20V N-Channel Enhancement Mode Power MOSFET

Description

EMR13N02TS uses advanced power trench technology that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

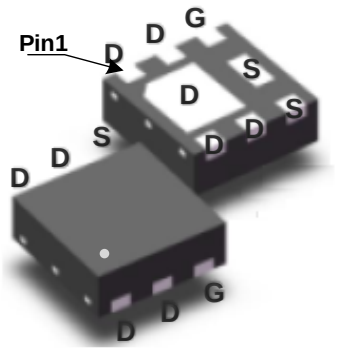
Features

- V_{DS}= 20V, I_D = 13A
  $R_{DS(on)}$ < 10mΩ @ V_{GS} = 4.5V
  $R_{DS(on)}$ < 13.5mΩ @ V_{GS} = 2.5V
- Green Device Available
- RoHS Compliant & Halogen-Free
- Super Low Gate Charge

Applications

- Load Switches
- DC/DC Converter

Schematic & PIN Configuration



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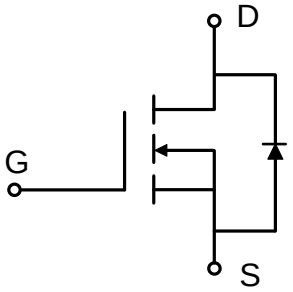


Absolute Maximum Ratings (T_A = 25°C, unless otherwise noted)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	20	V
Gate-Source Voltage		V_{GS}	±12	V
Continuous Drain Current	T_A=25°C	I_D	13	A
	T_A=100°C		8	
Pulsed Drain Current (1)		I_{DM}	52	A
Single Pulse Avalanche Energy (2)		EAS	42.25	mJ
Total Power Dissipation	T_A=25°C	P_D	2.8	W
Operating Junction and Storage Temperature Range		T_J ,T_{STG}	-55 to +150	°C

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance from Junction to Ambient (3)	$R_{\theta JA}$	44.6	°C/W

Electrical Characteristics (T_J = 25°C, unless otherwise noted)

Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Static Characteristics							
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 250μA	20	-	-	V
Gate-body Leakage Current		I_{GSS}	V_{DS} = 0V, V_{GS} = ±12V	-	-	±100	nA
Zero Gate Voltage Drain Current	T_J=25°C	I_{DSS}	V_{DS} = 20V, V_{GS} = 0V	-	-	1	μA
	T_J=100°C			-	-	100	
Gate Threshold Voltage		$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	0.5	0.75	1	V
Drain-Source on-state Resistance (4)		$R_{DS(on)}$	V_{GS} = 4.5V, I_D = 10A	-	7.8	10	mΩ
			V_{GS} = 2.5V, I_D = 5A	-	10	13.5	
Forward Transconductance (4)		g_{fs}	V_{DS} = 4.5V, I_D = 10A	-	44	-	S
Dynamic Characteristics (5)							
Input Capacitance		C_{iss}	V_{DS} = 10V, V_{GS} = 0V, f = 1MHz	-	1259	-	pF
Output Capacitance		C_{oss}		-	160	-	
Reverse Transfer Capacitance		C_{rss}		-	155	-	
Switching Characteristics (5)							
Total Gate Charge		Q_g	V_{GS} = 4.5V, V_{DS} = 10V, I_D= 10A	-	13.5	-	nC
Gate-Source Charge		Q_{gs}		-	2.9	-	
Gate-Drain Charge		Q_{gd}		-	2.9	-	
Turn-On Delay Time		$t_{d(on)}$	V_{GS} = 4.5V, V_{DD} = 10V, R_G = 3Ω, I_D= 10A	-	5.5	-	ns
Rise Time		t_r		-	8.9	-	
Turn-Off Delay Time		$t_{d(off)}$		-	9.8	-	
Fall Time		t_f		-	22.9	-	
Body Diode Reverse Recovery Time		t_{rr}	I_F=10A, di/dt=100A/μs	-	22	-	ns
Body Diode Reverse Recovery Charge		Q_{rr}		-	3.5	-	nC
Drain-Source Body Diode Characteristics							
Body Forward Voltage (4)		V_{SD}	I_S = 4A, V_{GS} = 0V	-	-	1.2	V
Continuous Source Current	T_A=25°C	I_S		-	-	13	A

Note1：Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150°C

Note2：The test condition is V_{DD}= 24V, V_{GS}=10V, L= 0.5mH, I_{AS}= 13A.

