SOT227 Module
1200V,75A
SC075N12S1

General Description

KunSemi SC075N12S1 is a Single Unit SiC MOS Power Module. It integrates high performance SiC MOS chips designed for the applications such as Motor drives and EV charging.

Features

- High speed switching
- 175°C maximum junction temperature
- Very low switching losses
- High blocking voltage with low on-resistance
- Temperature independent turn-off switching losses
- Ultra-low thermal resistance
- Isolated back-side

Typical Applications

- UPS system
- Motor Drive
- Solar power optimizer
- High Voltage DC-DC Converters
- Photovoltaics,wind power generation
- Induction heating equipment
- Smart Grid Transmission and Distribution



Figure 2. Package

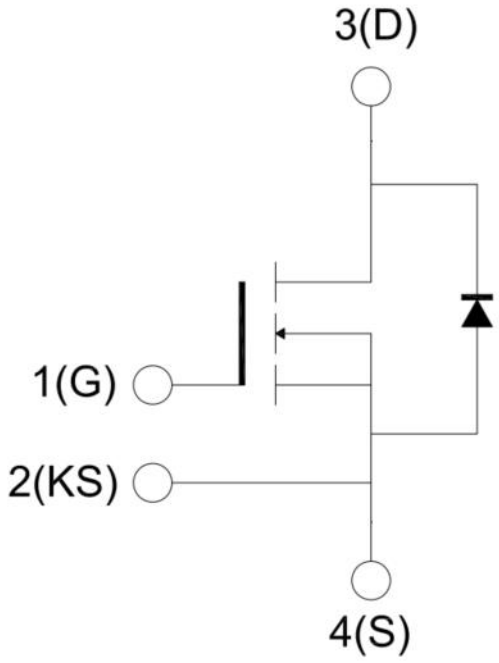


Figure 1. Schematic

ORDERING INFORMATION

Device	SC075N12S1
V_{DS}	1200V
I_{DS} (T_C=25°C,$R_{th(j\text{-}c,max)}$)	75A
$R_{DS(ON),typ}$ (V_{GS}=18V,I_D=60A,T_j=25°C)	25mΩ
$T_{j,max}$	175°C
Package	SOT227

PIN DESCRIPTION

Pin	Name	Description
1	G	G1 Gate
2	KS	Source Sensing
3	D	Drain
4	S	Source

Maximum Rated Values(TC = 25℃ unless otherwise specified)

Symbol	Parameter	Test Conditions	Value	Unit
$V_{DS,max}$	Drain source voltage	V_{GS} = 0V, I_D = 100 μA	1200	V
$V_{GS,max}$	Gate source voltage	Absolute maximum values	-8 /+22	V
V_{GSop}	Gate source voltage	Recommended operational values	-4 /+18	V
I_D	Continuous drain current	V_{GS} = 18V, T_C = 25˚C	75	A
		V_{GS} = 18V, T_C = 100˚C	65	A
$I_{D(pulse)}$	Pulsed drain current	Pulse width t_p limited by $T_{j,max}$	150	A
P_D	Power dissipation	T_C = 25˚C, T_j = 175˚C	335	W
T_j ,T_{stg}	Operating Junction and storage temperature		-55 to +175	˚C

Package CHARACTERISTICS

Symbol	Description	Min.	Typ.	Max.	Unit
R_{th-JC}	Thermal Resistance, Junction to Case	-	0.44	-	˚C/W
V_{ISO}	Isolation Test Voltage RMS, f=50Hz, t=1min	2.5	-	-	kV
Creepage	Terminal to Heatsink Creepage Distance	-	8.5	-	mm
	Terminal to Terminal Creepage Distance	-	10.5	-	mm
Clearance	Terminal to Heatsink Clearance	-	6.8	-	mm
	Terminal to Terminal Clearance	-	4.4	-	mm
T_{jmax}	Maximum Junction Temperature	-	175	-	˚C
T_{jop}	Operation Junction Temperature	-	-55 to +175	-	˚C
T_{STG}	Storage Temperature Range	-	-55 to +175	-	˚C
W	Weight	-	28.5	-	g
T_M	Screws to Heatsink Mounting Torque	-	-	1.5	N.m
T_C	Terminal Connection Torque (M4 *8mm)	-	-	1.3	N.m

