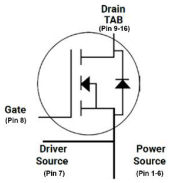
DAC023N065WY3

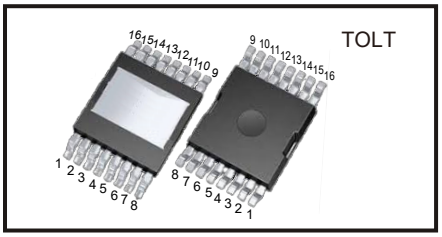
Silicon Carbide Enhancement Mode MOSFET

V_{DSS}	650V
$I_{D(@25℃)}$	102A
$R_{DS(ON)}$ typ.	22.5mΩ

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





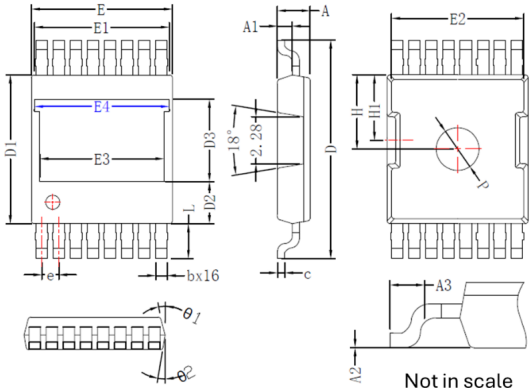
Benefits

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

Applications

- Server power
- EV/HEV charging station
- Energy storage systems
- High performance DC-DC converters
- On-board charger
- Battery management systems

Package Dimensions



Not in scale

Absolute Maximum Ratings

(Tc = 25℃ unless otherwise specified)

Parameter		Symbol	Ratings	Unit
Drain-Source Voltage	V_{GS}=0V I_D=100μA	V_{DS}	650	V
Gate-Source Voltage (dynamic)	AC (f>1 Hz, duty cycle<1%, pulse width<200ns)	V_{GS}	-9/+23	V
Gate-Source Voltage (static)		$V_{GS(op)}$	-4/+18	V
Drain Current-Continuous	@ T_C=25°C @ T_C=100°C	I_D	102 72	A
Pulse Drain Current		$I_{D,pulse}$	220	A
Power Dissipation		P_D	325	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=2mH	I_{AV}	36	A
Avalanche Capability, single pulse**	V_{DD}=100V V_{GS}=10V L=2mH	E_{AV}	1200	mJ

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

SYMBOL	mm		
	MIN	NOM	MAX
✻A	2.25	2.30	2.35
✻A1	1.00	1.04	1.08
✻A2	0.01	0.08	0.16
A3		1.50REF	
✻b	0.68	0.70	0.74
✻c	0.45	0.50	0.55
✻D	14.80	15.00	15.20
✻D1	10.00	10.10	10.30
D2	2.60	2.80	3.00
D3		5.77REF	
✻E	9.70	9.90	10.10
E1		9.46REF	
E2		9.25REF	
E3		8.25REF	
E4		8.70REF	
✻e	1.18	1.20	1.22
✻H	5.00	5.20	5.40
H1	4.40	4.60	4.80
✻L	2.40	2.45	2.50
✻P	2.80	3.00	3.20
θ1	7°	-	9°
θ2	7°	-	9°

