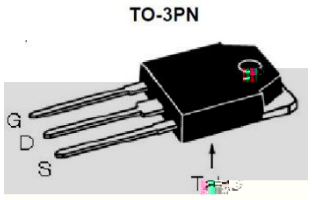
TMAN23N50A

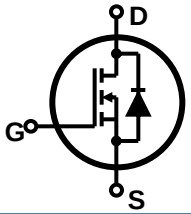
N-channel MOSFET

BV_{DSS}	I_D	$R_{DS(on)}$
500V	23A	< 0.22Ω

Features

- Low gate charge
- 100% avalanche tested
- Improved dv/dt capability
- RoHS compliant
- JEDEC Qualification





Device	Package	Marking	Remark
TMAN23N50A	TO-3PN	TMAN23N50A	RoHS

Absolute Maximum Ratings

Parameter		Symbol	TMAN23N50A	Unit
Drain-Source Voltage		V_{DS}	500	V
Gate-Source Voltage		V_{GS}	30	V
Continuous Drain Current	T_C = 25	I_D	23	A
	T_C = 100		14.5	A
Pulsed Drain Current (Note 1)		I_{DM}	92	A
Single Pulse Avalanche Energy (Note 2)		E_{AS}	822	mJ
Repetitive Avalanche Current (Note 1)		I_{AR}	23	A
Repetitive Avalanche Energy (Note 1)		E_{AR}	34.7	mJ
Power Dissipation	T_C = 25	P_D	347	W
	Derate above 25		2.77	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,		T_L	300	

* Limited only by maximum junction temperature

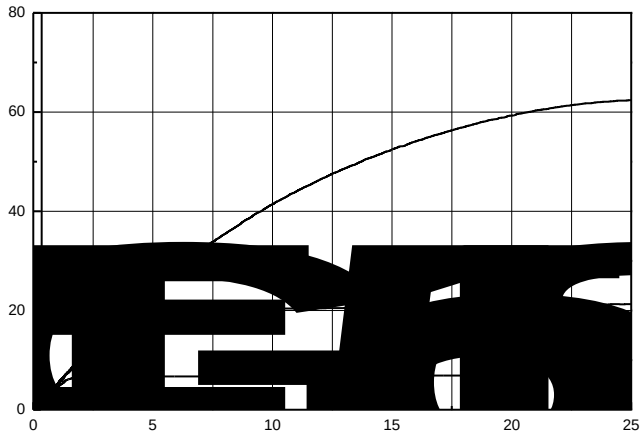
Thermal Characteristics

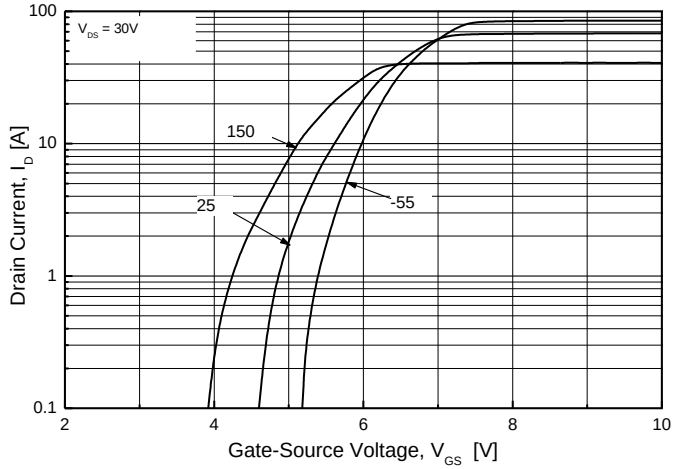
Parameter	Symbol	TMAN23N50A	Unit
Maximum Thermal resistance, Junction-to-Case	$R_{\theta JC}$	0.36	/W
Maximum Thermal resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	/W

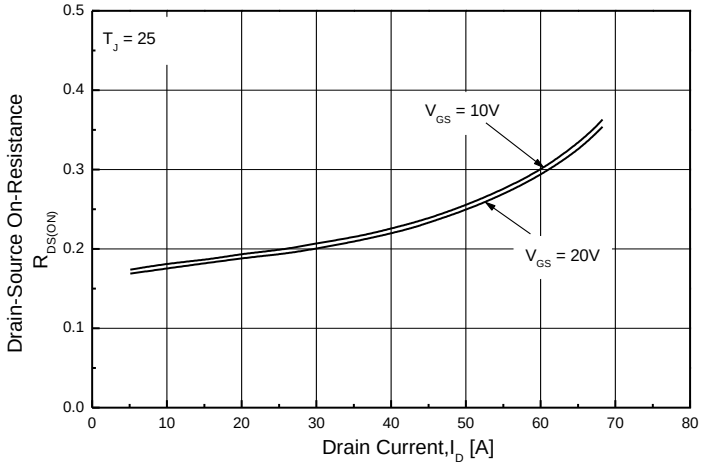
Electrical Characteristics : T_C=25 , unless otherwise noted

