DESCRIPTION

The AM120C029TL4-Q is an N-channel enhancement type planar MOSFET, available in TO-247-4 Package.

VDS	RDSON TYP.	ID
1200V	13mΩ	152A

APPLICATION

- Switching mode power supply
- Solar Inverters
- DC-DC Converter

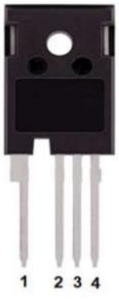
ORDERING INFORMATION

Package Type	Part Number	
TO-247-4 SPQ: 30pcs/Tube	TL4F	AM120C029TL4FU-Q
		AM120C029TL4FVU-Q
Note	R: Tape & Reel V: Halogen free Package	
AiT provides all RoHS products		

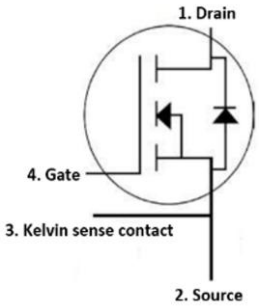
FEATURE

- Revolutionary semiconductor material
  - Silicon Carbide
- High blocking voltage with low on-resistance
- Fast intrinsic diode with low reverse recovery
- Low switching losses
- AEC-Q101 Qualified

PIN DESCRIPTION



TO-247-4



Pin#	Symbol	Function
1	D	Drain
2	S	Source
3	K	Kelvin Sense Contact
4	G	Gate

ABSOLUTE MAXIMUM RATINGS

T_C=25℃, unless otherwise noted.

V_{DSS}, Drain-to-Source Voltage		1200V
I_D, Continuous Drain Continuous	T_C=25℃	70A
	T_C=100℃	50A
I_{DM} (1), Pulsed Drain Current		160A
V_{GS}, Gate-to-Source Voltage		-10V ~ +25V
V_{GSop}, Recommended turn-on gate-to-source voltage, $V_{GS,on}$		-15V ~ +20V
V_{GSop}, Recommended turn-off gate-to-source voltage, $V_{GS,off}$		-4V
P_D, Power Dissipation at T_C=25℃		306W
T_{STG}, Storage Temperature Range		-40℃~+175℃
T_J, Operating Junction Temperature Range		-40℃~+175℃
T_L, Maximum Temperature for Soldering		260℃
$R_{\theta JA}$, Junction-to-Ambient		40℃/W

Stresses above may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the Electrical Characteristics are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

(1) Pulse width limited by maximum junction temperature

ELECTRICAL CHARACTERISTICS

T_C=25℃,unless otherwise noted.

Parameter	Symbol	Conditions	Min	Typ.	Max	Unit
OFF Characteristics						
Drain to Source Breakdown Voltage	V_{DSS}	V_{GS}=0V, I_D=100μA	1200	-	-	V
Drain to Source Leakage Current	I_{DSS}	V_{DS}=1200V, V_{GS}=0V, T_J=25℃	-	1	100	μA
Gate to Source Forward Leakage	$I_{GSS(F)}$	V_{GS} =+25V	-	-	100	nA
Gate to Source Reverse Leakage	$I_{GSS(R)}$	V_{GS} =-10V	-	-	-100	nA
ON Characteristics						
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS}=V_{DS}, I_{DS}=10.5mA, T_J=25℃	1.8	2.6	3.6	V
		V_{GS}=V_{DS}, I_{DS}=10.5mA, T_J=175℃	-	1.8	-	
Drain-to-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=15V, I_{DS}=35A, T_J=25℃	-	39	53	mΩ
		V_{GS}=18V, I_{DS}=35A, T_J=25℃	-	29	39	
		V_{GS}=20V, I_{DS}=35A, T_J=25℃	-	26	35	
		V_{GS}=15V, I_{DS}=35A, T_J=175℃	-	56	-	
		V_{GS}=18V, I_{DS}=35A, T_J=175℃	-	50	-	
		V_{GS}=20V, I_{DS}=35A, T_J=175℃	-	48	--	
Pulse width tp≤300μs, δ≤2%						
Dynamic Characteristics						
Gate Resistance	R_g	f=1MHz	-	3.3	-	Ω
Input Capacitance	C_{iss}	V_{DS}=1000V, V_{GS}=0V, f=1MHz	-	3686.6	-	pF
Output Capacitance	C_{oss}		-	107.4	-	
Reverse Transfer Capacitance	C_{rss}		-	4.8	-	
Switching Characteristics						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=800V, I_D=35A, R_G=2.5Ω, V_{GS}=-4V ~ +15V, Inductive Load T_J=25 ºC	-	14.4	-	ns
Turn-on Rise Time	t_r		-	32.6	-	
Turn-Off Delay Time	$t_{d(off)}$		-	30.4	-	
Turn-Off Fall Time	t_f		-	10.5	-	
Turn-on Energy	E_{on}		-	637.6	-	μJ
Turn-off Energy	E_{off}		-	183	-	
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=800V, I_D=35A, R_G=2.5Ω, V_{GS}=-4V ~ +18V, Inductive Load T_J=25 ºC	-	12.5	-	ns
Turn-on Rise Time	t_r		-	21.1	-	
Turn-Off Delay Time	$t_{d(off)}$		-	33.6	-	
Turn-Off Fall Time	t_f		-	10.2	-	

