

20V P-Channel Enhancement Mode Power MOSFET

General Description

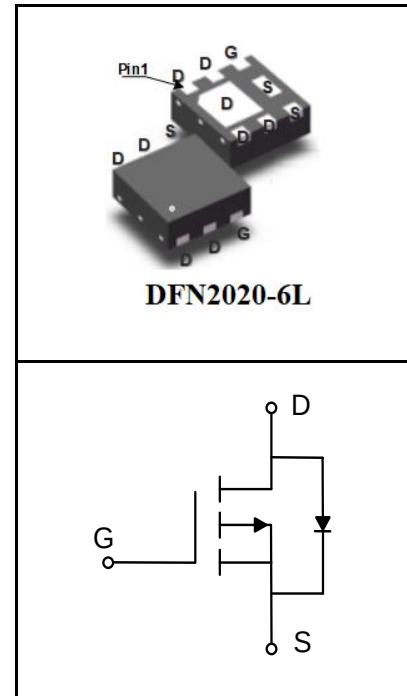
EMR12P02T1 uses advanced power trench technology that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

Features

- $V_{DS} = -20V$, $I_D = -11.5A$
 $R_{DS(on)} < 17m\Omega @ V_{GS} = -4.5V$
 $R_{DS(on)} < 22m\Omega @ V_{GS} = -2.5V$
- Green Device Available
- High Power and Current Handling Capability

Applications

- Battery Protection
- Power Management
- Load Switch



Absolute Maximum Ratings (TA = 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	I_D	$T_A = 25^\circ C$ -11.5	A
		$T_A = 100^\circ C$ -7.3	
Pulsed Drain Current ¹	I_{DM}	-46	A
Single Pulse Avalanche Energy ²	E_{AS}	20	mJ
Total Power Dissipation	P_D	$T_A = 25^\circ C$ 3.1	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ C$

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance from Junction-to-Ambient ³	$R_{\theta JA}$	40.3	$^\circ C/W$

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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	-0.3	-0.65	-1	V
Drain-Source on-Resistance ⁴		R _{DS(on)}	V _{GS} = -4.5V, I _D = -8A	-	12.5	17	mΩ
			V _{GS} = -2.5V, I _D = -6A	-	16.5	22	
Forward Transconductance ⁴		g _{fs}	V _{DS} = -4.5V, I _D = -8A	-	35	-	S
Dynamic Characteristics ⁵							
Input Capacitance		C _{iss}	V _{DS} = -10V, V _{GS} =0V, f =1MHz	-	1555	-	pF
Output Capacitance		C _{oss}		-	224	-	
Reverse Transfer Capacitance		C _{rss}		-	195	-	
Gate Resistance		R _G	f =1MHz	-	10	-	Ω
Switching Characteristics ⁵							
Total Gate Charge		Q _g	V _{GS} = -4.5V, V _{DS} = -10V, I _D = -8A	-	12	-	nC
Gate-Source Charge		Q _{gs}		-	1.8	-	
Gate-Drain Charge		Q _{gd}		-	3.2	-	
Turn-on Delay Time		t _{d(on)}	V _{GS} = -4.5V, V _{DD} = -10V, I _D = -8A, R _G = 3Ω	-	17	-	ns
Rise Time		t _r		-	25.5	-	
Turn-off Delay Time		t _{d(off)}		-	32	-	
Fall Time		t _f		-	15	-	
Drain-Source Body Diode Characteristics							
Diode Forward Voltage ⁴		V _{SD}	I _S = -8A, V _{GS} = 0V	-	-	-1.2	V
Continuous SourceCurrent	T _A =25°C	I _S	-	-	-	-11.5	A

Notes:

1. Repetitive rating, pulse width limited by junction temperature T_{J(MAX)}=150°C.
2. The EAS data shows Max. rating . The test condition is V_{DD}= -20V, V_{GS}= -10V, L=0.1mH, I_{AS}= -20A.
3. The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper, The value in any given application depends on the user's specific board design.
4. The data tested by pulsed, pulse width ≤ 300us , duty cycle ≤ 2%.
5. This value is guaranteed by design hence it is not included in the production test.

