DACO SEMICONDUCTOR

DAC040N120Z2

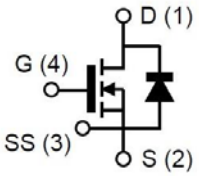
Silicon Carbide Enhancement Mode MOSFET

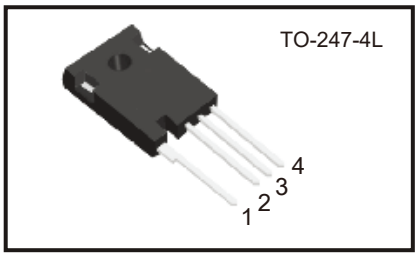
Preliminary

V_{DSS}	1200V
$I_{D(@25℃)}$	60A
$R_{DS(ON)}$	40mΩ

Features

- Low On-Resistance and High Current Density
- Low Capacitance for High Frequency Operation
- Positive Temperature Coefficient Device





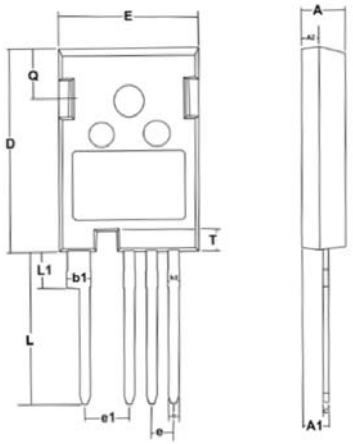
Benefits

- Higher System Efficiency
- Increase Parallel Device Convenience
- Allow High Frequency Operation
- Realize Compact and Lightweight Systems

Applications

- Switching Mode Power Supply
- DC/DC Converters, UPS, and PFC
- Power Inverters
- Auxiliary Power Supplies
- Solar/Wind Renewable Energy

Package Dimensions



Absolute Maximum Ratings

(Tc = 25℃ unless otherwise specified)

Parameter		Symbol	Ratings	Unit
Drain-Source Voltage	V_{GS}=0V I_D=100μA	V_{DS}	1200	V
Gate-Source Voltage		V_{GS}	-5/+20	V
Drain Current-Continuous	@ T_C =25°C @ T_C =100°C	I_D	60 40	A
Pulse Drain Current		$I_{D,pulse}$	160	A
Power Dissipation	@ T_C =25°C @ T_J =150°C	P_D	270	W
Storage Temperature Range		T_{STG}	-55 to +150	°C
Operating Junction Temperature Range		T_J	-55 to +150	°C

Symbol	Dimensions in millimeters		
	Min.	Avg.	Max.
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.80	2.00	2.20
b	1.06	1.21	1.36
b1	2.33	2.63	2.93
b2	1.07	1.30	1.60
C	0.51	0.61	0.75
D	23.30	23.45	23.60
E	15.74	15.94	16.14
e	2.54 BSC		
e1	5.08 BSC		
L	17.27	17.57	17.87
L1	3.99	4.19	4.39
Q	5.49	5.79	6.09
T	2.35	2.50	2.65

