

Silicon Carbide Enhancement Mode MOSFET

Features

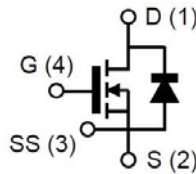
- High blocking voltage with low $R_{ds(on)}$
- High frequency operation with low Capacitance
- Simple to drive with -4V/+15V gate
- Robust body diode with low Q_{rr}
- 100% Avalanche Tested

Benefits

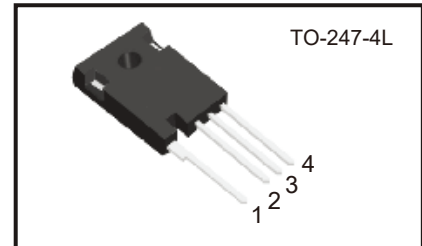
- Superior robustness and system reliability
- Higher system efficiency
- Easier paralleling without thermal runaway
- Capable of high temperature application
- Faster and more efficient switching

Applications

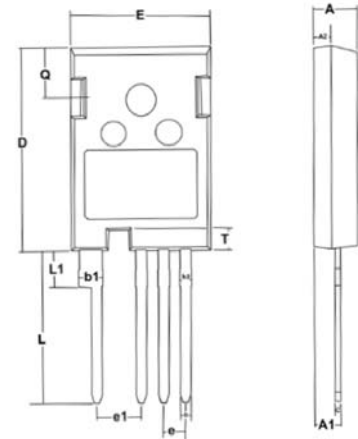
- EV motor drives
- EV/HEV charging station
- Energy storage and Battery charging
- High voltage DC-DC converters
- Solar / Wind Inverters
- UPS and PFC



V_{DSS}	1200V
$I_D(@25^\circ\text{C})$	67A
$R_{DS(ON) \text{ typ.}}$	38m Ω



Package Dimensions



Absolute Maximum Ratings

($T_c = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Rated	Unit
Drain-Source Voltage $V_{GS}=0V$ $I_D=100\mu A$	V_{DS}	1200	V
Gate-Source Voltage (dynamic) AC ($f > 1 \text{ Hz}$, duty cycle $< 1\%$, pulse width $< 200 \text{ ns}$)	V_{GS}	-8/+19	V
Gate-Source Voltage (static)	$V_{GS(op)}$	-4/+15	V
Drain Current-Continuous @ $T_c = 25^\circ\text{C}$ @ $T_c = 100^\circ\text{C}$	I_D	67 47	A
Pulse Drain Current	$I_{D,pulse}$	134	A
Power Dissipation	P_D	312	W
Storage Temperature Range	T_{STG}	-55 to +175	$^\circ\text{C}$
Operating Junction Temperature Range	T_J	-55 to +175	$^\circ\text{C}$
Soldering Temperature	T_L	260	$^\circ\text{C}$
Avalanche Capability, single pulse * $V_{DD}=100V$ $V_{GS}=10V$ $L=2mH$	I_{AV}	35	A
Avalanche Capability, single pulse** $V_{DD}=100V$ $V_{GS}=10V$ $L=2mH$	E_{AV}	1225	mJ