Turn-on Energy	E_{on}		-	518.6	-	µJ
Turn-off Energy	E_{off}		-	181	-	
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=800V, I_D=35A, R_G=2.5Ω, V_{GS}=-4V ~ +20V, Inductive Load T_J=25 ºC	-	11.5	-	ns
Turn-on Rise Time	t_r		-	18.9	-	
Turn-Off Delay Time	$t_{d(off)}$		-	35.8	-	
Turn-Off Fall Time	t_f		-	9.9	-	
Turn-on Energy	E_{on}		-	475.6	-	µJ
Turn-off Energy	E_{off}		-	179.1	-	
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=800V, I_D=35A, R_G=2.5Ω, V_{GS}=-4V ~ +15V, Inductive Load T_J=175 ºC	-	11.5	-	ns
Turn-on Rise Time	t_r		-	19.8	-	
Turn-Off Delay Time	$t_{d(off)}$		-	41.6	-	
Turn-Off Fall Time	t_f		-	11.5	-	
Turn-on Energy	E_{on}		-	502.7	-	µJ
Turn-off Energy	E_{off}		-	217.9	-	
Total Gate Charge	Q_g	V_{DS}=800V, I_D=35A V_{GS}=-4V ~ +15V, T_J=25 ºC	-	94	-	nC
Gate-Source Charge	Q_{gs}		-	38.5	-	
Gate-Drain Charge	Q_{gd}		-	19.8	-	
Source-Drain Diode Characteristics						
Continuous Source Current (Body Diode)	I_S	T_C=25℃	-	-	70	A
Maximum Pulsed Current (Body Diode)	I_{SM}		-	-	160	A
Drain Forward Voltage	V_{SD}	I_S=35A, V_{GS}= -4V, T_J=25 ºC	-	5.3	-	V
		I_S=35A, V_{GS}= -4V, T_J=175 ºC	-	4.7	-	
Reverse Recovery Time	T_{rr}	I_S=35A ,T_J=25℃ dI$_F$/dt=2250A/us, V_{DD}=800V	-	18.5	-	nS
Reverse Recovery Charge	Q_{rr}		-	279	-	nC
Reverse Recovery Current	Irrm		-	27.1	-	A