Electrical Characteristics @ T_C =25°C (unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
OFF Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V，I_{DS}=0.1mA	1200	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS}=0V，V_{DS}=1200V	-	1	100	μA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=20V ，V_{DS}=0V	-	-	250	nA
ON Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}= 10V，I_{DS}=1mA	2	2.6	4	V
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS}=20V，I_{DS}=40A	-	40	52	mΩ
Transconductance	g_{fs}	V_{DS} =20V，I_{DS}=40A	-	15.1	-	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{DS}=1000V V_{GS}=0V V_{AC}=25mV Freq.=0.1MHz	-	1893	-	pF
Output Capacitance	C_{oss}		-	150	-	
Reverse Transfer Capacitance	C_{rss}		-	10	-	
C_{oss} Stored Energy	E_{oss}	V_{GS}=0V，V_{DS}=1000V Freq.=0.1MHz，V_{AC}=25mV	-	82	-	μJ
Turn-On Switching Energy	E_{on}	V_{DD}=800V，V_{GS}=-5V/+20V I_D =40A，$R_{G(ext)}$=2.5Ω L=100μH	-	1	-	mJ
Turn-Off Switching Energy	E_{off}		-	0.4	-	
Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	V_{DS}=800V V_{GS}=-5/+20V I_D =40A，R_L=20Ω $R_{G(ext)}$ =2.5Ω Timing relative to V_{DS}	-	15	-	ns
Rise Time	t_r		-	52	-	
Turn-Off Delay Time	$t_{d(off)}$		-	26	-	
Fall Time	t_f		-	34	-	
Total Gate Charge	Q_g	V_{DS}=800V V_{GS}=-5/+20V I_D =40A	-	115	-	nC
Gate to Source Charge	Q_{gs}		-	28	-	
Gate to Drain Charge	Q_{gd}		-	37	-	
Body Diode Characteristics						
Inverse Diode Forward Voltage	V_{SD}	V_{GS}=-5V，I_{SD}=20A	3.3	-	-	V
Continuous Diode Forward Current	I_S	T_C=25°C	-	-	60	A
Reverse Recovery Time	T_{rr}	V_{GS}=-5V I_{SD}=40A，V_{DS}=800V, dif/dt=1100A/μs T_J=25°C	-	54	-	ns
Reverse Recovery Charge	Q_{rr}		-	283	-	nC
Peak Reverse Recovery Current	I_{rrm}		-	15	-	A
Thermal Resistance						
Thermal Resistance, Junction-to-Case	$R\theta_{JC}$		-	0.46	-	°C/W

Typical Device Performance

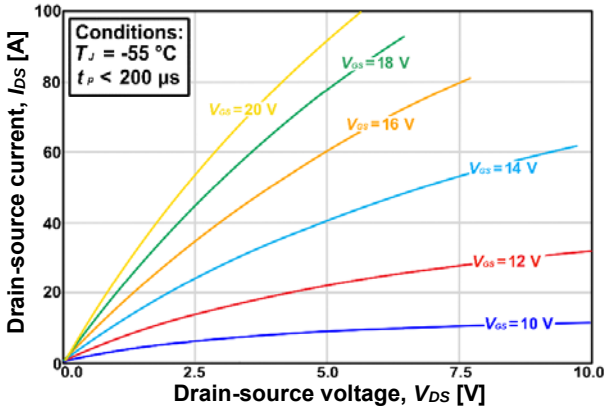


Fig 1. Output characteristics, T_J = -55 °C (1st quadrant)

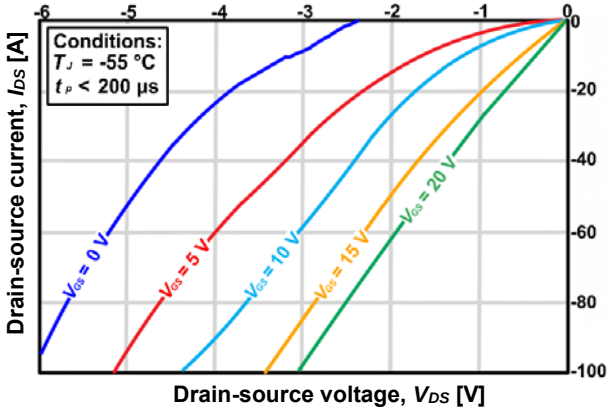


Fig 2. Output characteristics, T_J = -55 °C (3rd quadrant)

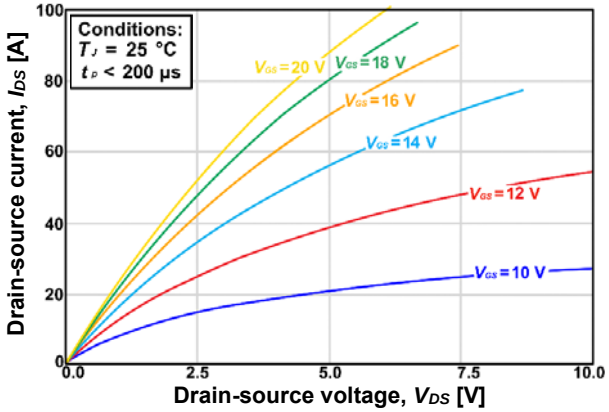


Fig 3. Output characteristics, T_J = 25 °C (1st quadrant)