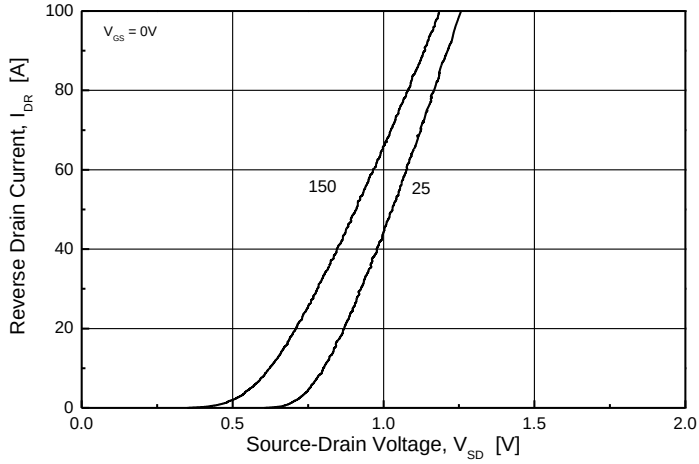
Parameter	Symbol	Test condition	Min	Typ	Max	Units
OFF						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS} = 0 V, I_D = 250 µA	500	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 500 V, V_{GS} = 0 V	--	--	1	µA
		V_{DS} = 400 V, T_C = 125°C	--	--	10	µA
Forward Gate-Source Leakage Current	I_{GSSF}	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	3	--	5	V
Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 11.5 A	--	0.185	0.22	Ω
Forward Transconductance (Note 4)	g_{FS}	V_{DS} = 30 V, I_D = 11.5 A	--	28	--	S
DYNAMIC						
Input Capacitance	C_{iss}	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	3270	--	pF
Output Capacitance	C_{oss}		--	360	--	pF
Reverse Transfer Capacitance	C_{rss}		--	16	--	pF
SWITCHING						
Turn-On Delay Time (Note 4,5)	$t_{d(on)}$	V_{DD} = 250 V, I_D = 23 A, R_G = 25	--	100	--	ns
Turn-On Rise Time (Note 4,5)	t_r		--	100	--	ns
Turn-Off Delay Time (Note 4,5)	$t_{d(off)}$		--	240	--	ns
Turn-Off Fall Time (Note 4,5)	t_f		--	60	--	ns
Total Gate Charge (Note 4,5)	Q_g	V_{DS} = 400V, I_D = 23 A, V_{GS} = 10 V	--	64	--	nC
Gate-Source Charge (Note 4,5)	Q_{gs}		--	17	--	nC
Gate-Drain Charge (Note 4,5)	Q_{gd}		--	25	--	nC
SOURCE DRAIN DIODE						
Maximum Continuous Drain-Source Diode Forward Current	I_S	---	--	--	23	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}	---	--	--	92	A
Drain-Source Diode Forward Voltage	V_{SD}	V_{GS} = 0 V, I_S = 23 A	--	--	1.5	V
Reverse Recovery Time (Note 4)	t_{rr}	V_{GS} = 0 V, I_S = 23 A	--	430	--	ns
Reverse Recovery Charge (Note 4)	Q_{rr}	dI_F / dt = 100 A/µs	--	5.9	--	µC

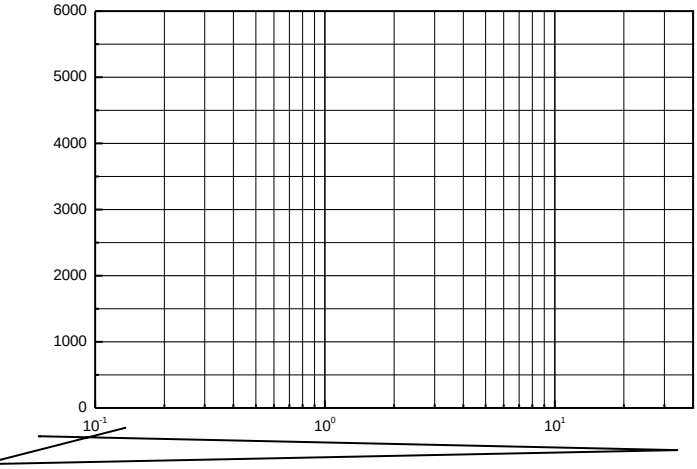
Note :
1. Repeated rating : Pulse width limited by safe operating area
2. L=2.8mH, I_{AS} = 23A, V_{DD} = 50V, R_G = 25 , Starting T_J= 25
3 I_{SD} µs , V_{DD} $_{DS}$, Starting T_J= 25
µ
5. Essentially Independent of Operating Temperature Typical Characteristics

