

Silicon Carbide Enhancement Mode MOSFET

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)

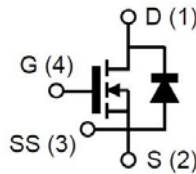
Benefits

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

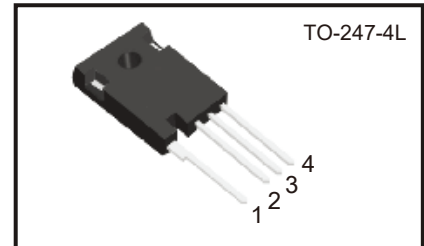
Applications

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

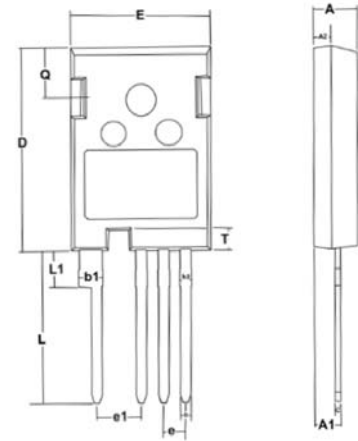
Preliminary



V_{DSS}	1200V
$I_D(@25^{\circ}C)$	115A
$R_{DS(ON)}$	16m Ω



Package Dimensions



Absolute Maximum Ratings

 (T_c = 25°C unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Drain-Source Voltage $V_{GS}=0V$ $I_D=100\mu A$	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

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	B_{VDS}	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	-	
Reverse Transfer Capacitance	C_{rss}	V_{AC}=25mV Freq.=1MHz	-	13	-	
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	-	
Switching Characteristics						
Turn-On Delay Time	t_{d(on)}	V_{DS}=800V	-	34	-	ns
Rise Time	t_r	V_{GS}=-4/+15V I_D=75A , L=65.7μH	-	33	-	
Turn-Off Delay Time	t_{d(off)}	R_{G(ext)}=2.5Ω	-	65	-	
Fall Time	t_f	Timing relative to V_{DS}, Inductive load	-	13	-	
Total Gate Charge	Q_g	V_{DS}=800V	-	211	-	nC
Gate to Source Charge	Q_{gs}	V_{GS}=-4/+15V	-	67	-	
Gate to Drain Charge	Q_{gd}	I_D=75A	-	61	-	
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
Thermal Resistance						
Thermal Resistance, Junction-to-Case	R_{θJC}		-	0.3	-	°C/W

Typical Device Performance

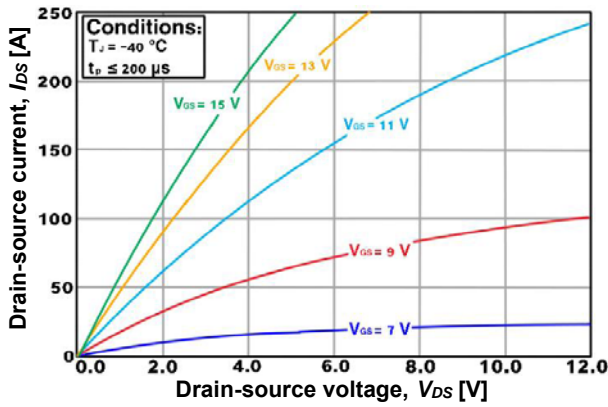


Fig 1. Output characteristics, $T_J = -55\text{ }^\circ\text{C}$ (1st quadrant)

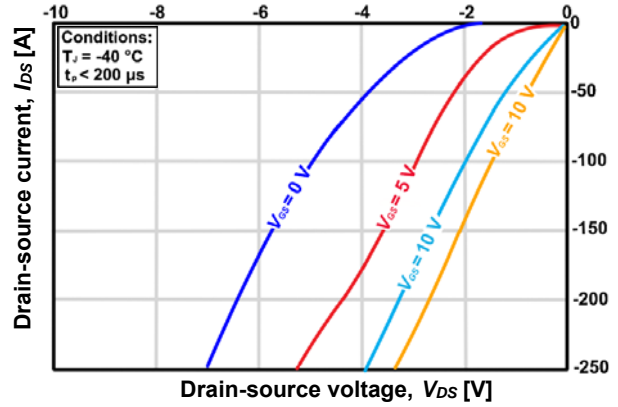


Fig 2. Output characteristics, $T_J = -55\text{ }^\circ\text{C}$ (3rd quadrant)