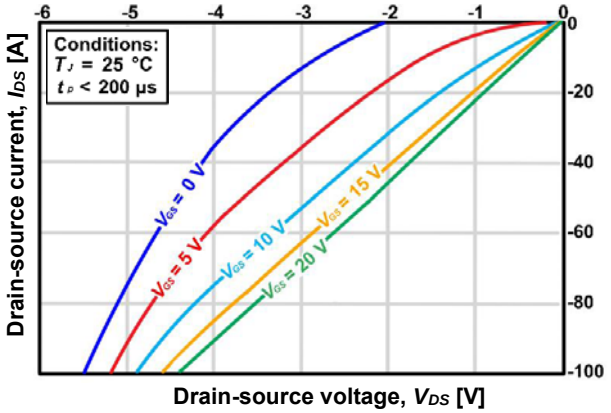


Fig 4. Output characteristics, T_J = 25 °C (3rd quadrant)

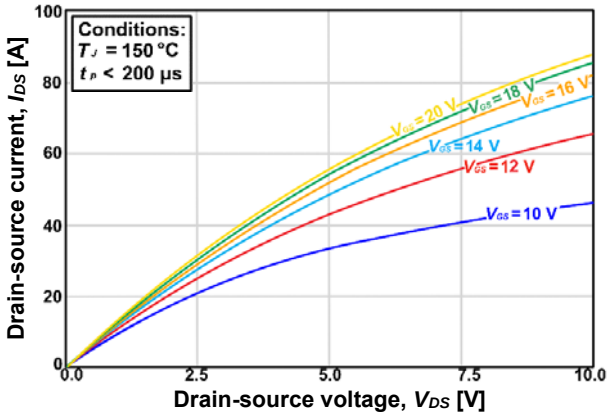


Fig 5. Output characteristics, T_J = 150 °C (1st quadrant)

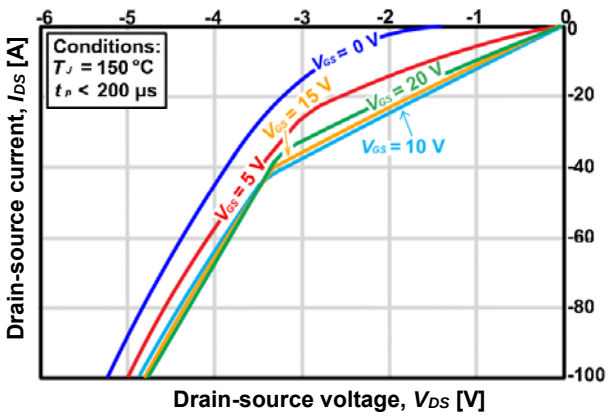


Fig 6. Output characteristics, T_J = 150 °C (3rd quadrant)