* 100% tested in 60% rating

** 100% tested in 36% rating

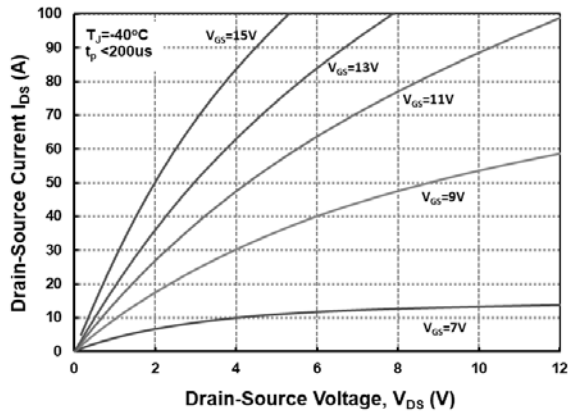
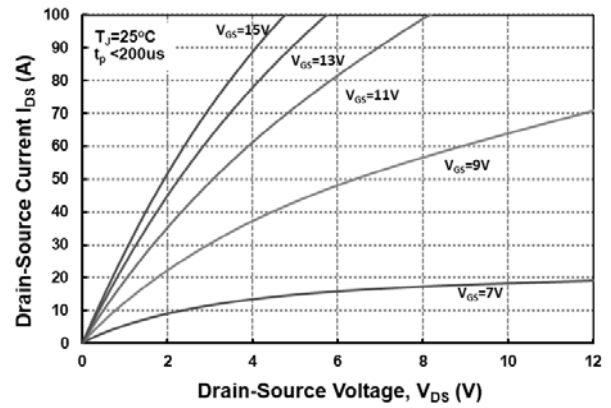
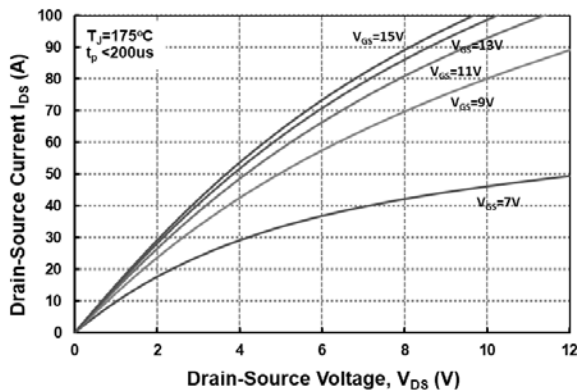
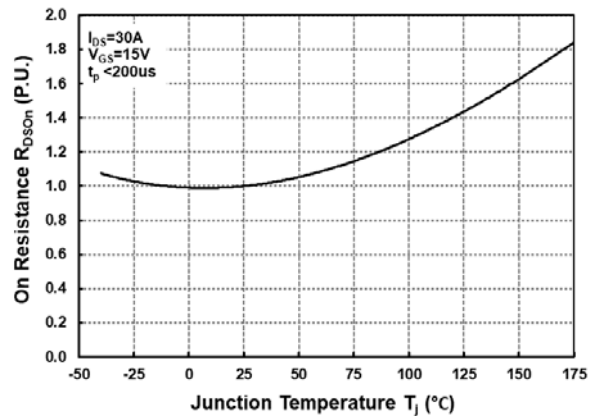
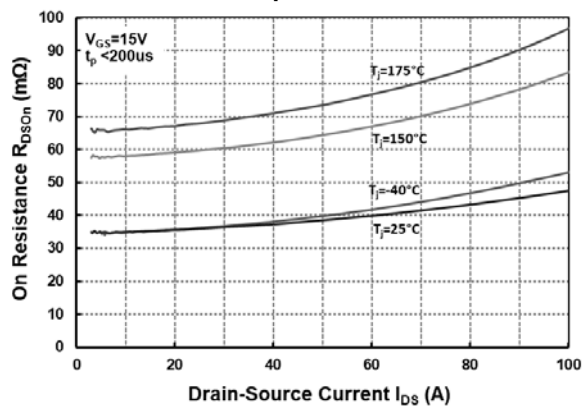
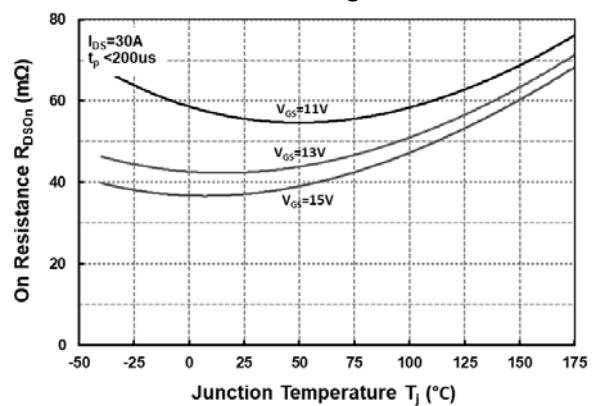
Symbol	Dimensions in millimeters		
	Min.	Avg.	Max.
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.80	2.00	2.20
b	1.06	1.21	1.36
b1	2.33	2.63	2.93
b2	1.07	1.30	1.60
C	0.51	0.61	0.75
D	23.30	23.45	23.60
E	15.74	15.94	16.14
e	2.54 BSC		
e1	5.08 BSC		
L	17.27	17.57	17.87
L1	3.99	4.19	4.39
Q	5.49	5.79	6.09
T	2.35	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}	$V_{GS}=0V, I_D=0.1mA$	1200	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS}=0V, V_{DS}=1200V$	-	0.5	60	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=15V, V_{DS}=0V$	-	5	100	nA
ON Characteristics						
Gate Threshold Voltage **	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=10mA$	2.0	2.7	3.6	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=15V, I_D=30A$	-	38	48	m Ω
Transconductance	g_{fs}	$V_{DS}=20V, I_D=30A$	-	27	-	S
Internal Gate Resistance	$R_{G(int.)}$		1.0	1.4	3.0	Ω