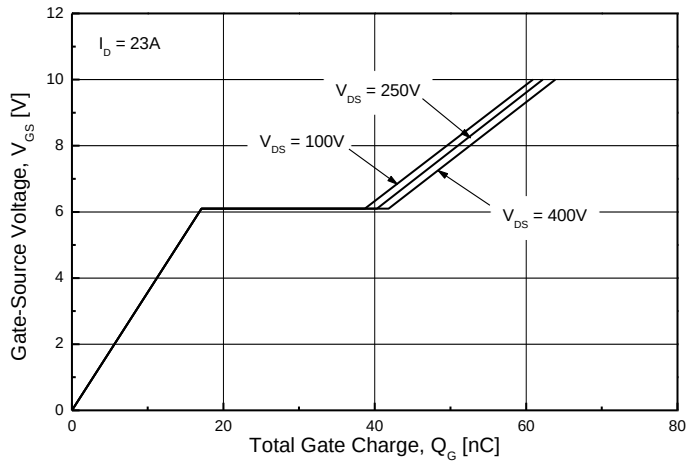

80
60
40
20
0
0
5
10
15
20
25

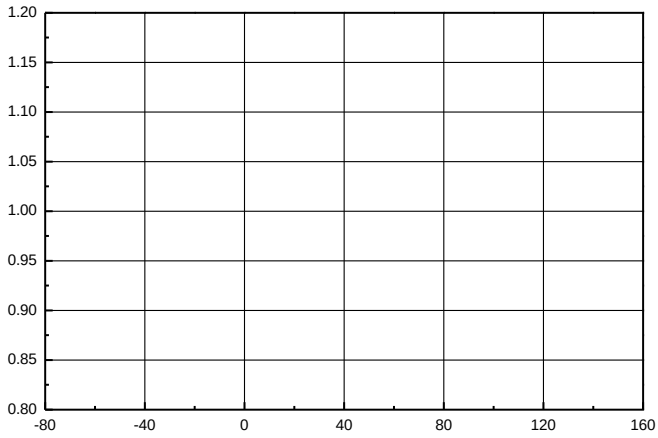

V_{DS} = 30V
150
25
-55
Drain Current, I_D [A]
100
10
1
0.1
2
4
6
8
10
Gate-Source Voltage, V_{GS} [V]

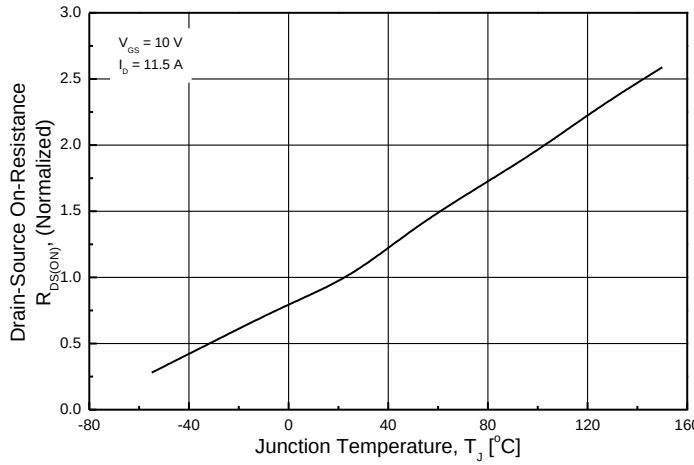

T_J = 25
V_{GS} = 10V
V_{GS} = 20V
Drain-Source On-Resistance
$R_{DS(ON)}$
0.5
0.4
0.3
0.2
0.1
0.0
0
10
20
30
40
50
60
70
80
Drain Current, I_D [A]

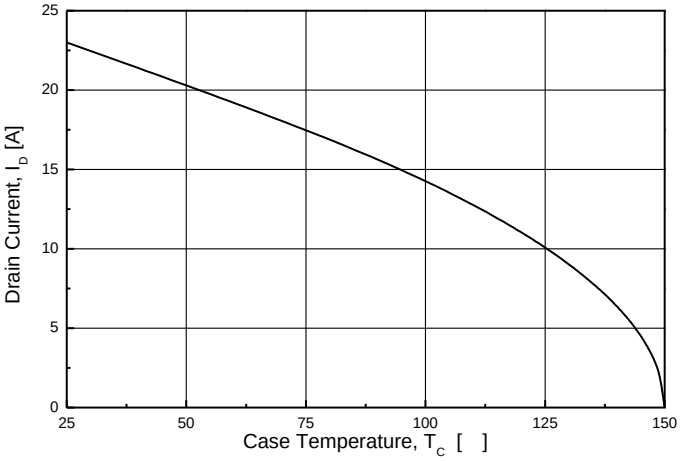

V_{GS} = 0V
150
25
Reverse Drain Current, I_{DR} [A]
100
80
60
40
20
0
0.0
0.5
1.0
1.5
2.0
Source-Drain Voltage, V_{SD} [V]

