DACO SEMICONDUCTOR

DAC040N120Z5

Silicon Carbide Enhancement Mode MOSFET

Preliminary

Features

- High blocking voltage
- High frequency operation
- Low on-resistance
- Fast intrinsic diode with low reverse recovery
- 100% Avalanche tested

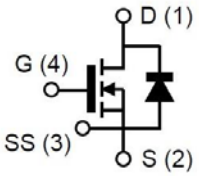
Benefits

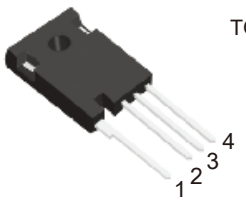
- Higher system efficiency
- High temperature application
- Hard switching & higher reliability
- Parallel device convenience without thermal runaway
- Easy to drive

Applications

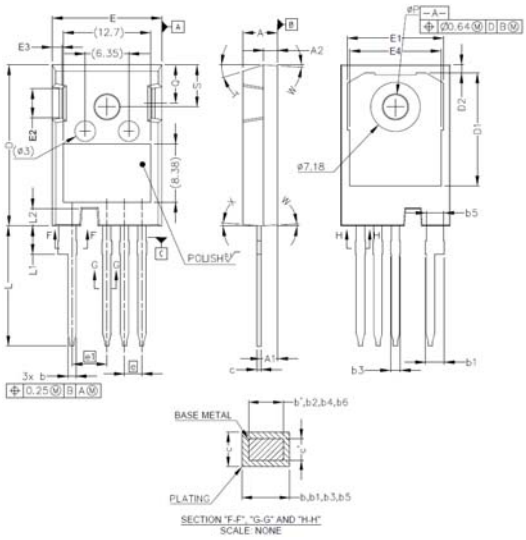
- Motor Drives
- Solar Inverters
- AC/DC converters
- DC/DC converters
- Uninterruptible power supplies

V_{DSS}	1200V
$I_{D(@25℃)}$	54A
$R_{DS(ON)}$	40mΩ





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 (dynamic)	T_{surge} <100ns	$V_{GS(max.)}$	-8/+19	V
Gate - Source Voltage (static)		$V_{GS(op)}$	-4/+15	V
Drain Current-Continuous	V_{GS} =15V,T_C=25°C V_{GS} =15V,T_C=100°C	I_D	54 38	A
Pulse Drain Current		$I_{D,pulse}$	150	A
Total Power Dissipation		P_D	230	W
Storage Temperature Range		T_{STG}	-55 to +175	°C
Operating Junction Temperature Range		T_J	-55 to +175	°C
Avalanche Peak Current	V_{DD}=100V,V_{GS}=15V L=2mH	I_{AV}	20	A
Avalanche Energy	V_{DD}=100V,V_{GS}=15V L=2mH	E_{AS}	400	mJ

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

SYMBOL	MILLIMETERS	
	MIN	MAX
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b'	1.07	1.28
b	1.07	1.33
b1	2.39	2.94
b2	2.39	2.84
b3	1.07	1.60
b4	1.07	1.50
b5	2.39	2.69
b6	2.39	2.64
c'	0.55	0.65
c	0.55	0.68
D	23.30	23.60
D1	16.25	17.65
D2	0.95	1.25

SYMBOL	MILLIMETERS	
	MIN	MAX
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	2.54 BSC	
e1	5.08 BSC	
N	4	
L	17.31	17.82
L1	3.97	4.37
L2	2.35	2.65
øP	3.51	3.65
Q	5.49	6.00
S	6.04	6.30
T	17.5° REF.	
W	3.5 ° REF.	
X	4° REF.	

