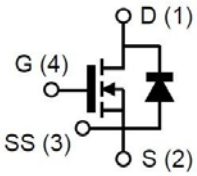
DAC013N120ZY2

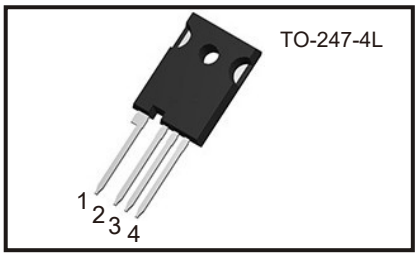
Silicon Carbide Enhancement Mode MOSFET

V_{DSS}	1200V
$I_{D(@25℃)}$	160A
$R_{DS(ON)\ typ.}$	13mΩ

Features

- High blocking voltage with low Rds(on)
- High frequency operation with low Capacitance
- Simple to drive with -4V/+18V gate
- Robust body diode with low Qrr
- 100% Avalanche Tested





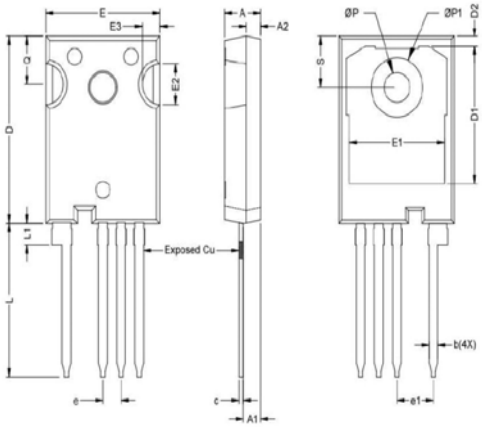
Benefits

- Superior robustness and system reliability
- Higher system efficiency
- Easier paralleling without thermal runaway
- Capable of high temperature application
- Faster and more efficient switching

Applications

- EV motor drives
- EV/HEV charging station
- Energy storage and Battery charging
- High voltage DC-DC converters
- Solar / Wind Inverters
- UPS and PFC

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)	AC (f>1 Hz, duty cycle<1%, pulse width<200ns)	V_{GS}	-10/+23	V
Gate-Source Voltage (static)		$V_{GS(op)}$	-4/+18	V
Drain Current-Continuous	V_{GS}=18V@ T_C=25°C V_{GS}=18V@ T_C=100°C	I_D	160 120	A
Pulse Drain Current		$I_{D,pulse}$	440	A
Power Dissipation		P_D	714	W
Storage Temperature Range		T_{STG}	-55 to +175	°C
Operating Junction Temperature Range		T_J	-55 to +175	°C
Soldering Temperature		T_L	260	°C
Avalanche Capability, single pulse *	V_{DD}=100V V_{GS}=10V L=1mH	I_{AV}	76	A
Avalanche Capability, single pulse**	V_{DD}=100V V_{GS}=10V L=1mH	E_{AV}	2900	mJ

* 100% tested in 60% rating
** 100% tested in 36% rating

DIM	MILLIMETERS		
	MIN	TYP.	MAX
A	4.82	5.02	5.22
A1	2.21	2.41	2.61
A2	1.8	2	2.2
b	0.95	1.2	1.45
b1	1.95	2.2	2.45
b2	2.95	3.2	3.45
c	0.35	0.6	0.85
D	22.34	22.54	22.74
D1	16.3	16.55	16.8
D2	0.99	1.19	1.39
E	15.74	15.94	16.14
E1	13.01	13.26	13.51
E2	4.71	4.91	5.11
E3	2.26	2.46	2.66
e	2.54BSC.		
e1	5.08BSC.		
L	18.23	18.48	18.73
L1	2.35	2.60	2.85
P	3.41	3.61	3.81
P1	6.94	7.19	7.44
Q	5.59	5.79	5.99
S	5.97	6.17	6.37