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=1000V$	-	2550	-	pF
Output Capacitance	C_{oss}	$V_{GS}=0V$	-	84	-	
Reverse Transfer Capacitance	C_{rss}	Freq.=100kHz	-	6	-	
C _{oss} Stored Energy	E_{oss}	$V_{AC}=25mV$	-	51	-	μJ
Turn-On Switching Energy	E_{on}	$V_{DS}=800V, V_{GS}=-4/+15V$	-	156	-	μJ
Turn-Off Switching Energy	E_{off}	$I_D=30A, R_{G(ext.)}=2.0\Omega$ $L=200\mu H$	-	45	-	
Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	$V_{DS}=800V$	-	13	-	ns
Rise Time	t_r	$V_{GS}=-4/+15V$	-	13	-	
Turn-Off Delay Time	$t_{d(off)}$	$I_D=30A$	-	25	-	
Fall Time	t_f	$R_{G(ext.)}=2.0\Omega$ $L=200\mu H$	-	10	-	
Total Gate Charge	Q_g	$V_{DS}=800V$	-	101	-	nC
Gate to Source Charge	Q_{gs}	$V_{GS}=-4/+15V$	-	29	-	
Gate to Drain Charge	Q_{gd}	$I_D=30A$	-	37	-	
Body Diode Characteristics						
Inverse Diode Forward Voltage	V_{SD}	$V_{GS}=-4V, I_{SD}=20A$	-	4.5	-	V
Continuous Diode Forward Current	I_S	$V_{GS}=-4V, T_J=25^\circ C$	-	-	46	A
Reverse Recovery Time	T_{rr}	$I_{SD}=30A, V_{GS}=-4V$	-	17	-	ns
Reverse Recovery Charge	Q_{rr}	$V_R=800V, T_J=25^\circ C$	-	360	-	nC
Reverse Recovery Charge	I_{rrm}	$di/dt=3100A/\mu s$	-	37	-	A
Thermal Resistance						
Thermal Resistance, Junction-to-Case	$R\theta_{JC}$		-	0.48	0.60	$^\circ C/W$