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	650	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} =650V，V_{GS} =0V	-	0.5	60	μA
		V_{DS} =650V，V_{GS} =0V，T_J =175°C	-	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 =10mA	2.6	3.1	4.2	V
		V_{DS} = V_{GS}，I_D =10mA，T_J =150°C	-	2.2	-	
		V_{DS} = V_{GS}，I_D =10mA，T_J =175°C	-	2.1	-	
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS} =18V，I_D =30A	-	22.5	28.5	mΩ
		V_{GS} =18V，I_D =30A，T_J =175°C	-	27	-	
Transconductance	g_{fs}	V_{DS} =20V，I_D =30A	-	23	-	S
		V_{DS} =20V，I_D =30A，T_J =175°C	-	21	-	
Internal Gate Resistance	$R_{G(int.)}$	f =1MHz，I_D =0A	-	1.2	-	Ω
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{DS} =400V V_{GS} =0V Freq.=1MHz V_{AC} =25mV	-	2400	-	pF
Output Capacitance	C_{oss}		-	190	-	
Reverse Transfer Capacitance	C_{rss}		-	8	-	
C oss Stored Energy	E_{oss}		-	19	-	μJ
Turn-On Switching Energy	E_{on}	V_{DS} =400V，V_{GS} =-4/+18V I_D =30A，$R_{G(ext)}$ =2.0Ω L=200μH	-	29	-	μJ
Turn-Off Switching Energy	E_{off}		-	26	-	
Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	V_{DS} =400V，V_{GS} =-4/+18V I_D =30A，$R_{G(ext)}$ =2.0Ω L=200μH	-	15	-	ns
Rise Time	t_r		-	11	-	
Turn-Off Delay Time	$t_{d(off)}$		-	29	-	
Fall Time	t_f		-	6	-	
Total Gate Charge	Q_g	V_{DS} =400V V_{GS} =-4/+18V I_D =30A	-	112	-	nC
Gate to Source Charge	Q_{gs}		-	30	-	
Gate to Drain Charge	Q_{gd}		-	45	-	
Body Diode Characteristics						
Diode Forward Voltage	V_{SD}	V_{GS}=-4V，I_{SD}=20A，T_J =25°C	-	3.3	-	V
		V_{GS}=-4V，I_{SD}=20A，T_J =175°C	-	3.0	-	
Continuous Diode Forward Current	I_S	V_{GS}=-4V，T_J =25°C	-	62	-	A
Reverse Recovery Time	T_{rr}	I_{SD}=30A，V_{GS}=-4V V_R=400V，$R_{G(ext)}$ =20Ω L=200μH，dif/dt=1420A/μs	-	22	-	ns
Reverse Recovery Charge	Q_{rr}		-	240	-	nC
Reverse Recovery Charge	I_{rrm}		-	21	-	A
Thermal Resistance						
Thermal Resistance, Junction-to-Case	$R\theta_{JC}$		-	0.46	0.55	°C/W