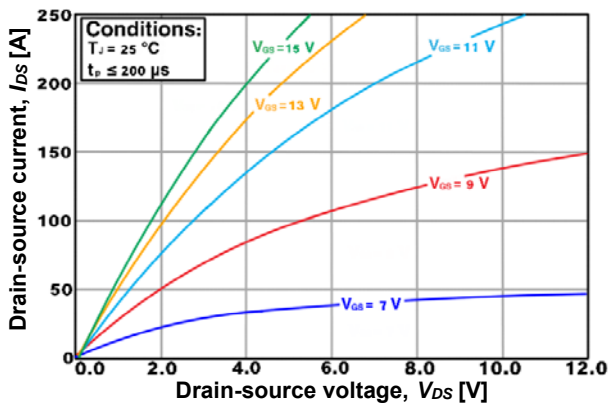


Fig 3. Output characteristics, $T_J = 25\text{ }^\circ\text{C}$ (1st quadrant)

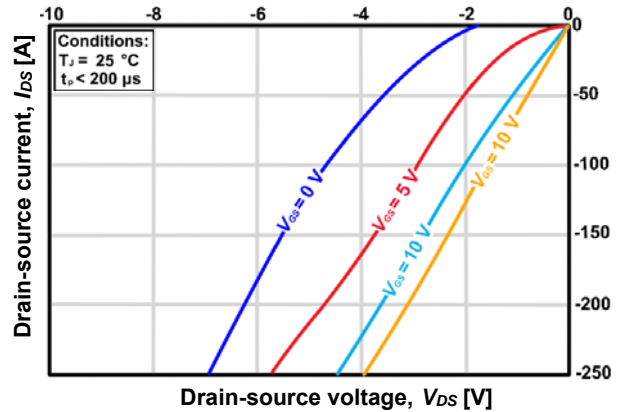


Fig 4. Output characteristics, $T_J = 25\text{ }^\circ\text{C}$ (3rd quadrant)

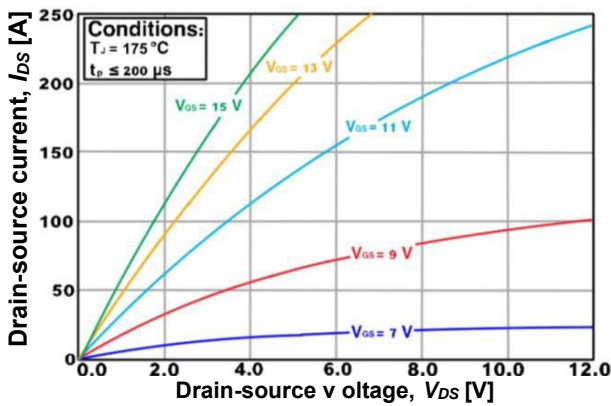


Fig 5. Output characteristics, $T_J = 150\text{ }^\circ\text{C}$ (1st quadrant)

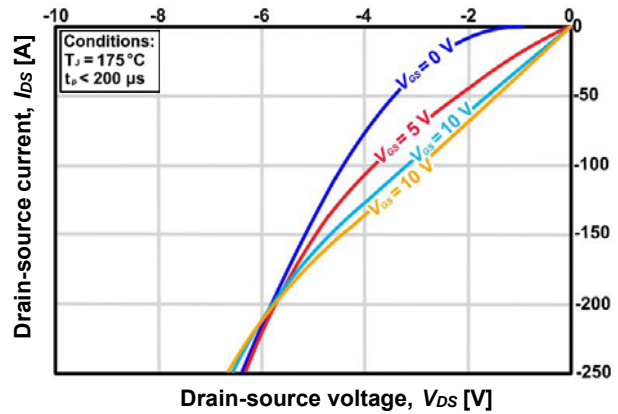


Fig 6. Output characteristics, $T_J = 150\text{ }^\circ\text{C}$ (3rd quadrant)