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

Typical Performance

Fig 1. Output Characteristics, $T_J = -40^\circ\text{C}$

Fig 2. Output Characteristics, $T_J = 25^\circ\text{C}$

Fig 3. Output Characteristics, $T_J = 175^\circ\text{C}$

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

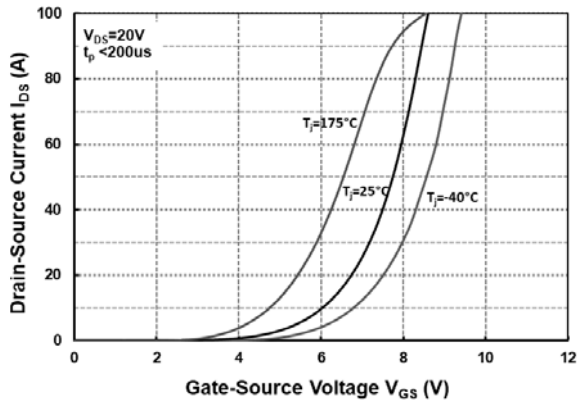


Fig 8. Body Diode Characteristics @ -40°C

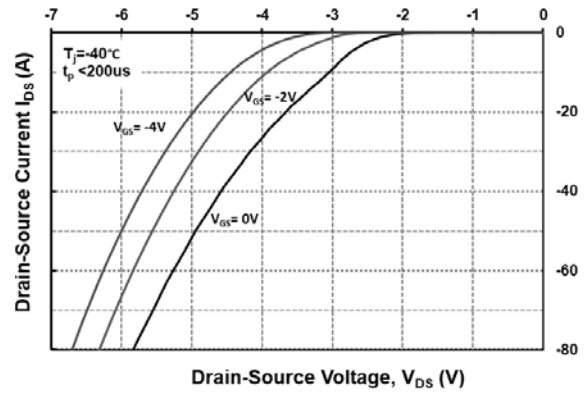


Fig 9. Body Diode Characteristics @ 25°C

