DAC016N120P2

Silicon Carbide Enhancement Mode MOSFET

Preliminary

V_{DSS}	1200V
$I_{D(@25℃)}$	115A
$R_{DS(ON)}$	16mΩ

TO-247-3L

Features

- Optimized package with separate driver source pin
- 8 mm of creepage distance between drain and source
- High blocking voltage with low on-resistance
- High-speed switching with low capacitances
- Fast intrinsic diode with low reverse recovery (Qrr)
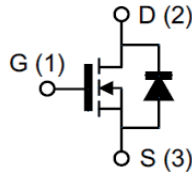
Benefits

- Reduce switching losses and minimize gate ringing
- Higher system efficiency
- Reduce cooling requirements
- Increase power density
- Increase system switching frequency

Applications

- Solar inverters
- EV motor drive
- EHigh voltage DC/DC converters
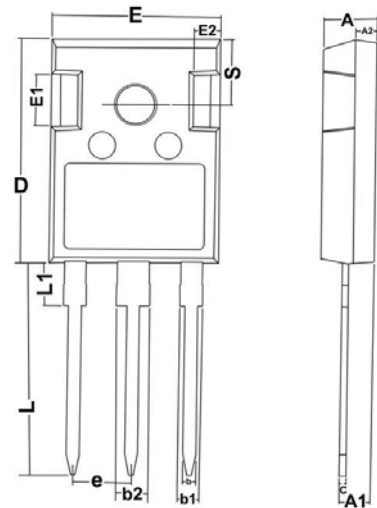- Switched mode power supplies
- Load switch

D (2)
G (1)
S (3)

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}	-4/+15	V
Drain Current-Continuous	@ T_C =25°C @ T_C =100°C	I_D	115 85	A
Pulse Drain Current		$I_{D,pulse}$	250	A
Power Dissipation	@ T_C =25°C @ T_J =175°C	P_D	556	W
Storage Temperature Range		T_{STG}	-55 to +175	°C
Operating Junction Temperature Range		T_J	-55 to +175	°C
Thermal Resistance, Junction-to-Case		$R\theta_{JC}$	Typ. 0.30	°C/W

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	50	µA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=15V ，V_{DS}=0V	-	10	250	nA
ON Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}= V_{GS}，I_{DS}=23mA	1.8	2.5	3.6	V
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS}=15V，I_{DS}=75A	11.2	16	22.3	mΩ
Transconductance	g_{fs}	V_{DS} =20V，I_{DS}=75A	-	53	-	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{DS}=1000V	-	6085	-	pF
Output Capacitance	C_{oss}	V_{GS}=0V	-	230	-	pF
Reverse Transfer Capacitance	C_{rss}	V_{AC}=25mV Freq.=1MHz	-	13	-	pF
C_{oss} Stored Energy	E_{oss}	V_{GS}=0V，V_{DS}=1000V Freq.=1MHz，V_{AC}=25mV	-	130	-	µJ
Turn-On Switching Energy	E_{on}	V_{DD}=800V，V_{GS}=-4V/+15V	-	2.3	-	mJ
Turn-Off Switching Energy	E_{off}	I_D=75A，$R_{G(ext)}$=2.5Ω L=65.7µH，T_J=175°C	-	0.6	-	mJ
Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	V_{DS}=800V	-	34	-	ns
Rise Time	t_r	V_{GS}=-4/+15V	-	33	-	ns
Turn-Off Delay Time	$t_{d(off)}$	I_D=75A，L=65.7µH $R_{G(ext)}$=2.5Ω	-	65	-	ns
Fall Time	t_f	Timing relative to V_{DS}, Inductive load	-	13	-	ns
Total Gate Charge	Q_g	V_{DS}=800V	-	211	-	nC
Gate to Source Charge	Q_{gs}	V_{GS}=-4/+15V	-	67	-	nC
Gate to Drain Charge	Q_{gd}	I_D=75A	-	61	-	nC
Body Diode Characteristics						
Inverse Diode Forward Voltage	V_{SD}	V_{GS}=-4V，I_{SD}=37.5A	-	4.6	-	V
Continuous Diode Forward Current	I_S	V_{GS}=-4V，T_C=25°C	-	-	112	A
Reverse Recovery Time	T_{rr}	V_{GS}=-4V	-	30	-	ns
Reverse Recovery Charge	Q_{rr}	I_{SD}=75A，V_{DS}=800V, di/dt=4000A/µs	-	1238	-	nC
Peak Reverse Recovery Current	I_{rrm}	T_J=175°C	-	64	-	A