ELECTRICAL CHARACTERISTICS (T_j = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0V, I_D = 100μA	1200	-	-	V
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 35mA	-	2.75	-	V
		V_{DS} = V_{GS}, I_D = 35mA,T_j = 175°C	-	2.18	-	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1200V, V_{GS} = 0V	-	-	100	uA
I_{GSS}	Gate source leakage current	V_{GS} = 20V, V_{DS} = 0V	-	-	10	nA
$R_{DS(on)}$	Current drain-source on-state resistance	V_{GS} = 16V, I_D = 60A	-	-	-	mΩ
		V_{GS} = 16V, I_D = 60A,T_j = 175°C	-	-	-	mΩ
		V_{GS} = 18V, I_D = 60A	-	25	-	mΩ
		V_{GS} = 18V, I_D = 60A,T_j = 175°C	-	48	-	mΩ
$R_{g,int}$	Internal gate resistance	V_{AC} = 25mV, f = 1MHz,open drain	-	2.3	-	Ω

Dynamic CHARACTERISTICS (T_j = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 1000V, V_{GS} = 0V, T_j = 25°C, V_{AC} = 25mV, f = 100KHz	-	2625	-	pF
C_{oss}	Output capacitance		-	301	-	pF
C_{rss}	Reverse capacitance		-	14	-	pF
E_{oss}	Coss stored energy		-	133	-	μJ
Q_{gs}	Gate source charge	V_{DS} = 800V, I_D = 60A	-	23	-	nC
Q_{gd}	Gate drain charge		-	41	-	nC
Q_g	Gate charge		-	110	-	nC

Dynamic CHARACTERISTICS (T_j = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Temperature	Min.	Typ.	Max.	Unit
E_{on}	Turn on switching energy	V_{DS} = 800V, V_{GS} = -4/+16V, I_D = 60A, Rg = 1Ω, Inductive load, FWD= DUT	T_j= 25°C	-	684	-	μJ
			T_j = 150°C	-	665	-	μJ
E_{off}	Turn off switching energy		T_j= 25°C	-	294	-	μJ
			T_j = 150°C	-	241	-	μJ
$t_{d(on)}$	Turn on delay time		T_j= 25°C	-	31	-	ns
			T_j = 150°C	-	26	-	ns
t_r	Rise time		T_j= 25°C	-	25	-	ns
			T_j = 150°C	-	24	-	ns
$t_{d(off)}$	Turn off delay time		T_j= 25°C	-	54	-	ns
			T_j = 150°C	-	58	-	ns
t_f	Fall time		T_j= 25°C	-	14	-	ns
			T_j = 150°C	-	15	-	ns

Body diode CHARACTERISTICS

Symbol	Parameter	Test Conditions	Temperature	Min.	Typ.	Max.	Unit
V_{SD}	Diode forward voltage	V_{GS} = -4V, I_{SD} = 30A	T_j= 25°C	-	3.67	-	V
			T_j = 150°C	-	4.25	-	V
I_S	Continuous diode forward current	V_{GS} = -4V	T_j= 25°C	-	75	-	A
E_{RR}	Reverse Recovery Energy	V_R = 800V, V_{GS} = -4V, I_D = 60A	T_j= 25°C	-	424	-	μJ
			T_j = 150°C	-	518	-	μJ
t_{rr}	Reverse recovery time		T_j= 25°C	-	24	-	ns
			T_j = 150°C	-	26	-	ns
Q_{rr}	Reverse recovery charge		T_j= 25°C	-	0.81	-	μC
			T_j = 150°C	-	0.95	-	μC
I_{rrm}	Peak reverse recovery current		T_j= 25°C	-	51	-	A
			T_j = 150°C	-	45	-	A