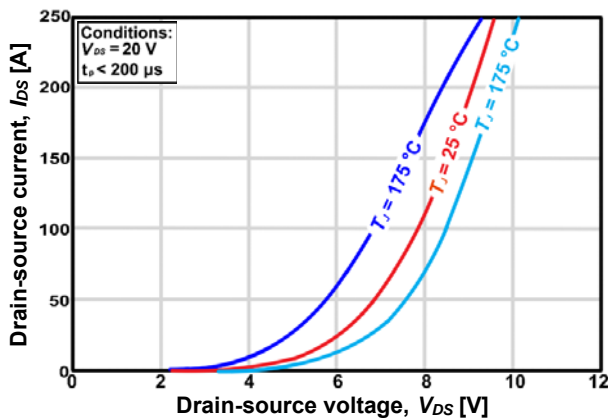


Fig 7. Transfer characteristic for various junction temperatures

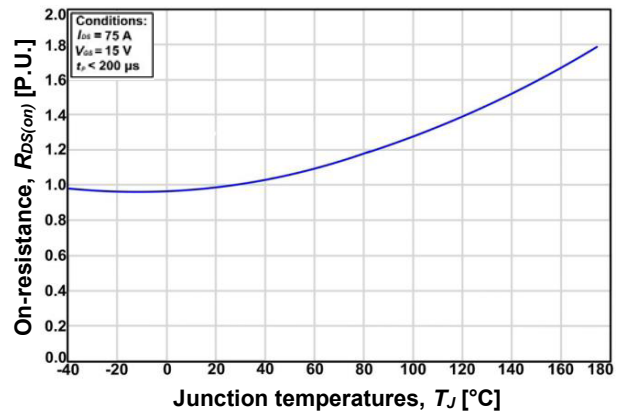


Fig 8. Normalized on-resistance vs. Temperatures

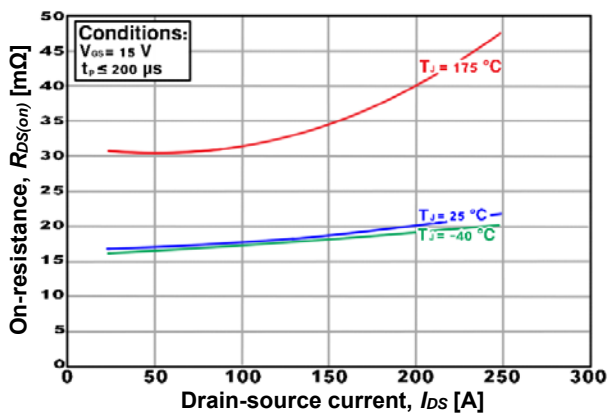


Fig 9. On-resistance vs. Drain current

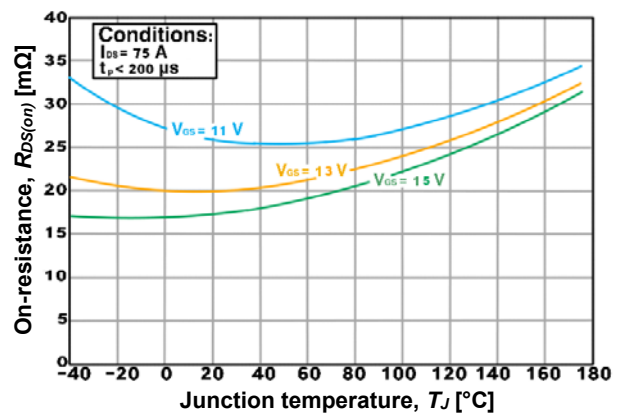


Fig 10. On-Resistance vs. Temperature for various gate voltage

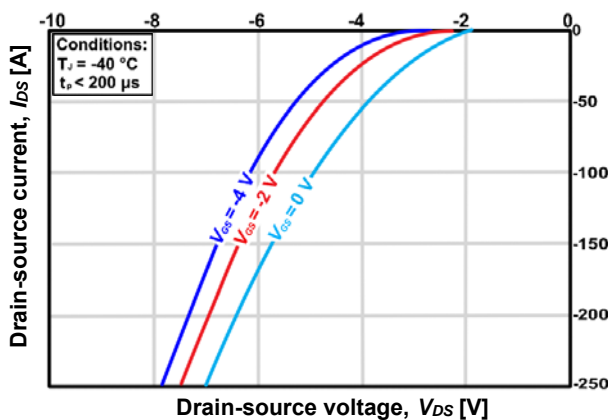