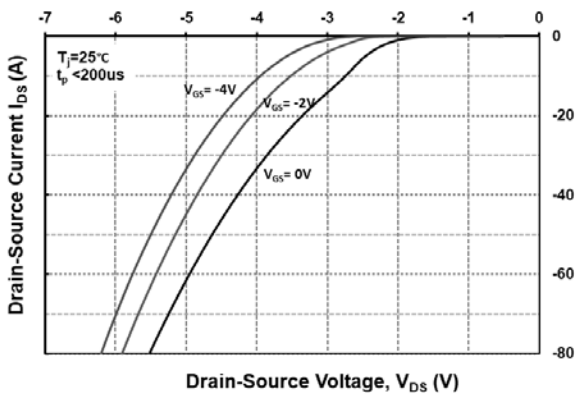


Fig 10. Body Diode Characteristics @ 175°C

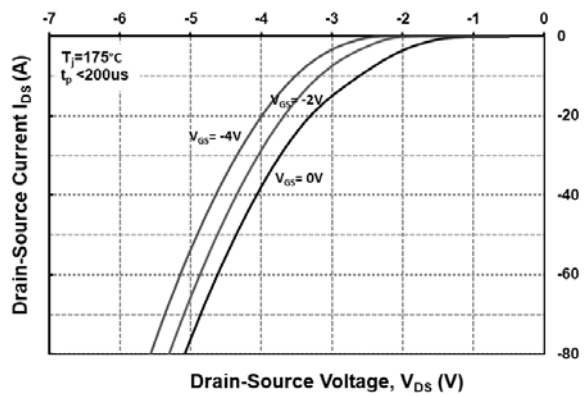


Fig 11. Threshold Voltage vs. Temperature

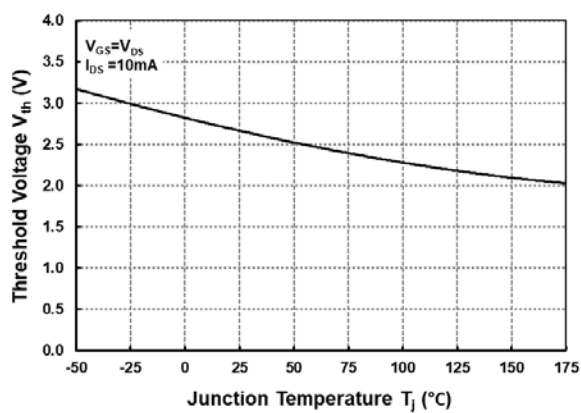
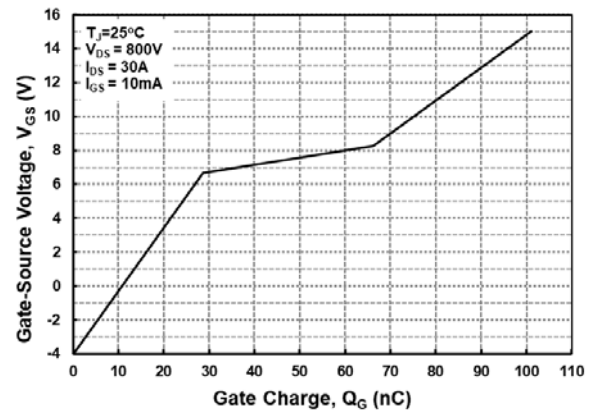
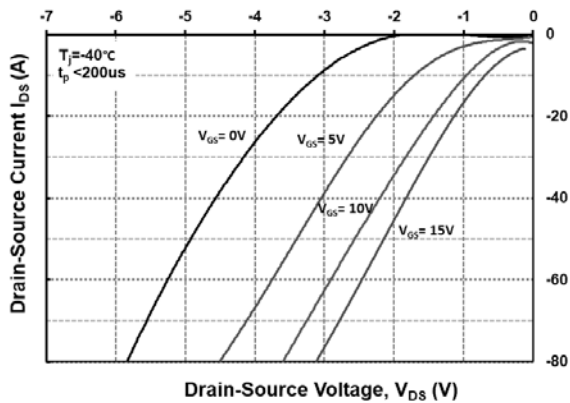
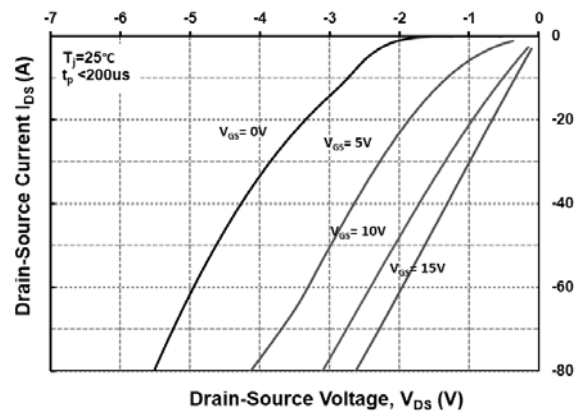
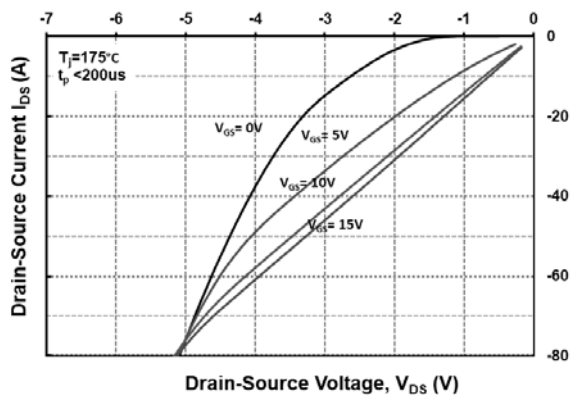
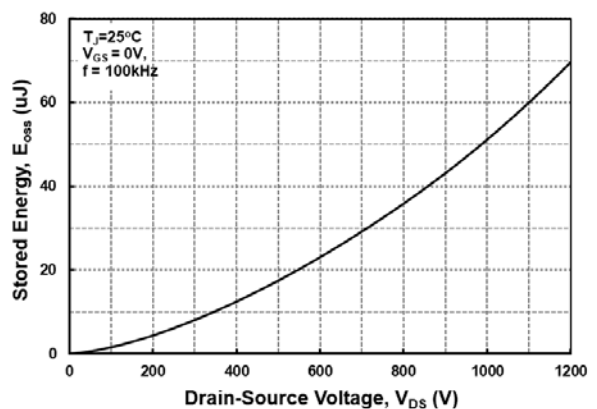
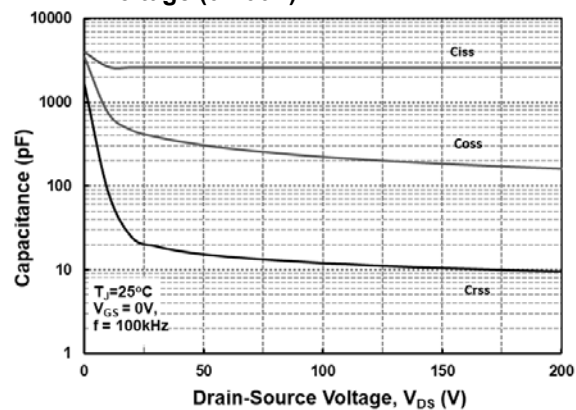
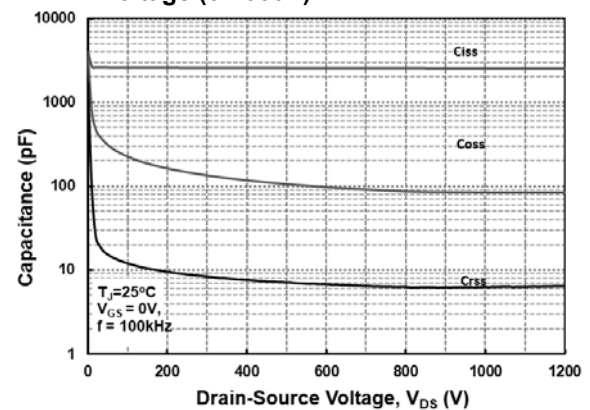