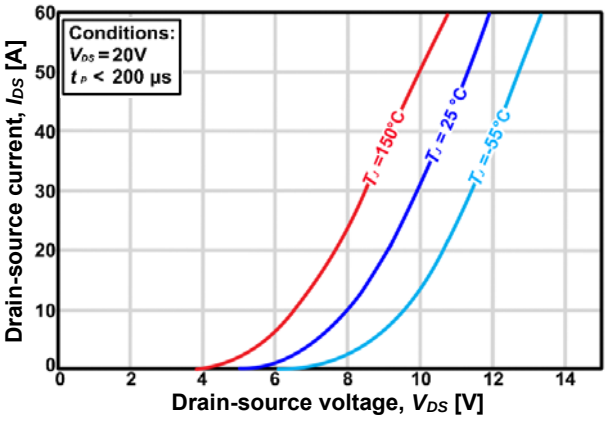


Fig 7. Transfer characteristic for various junction temperatures

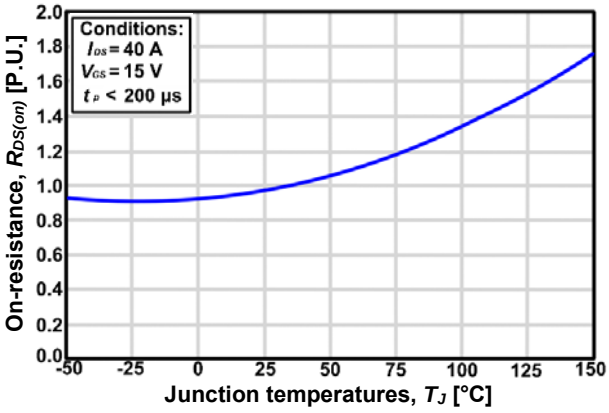


Fig 8. Normalized on-resistance vs. Temperatures

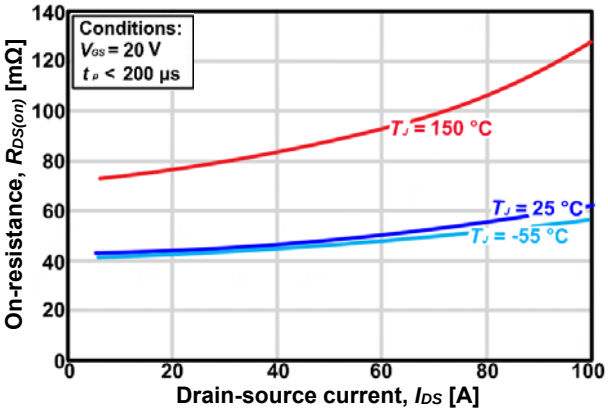


Fig 9. On-resistance vs. Drain current

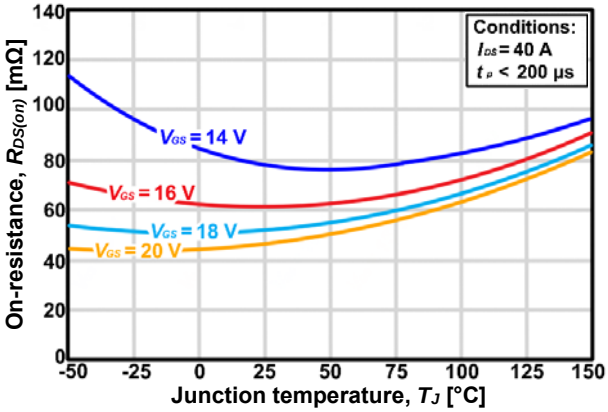


Fig 10. On-Resistance vs. Temperature for various gate voltage

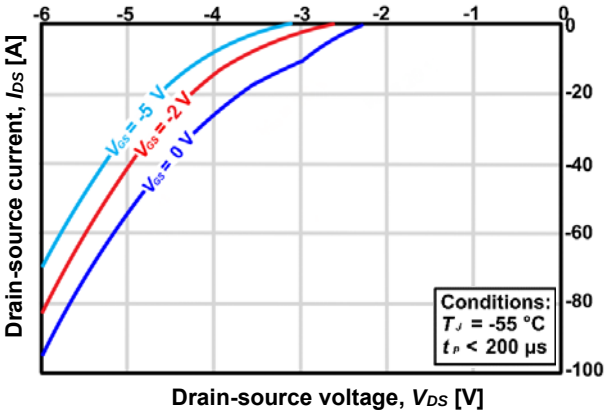


Fig 11. Body diode characteristic, T_J = -55 °C