Fig 11. Body diode characteristic at -55 °C

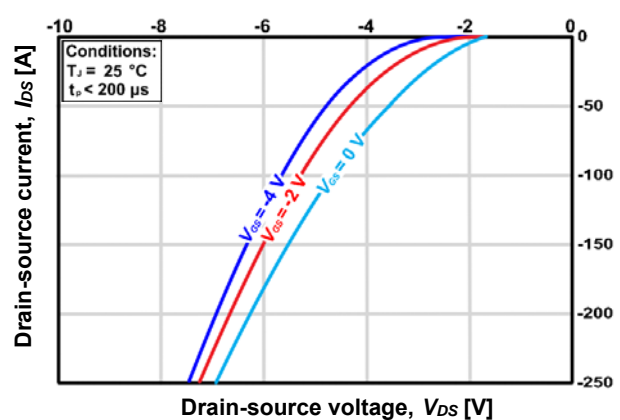


Fig 12. Body diode characteristic at 25 °C

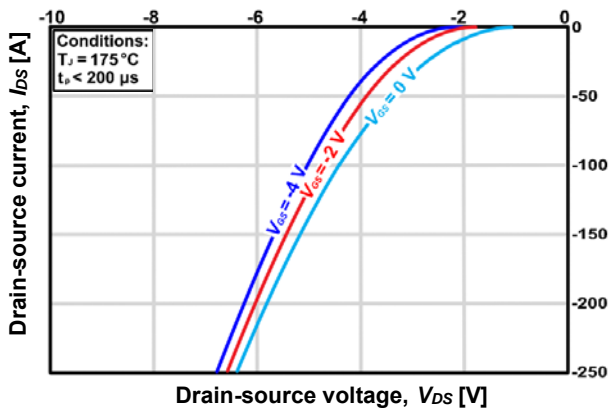


Fig 13. Body diode characteristic at 150 °C

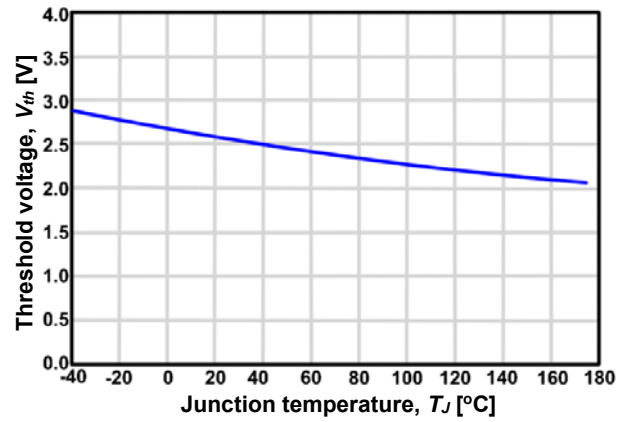


Fig 14. Threshold voltage vs. Temperature

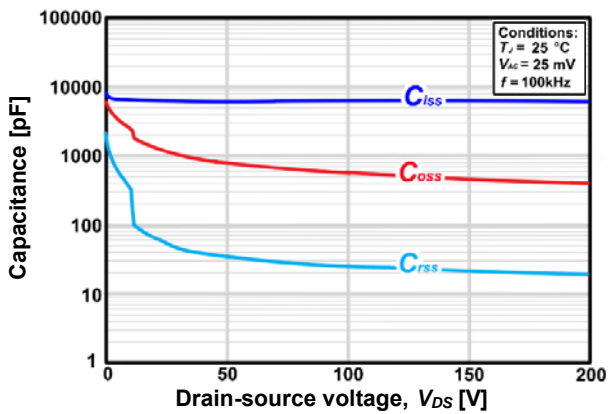


Fig 15. Capacitance vs. Drain-source voltage (0-200 V)