TYPICAL CHARACTERISTIC

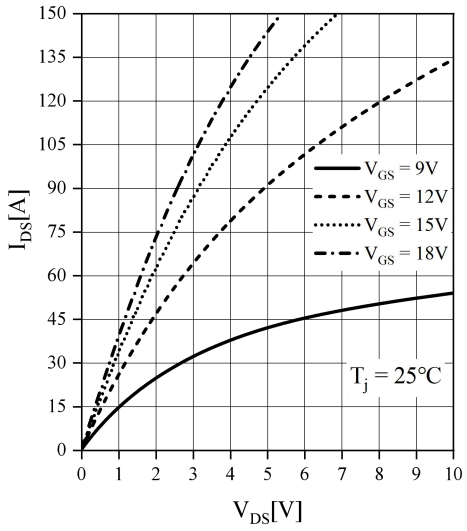


Figure 3. MOS Typical Output Characteristic

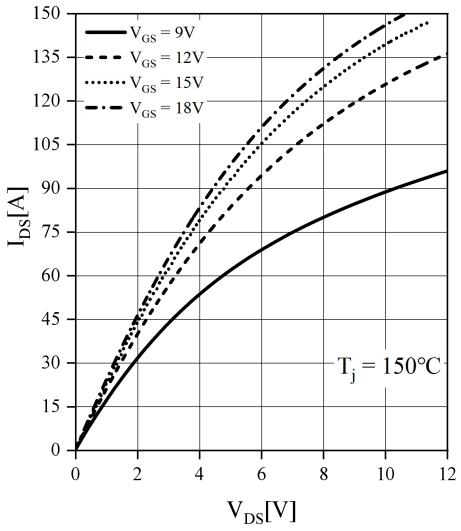


Figure 4. MOS Typical Output Characteristic

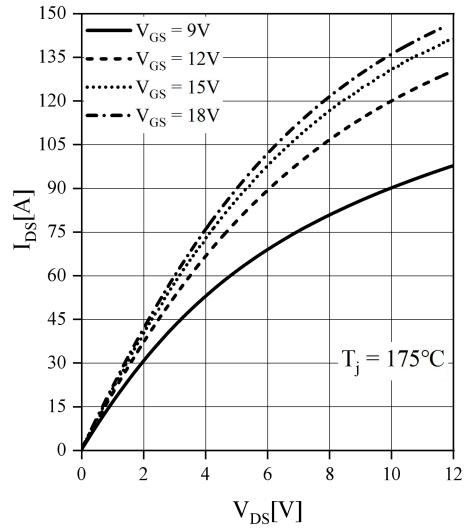


Figure 5. MOS Typical Output Characteristic

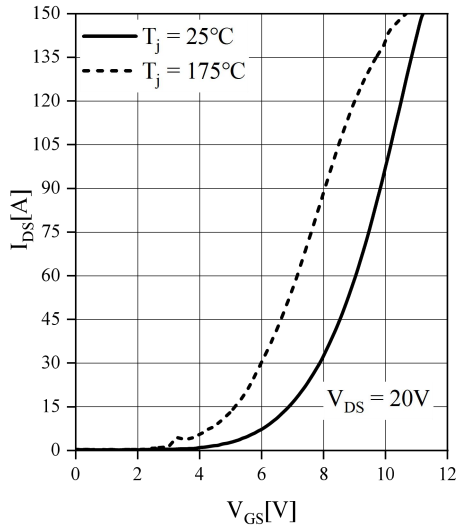


Figure 6. MOS Typical Transfer Characteristic

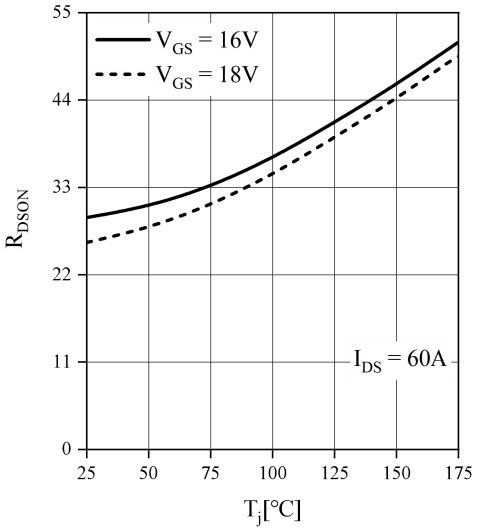