TYPICAL PERFORMANCE CHARACTERISTICS

Fig 1. Output Characteristics, T_J = -40℃

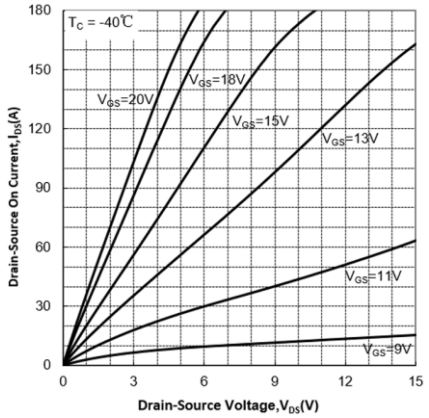


Fig 2. Output Characteristics, T_J =25℃

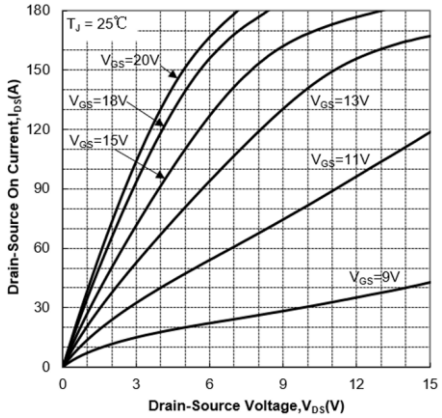


Fig 3. Output Characteristics, T_J =175℃

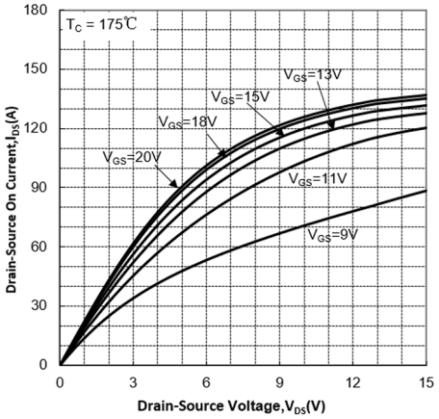


Fig 4. On-Resistance vs. Temperature for Various Gate Voltage

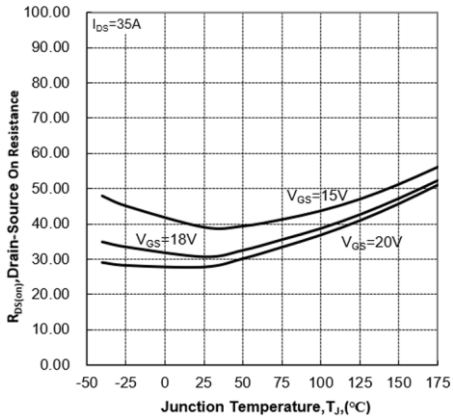


Fig 5. Transfer Characteristic for Various Junction Temperatures

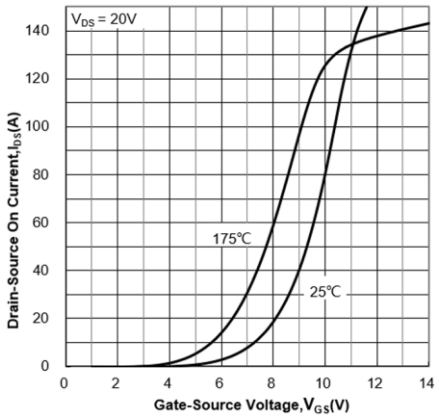


Fig 6. Normalized gate-source threshold voltage vs. Temperature