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_D=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	-	1	200	nA
ON Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}= V_{GS} ，I_D=10mA	1.8	2.8	3.7	V
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS}=15V，I_D=30A	-	40	53	mΩ
Transconductance	g_{fs}	V_{DS} = 20V，I_D=30A	-	22	-	S
Internal gate input resistance	$R_{G(int.)}$	f =1MHz, I_D = 0A	-	1.5	-	Ω
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{DS}=1000V V_{GS}=0V Freq.=100kHz	-	2130	-	pF
Output Capacitance	C_{oss}		-	96	-	
Reverse Transfer Capacitance	C_{rss}		-	7	-	
C_{oss} Stored Energy	E_{oss}		-	55	-	μJ
Turn-On Switching Energy	E_{on}	V_{DS}=800V，V_{GS}=-4V/+15V I_D=30A，$R_{G(ext)}$=2.0Ω L=100μH	-	400	-	μJ
Turn-Off Switching Energy	E_{off}		-	24	-	
Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	V_{DS}=800V V_{GS}=-4/+15V I_D=30A $R_{G(ext)}$=2.0Ω L=100μH	-	15	-	ns
Rise Time	t_r		-	16	-	
Turn-Off Delay Time	$t_{d(off)}$		-	27	-	
Fall Time	t_f		-	9	-	
Total Gate Charge	Q_g	V_{DS}=800V V_{GS}=-4/+15V I_D=30A	-	96	-	nC
Gate to Source Charge	Q_{gs}		-	26	-	
Gate to Drain Charge	Q_{gd}		-	42	-	
Body Diode Characteristics						
Inverse Diode Forward Voltage	V_{SD}	V_{GS}=-4V，I_{SD}=15A	-	4.2	-	V
Continuous Diode Forward Current	I_S	V_{GS}=-4V	-	-	43	A
Reverse Recovery Time	T_{rr}	V_{GS}=-4V I_{SD}=30A，V_R=800V, dif/dt=4200A/μs	-	14	-	ns
Reverse Recovery Charge	Q_{rr}		-	205	-	nC
Peak Reverse Recovery Current	I_{rrm}		-	27	-	A
Thermal Resistance						
Thermal Resistance, Junction-to-Case	$R\theta_{JC}$		-	0.48	0.65	°C/W