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_{DS} =1200V V_{GS} =0V	T_J =25℃	-	0.5	60	μA
			T_J =175℃	-	5	200	
Gate-Source Leakage Current	I_{GSS}	V_{GS} =18V，V_{DS} =0V		-	5	100	nA
		V_{GS} =-4V，V_{DS} =0V		-100	-5	-	
ON Characteristics							
Gate Threshold Voltage ***	$V_{GS(th)}$	V_{DS} = V_{GS}，I_D =30mA	T_J =25℃	2.8	3.2	4.3	V
			T_J =175℃	-	2.3	-	
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS} =18V，I_D =60A	T_J =25℃	-	13	18	mΩ
			T_J =175℃	-	22	-	
Transconductance	g_{fs}	V_{DS} =20V，I_D =60A	T_J =25℃	-	51	-	S
			T_J =175℃	-	48	-	
Internal Gate Resistance	$R_{G(int.)}$	f =1MHz，I_D =0A		-	8	-	Ω
Dynamic Characteristics							
Input Capacitance	C_{iss}	V_{DS} =800V V_{GS} =0V f =100kHz V_{AC} =25mV		-	5250	-	pF
Output Capacitance	C_{oss}			-	210	-	
Reverse Transfer Capacitance	C_{rss}			-	18	-	
Coss Stored Energy	E_{oss}			-	88	-	μJ
Turn-On Switching Energy	E_{on}	V_{DS} =800V，V_{GS} =-4/+18V I_D =60A，$R_{G(ext)}$ =2.0Ω L=200μH，$R_{G(int)}$ =8Ω		-	1680	-	μJ
Turn-Off Switching Energy	E_{off}			-	680	-	
Switching Characteristics							
Turn-On Delay Time	$t_{d(on)}$	V_{DS} =800V，V_{GS} =-4/+18V I_D =60A，$R_{G(ext)}$ =2.0Ω L=200μH，$R_{G(int)}$ =8Ω		-	45	-	ns
Rise Time	t_r			-	46	-	
Turn-Off Delay Time	$t_{d(off)}$			-	150	-	
Fall Time	t_f			-	30	-	
Total Gate Charge	Q_g	V_{DS} =800V V_{GS} =-4/+18V I_D =60A		-	260	-	nC
Gate to Source Charge	Q_{gs}			-	75	-	
Gate to Drain Charge	Q_{gd}			-	80	-	
Body Diode Characteristics							
Inverse Diode Forward Voltage	V_{SD}	V_{GS}=-4V，I_{SD}=40A	T_J =25℃	-	4.1	-	V
Inverse Diode Forward Voltage			T_J =175℃	-	3.7	-	V
Continuous Diode Forward Current	I_S	V_{GS}=-4V，T_J =25°C		-	120	-	A
Reverse Recovery Time	T_{rr}	I_{SD}=60A，V_{GS}=-4V V_R=800V，T_J =25°C dif/dt=1840A/μs L=200μH		-	26	-	ns
Reverse Recovery Charge	Q_{rr}			-	530	-	nC
Peak Reverse Recovery Current	I_{rrm}			-	38	-	A
Thermal Resistance							
Thermal Resistance, Junction-to-Case	$R\theta_{JC}$			-	0.18	0.21	°C/W