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

Typical Performance

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

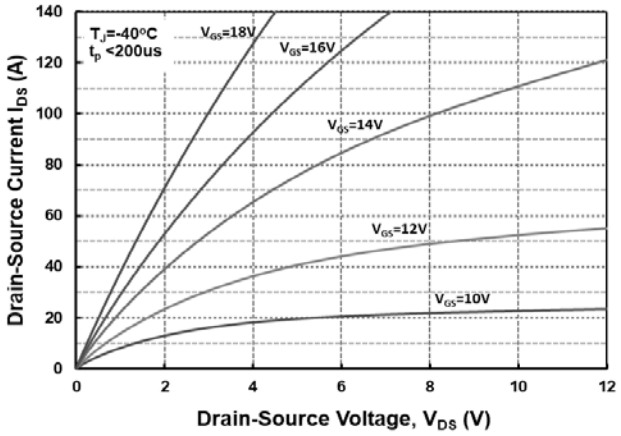


Fig 2. Output Characteristics, T_J = 25°C

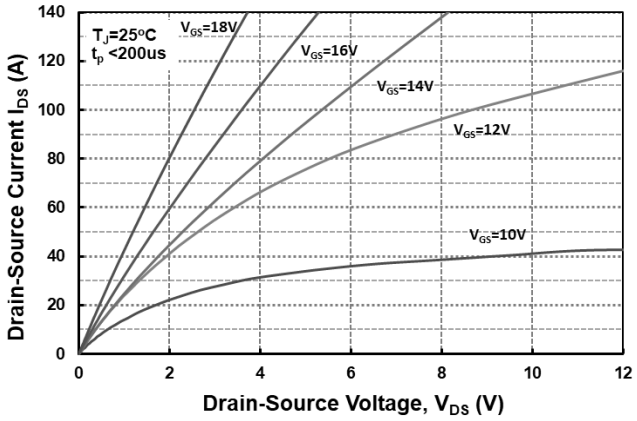


Fig 3. Output Characteristics at T_J =175℃

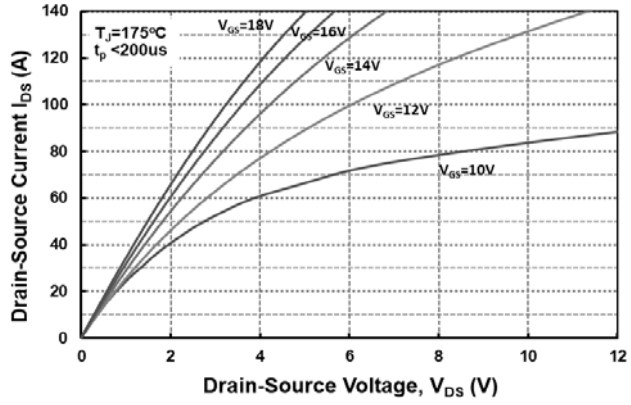


Fig 4. Normalized On-Resistance vs. Temperature

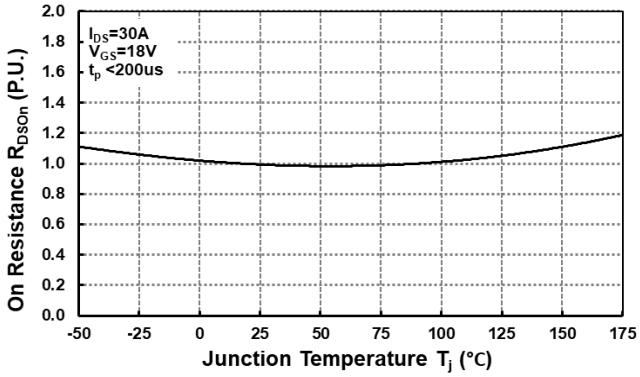


Fig 5. On-Resistance vs. Drain Current for Various Temperatures

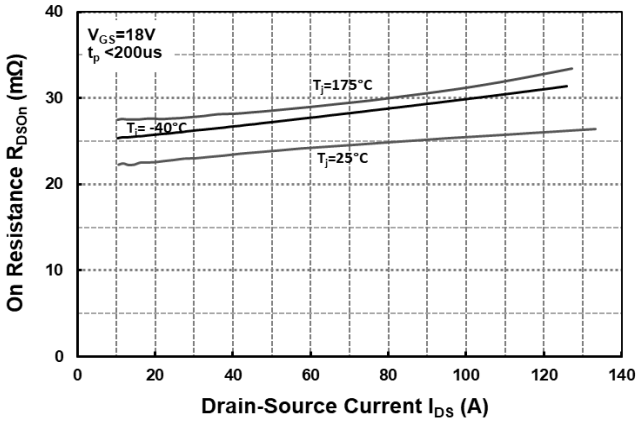
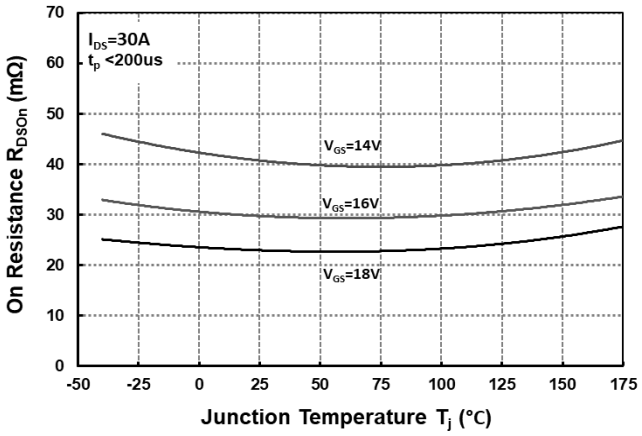