Typical Performance

Fig 1. Output Characteristics, T_J = -55°C

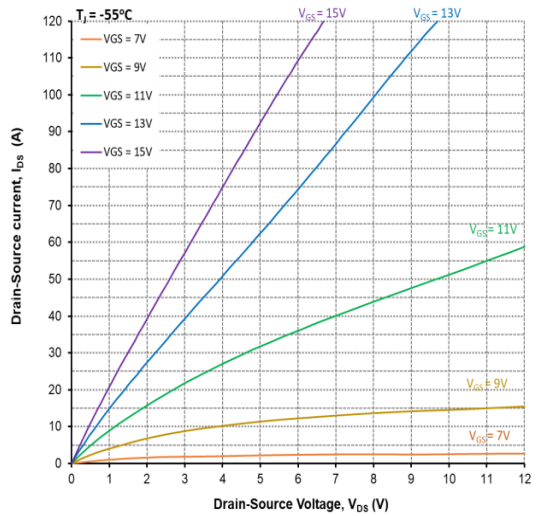


Fig 2. Output Characteristics, T_J = 25°C

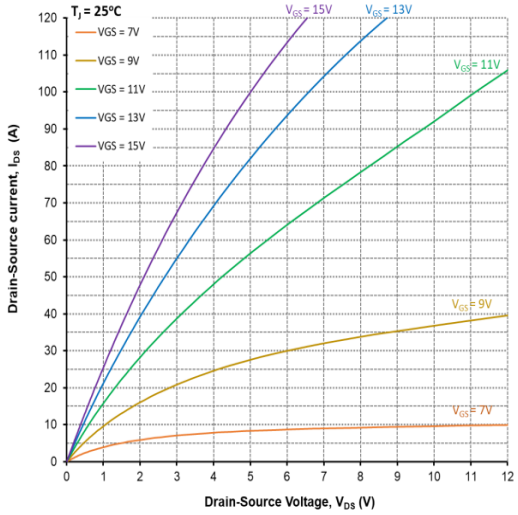


Fig 3. Output Characteristics, T_J = 175°C

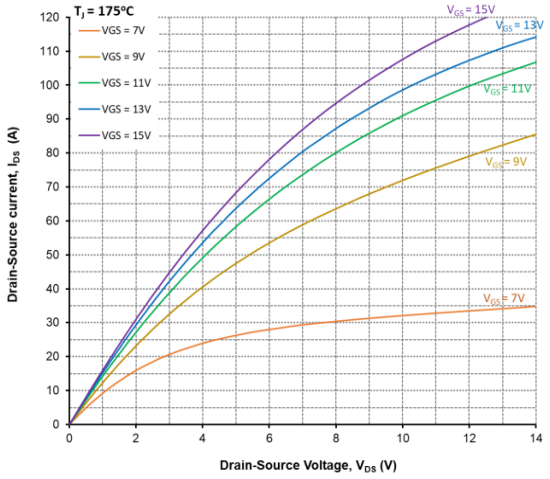


Fig 4. On-Resistance vs. Temperature

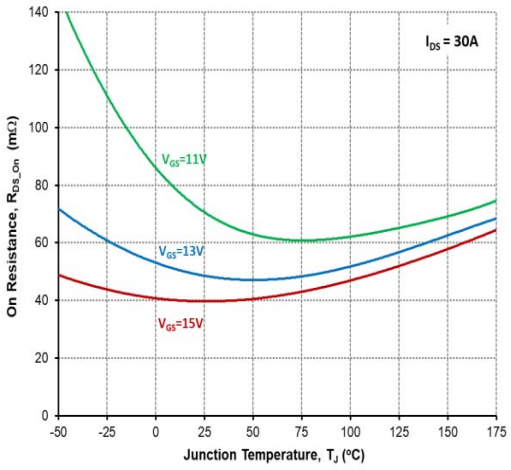


Fig 5. On-Resistance vs. Drain Current For Various Temperatures

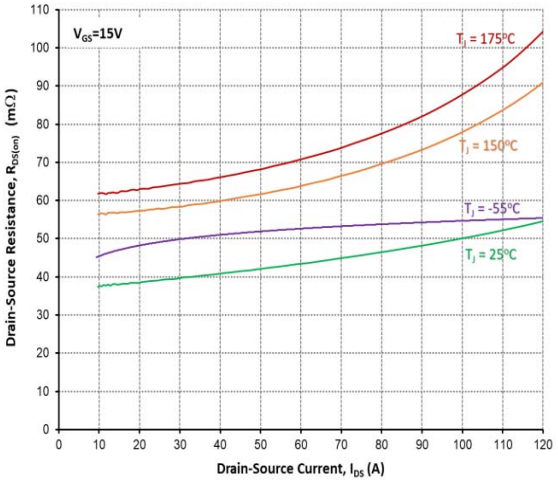
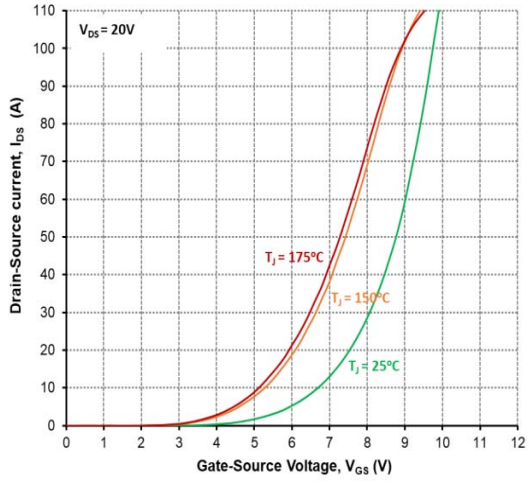