*** Turn-off with -4V gate bias is highly recommended

Typical Performance

Fig 1. Output Characteristics, T_J = -40°C

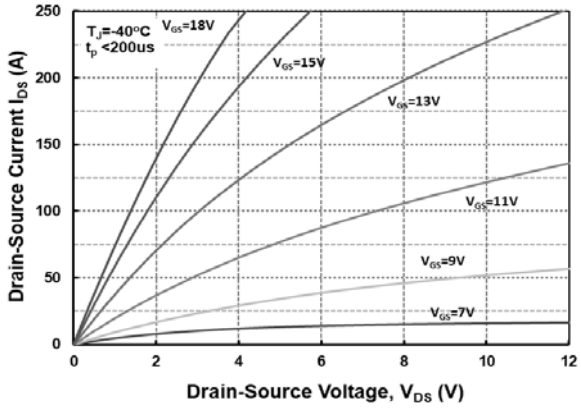


Fig 2. Output Characteristics, T_J = 25°C

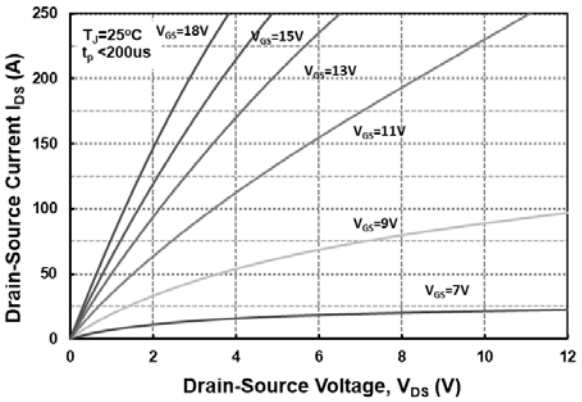


Fig 3. Output Characteristics, T_J = 175°C

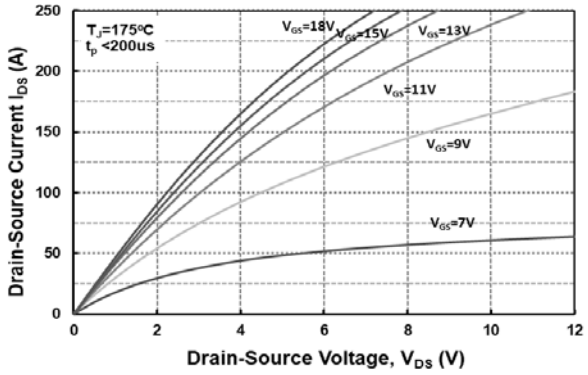


Fig 4. Normalized On-Resistance vs. Temperature

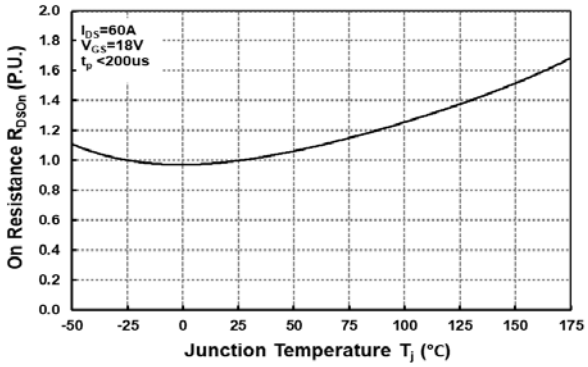


Fig 5. On-Resistance vs. Drain Current for Various Temperatures

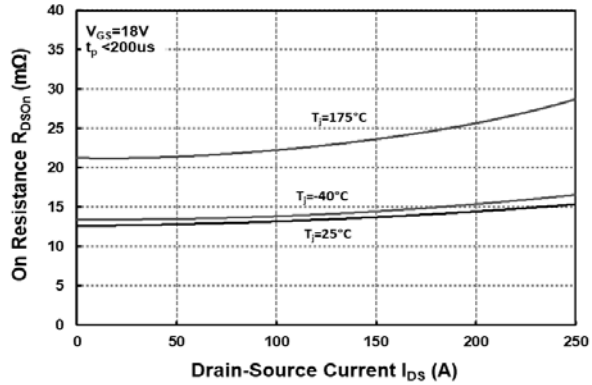
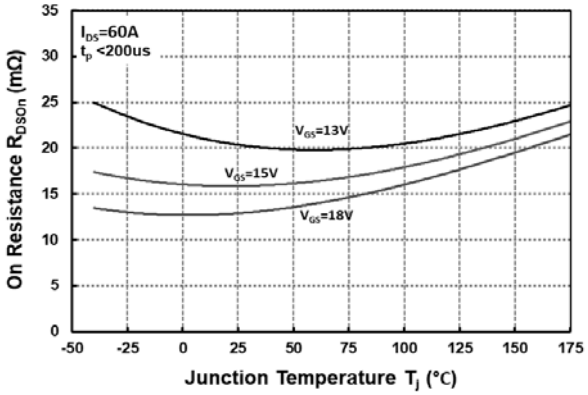


