

MT13G021T

N-Channel Enhancement Mode Field Effect Transistor

Product Summary

- $V_{DS} = 130V$
- $I_D = 380A$
- $R_{DS(ON)} = 2.0 m\Omega @ V_{GS} = 10V$

Features

- Advanced Trench Process Technology.
- High Density Cell Design for Ultra Low On-Resistance.
- Lead free product is acquired.
- RoHS Compliant.
- TOLL Package

Applications

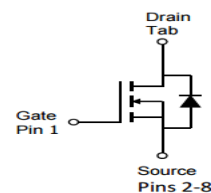
- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply



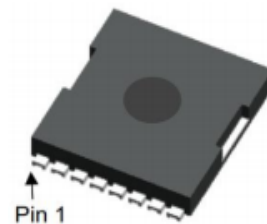
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Simplified Schematic



MARKING DIAGRAM & PIN ASSIGNMENT



Absolute Maximum Ratings ($T_A = 25^\circ C$ unless otherwise noted)

Symbol	Parameter		Steady State	Units
V _{DS}	Drain-Source Voltage		130	V
V _{GS}	Gate-Source Voltage		± 20	V
I _D	Continuous Drain Current ¹	T _C = 25°C	380	A
I _{DM}	Pulsed Drain Current ²		1190	A
I _S	Continuous Source Current (Diode Conduction) ¹		320	A
E _{AS}	Single Pulse Drain-Source Avalanche Energy ³		2632	mJ
P _D	Maximum Power Dissipation	T _C = 25°C	450	W
T _J , T _{STG}	Operating Junction and Storage Temperature Range		-55~150	°C

Notes:

1. Surface Mounted on 1" x 1" FR4 Board, $t \leq 10$ Sec.
2. Pulse width limited by maximum junction temperature.
3. The test condition is $T_J = 25^\circ C$, $V_{DD} = 30V$, $V_{GS} = 10V$, $L = 0.1mH$, $R_G = 25\Omega$, $I_{AS} = 50A$.

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.4	$^{\circ}\text{C/W}$
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Electrical Characteristics ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	130	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =100V, V _{GS} =0V	-	-	1	uA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	100	nA
On Characteristics						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	2.0	2.8	5.0	V
Drain-Source On-State Resistance ^a	R _{DS(ON)}	V _{GS} =10V, I _D =30A	-	2.0	2.6	mΩ
Dynamic Characteristics ^b						
Input Capacitance	C _{ISS}	V _{DS} =50V, V _{GS} =0V, F=1.0MHz	-	10623	-	PF
Output Capacitance	C _{OSS}		-	2149	-	PF
Reverse Transfer Capacitance	C _{rSS}		-	79	-	PF
Switching Characteristics						
Turn-on Delay Time	t _{d(on)}	V _{DD} = 50V, I _D =90A V _{GS} =10V, R _G =3.0Ω	-	30	-	nS
Turn-on Rise Time	t _r		-	109	-	nS
Turn-Off Delay Time	t _{d(off)}		-	81	-	nS
Turn-Off Fall Time	t _f		-	109	-	nS
Total Gate Charge	Q _g	V _{DS} = 50V, I _D =90A , V _{GS} =10V	-	146		nC
Gate-Source Charge	Q _{gs}		-	48		nC
Gate-Drain Charge	Q _{gd}		-	30		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =30A	-	0.75	1.4	V
Diode Forward Current	I _S		-	-	380	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = 90A di/dt = 500A/μs	-	56	-	nS
Reverse Recovery Charge	Q _{rr}		-	96	-	nC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Note:

a. Pulse test; pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

b. Guaranteed by design, not subject to production testing.

Typical Electrical and Thermal Characteristics (Curves)

