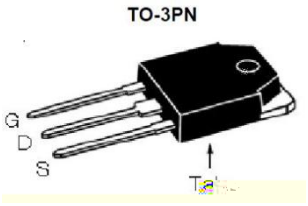
TMAN20N50

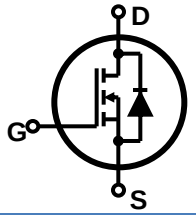
N-channel MOSFET

BV_{DSS}	I_D	$R_{DS(on)}$
500V	20A	<0.3Ω

Features

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





Device	Package	Marking	Remark
TMAN20N50	TO-3PN	TMAN20N50	RoHS

Absolute Maximum Ratings

Parameter		Symbol	TMAN20N50	Unit
Drain-Source Voltage		V_{DS}	500	V
Gate-Source Voltage		V_{GS}	30	V
Continuous Drain Current	T_C = 25	I_D	20	A
	T_C = 100		13.1	A
Pulsed Drain Current (Note 1)		I_{DM}	80	A
Single Pulse Avalanche Energy (Note 2)		E_{AS}	1088	mJ
Repetitive Avalanche Current (Note 1)		I_{AR}	20	A
Repetitive Avalanche Energy (Note 1)		E_{AR}	31.2	mJ
Power Dissipation	T_C = 25	P_D	312	W
	Derate above 25		2.5	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

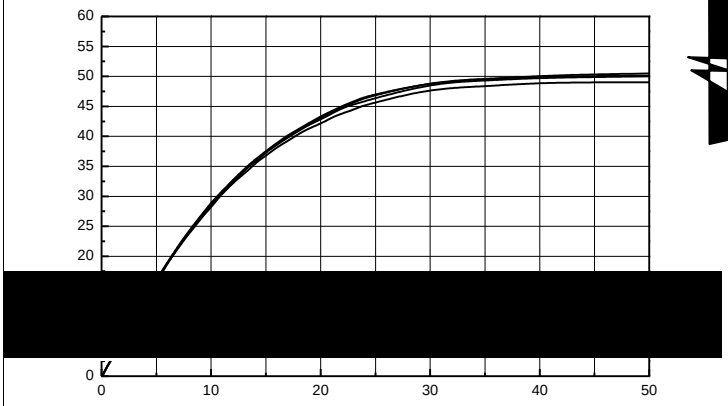
Thermal Characteristics

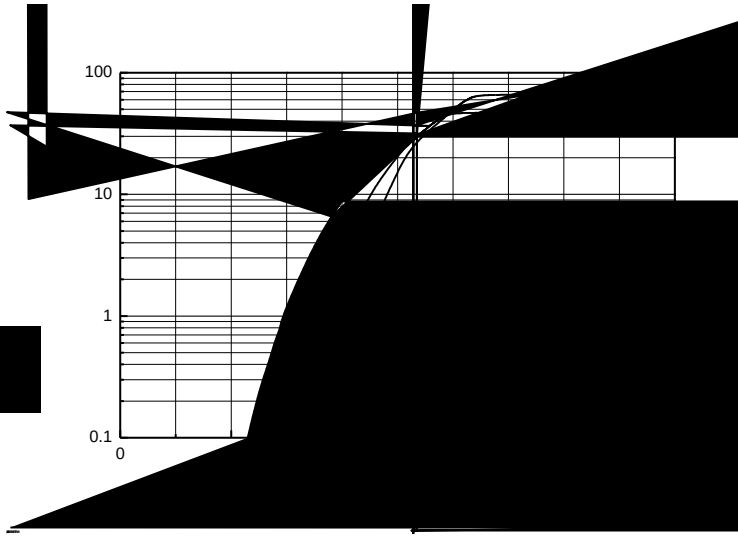
Parameter	Symbol	TMAN20N50	Unit
Maximum Thermal resistance, Junction-to-Case	$R_{\theta JC}$	0.4	/W
Maximum Thermal resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	/W