Fig 12. Gate Charge Characteristics



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 (0-1000V)


Typical Performance

Fig 19. Continuous Drain Current Derating vs. Case Temperature

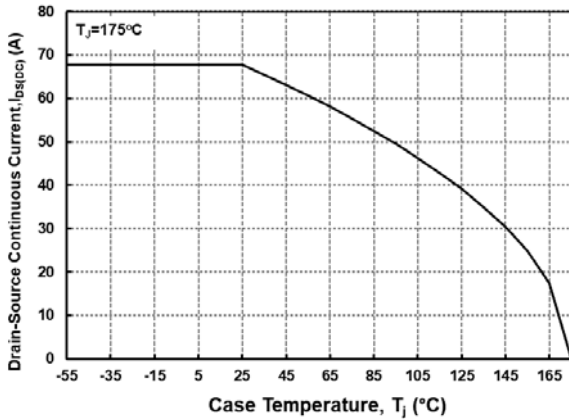


Fig 20. Maximum Power Dissipation Derating vs. Case Temperature

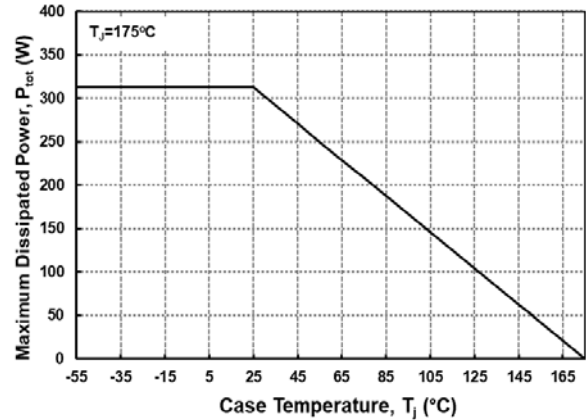


Fig 21. Transient Thermal Impedance (Junction – Case)

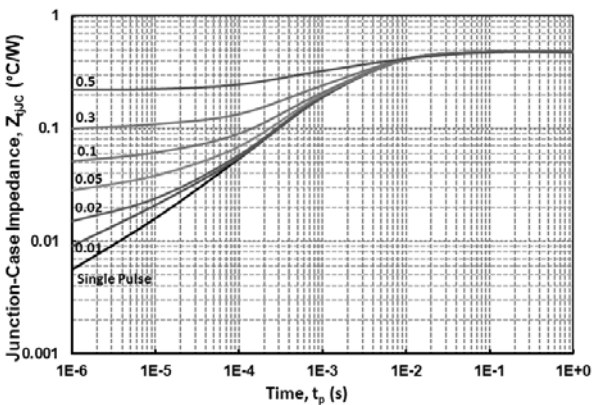


Fig 22. Safe Operating Area

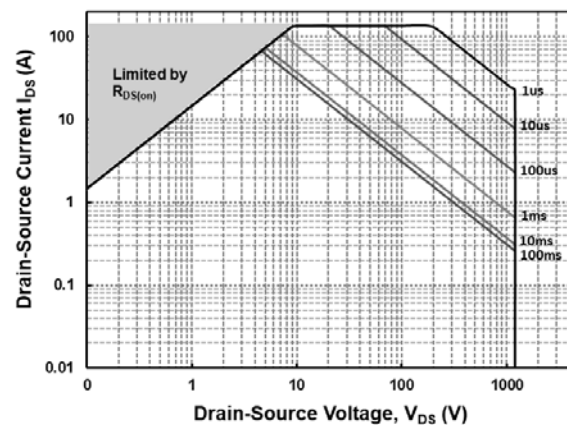


Fig 23. Clamped Inductive Switching Energy vs Drain Current ($V_{DD} = 800V$)