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Typical Characteristics

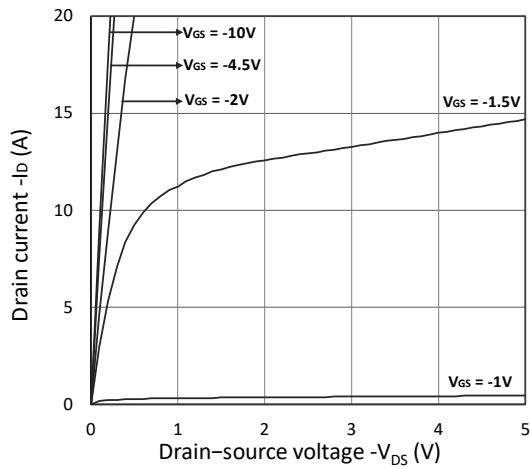


Figure 1. Output Characteristics

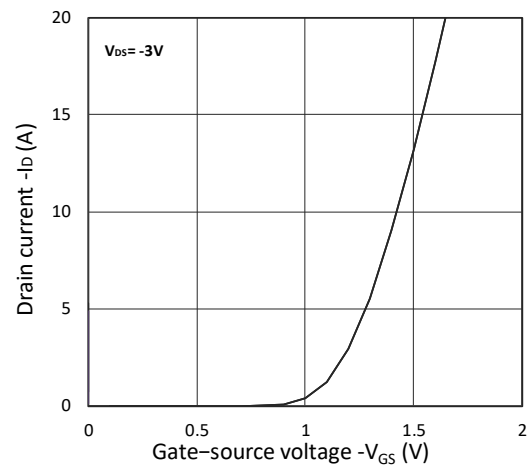


Figure 2. Transfer Characteristics

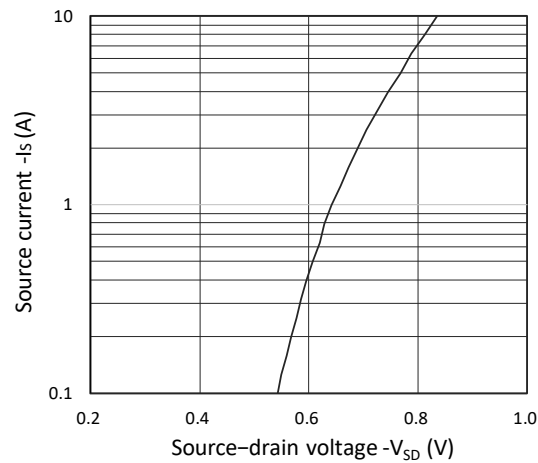


Figure 3. Forward Characteristics of Reverse