Fig 6. Transfer Characteristic For Various Junction Temperatures



Typical Performance

Fig 7. Threshold Voltage vs. Temperature

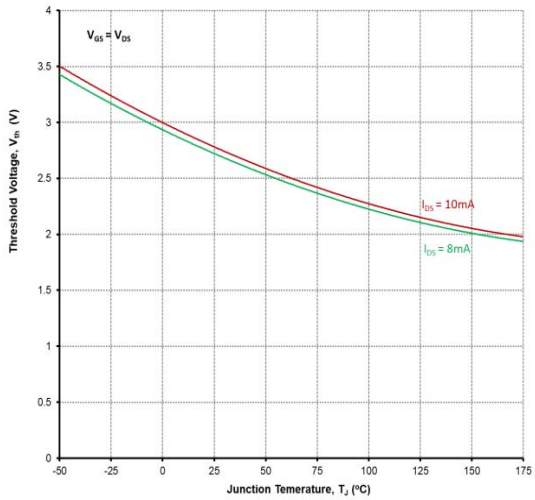


Fig 8.Body Diode Characteristics @ -55°C

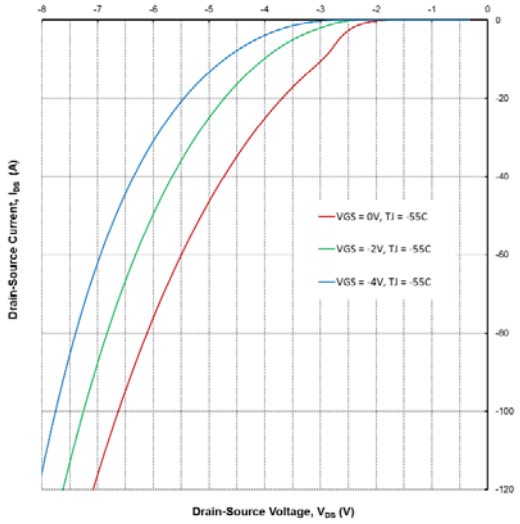


Fig 9. Body Diode Characteristics @ 25°C

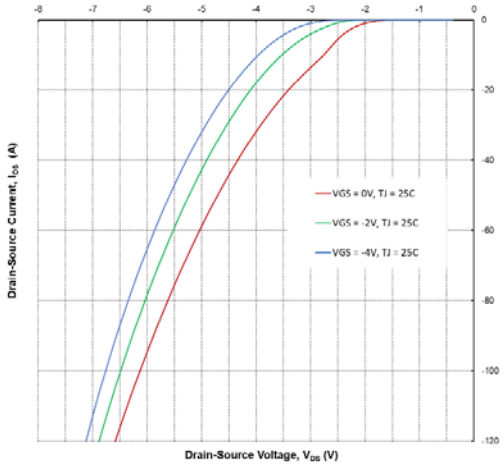


Fig 10. Body Diode Characteristics @ 175°C

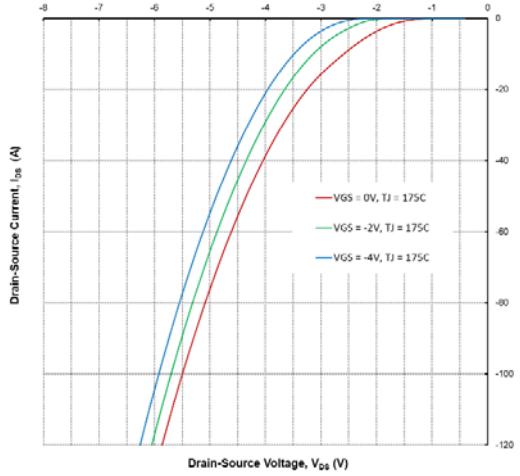


Fig 11. Gate Charge Characteristics