Figure 7. MOS Junction Temperature vs. R_{DSON}

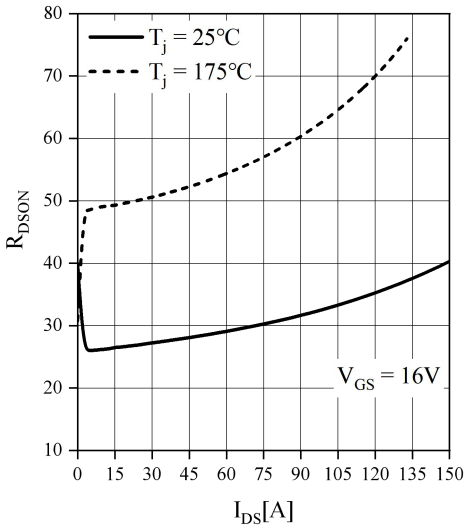


Figure 8. MOS Drain current vs. R_{DSON}

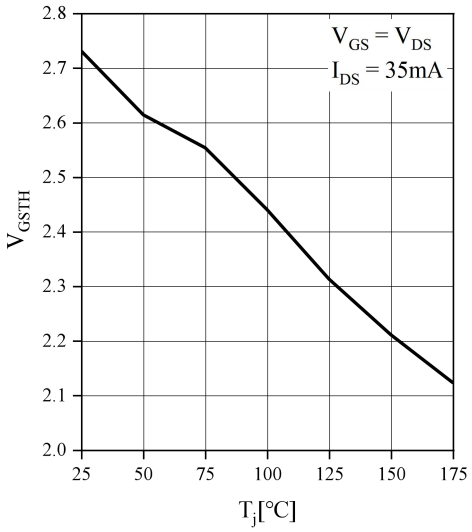


Figure 9. Threshold voltage vs. temperature

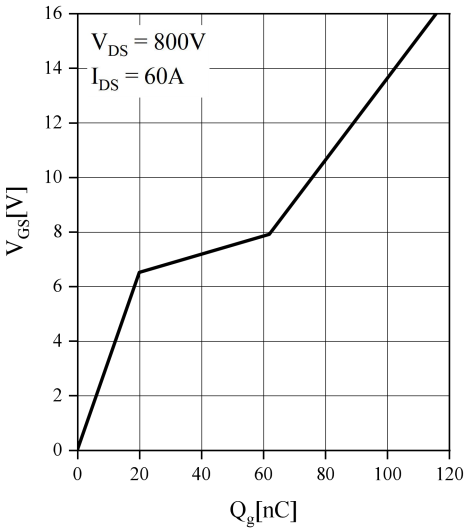


Figure 10. Gate charge characteristic

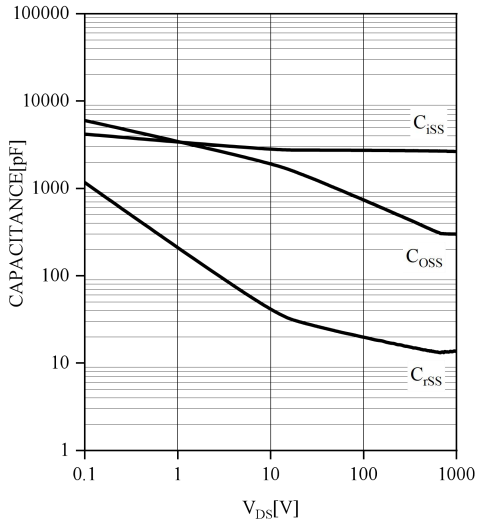


Figure 11. Capacitances vs. drain-source voltage