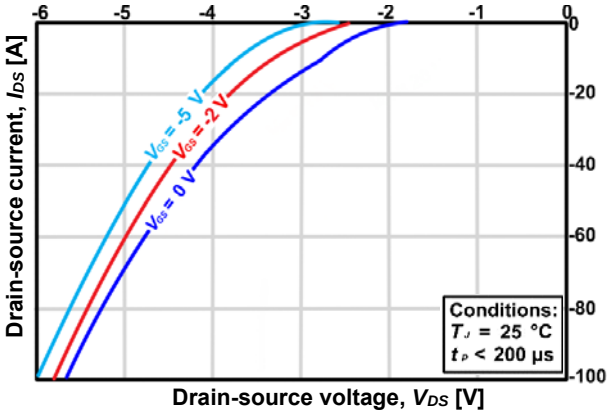


Fig 12. Body diode characteristic, T_J = 25 °C

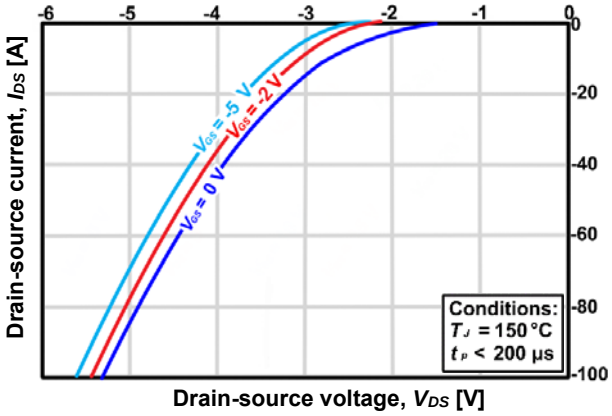


Fig 13. Body diode characteristic, T_J = 150 °C

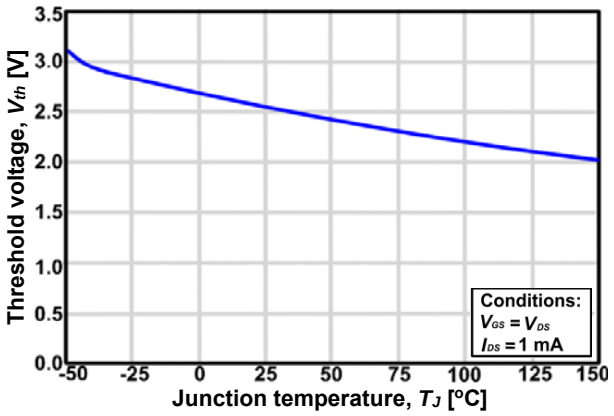


Fig 14. Threshold voltage vs. Temperature

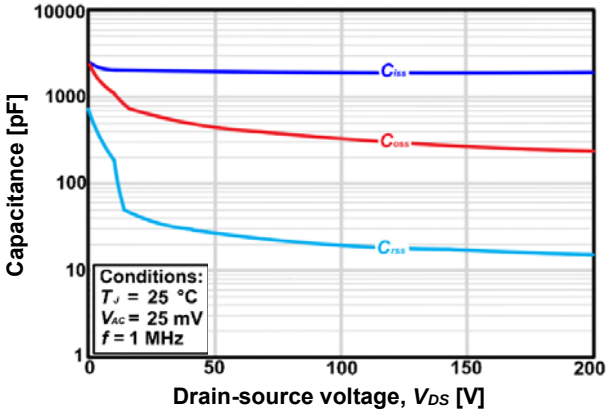


Fig 15. Capacitance vs. Drain-source voltage (0-200 V)

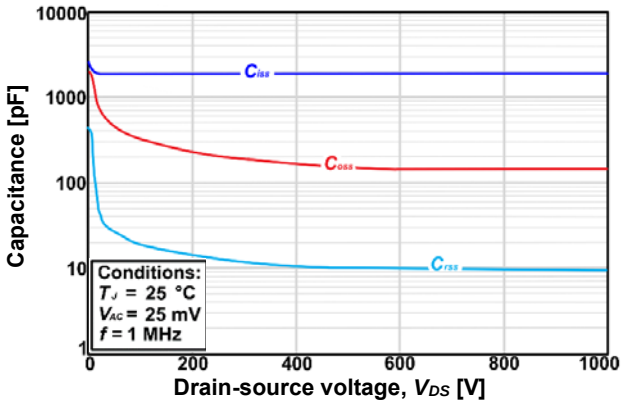


Fig 16. Capacitance vs. Drain-source voltage (0-1000 V)