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Typical Device Performance
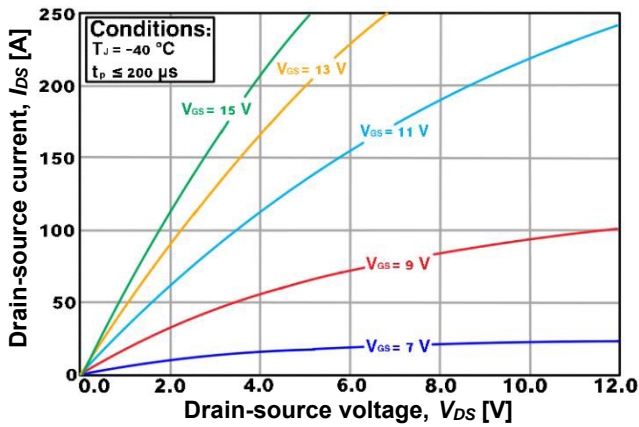
Fig 1. Output characteristics, T_J = -55 °C (1st quadrant)
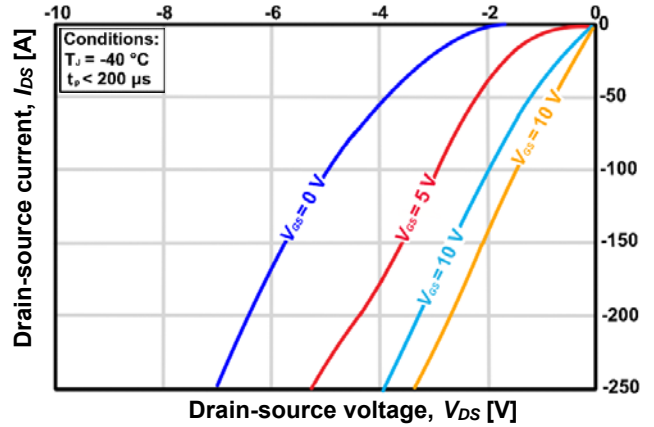
Fig 2. Output characteristics, T_J = -55 °C (3rd quadrant)
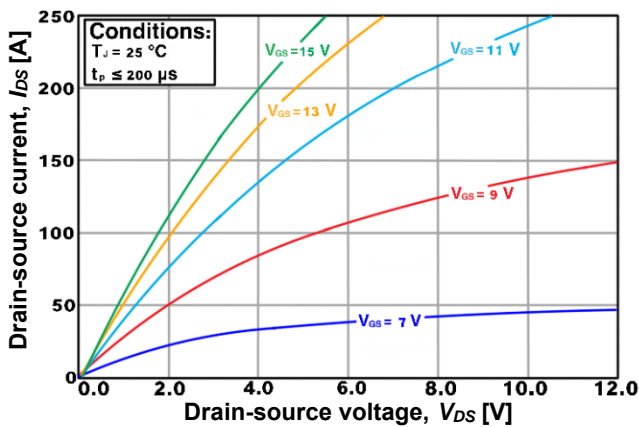
Fig 3. Output characteristics, T_J = 25 °C (1st quadrant)
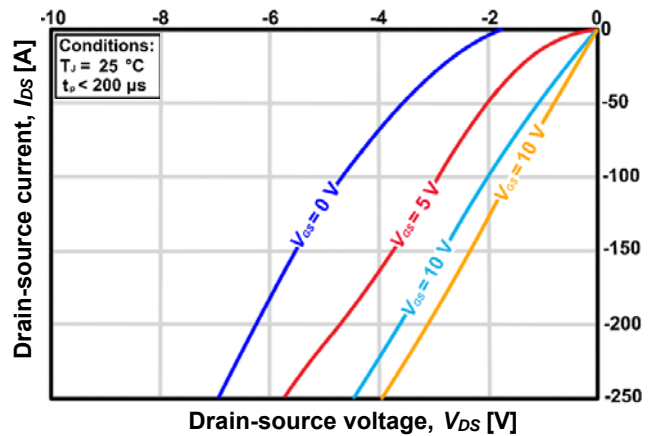
Fig 4. Output characteristics, T_J = 25 °C (3rd quadrant)
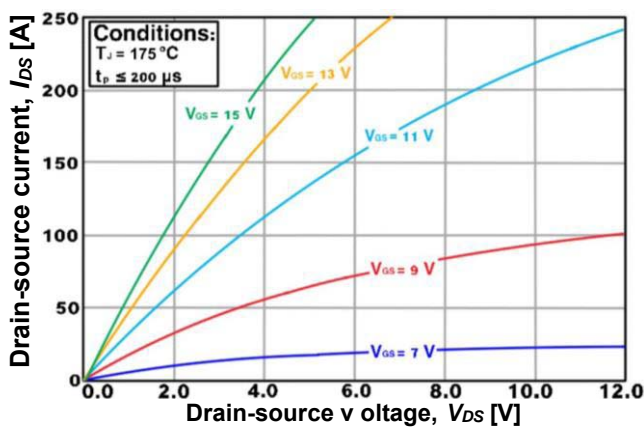
Fig 5. Output characteristics, T_J = 150 °C (1st quadrant)