Fig 6. On-Resistance vs. Temperature for Various Gate Voltage



Typical Performance

Fig 7. Transfer Characteristic for Various Junction Temperatures

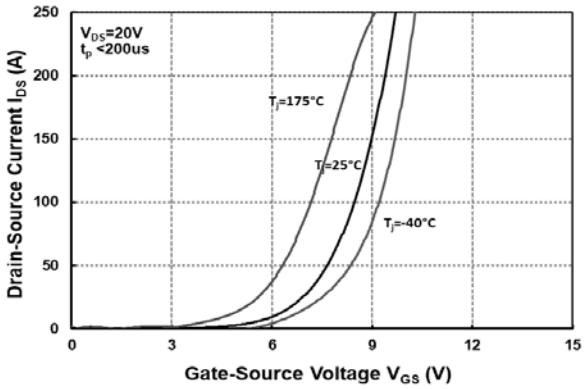


Fig 8.Body Diode Characteristics @ -40°C

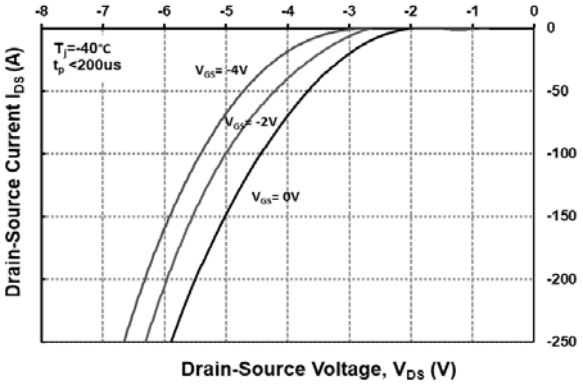


Fig 9. Body Diode Characteristics @ 25°C

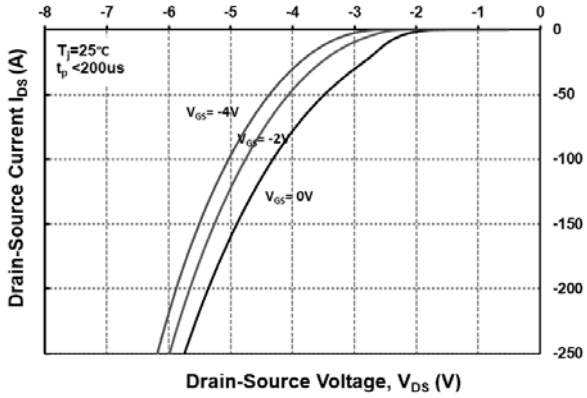


Fig 10. Body Diode Characteristics @ 175°C

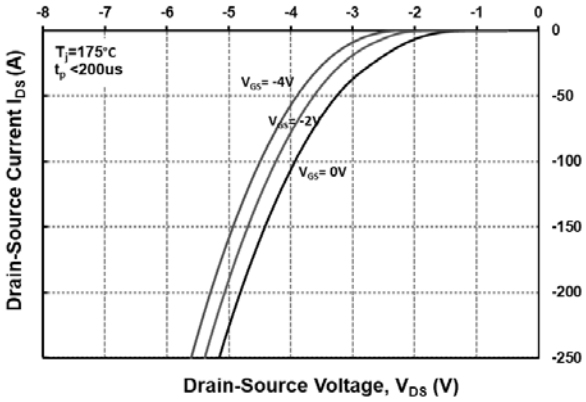


Fig 11. Threshold Voltage vs. Temperature

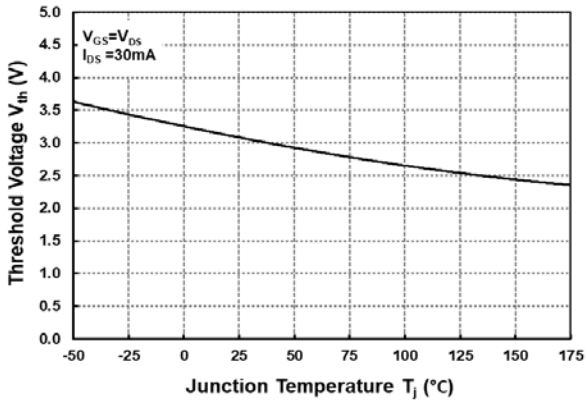
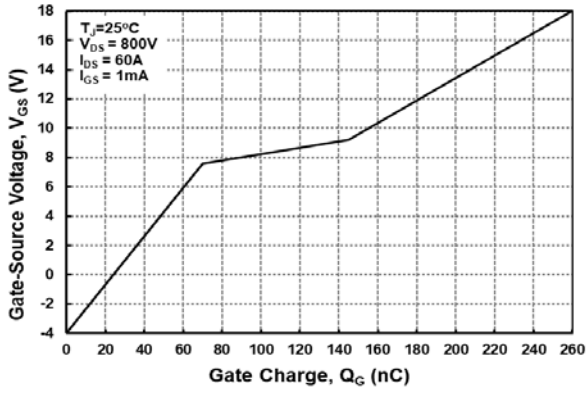