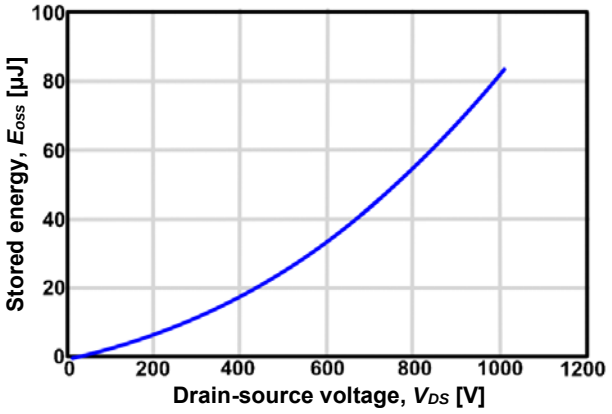


Fig 17. Output capacitance stored energy

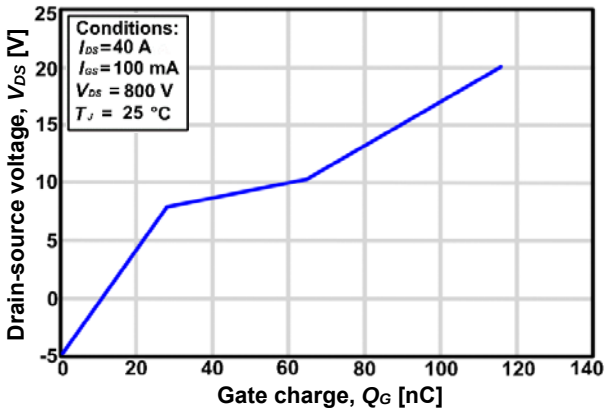


Fig 18. Gate charge characteristics

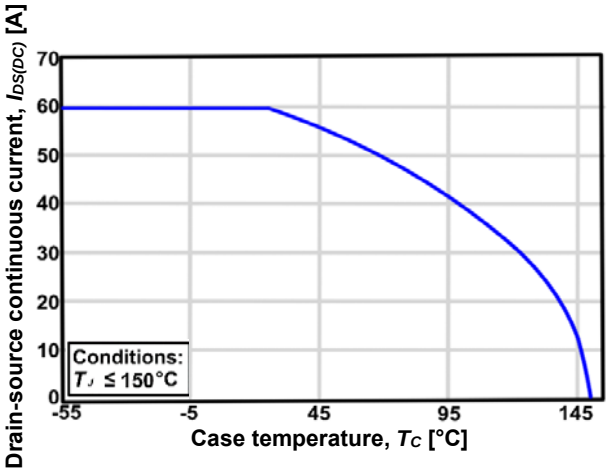


Fig 19. Continuous drain current derating vs. Case Temperature

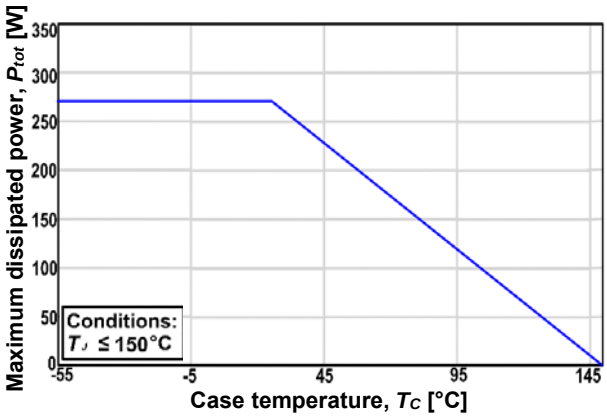


Fig 20. Maximum power dissipation derating vs. Case temperature