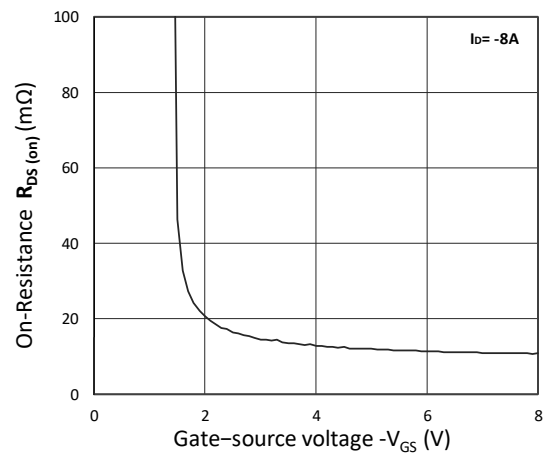


Figure 4. $R_{DS(on)}$ vs. V_{GS}

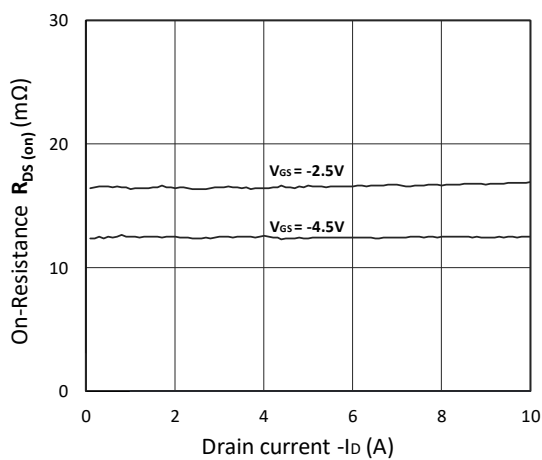


Figure 5. $R_{DS(on)}$ vs. I_D

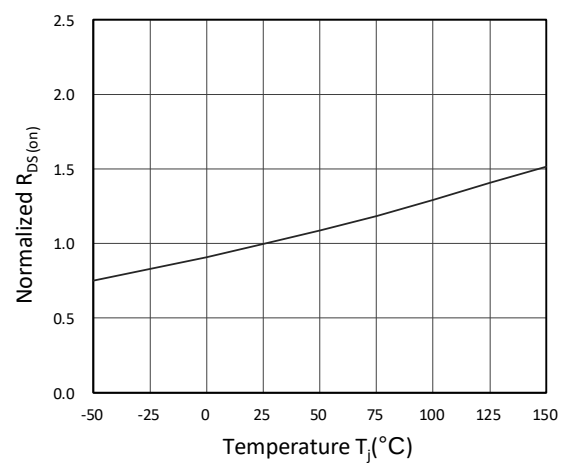


Figure 6. Normalized $R_{DS(on)}$ vs. Temperature

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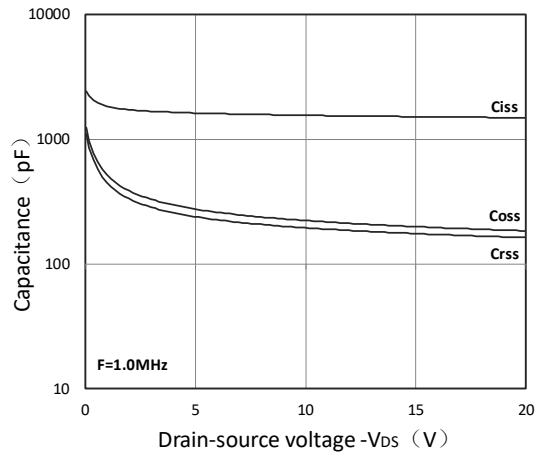