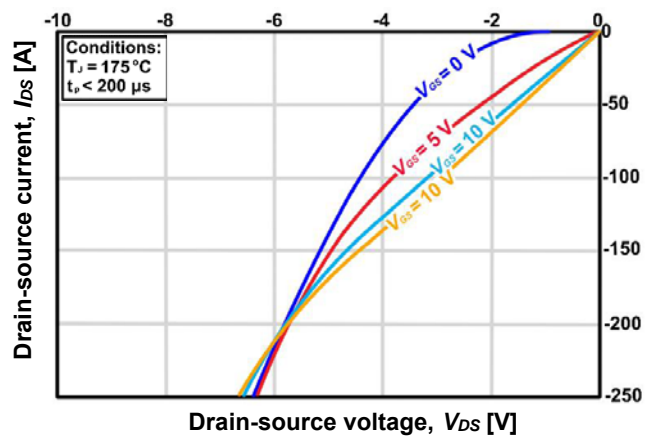
Fig 6. Output characteristics, T_J = 150 °C (3rd quadrant)
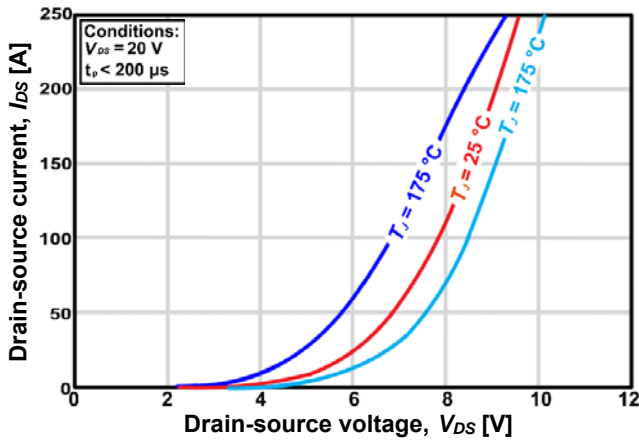
Fig 7. Transfer characteristic for various junction temperatures
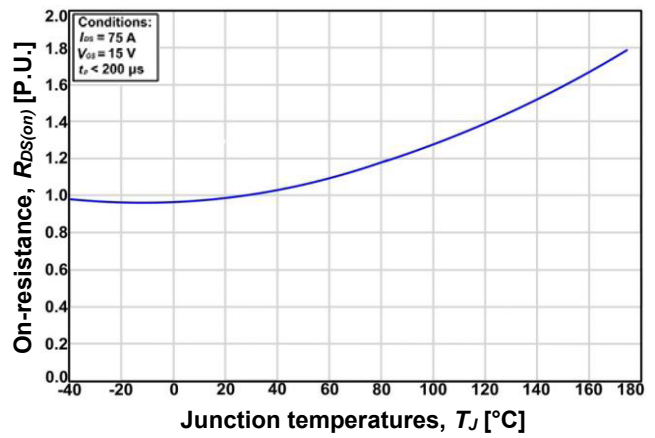
Fig 8. Normalized on-resistance vs. Temperatures
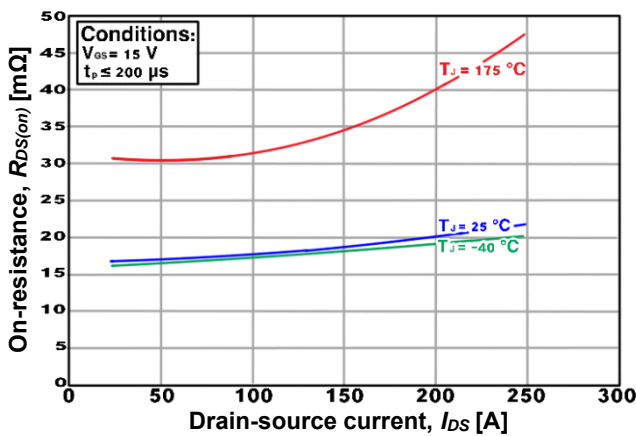
Fig 9. On-resistance vs. Drain current
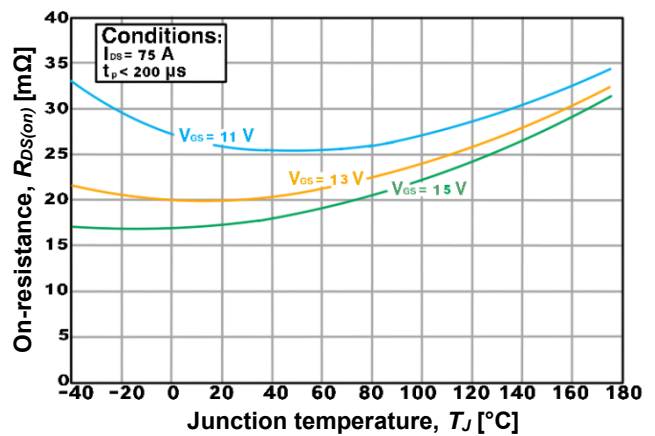
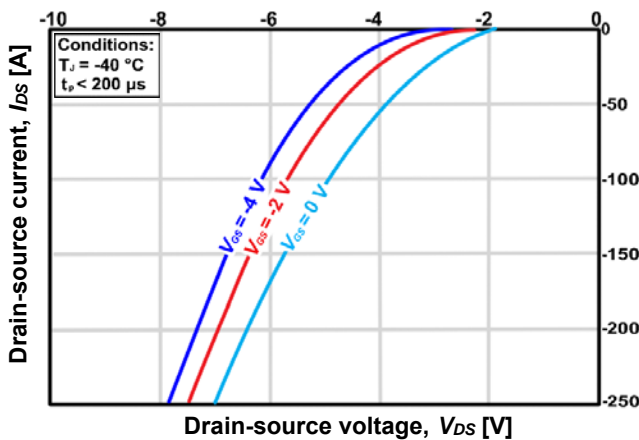**Fig 10. On-Resistance vs. Temperature for various gate voltage**