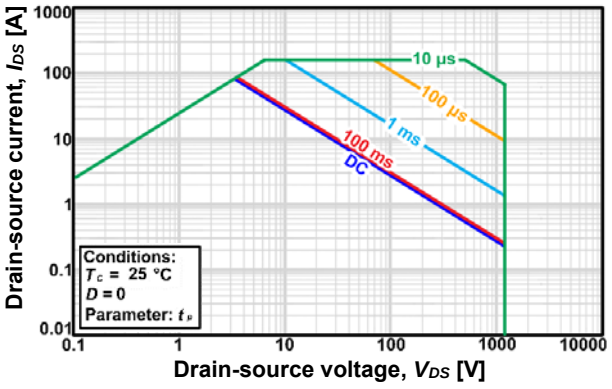


Fig 21. Safe operating area

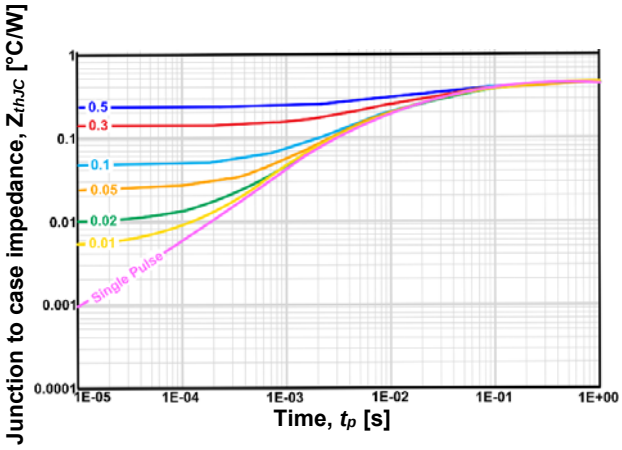


Fig 22. Transient thermal impedance (Junction - Case)

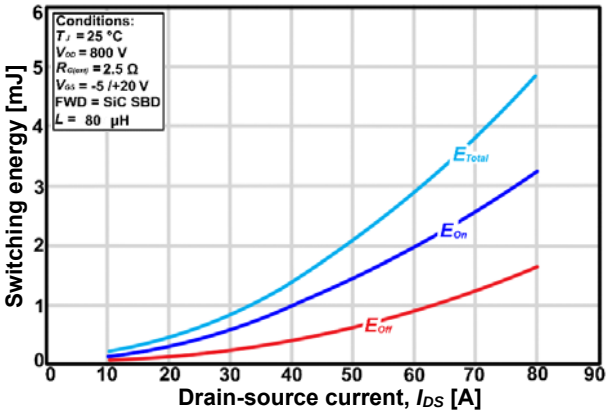


Fig 23. Clamped inductive switching energy vs. Drain current (V_{DD} = 800 V)

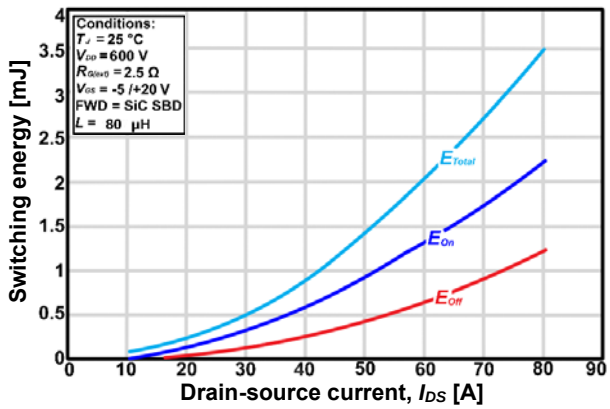


Fig 24. Clamped inductive switching energy vs. Drain current (V_{DD} = 600 V)