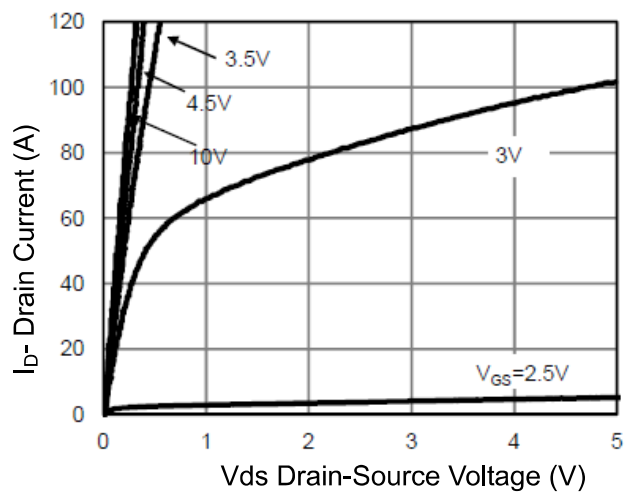


Figure 1 Output Characteristics

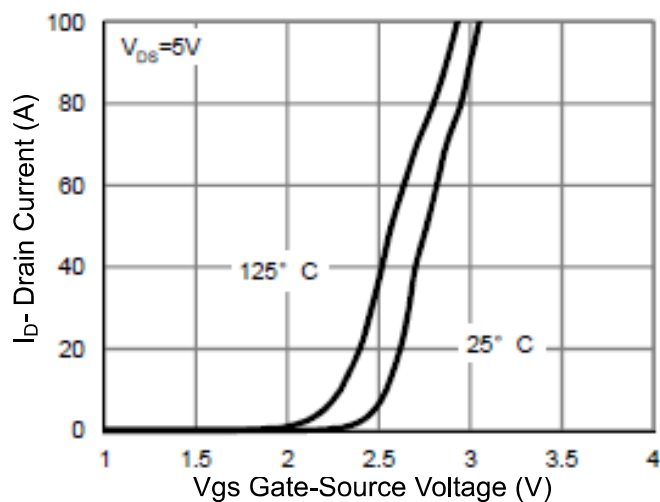


Figure 2 Transfer Characteristics

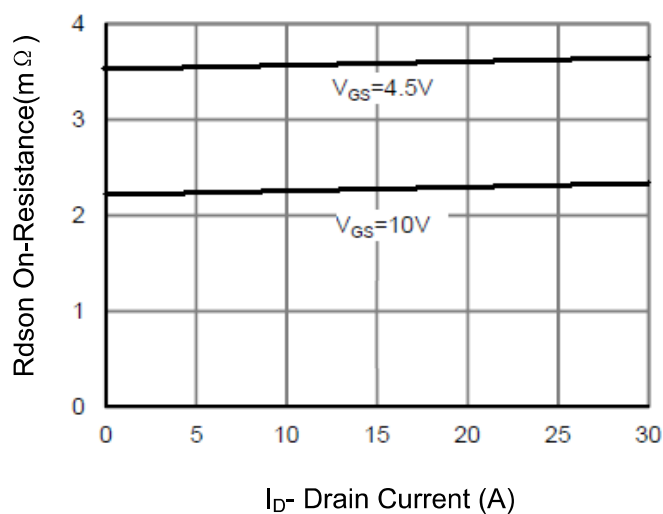


Figure 3 $R_{DS(on)}$ - Drain Current

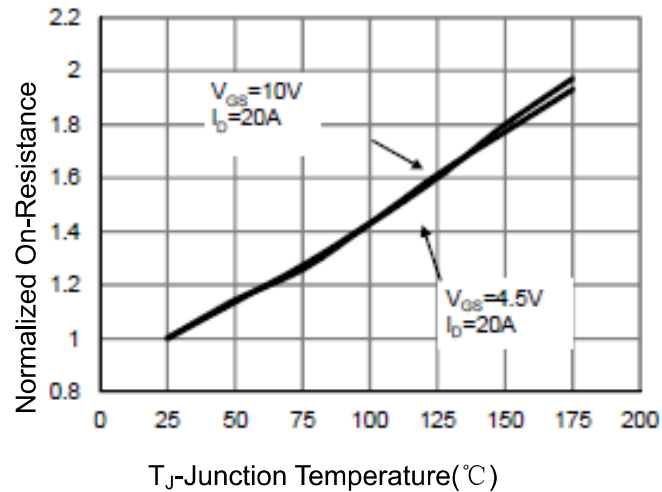


Figure 4 $R_{DS(on)}$ -Junction Temperature

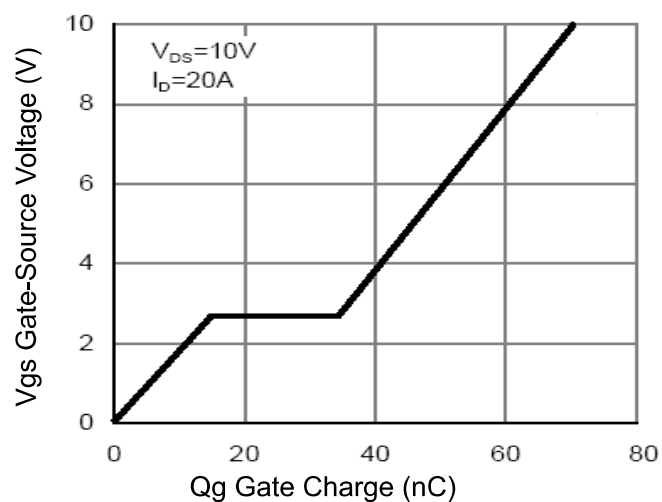


Figure 5 Gate Charge