Fig 12. Gate Charge Characteristics



Typical Performance

Fig 13. 3rd Quadrant Characteristics @ -40°C

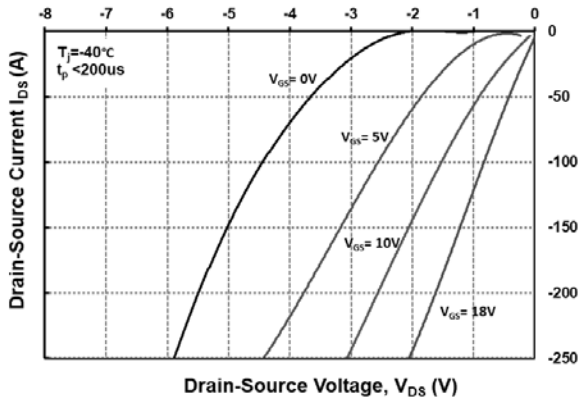


Fig 14. 3rd Quadrant Characteristics @ 25°C

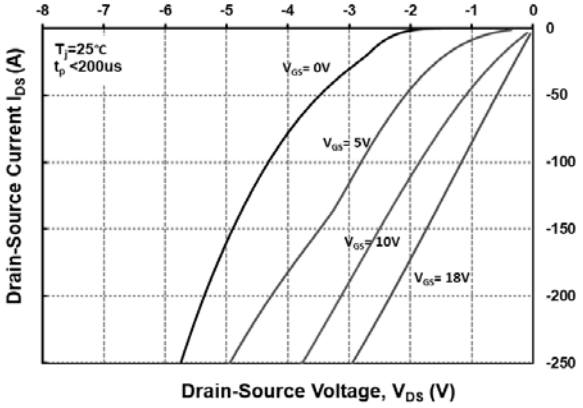


Fig 15. 3rd Quadrant Characteristics @ 175°C

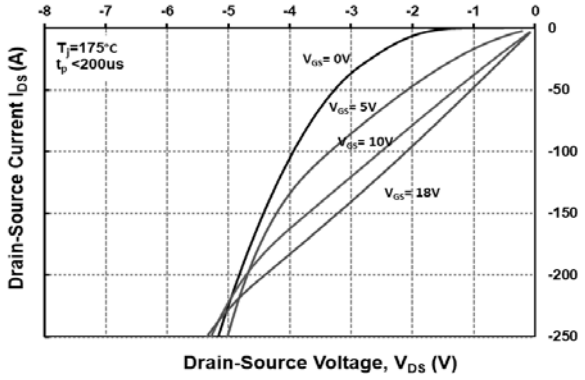


Fig 16. Output Capacitor Stored Energy

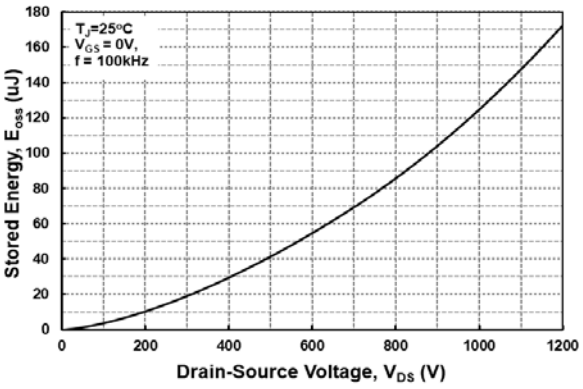


Fig 17. Capacitances vs. Drain-Source Voltage (0-200V)

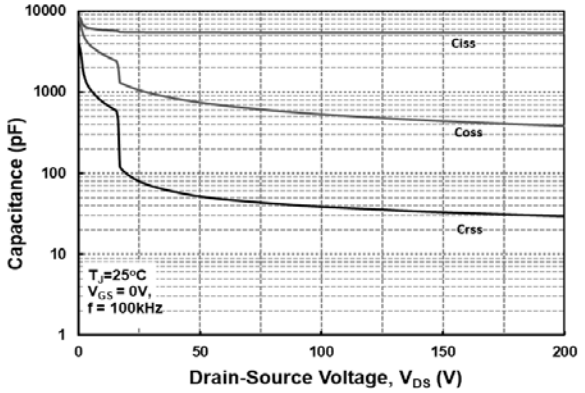
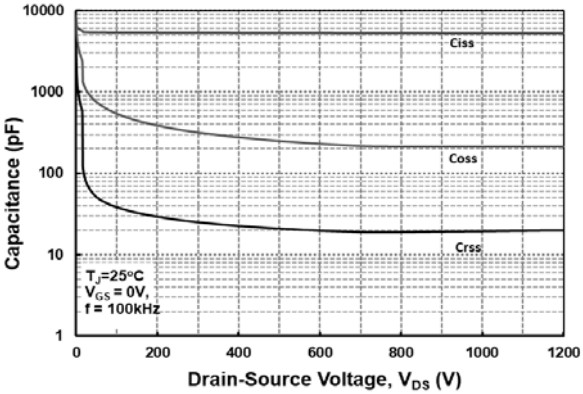