Fig 6. On-Resistance vs. Temperature for Various Gate Voltage



Typical Performance

Fig 7. Transfer Characteristic for Various Junction Temperatures

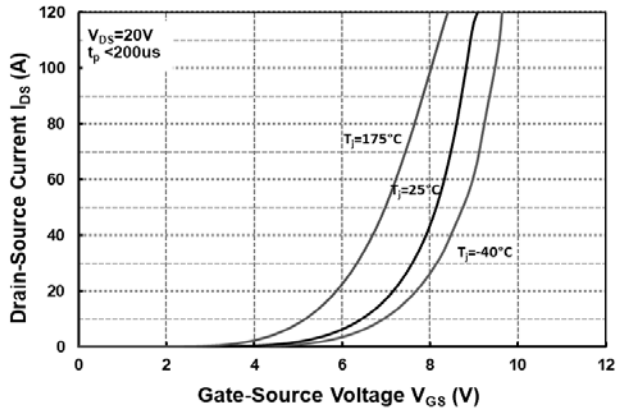


Fig 8. Body Diode Characteristics @ -40°C

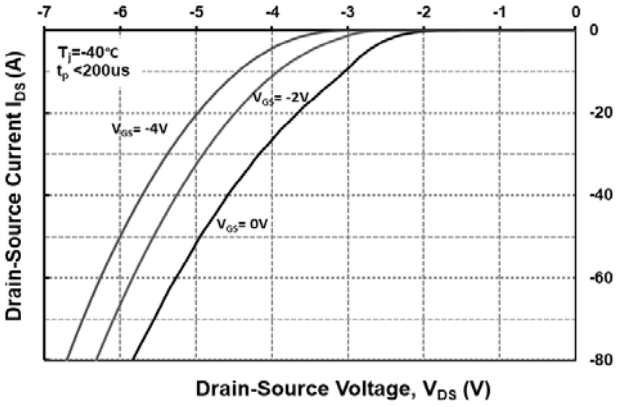


Fig 9. Body Diode Characteristics @ 25°C

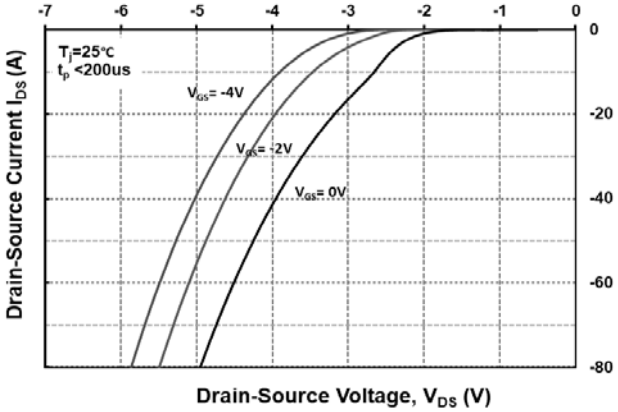


Fig 10. Body Diode Characteristics @ 175°C

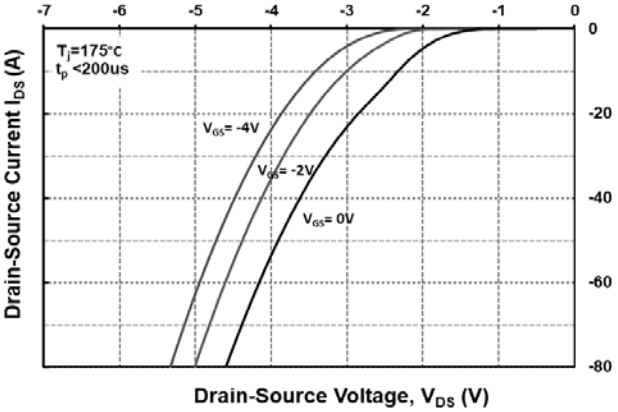


Fig 11. Threshold Voltage vs. Temperature

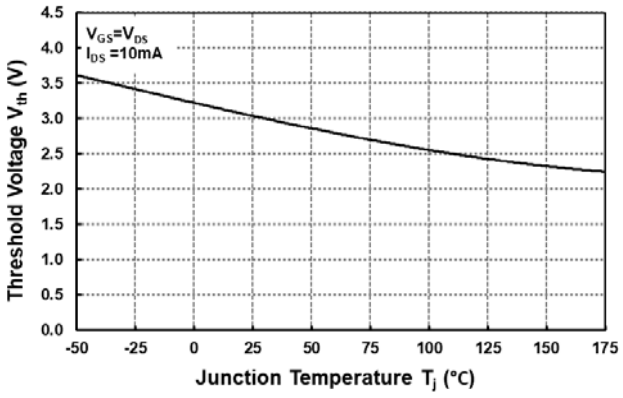
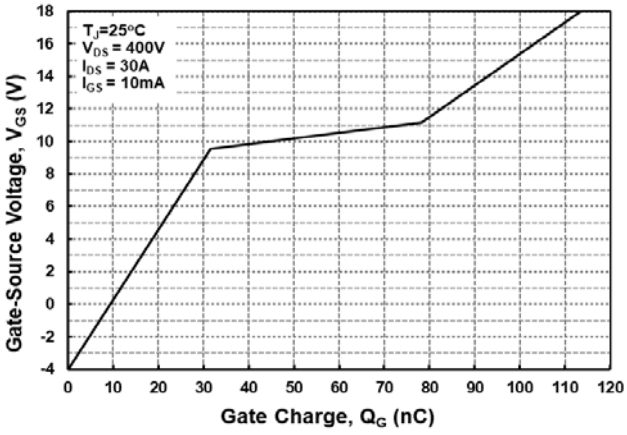