Note3：The data tested by surface mounted on a 1 inch2 FR-4 board with 2OZ copper, The value in any given application depends on the user's specific board design.

Note4：The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.

Note5：This value is guaranteed by design hence it is not included in the production test.

Typical Characteristics

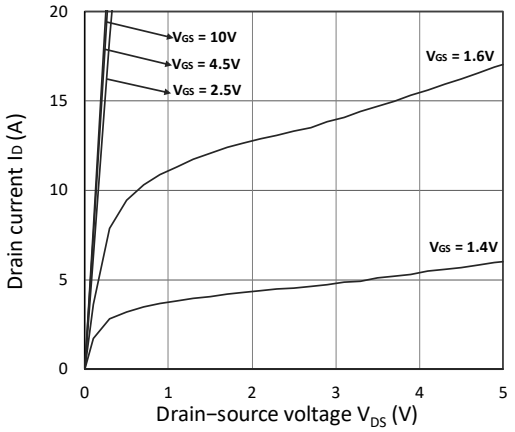


Figure 1. Output Characteristics

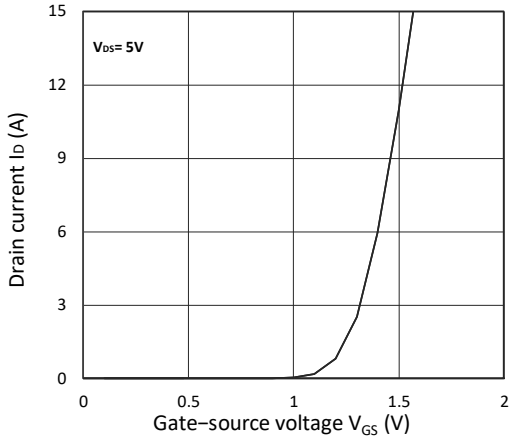


Figure 2. Transfer Characteristics

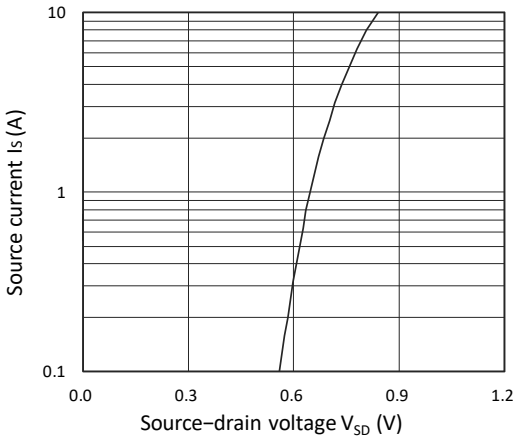


Figure 3. Forward Characteristics of Reverse

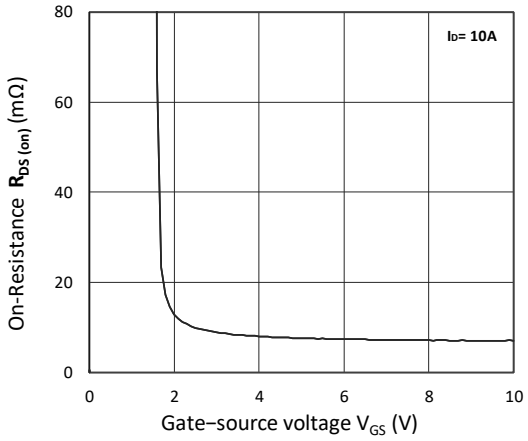


Figure 4. $R_{DS(ON)}$ vs. V_{GS}

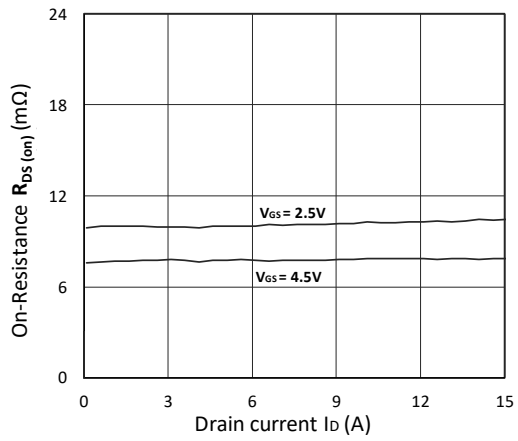


Figure 5. $R_{DS(ON)}$ vs. I_D

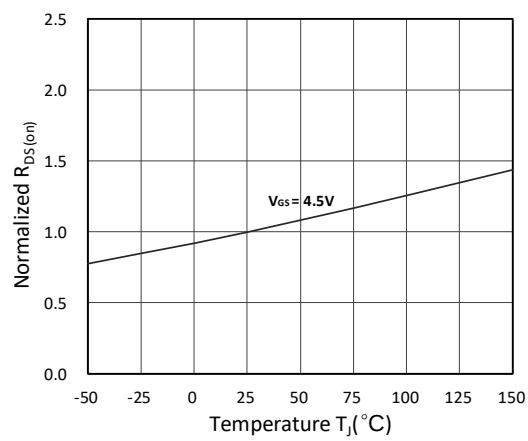


Figure 6. Normalized $R_{DS(on)}$ vs. Temperature

Typical Characteristics(Continued)