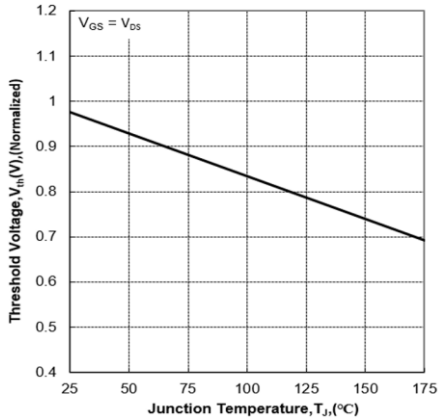


Fig 7. Body Diode Characteristic at -40℃

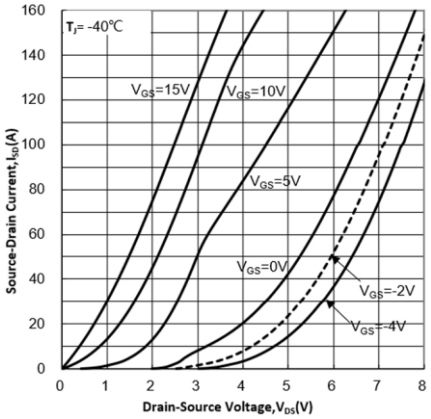


Fig 8. Body Diode Characteristic at 25℃

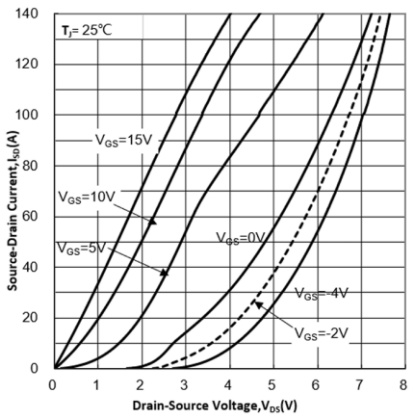


Fig 9. Body Diode Characteristic at 175℃

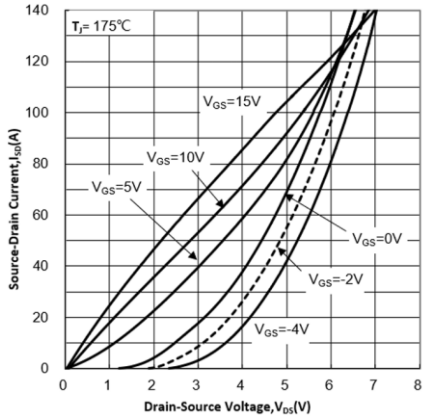


Fig 10. Gate Charge Characteristics

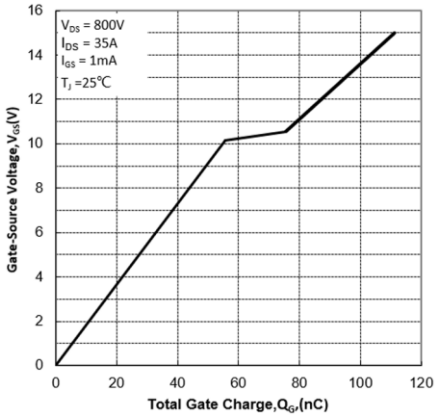
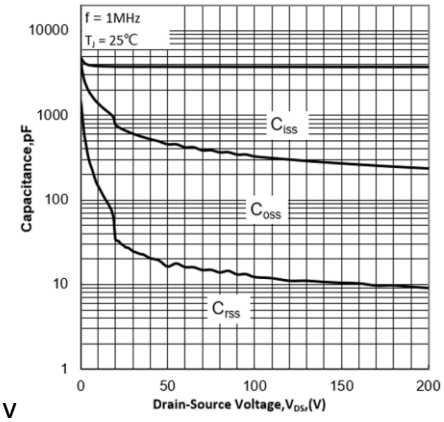


Fig 11. Capacitances vs. Drain-Source Voltage (0-200V)



V

Fig 12. Capacitances vs. Drain-Source Voltage (0-1000V)

