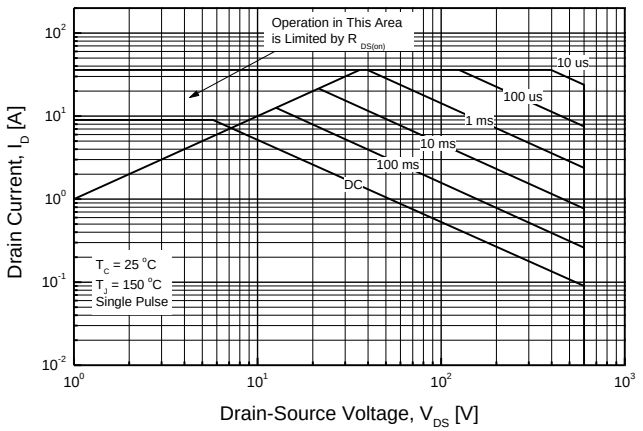

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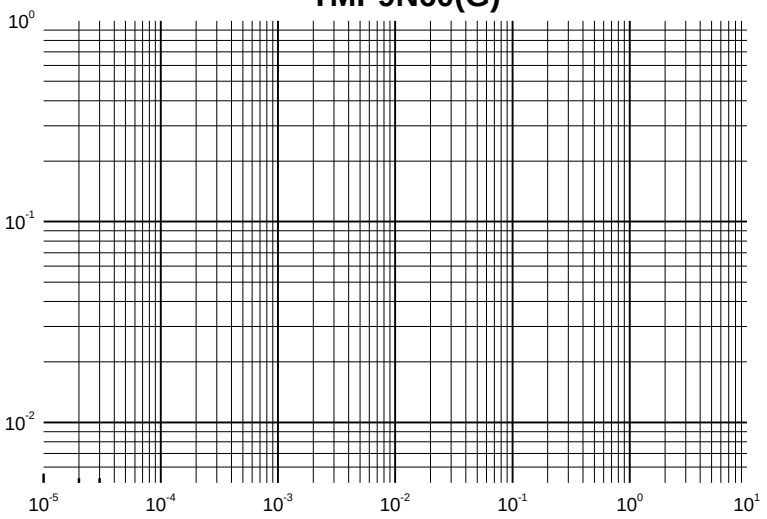

TMPF9N60(G)