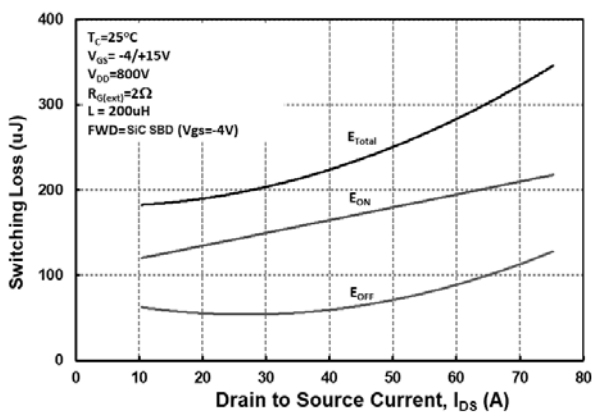
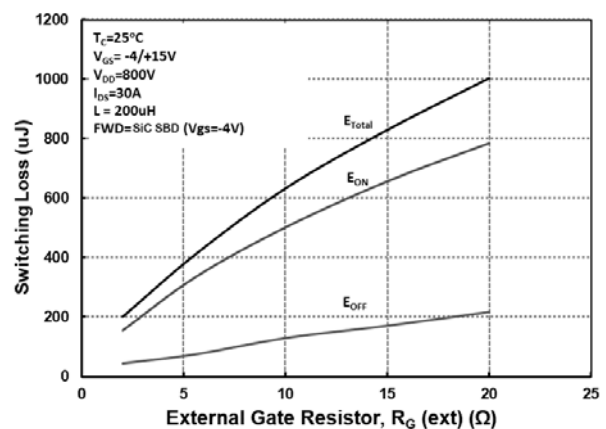
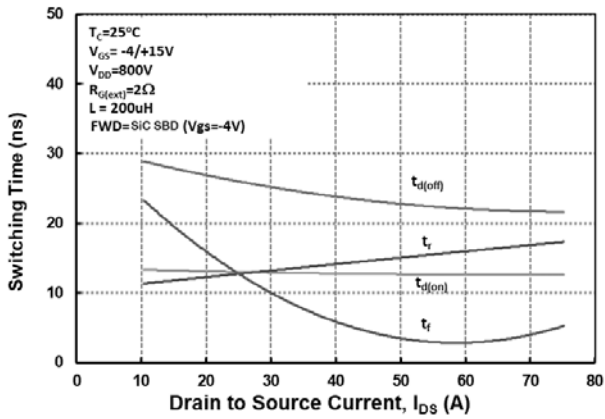
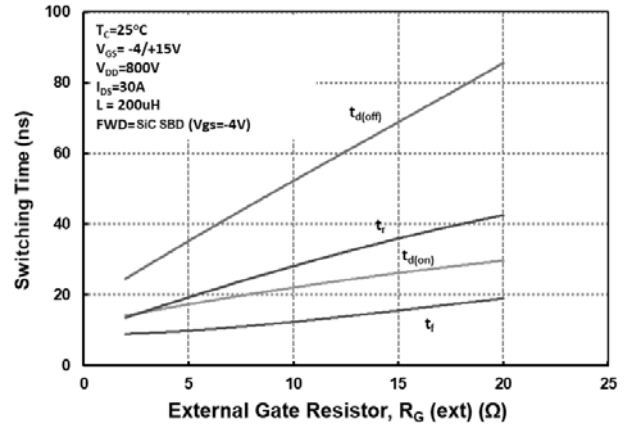


Fig 24. Clamped Inductive Switching Energy vs External Gate Resistor $R_{G(ext)}$



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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