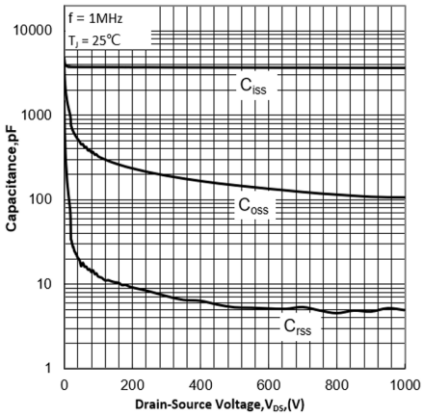


Fig 13. Continuous Drain Current Derating vs. Case Temperature

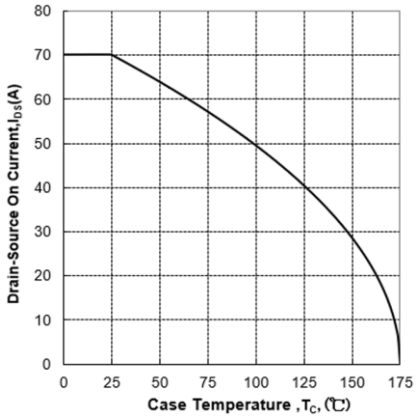


Fig 14. Maximum Power Dissipation Derating vs. Case Temperature

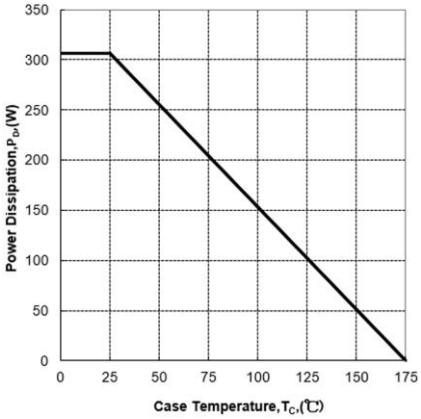


Fig 15. Transient Thermal Impedance (Junction - Case)

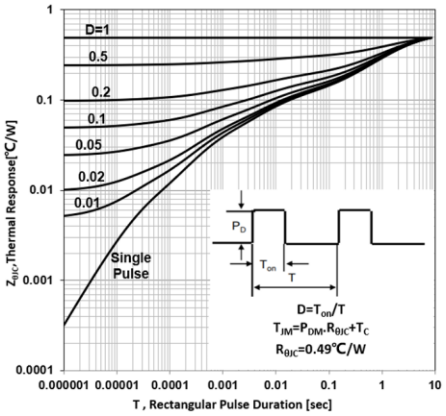


Fig 16. Safe Operating Area

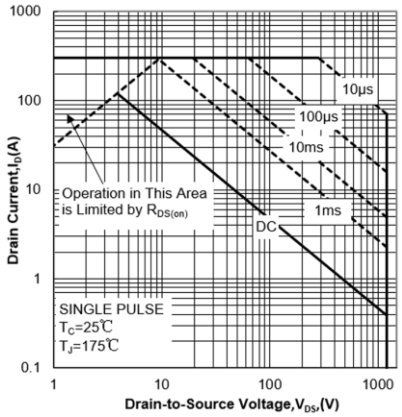


Fig 17. Clamped Inductive Switching Energy vs. Drain Current (VGS=-4V/+15V)

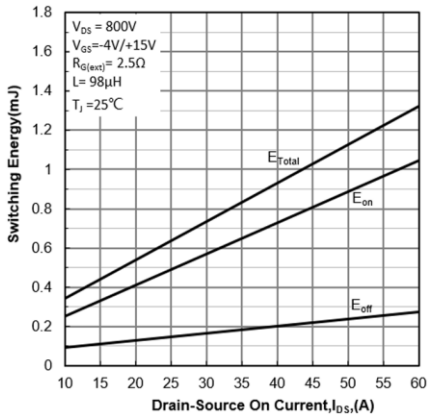


Fig 18. Clamped Inductive Switching Energy vs. Drain Current (VGS=-4V/+18V)

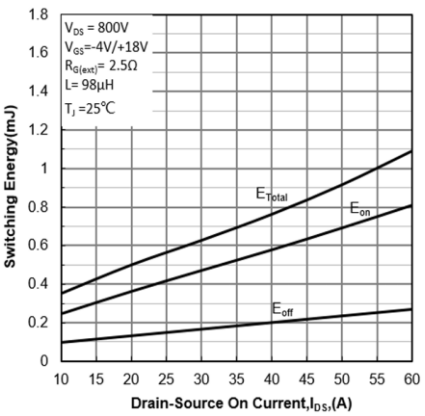


Fig 19. Clamped Inductive Switching Energy vs. Drain Current (VGS=-4V/+20V)