Figure 7. Capacitance Characteristics

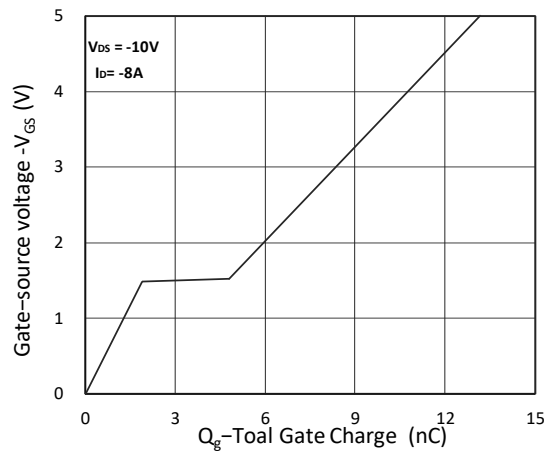


Figure 8. Gate Charge Characteristics

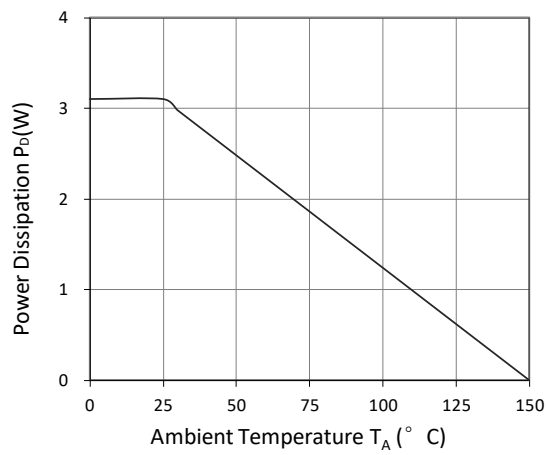


Figure 9. Power Dissipation

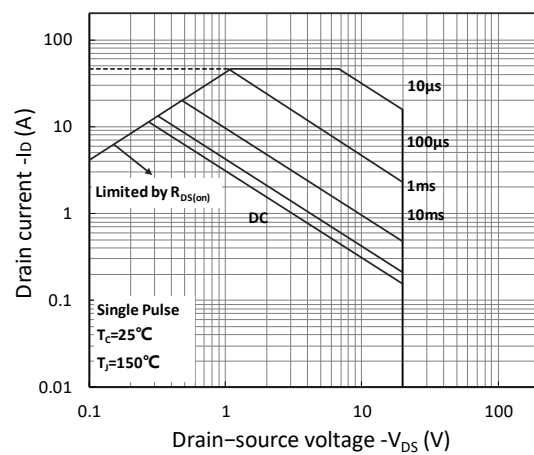


Figure 10. Safe Operating Area

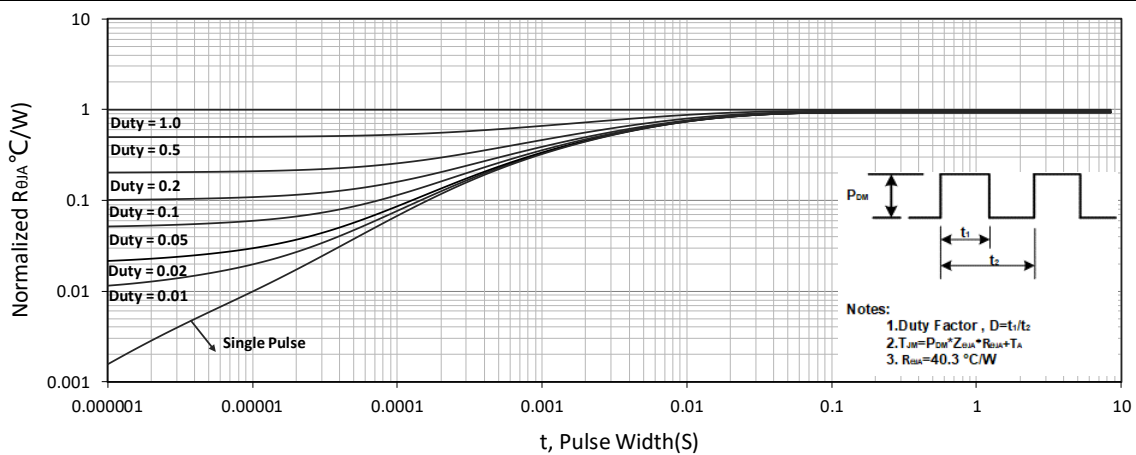


Figure 11. Normalized Maximum Transient Thermal Impedance

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Test Circuit

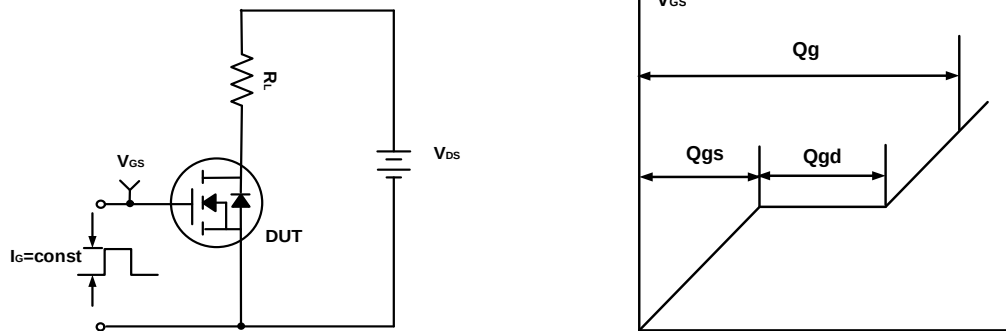


Figure A. Gate Charge Test Circuit & Waveforms

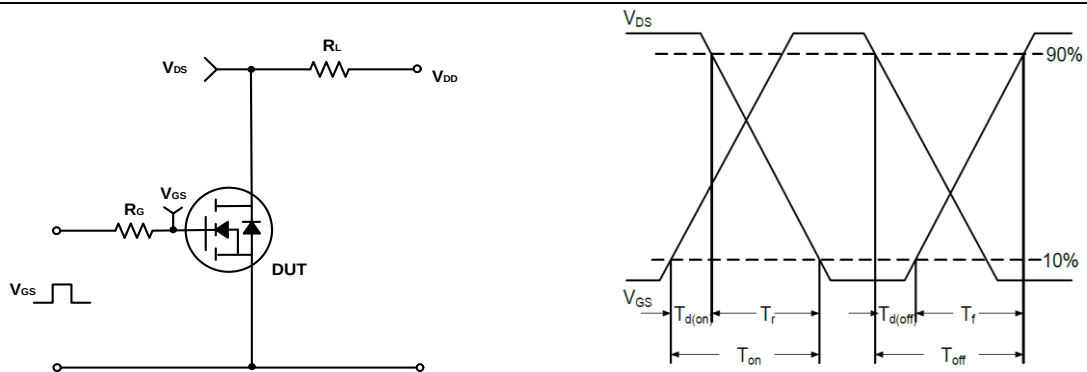


Figure B. Switching Test Circuit & Waveforms