Fig 12. Gate Charge Characteristics



Typical Performance

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

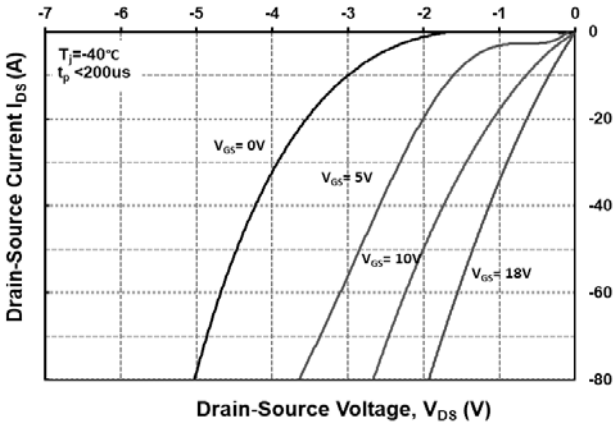


Fig 14. 3rd Quadrant Characteristics @ 25°C

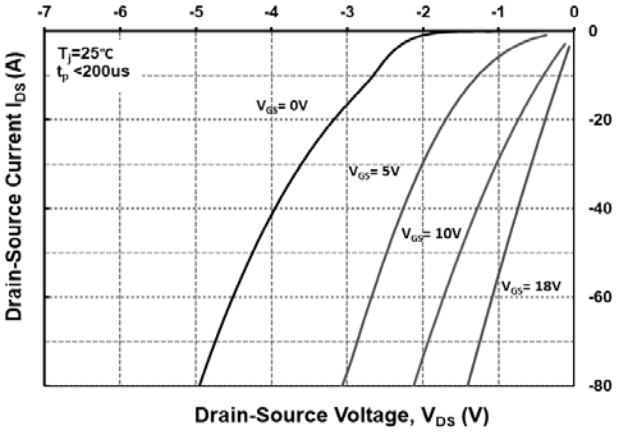


Fig 15. 3rd Quadrant Characteristics @ 175°C