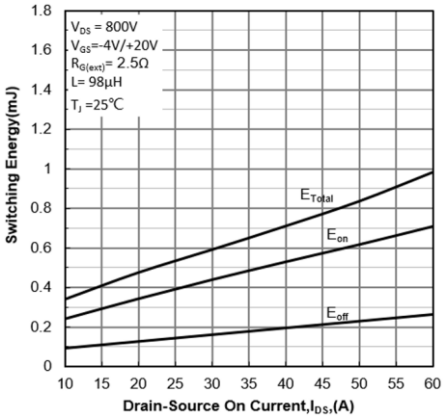


Fig 20. Clamped Inductive Switching Energy vs. RG(ext)

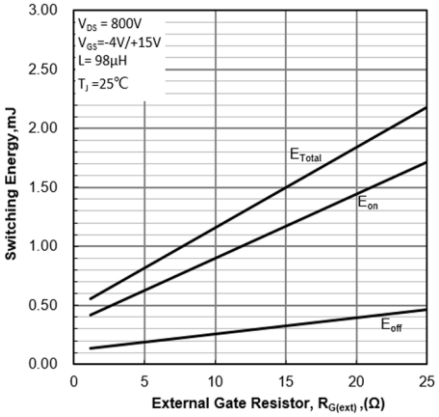


Fig 21. Clamped Inductive Switching Energy vs. Temperature (VGS=-4V/+15V)

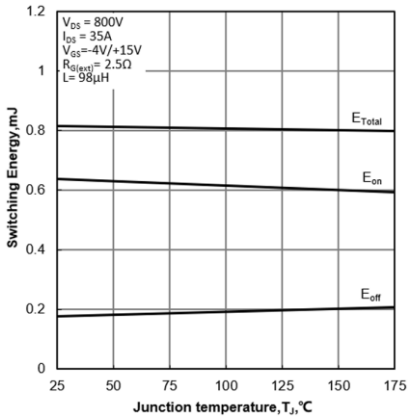


Fig 22. Clamped Inductive Switching Energy vs. Temperature (VGS=-4V/+18V)

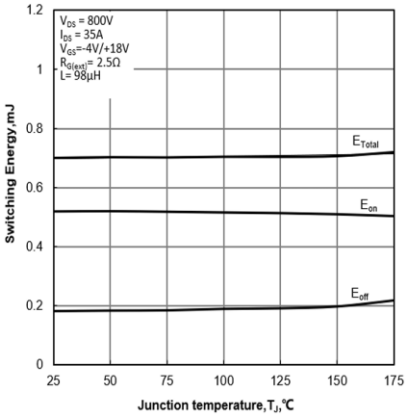


Fig 23. Clamped Inductive Switching Energy vs. Temperature (VGS=-4V/+20V)

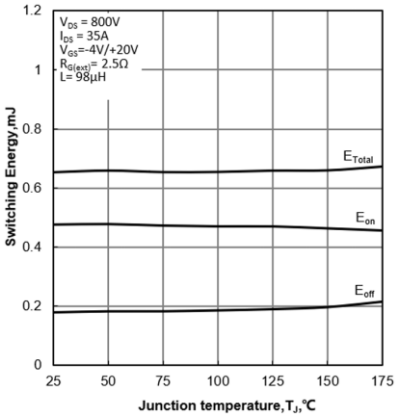


Fig 24. Switching Times vs. RG(ext)