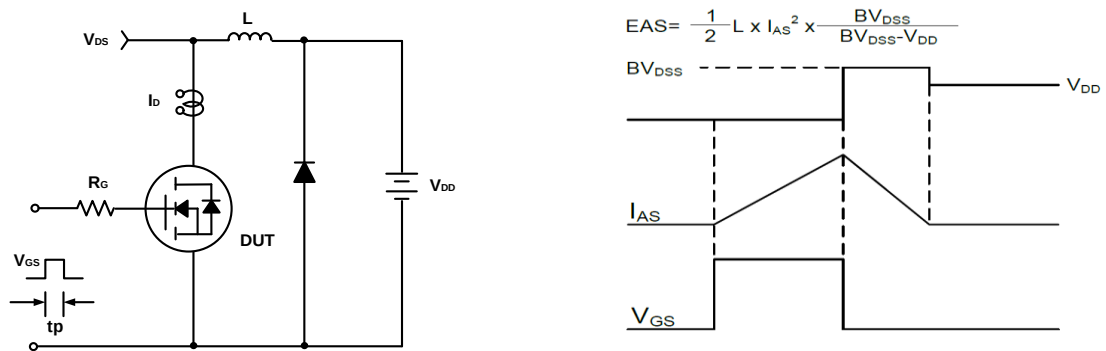
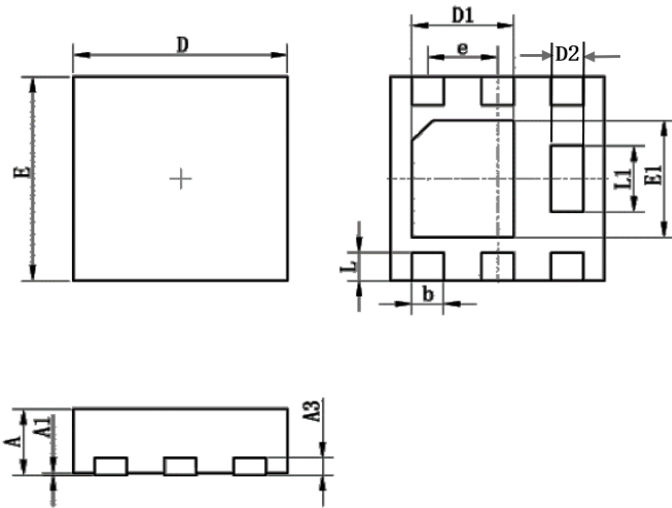


Figure C. Unclamped Inductive Switching Circuit & Waveforms

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Package Dimension

DFN2020-6L(Unit: mm)



SYMBOL	Unit: mm	
	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 method
EMR12P02T1	DFN2020-6L	R12P02	Tape and Reel

Revision History and Checking Table

No.	Version	Date	Revision Item	Request	Function & Spec Checking	Package Checking	Tape Checking
1	1.0	2021-09-15	Released Version	Qi Shu Kun	Qi Shu Kun	Liu Jia Ying	Liu Jia Ying