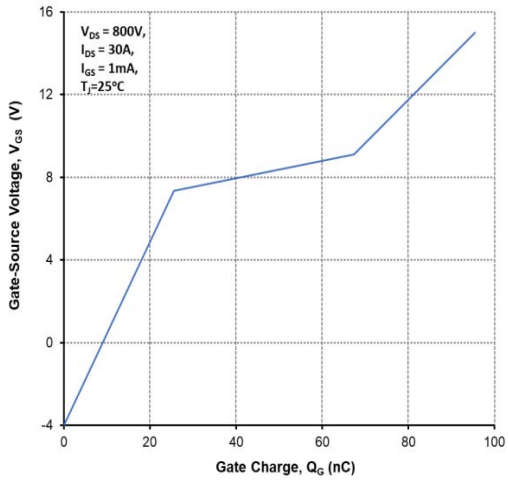
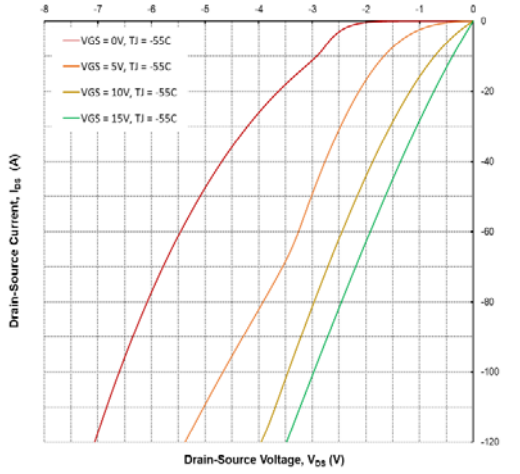


Fig 12. 3rd Quadrant Characteristics @ -55°C



Typical Performance

Fig 13. 3rd Quadrant Characteristics @ 25°C

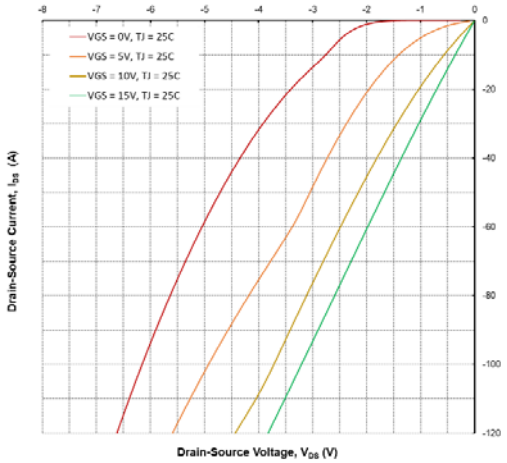


Fig 14. 3rd Quadrant Characteristics @ 175°C

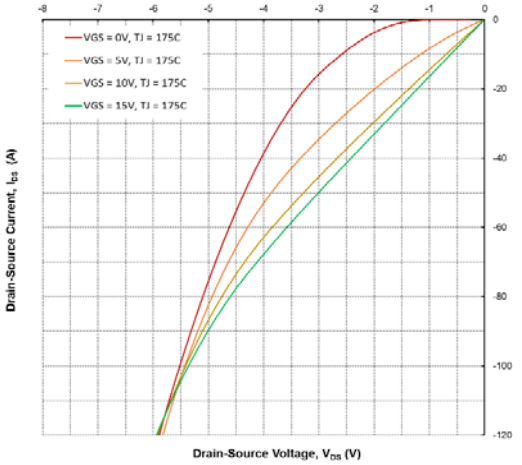


Fig 15. Output Capacitor Stored Energy

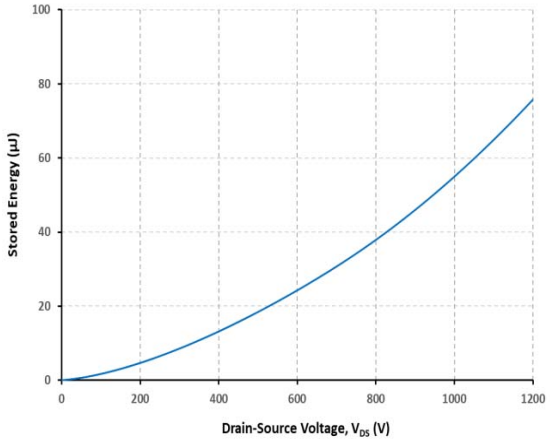


Fig 16. Capacitances vs. Drain-Source Voltage (0-200V)