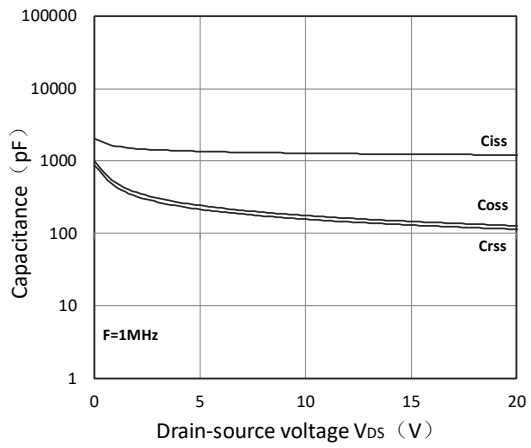


Figure 7. Capacitance Characteristics

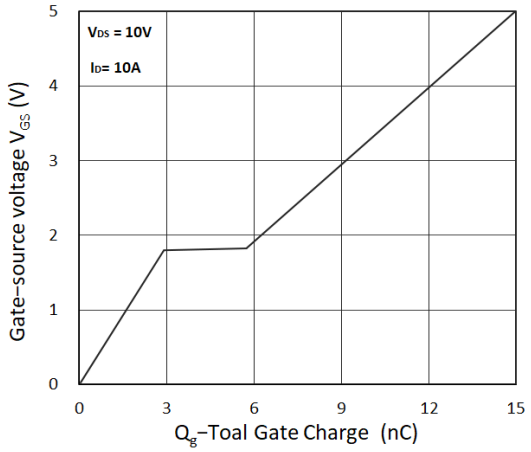


Figure 8. Gate Charge Characteristics

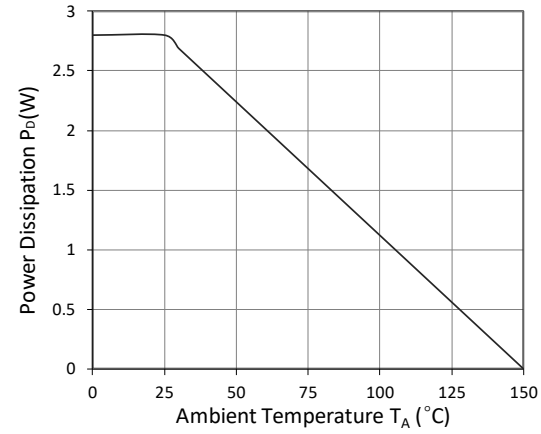


Figure 9. Power Dissipation

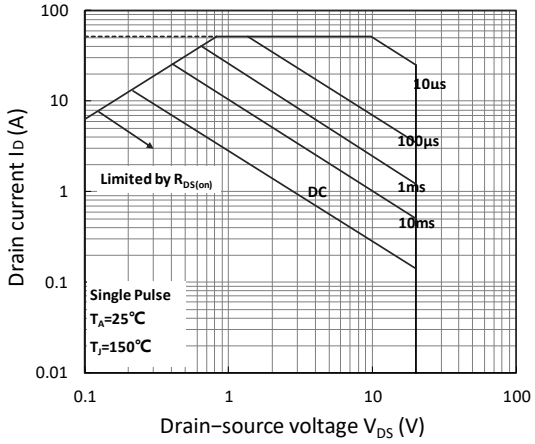


Figure10. Safe Operating Area

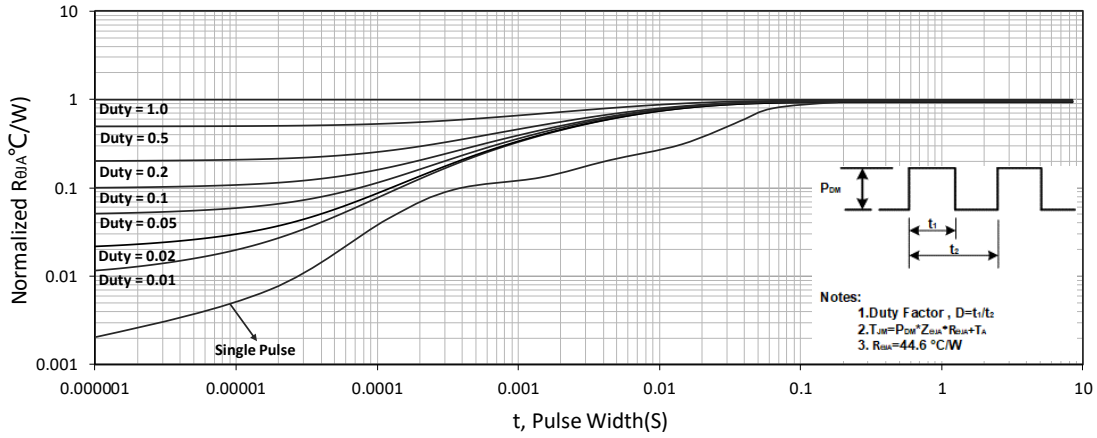


Figure 11. Normalized Maximum Transient Thermal Impedance