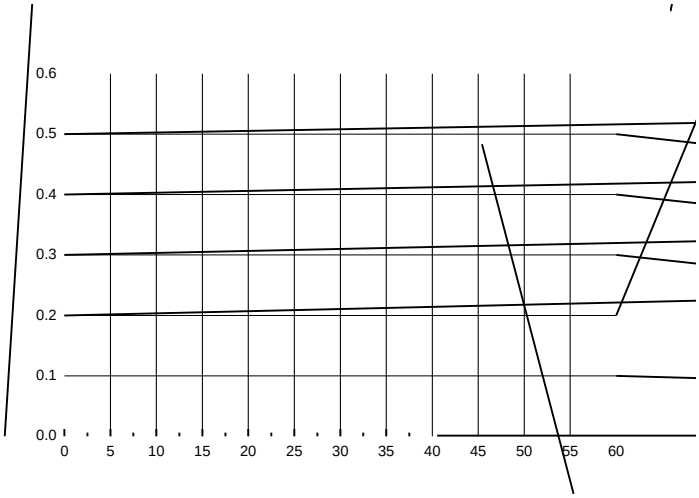
Electrical Characteristics : T_C=25 , unless otherwise noted

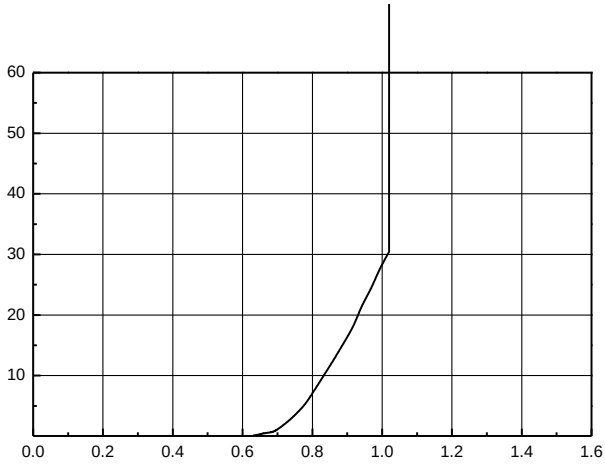
Parameter	Symbol	Test condition	Min	Typ	Max	Units
OFF						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS} = 0 V, I_D = 250 µA	500	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 500 V, V_{GS} = 0 V	--	--	1	µA
		V_{DS} = 400 V, T_C = 125°C	--	--	10	µA
Forward Gate-Source Leakage Current	I_{GSSF}	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	2	--	4	V
Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 10 A	--	0.25 1	0.3	Ω 0
Forward Transconductance (Note 4)	g_{FS}	V_{DS} = 30 V, I_D = 10 A	--	11	--	S
DYNAMIC						
Input Capacitance	C_{iss}	V_{DS} = 25 V, V_{GS} = 0 V,	--	3094	--	pF
Output Capacitance	C_{oss}	f = 1.0 MHz	--	296	--	pF
Reverse Transfer Capacitance	C_{rss}	1	1 --	9.2	--	pF <
SWITCHING						
Turn-On Delay Time (Note 4,5)	$t_{d(on)}$	V_{DD} = 250 V, I_D = 20 A,	--	78	--	ns
Turn-On Rise Time (Note 4,5)	t_r	R_G = 25	--	72	--	ns
Turn-Off Delay Time (Note 4,5)	$t_{d(off)}$		--	184	--	ns
Turn-Off Fall Time (Note 4,5)	t_f		--	68	--	ns
Total Gate Charge (Note 4,5)	Q_g	V_{DS} = 400V, I_D = 20 A,	--	54	--	nC
Gate-Source Charge (Note 4,5)	Q_{gs}	V_{GS} = 10 V	--	8 15	--	1 nC
Gate-Drain Charge (Note 4,5)	Q_{gd}		--	12.5	--	nC
SOURCE DRAIN DIODE						
Maximum Continuous Drain-Source						

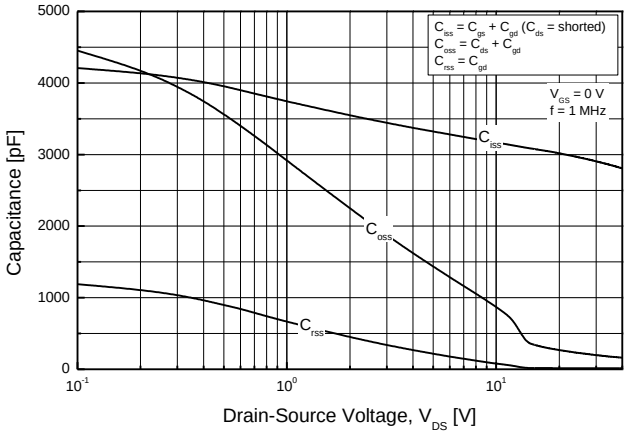
Note :
1. Repeated rating : Pulse width limited by safe operating area
2. L=4.9mH, I_{AS} = 20A, V_{DD} = 50V, R_G = 25 , Starting T_J= 25
3 I_{SD} µs , V_{DD} $_{DS}$, Starting T_J= 25
µ
5. Essentially Independent of Operating Temperature Typical Characteristics