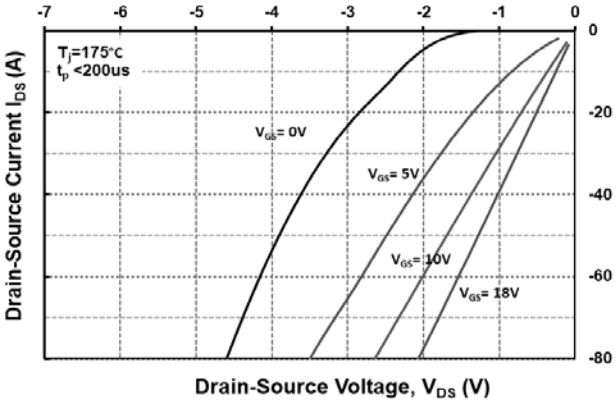


Fig 16. Output Capacitor Stored Energy

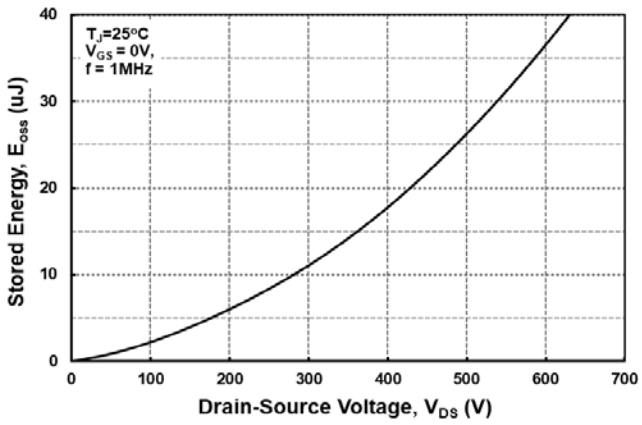


Fig 17. Capacitances vs. Drain-Source Voltage (0-200V)

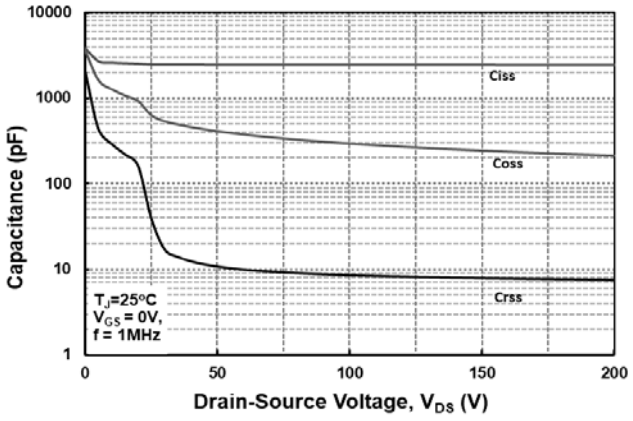
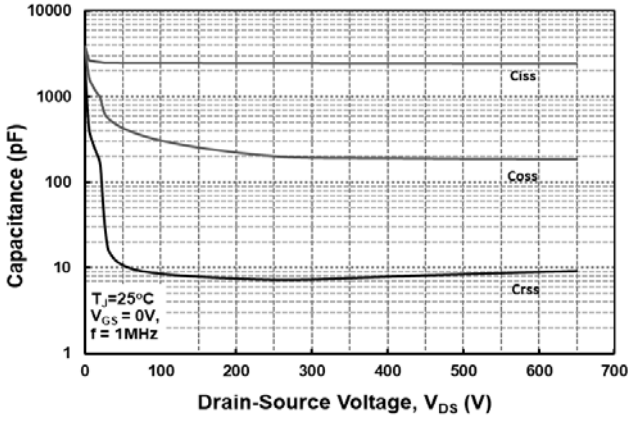


Fig 18. Capacitances vs. Drain-Source Voltage (0-650V)