Test Circuit

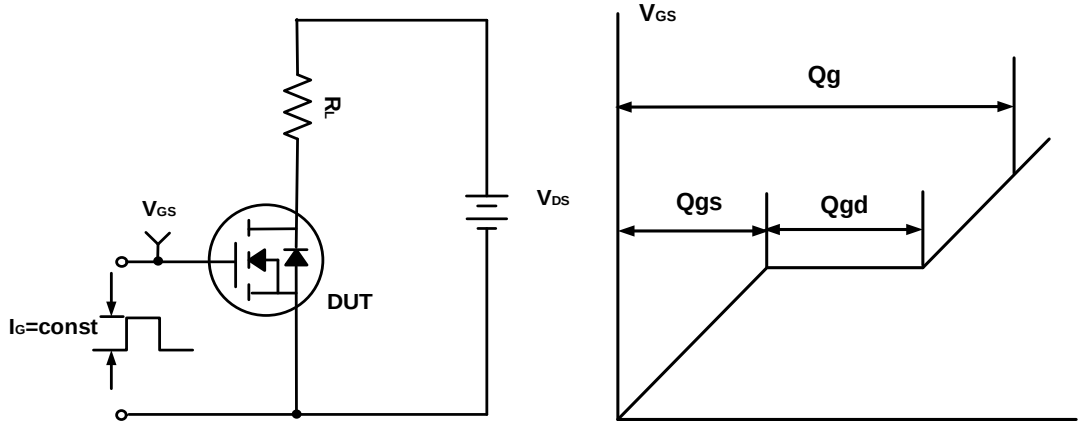


Figure A. Gate Charge Test Circuit & Waveforms

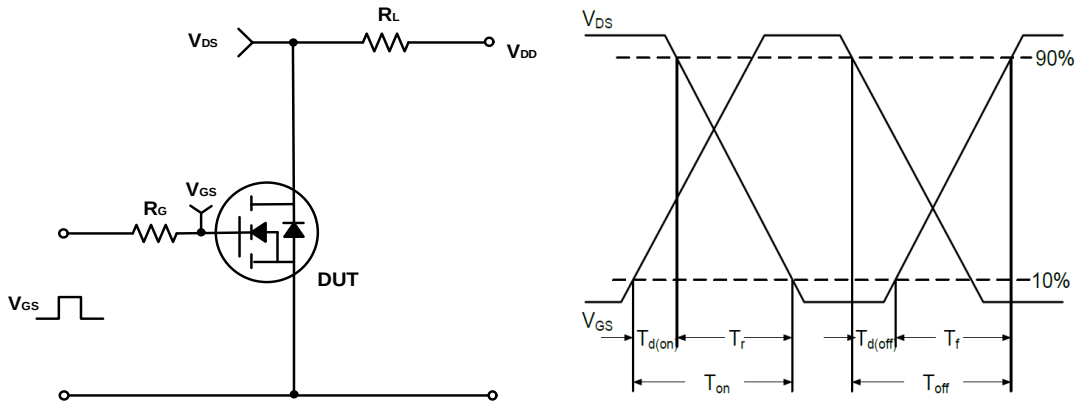


Figure B. Switching Test Circuit & Waveforms

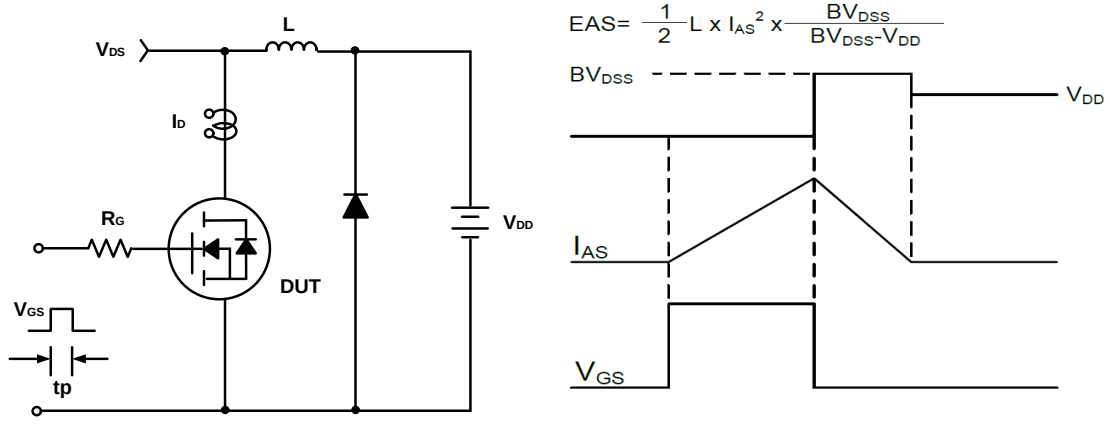
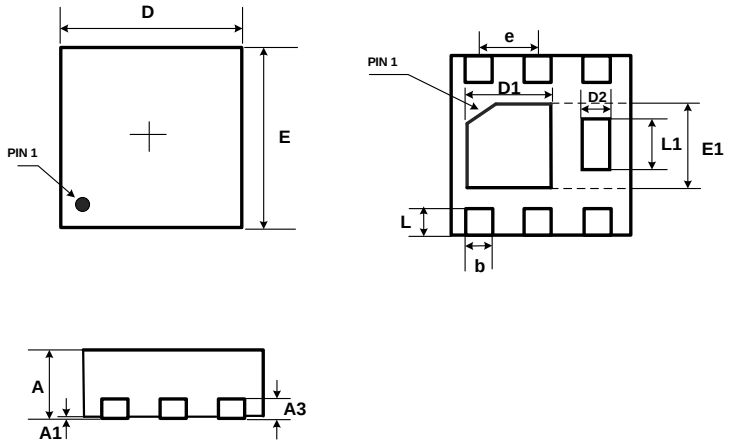


Figure C. Unclamped Inductive Switching Circuit & Waveforms

Package Dimension

DFN2020-6L



SYMBOL	MILLIMETER	
	MIN	MAX
A	0.50	0.60
A1	0.00	0.05
A3	0.152REF	
b	0.25	0.35
D	1.90	2.10
D1	0.80	1.00
E	1.90	2.10
E1	0.80	1.00
L1	0.46	0.66
e	0.65BSC	
D2	0.25	0.35
L	0.25	0.35

Ordering Information

Part	Package	Marking	Packing Information
EMR13N02TS	DFN2020-6L	R13N02S	Tape and Reel

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2022-09-22	Released Version	Pan Shun Ye	Qi Shu Kun	Liu Jia Ying