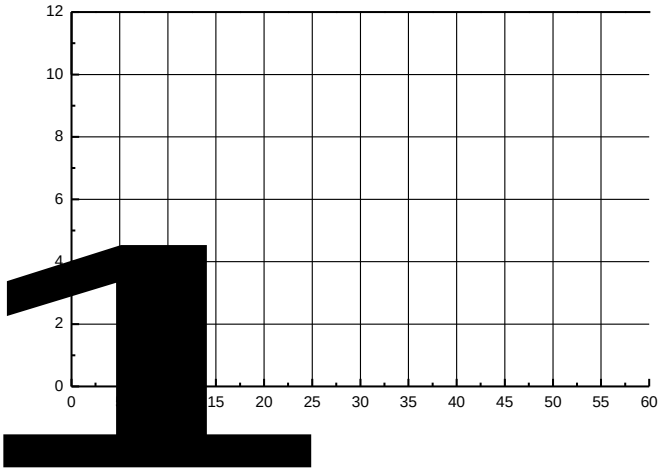

60
55
50
45
40
35
30
25
20
0
0
10
20
30
40
50

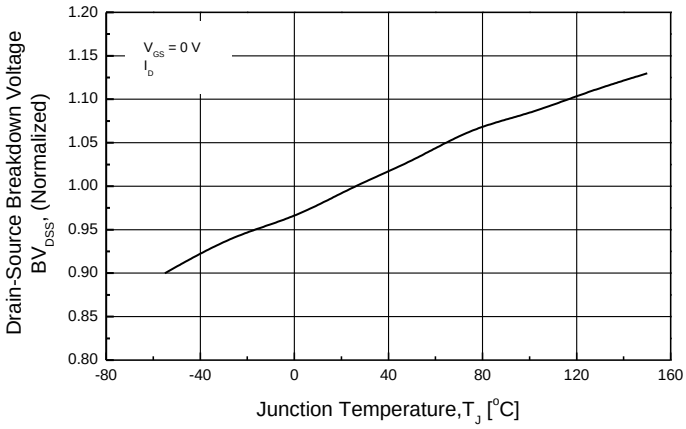

100
10
1
0.1
0

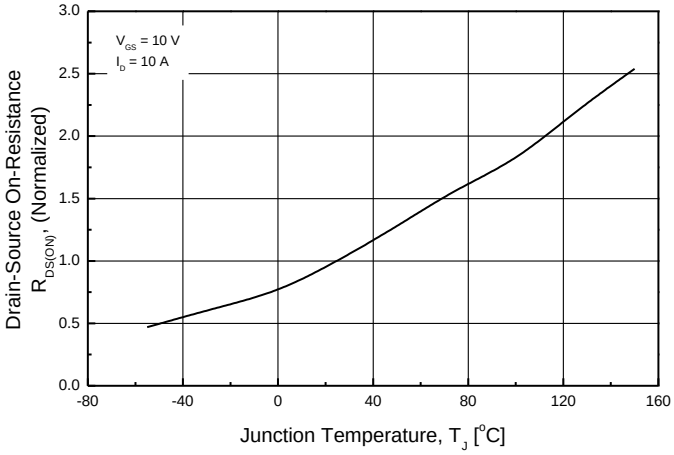

0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
5
10
15
20
25
30
35
40
45
50
55
60