Typical Performance

Fig 19. Continuous Drain Current Derating vs. Case Temperature

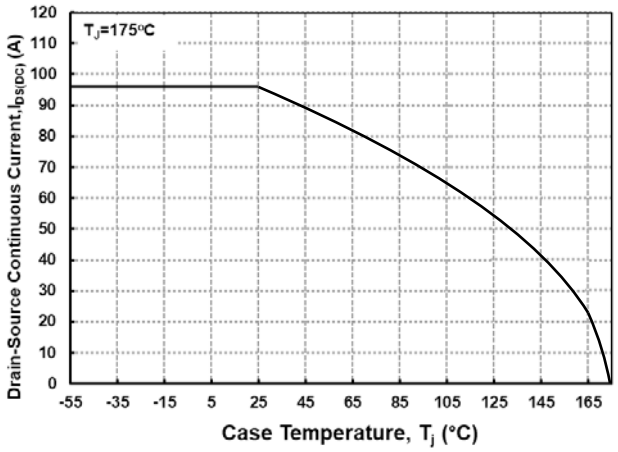


Fig 20. Maximum Power Dissipation Derating vs. Case Temperature

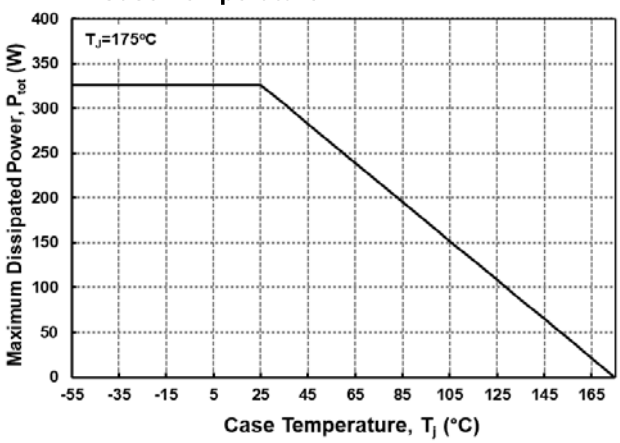


Fig 21. Transient Thermal Impedance (Junction – Case)

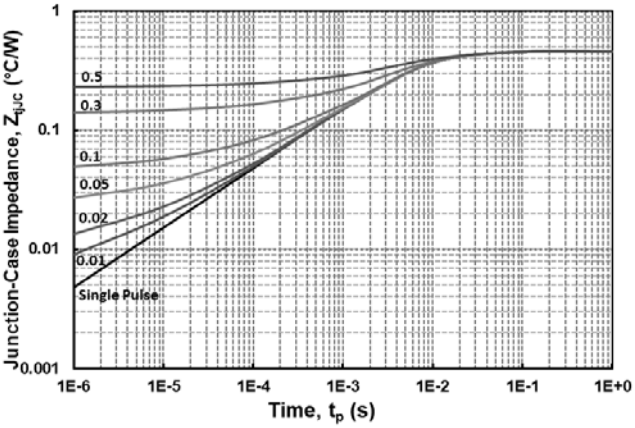


Fig 22. Safe Operating Area

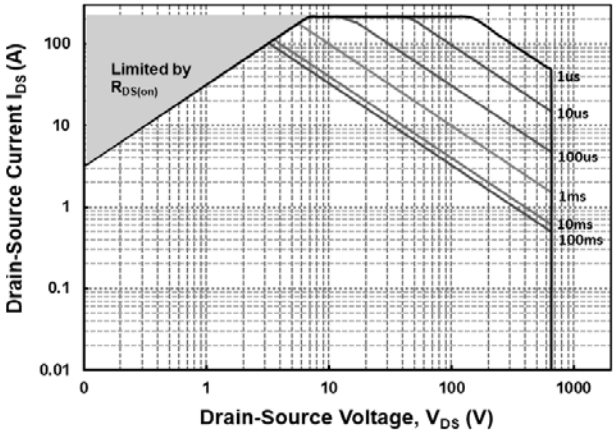


Fig 23. Clamped Inductive Switching Energy vs Drain Current (V_{DD} = 400V)