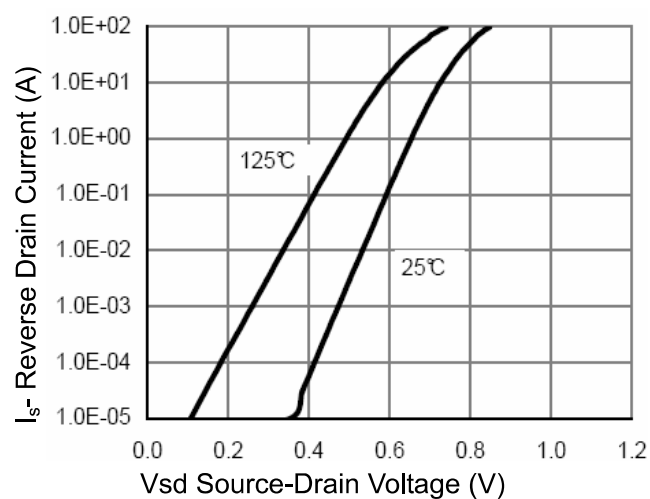


Figure 6 Source- Drain Diode Forward

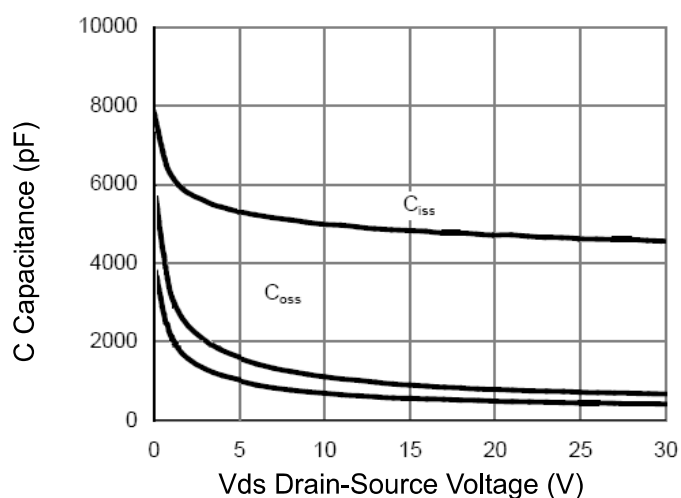


Figure 7 Capacitance vs Vds

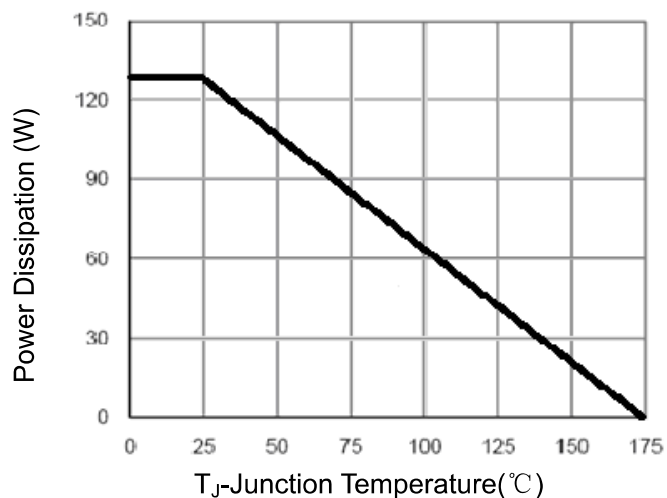


Figure 9 Power De-rating

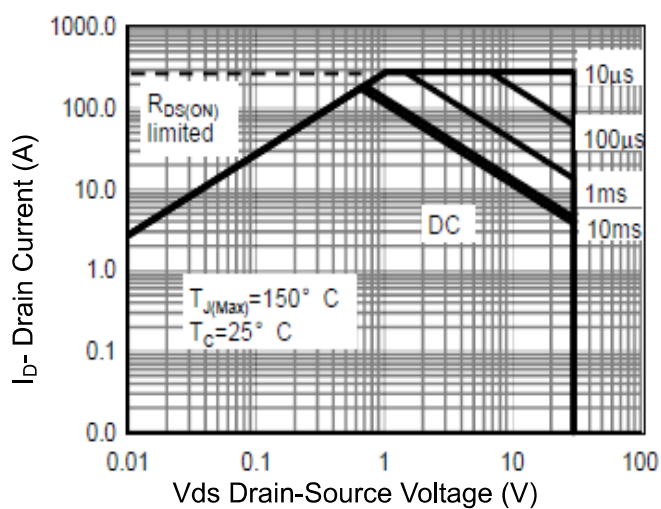


Figure 8 Safe Operation Area

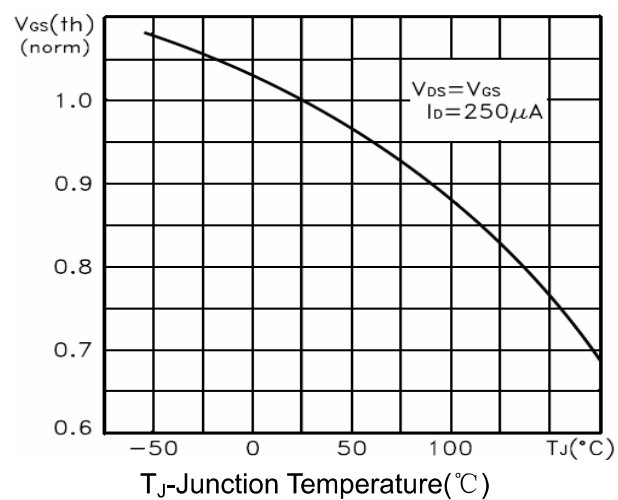
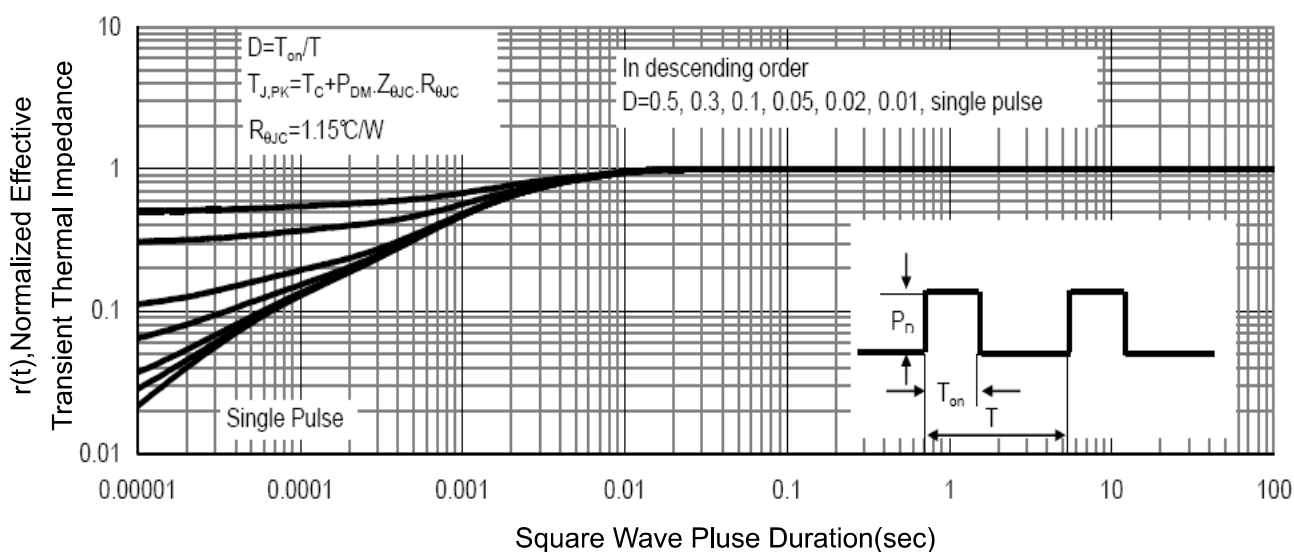