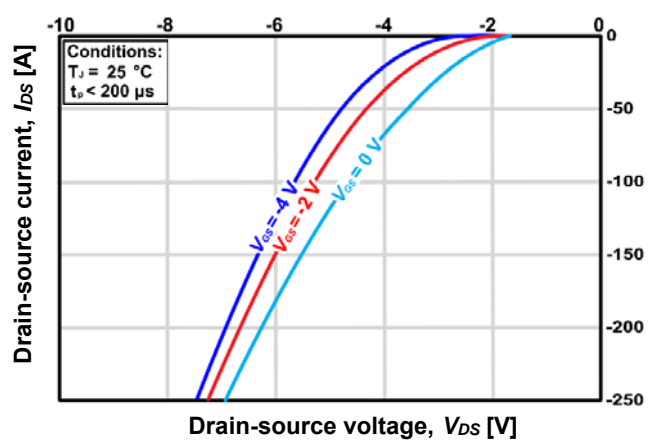**Fig 11. Body diode characteristic at -55 °C**
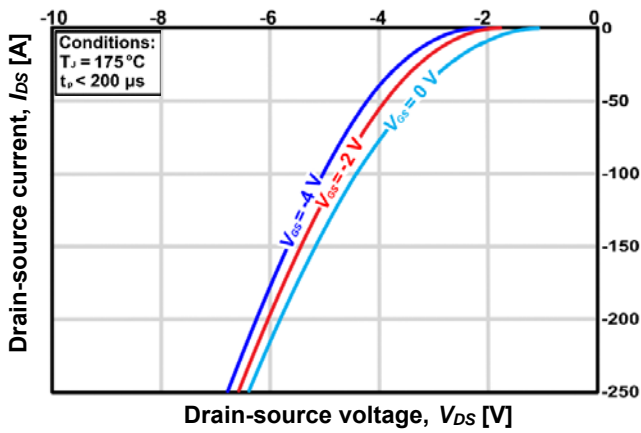