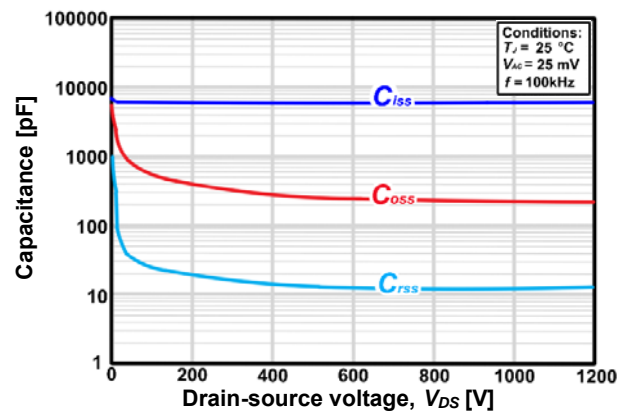


Fig 16. Capacitance vs. Drain-source voltage (0-1200 V)

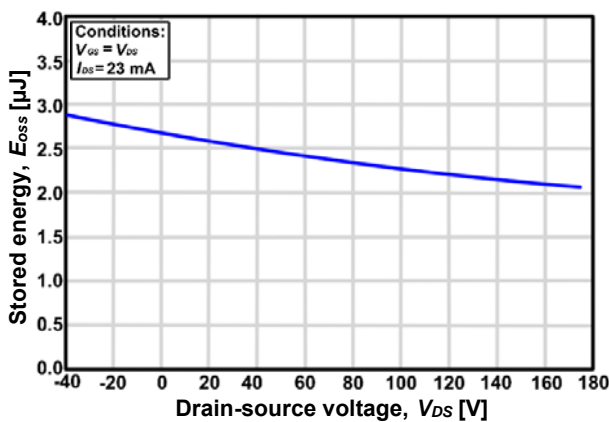


Fig 17. Output capacitance stored energy

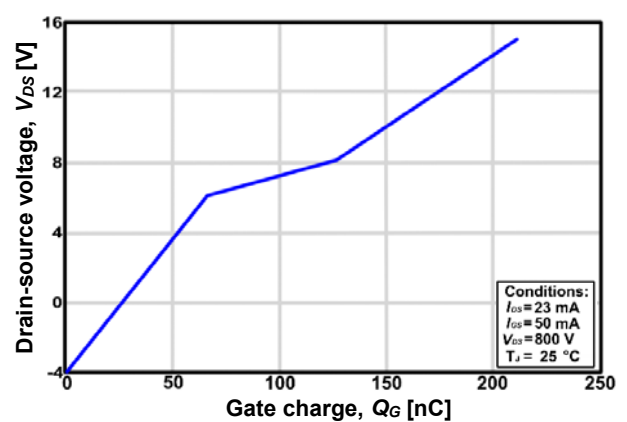


Fig 18. Gate charge characteristics

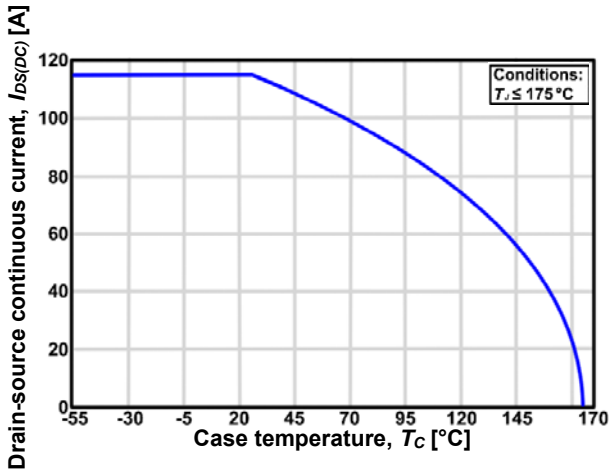


Fig 19. Continuous drain current derating vs. Case Temperature

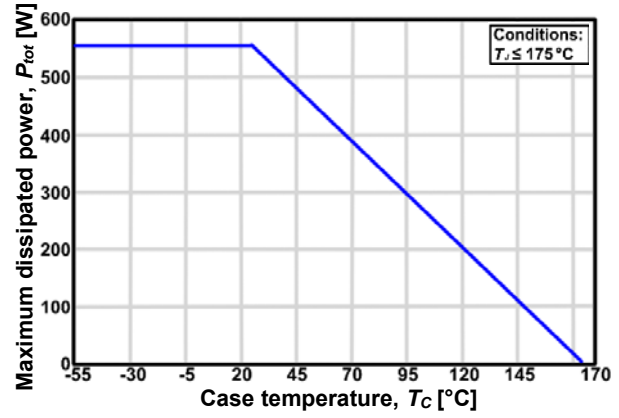


Fig 20. Maximum power dissipation derating vs. Case temperature