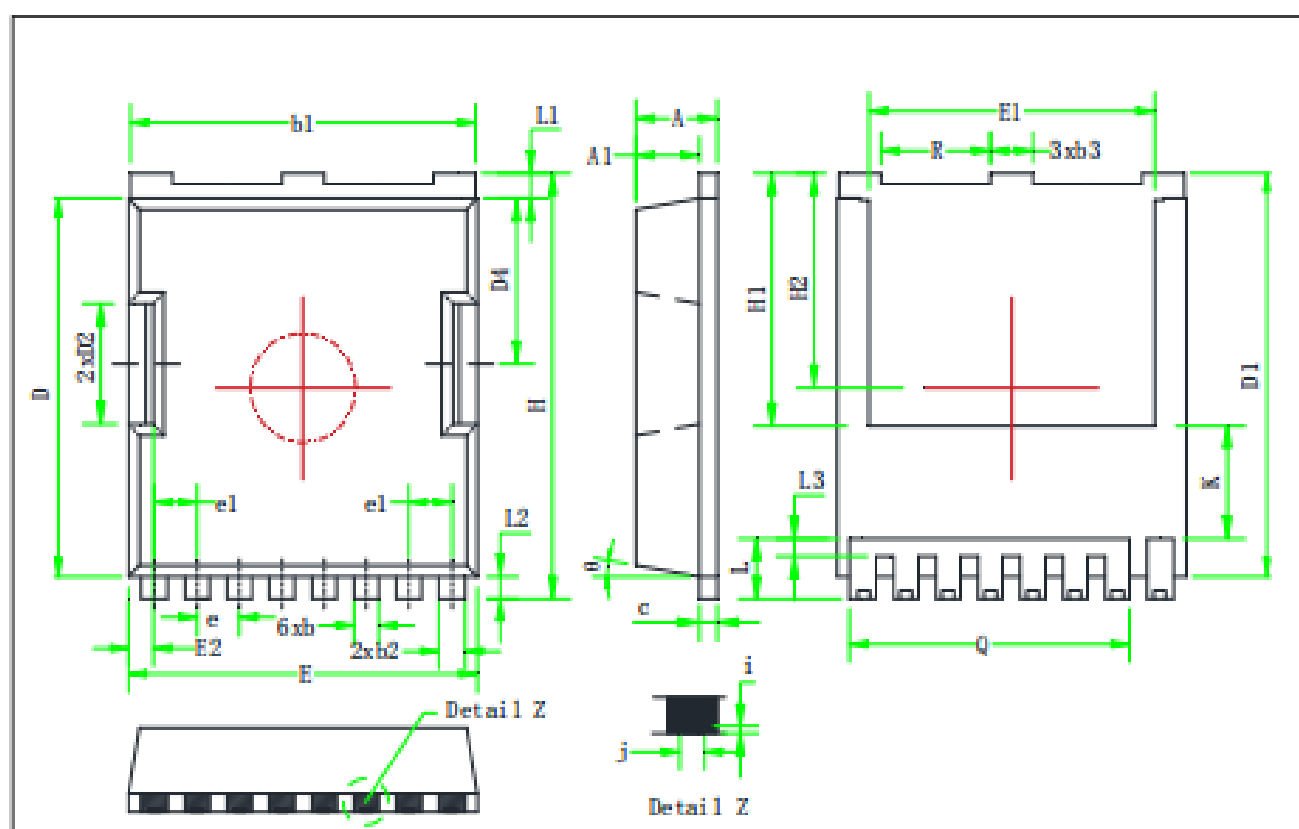
Figure 10 $V_{GS(th)}$ vs Junction Temperature

Figure 11 Normalized Maximum Transient Thermal Impedance

Package Mechanical Data(TOLL)



Symbol	Min	Typ	Max	Symbol	Min	Typ	Max
A	2.25	2.30	2.35	E2	0.65	0.70	0.75
A1	1.75	1.80	1.85	H	11.60	11.70	11.80
b	0.65	0.70	0.75	H1	6.95 BSC		
b1	9.75	9.80	9.85	H2	5.90 BSC		
b2	0.70	0.75	0.80	i	0.10 REF		
b3	1.15	1.20	1.25	j	0.35 REF		
c	0.45	0.50	0.55	K	3.10 REF		
D	10.35	10.40	10.45	L	1.55	1.65	1.75
D1	11.00	11.10	11.20	L1	0.65	0.70	0.75
D2	3.25	3.30	3.35	L2	0.50	0.60	0.70
D4	4.50	4.55	4.60	L3	0.40	0.50	0.60
e	1.20 BSC			Q	7.95 REF		
e1	1.225 BSC			R	3.05	3.10	3.15
E	9.85	9.90	9.95	θ	10°REF		
E1	8.00	8.10	8.20				

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