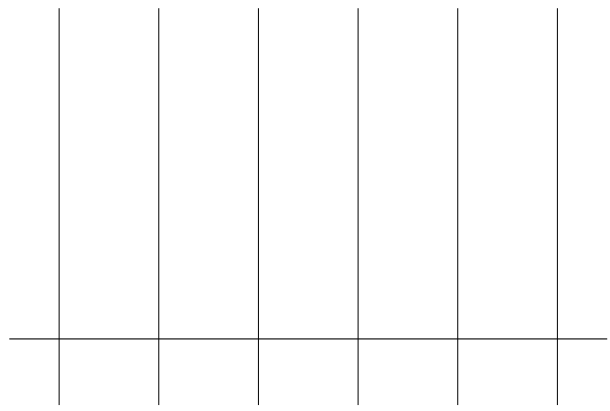

6000
5000
4000
3000
2000
1000
0
10^{-1}
10^{0}
10^{1}

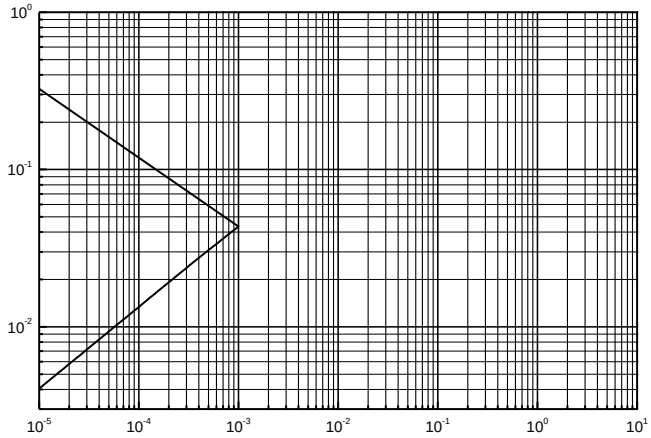

I_D = 23A
V_{DS} = 250V
V_{DS} = 100V
V_{DS} = 400V
Gate-Source Voltage, V_{GS} [V]
12
10
8
6
4
2
0
0
20
40
60
80
Total Gate Charge, Q_G [nC]

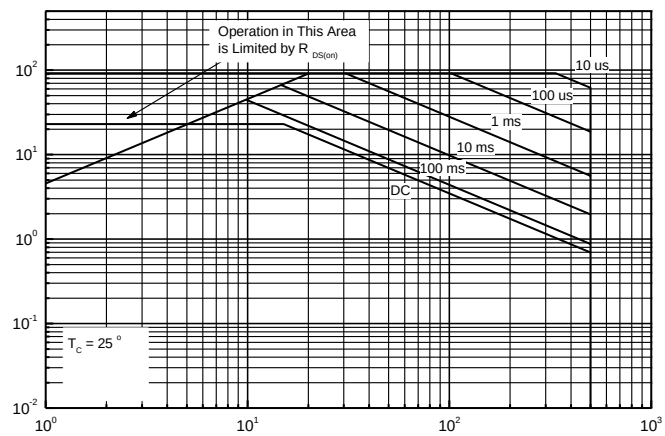

1.20
1.15
1.10
1.05
1.00
0.95
0.90
0.85
0.80
-80
-40
0
40
80
120
160


V_{GS} = 10 V
I_D = 11.5 A
Drain-Source On-Resistance
$R_{DS(ON)}$, (Normalized)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-80
-40
0
40
80
120
160
Junction Temperature, T_J [°C]


Drain Current, I_D [A]
25
20
15
10
5
0
25
50
75
100
125
150
Case Temperature, T_C [ ]




10^0
10^{-1}
10^{-2}
10^{-5}
10^{-4}
10^{-3}
10^{-2}
10^{-1}
10^0
10^1


Operation in This Area
is Limited by $R_{DS(on)}$
10 us
100 us
1 ms
10 ms
100 ms
DC
T_C = 25 °
10^2
10^1
10^0
10^{-1}
10^{-2}
10^0
10^1
10^2
10^3