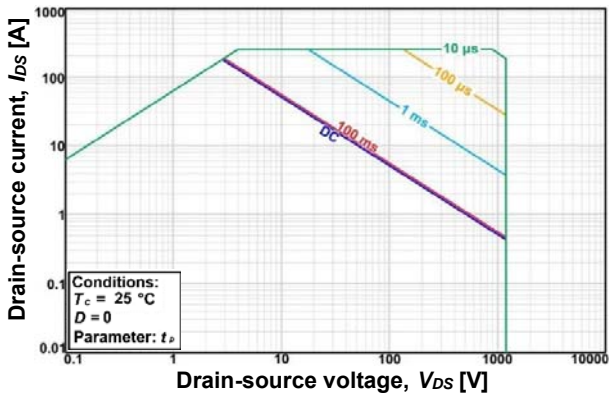


Fig 21. Safe operating area

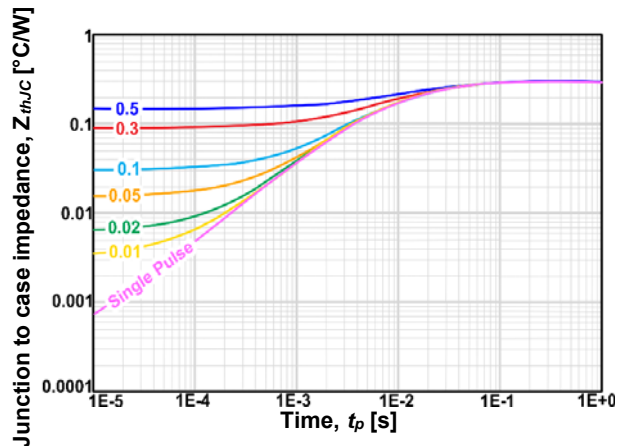


Fig 22. Transient thermal impedance (Junction - Case)

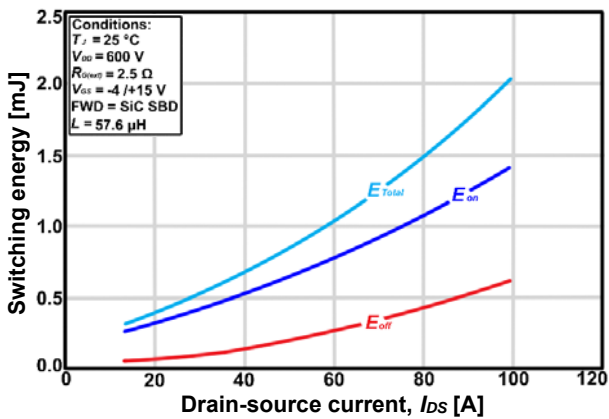


Fig 23. Clamped inductive switching energy vs. Drain current ($V_{DD} = 800\text{ V}$)

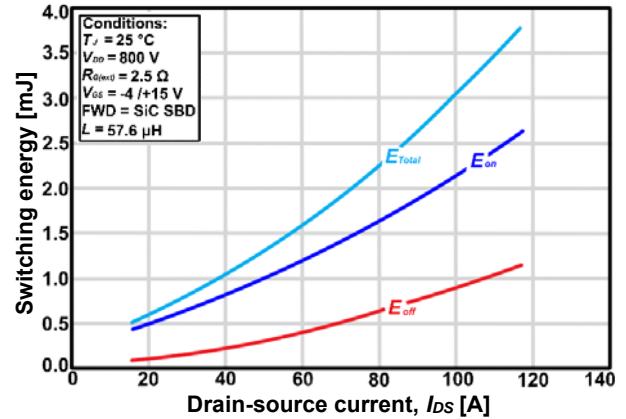


Fig 24. Clamped inductive switching energy vs. Drain current ($V_{DD} = 600\text{ V}$)