Fig 18. Capacitances vs. Drain-Source Voltage (0-1200V)



Typical Performance

Fig 19. Continuous Drain Current Derating vs. Case Temperature

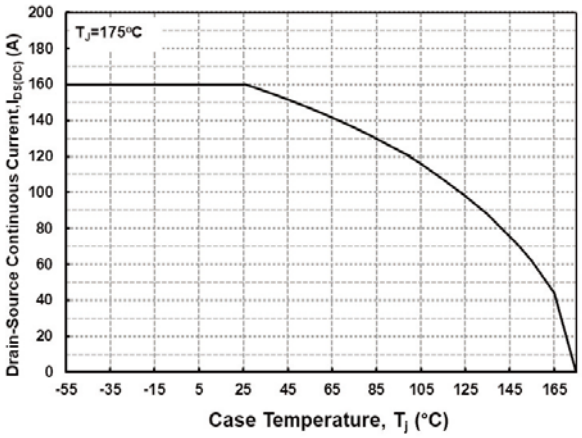


Fig 20. Maximum Power Dissipation Derating vs. Case Temperature

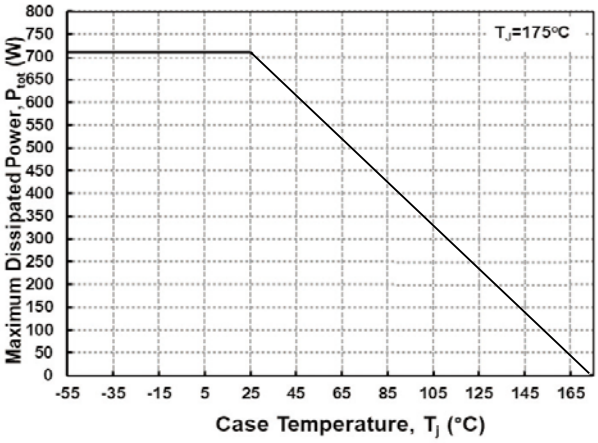


Fig 21. Transient Thermal Impedance (Junction – Case)

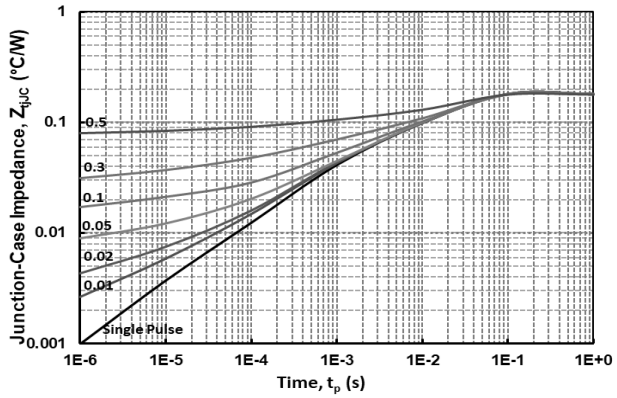


Fig 22. Safe Operating Area

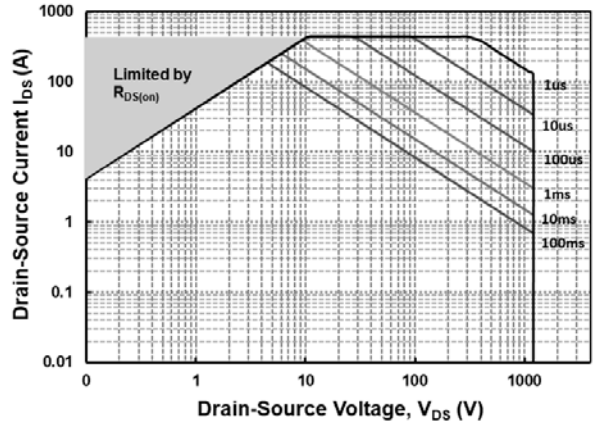


Fig 23. Clamped Inductive Switching Energy vs Drain Current (V_{DD} = 800V)