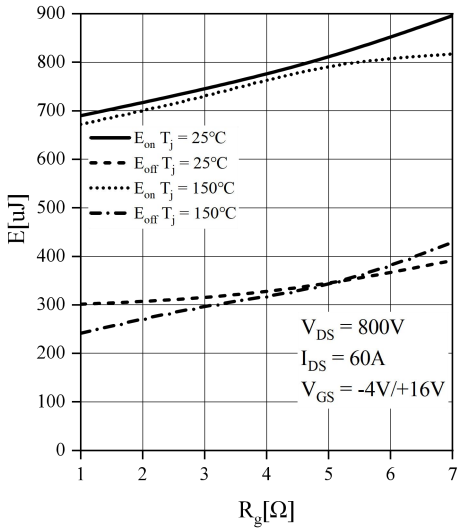


Figure 12. MOS Switching losses vs. R_G

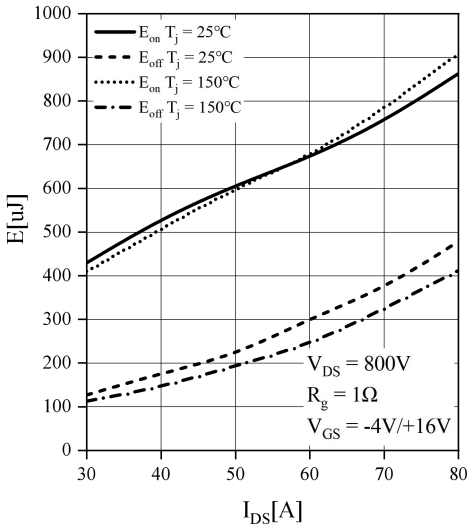


Figure 13. MOS Switching losses vs. I_C

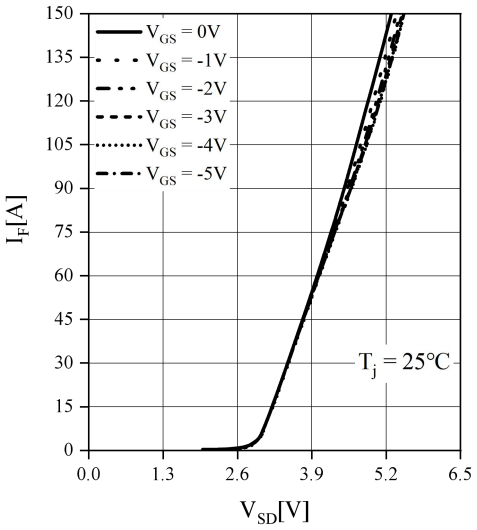


Figure 14. Diode forward characteristic

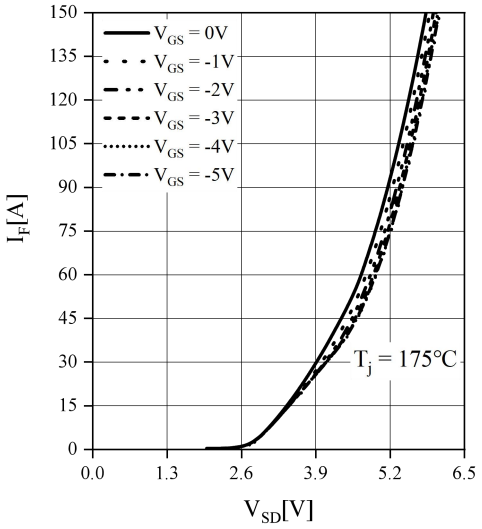


Figure 15. Diode forward characteristic

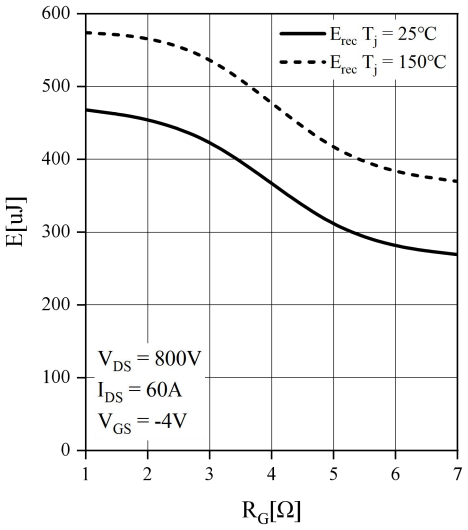


Figure 16. Diode switching losses vs. R_G