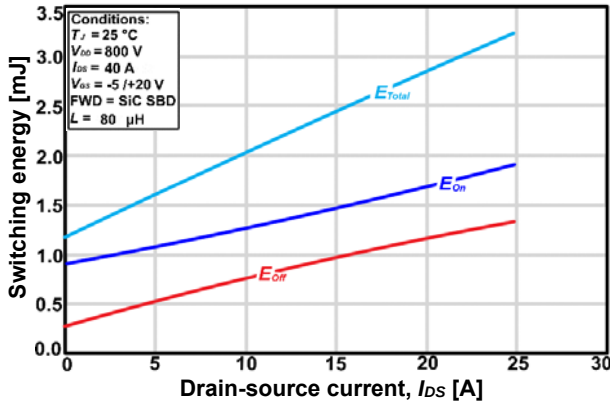


Fig 25. Clamped inductive switching energy vs. $R_{G(ext)}$

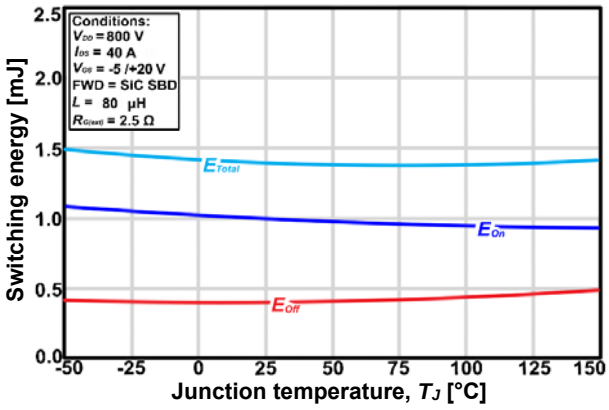


Fig 26. Clamped inductive switching energy vs. Temperature

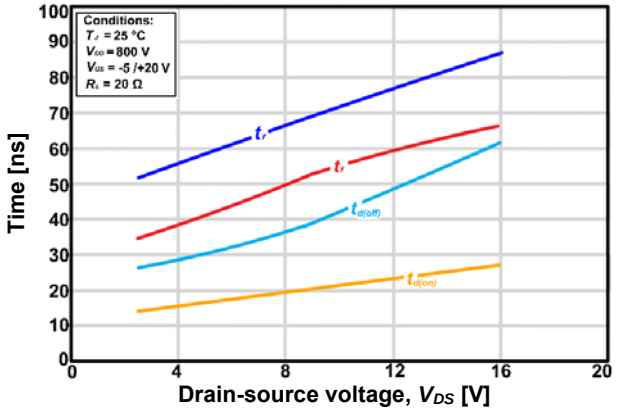


Fig 27. Switching times vs. $R_{G(ext)}$

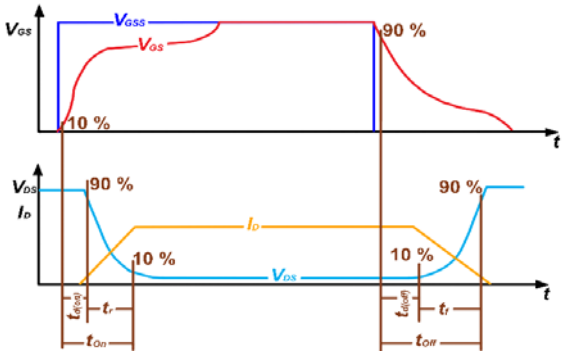


Fig 28. Switching times definition

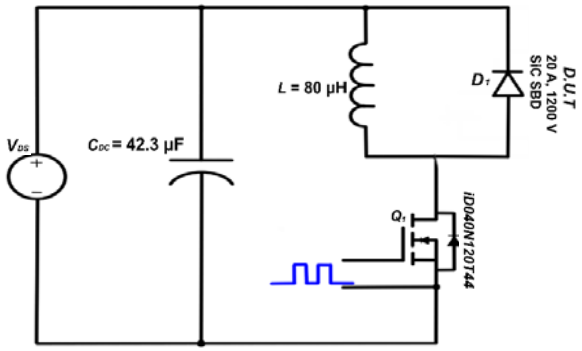


Fig 29. Clamped inductive switching waveform test circuit

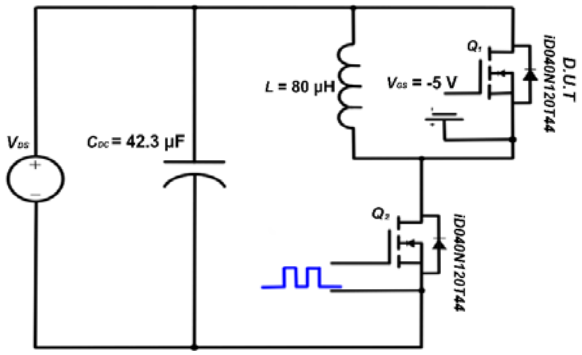


Fig 30. Body diode recovery test circuit

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