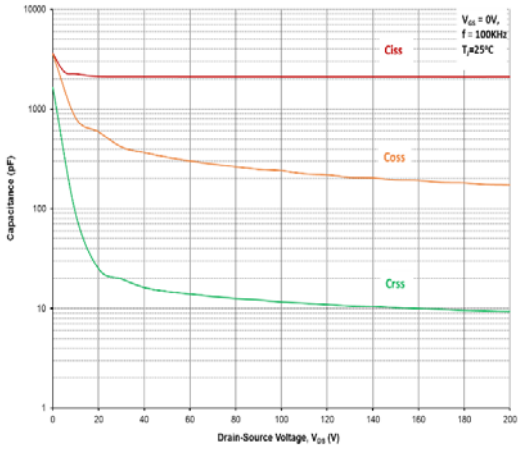


Fig 17. Capacitances vs. Drain-Source Voltage (0-1200V)

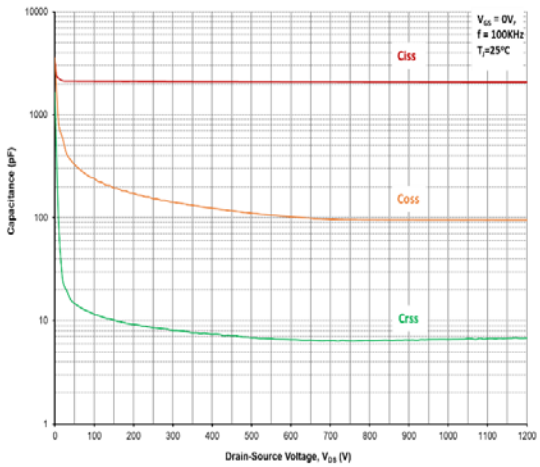
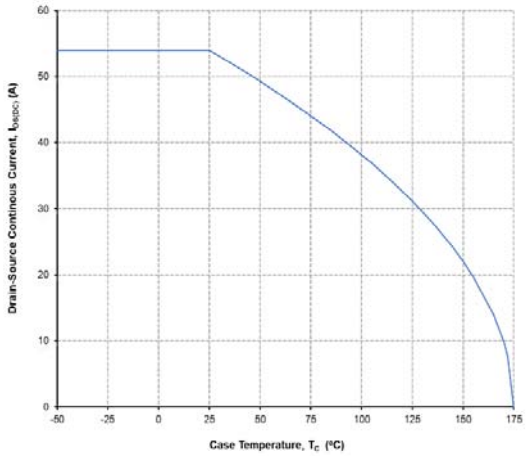


Fig 18. Continuous Drain Current Derating vs. Case Temperature



Typical Performance

Fig 19. Maximum Power Dissipation Derating vs. Case Temperature

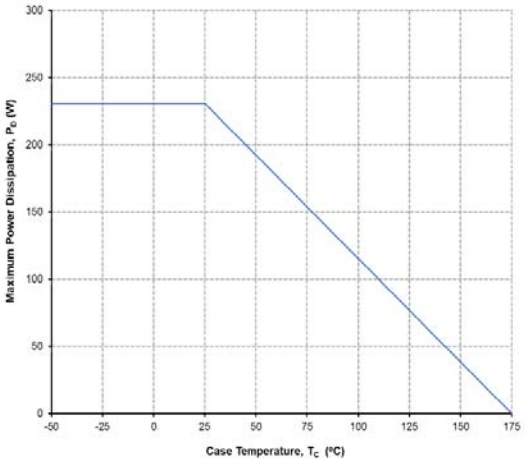


Fig 20. Transient Thermal Impedance (Junction to Case)