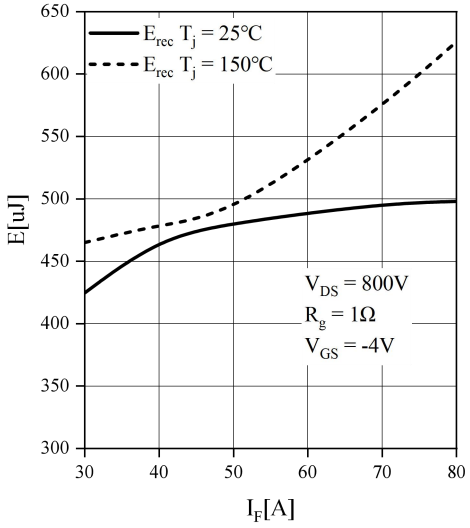


Figure 17. Diode switching losses vs. I_F

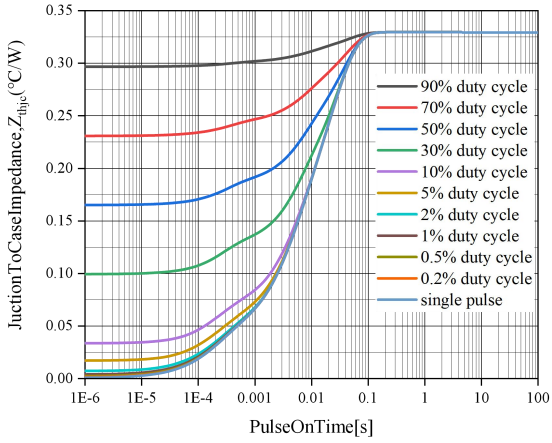
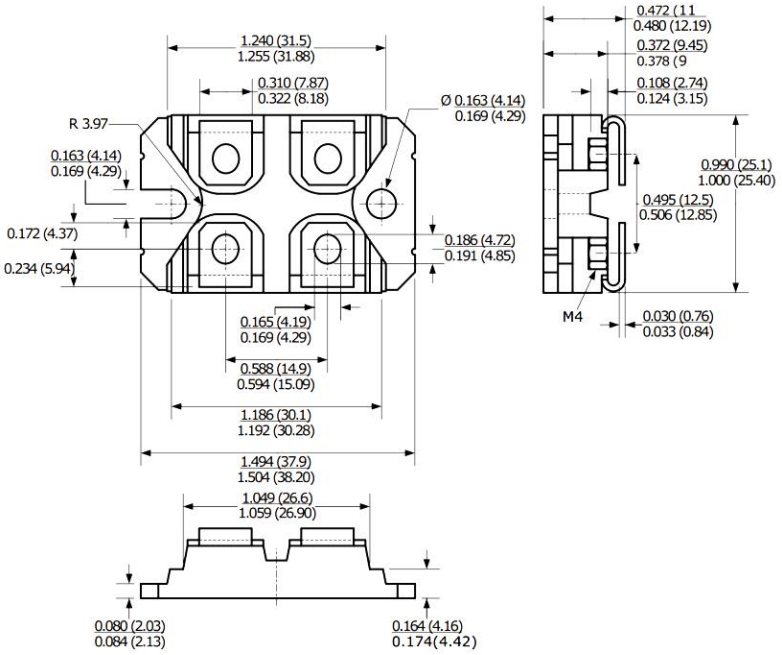


Figure 18. Transient thermal impedance (junction - case)

Package Drawing



UNIT:mm

Test conditions

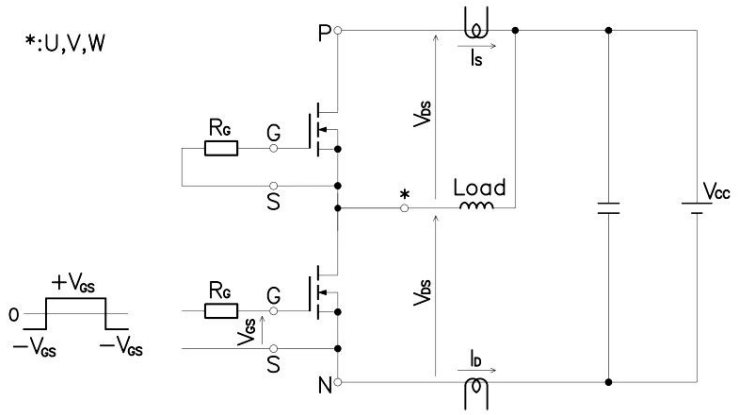


Figure 19. Switching time measure circuit

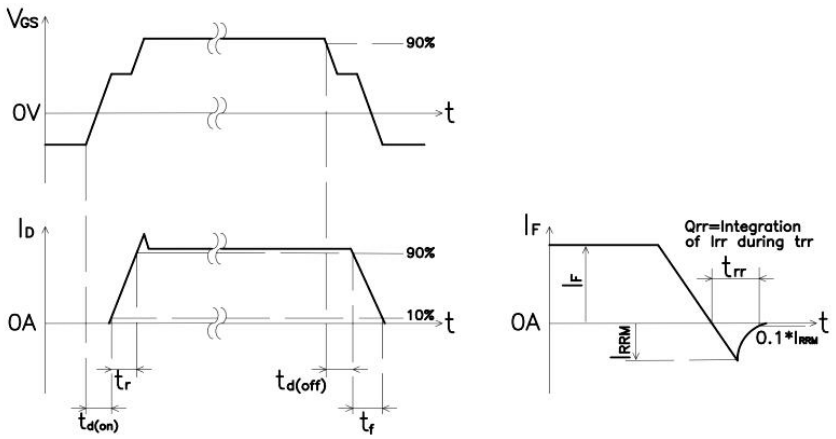


Figure 20. Switching time definition