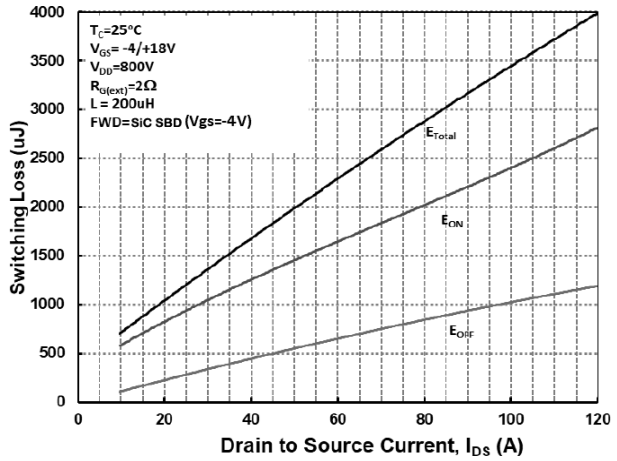
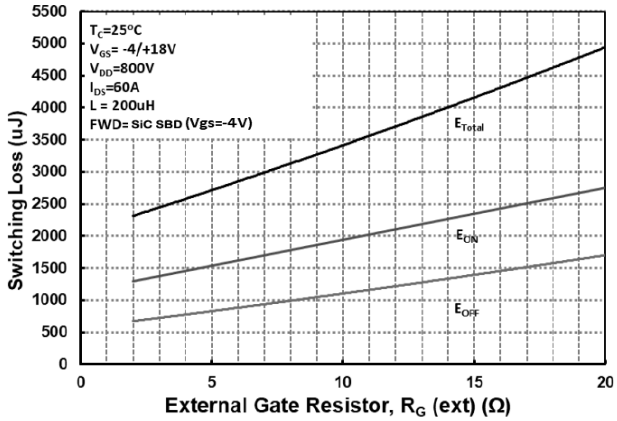


Fig 24. Clamped Inductive Switching Energy vs External Gate Resistor $R_{G(ext)}$



Typical Performance

Fig 25. Switching Times vs Drain Current (V_{DD} = 800V)

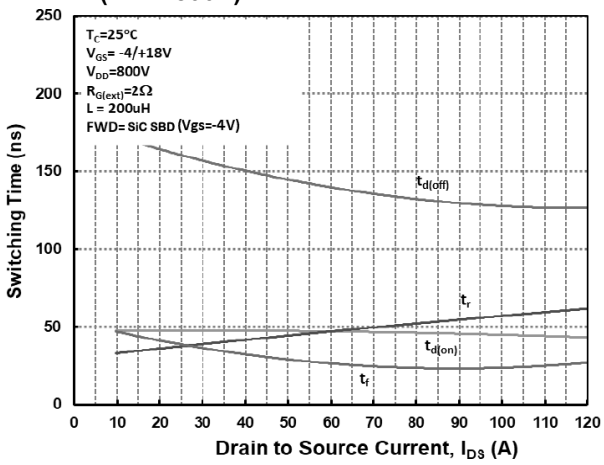
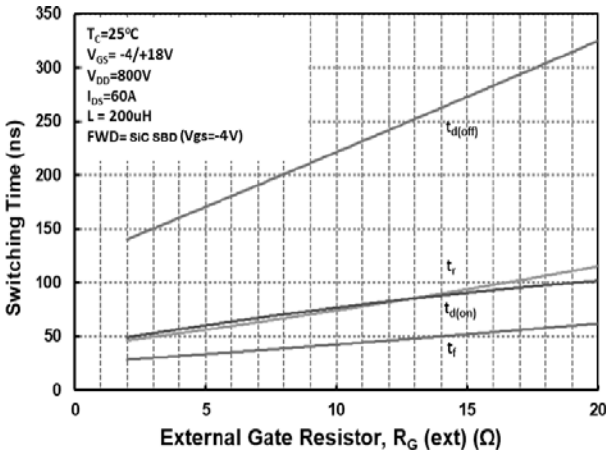


Fig 26. Switching Times vs External Gate Resistor $R_{G(ext)}$



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