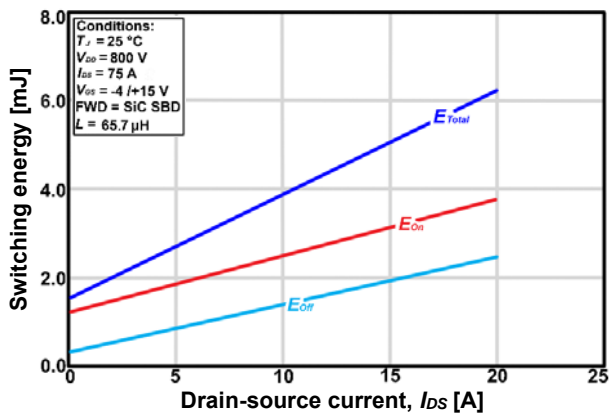


Fig 25. Clamped inductive switching energy vs. $R_{G(ext)}$

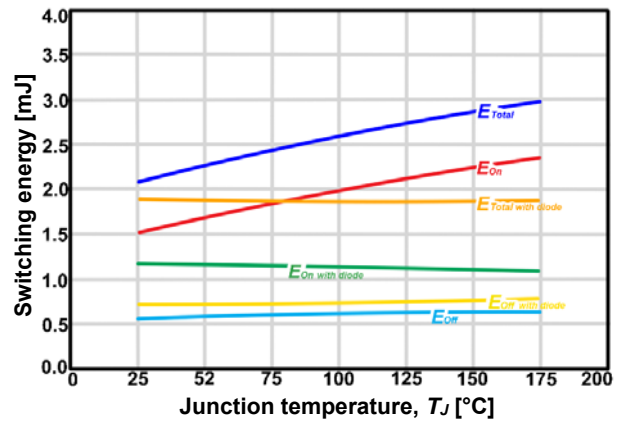


Fig 26. Clamped inductive switching energy vs. Temperature

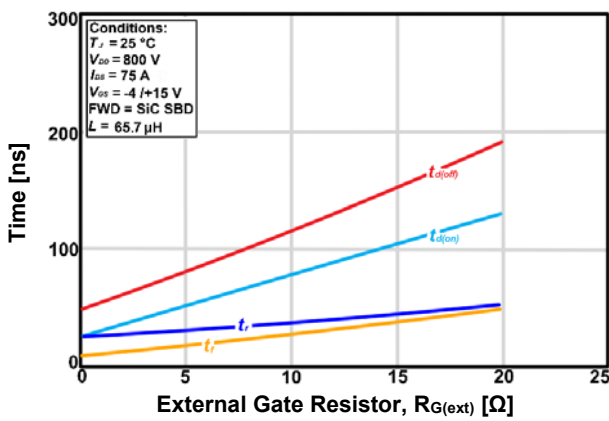


Fig 27. Switching times vs. $R_{G(ext)}$

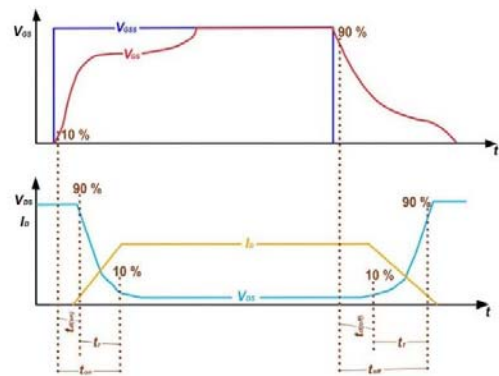


Fig 28. Switching times definition

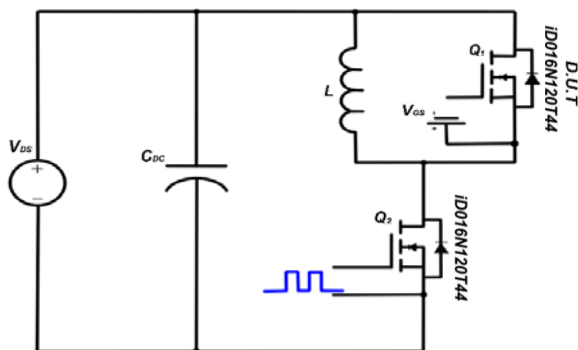


Fig 29. Clamped inductive switching waveform test circuit

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