Fig 12. Body diode characteristic at 25 °C

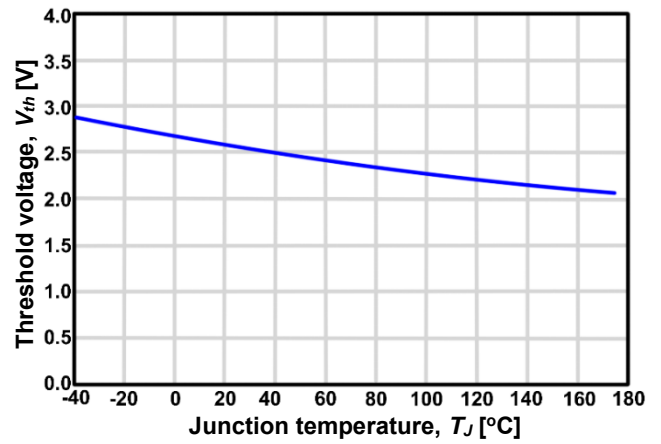**Fig 13. Body diode characteristic at 150 °C**

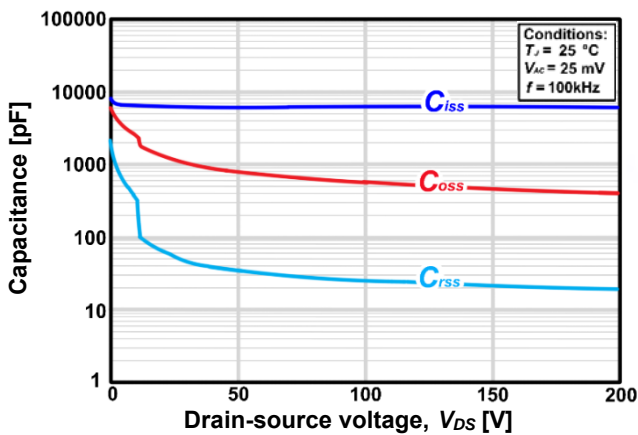**Fig 14. Threshold voltage vs. Temperature**
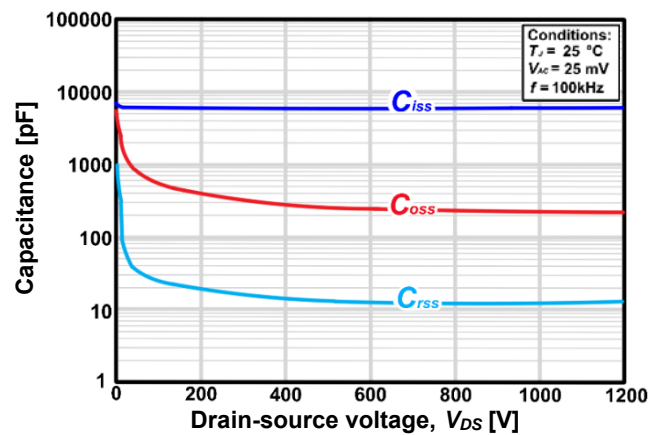