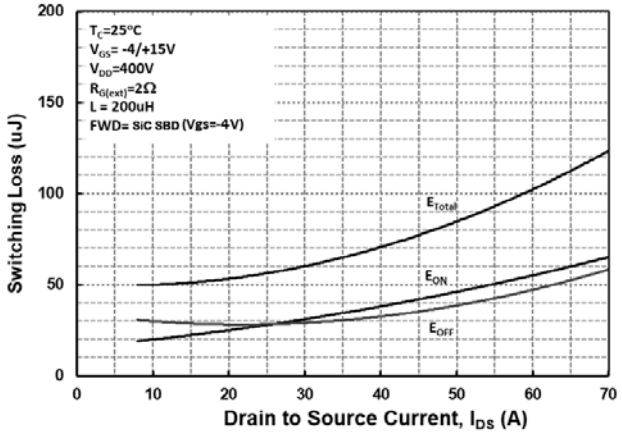
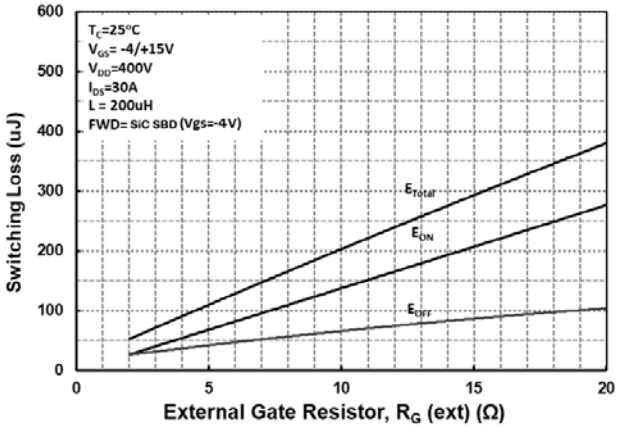


Fig 24. Clamped Inductive Switching Energy vs External Gate Resistor $R_{G(ext)}$



Typical Performance

Fig 25. Switching Times vs Drain Current (V_{DD} = 400V)

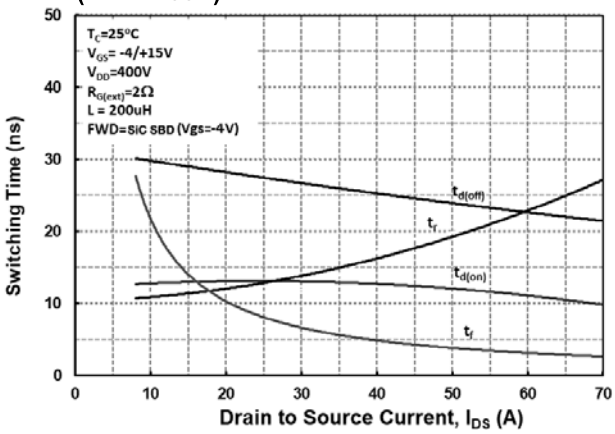
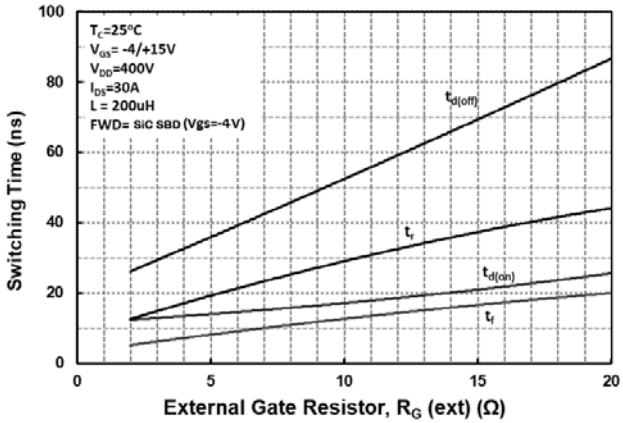


Fig 26. Switching Times vs External Gate Resistor $R_{G(ext)}$



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