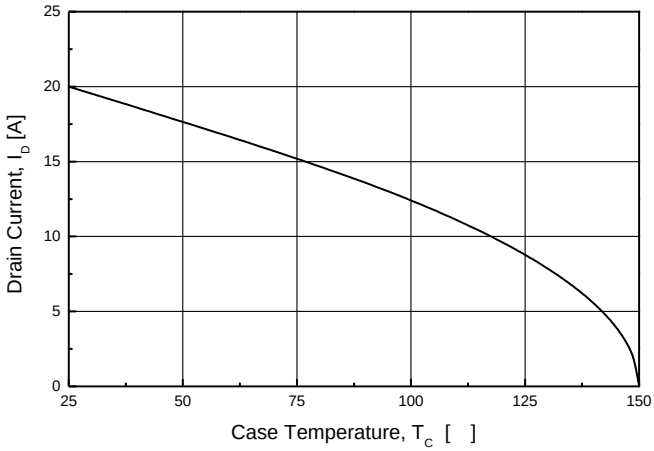

60
50
40
30
20
10
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6

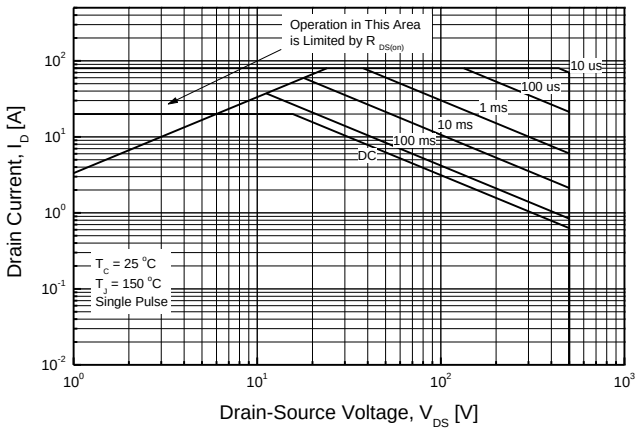

5000
4000
3000
2000
1000
0
Capacitance [pF]
$C_{iss} = C_{gs} + C_{gd}$ (C_{ds} = shorted)
$C_{oss} = C_{ds} + C_{gd}$
$C_{rss} = C_{gd}$
V_{GS} = 0 V
f = 1 MHz
C_{iss}
C_{oss}
C_{rss}
10^{-1}
10^{0}
10^{1}
Drain-Source Voltage, V_{DS} [V]

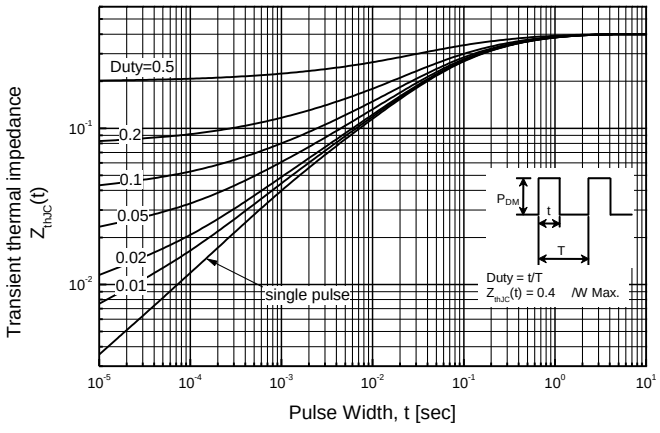

12
10
8
6
4
2
0
0
15
20
25
30
35
40
45
50
55
60


Drain-Source Breakdown Voltage
BV_DSS, (Normalized)
V_GS = 0 V
I_D
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
Junction Temperature,T_J [°C]


Drain-Source On-Resistance
R_DS(ON), (Normalized)
V_GS = 10 V
I_D = 10 A
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 [ ]


Drain Current, I_D [A]
Operation in This Area
is Limited by R DS(on)
10 us
100 us
1 ms
10 ms
100 ms
DC
T_C = 25 °C
T_J = 150 °C
Single Pulse
10^2
10^1
10^0
10^-1
10^-2
10^0
10^1
10^2
10^3
Drain-Source Voltage, V_DS [V]


Transient thermal impedance
Z_thJC(t)
Duty=0.5
0.2
0.1
0.05
0.02
0.01
single pulse
P_DM
t
T
Duty = t/T
Z_thJC(t) = 0.4 /W Max.
10^-1
10^-2
10^-5
10^-4
10^-3
10^-2
10^-1
10^0
10^1
Pulse Width, t [sec]

TO