Fig 15. Capacitance vs. Drain-source voltage (0-200 V)

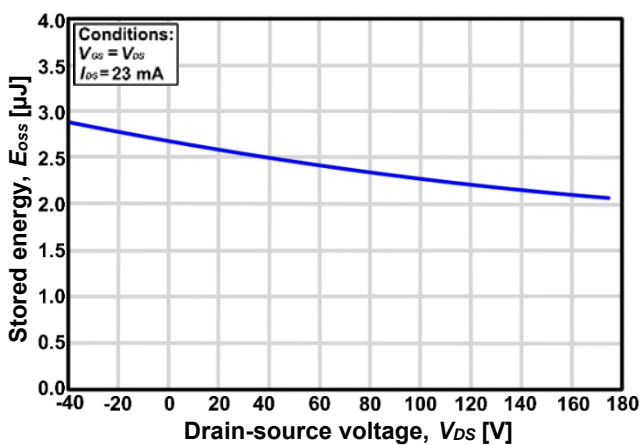**Fig 16. Capacitance vs. Drain-source voltage (0-1200 V)**

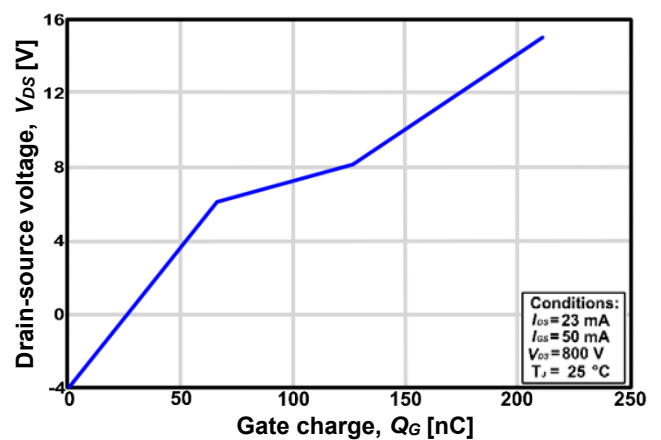**Fig 17. Output capacitance stored energy**

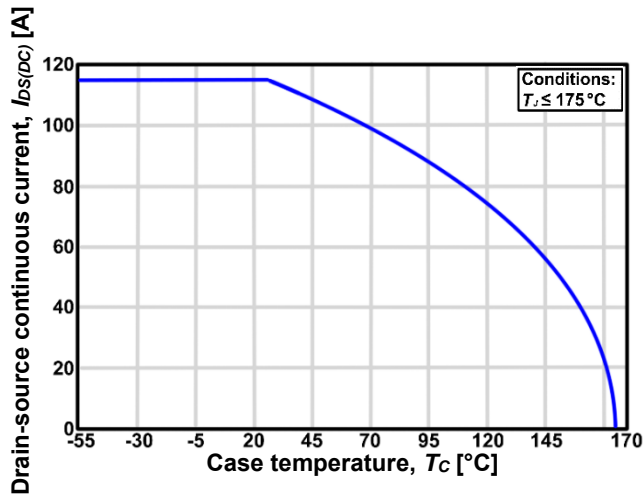**Fig 18. Gate charge characteristics**

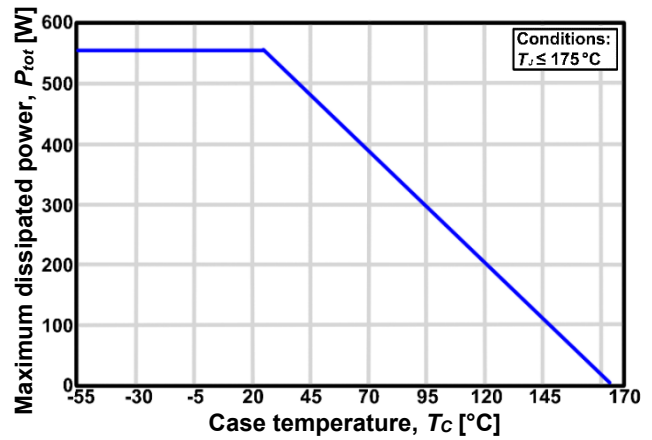**Fig 19. Continuous drain current derating vs. Case Temperature**