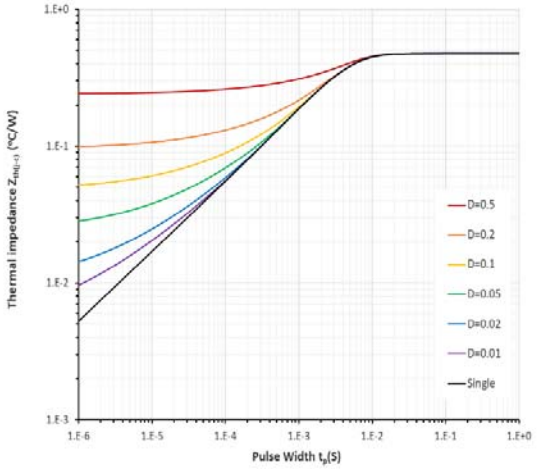


Fig 21. Safe Operating Area

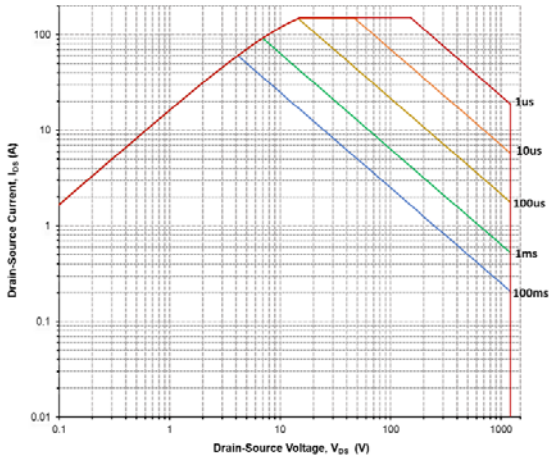


Fig 22. Switching energy vs Drain current

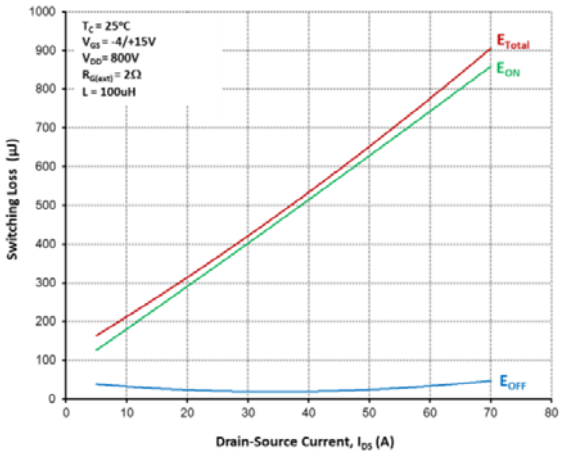


Fig 23. Switching energy vs External Gate Resistor

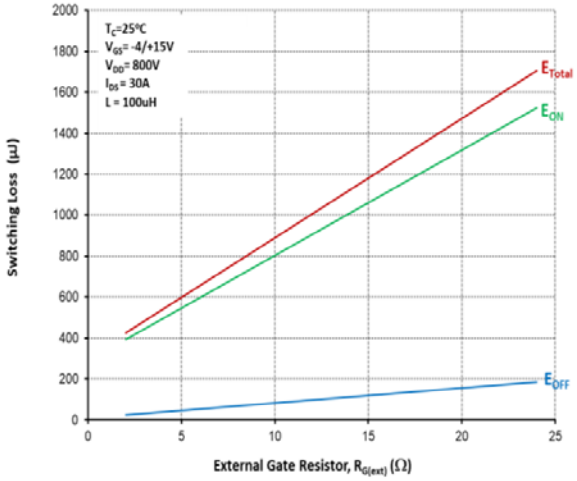
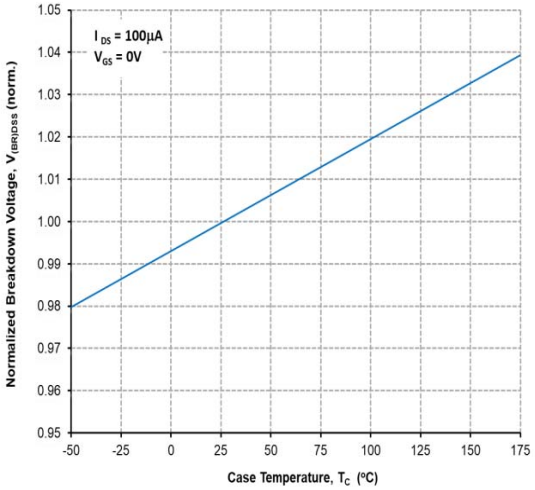


Fig 24. Normalized breakdown voltage vs Temperature



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