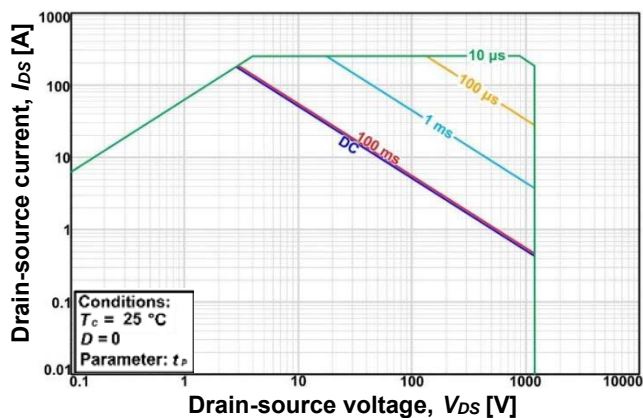**Fig 20. Maximum power dissipation derating vs. Case temperature**

Fig 21. Safe operating area
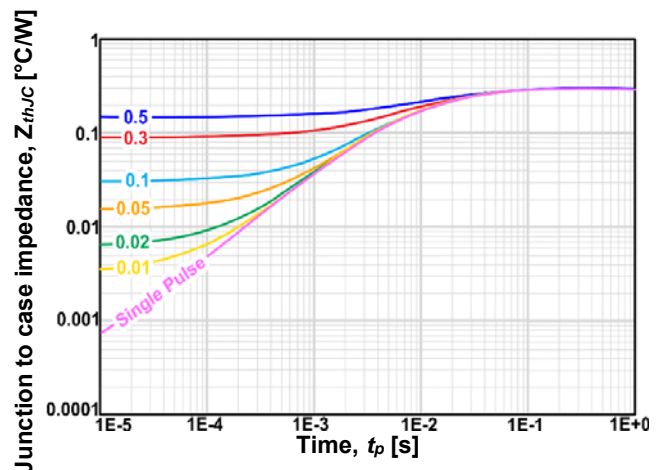

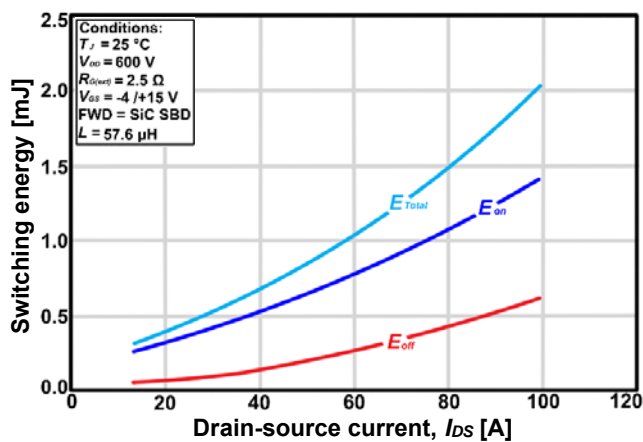**Fig 22. Transient thermal impedance (Junction - Case)**

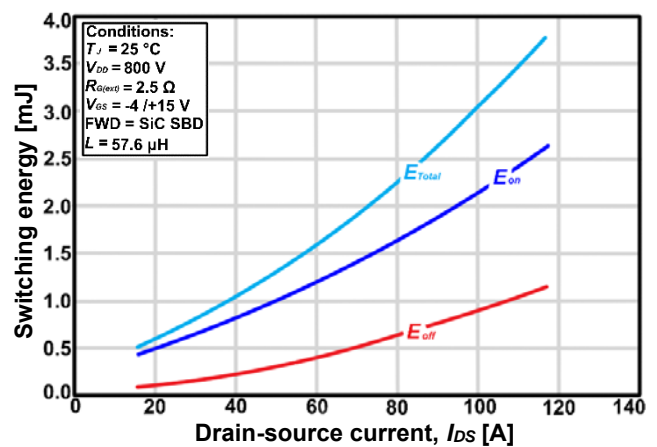**Fig 23. Clamped inductive switching energy vs. Drain current (V_{DD} = 800 V)**

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

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