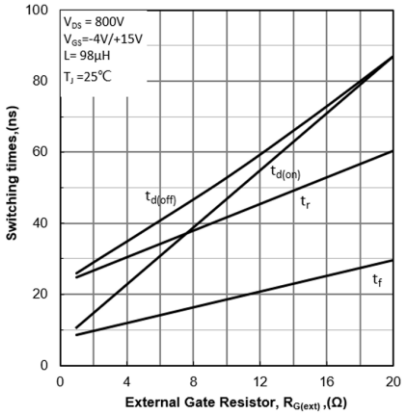


Fig 25. Gate Charge Test Circuit

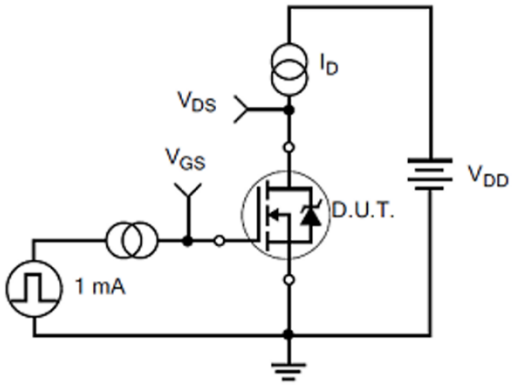


Fig 26. Gate Charge Waveforms

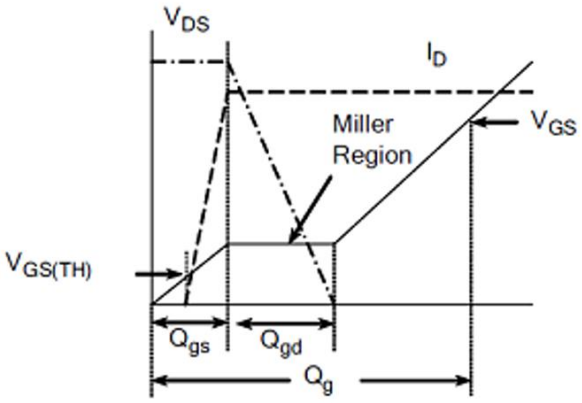


Fig 27. Inductive Switching Test Circuit

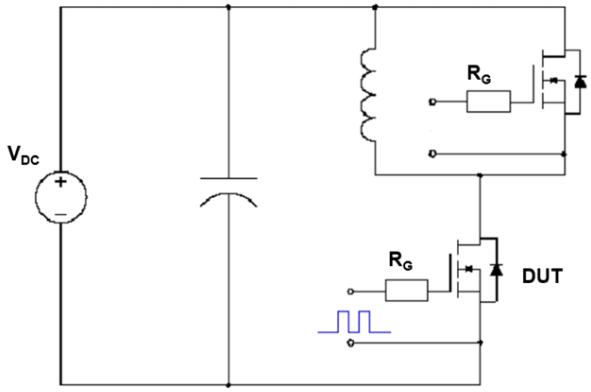


Fig 28. Diode Reverse Recovery Waveform

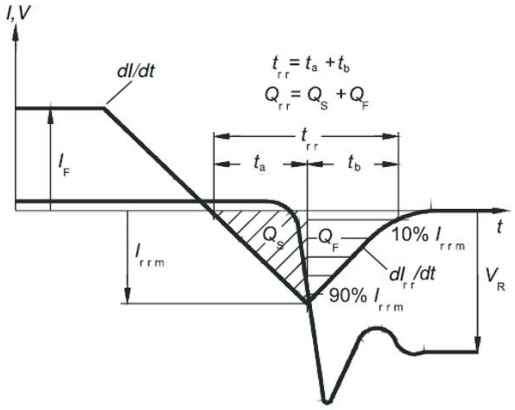


Fig 29. Definition of Switching Times

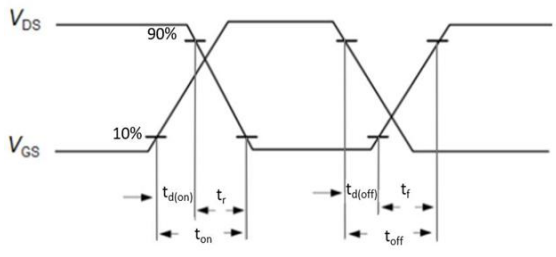
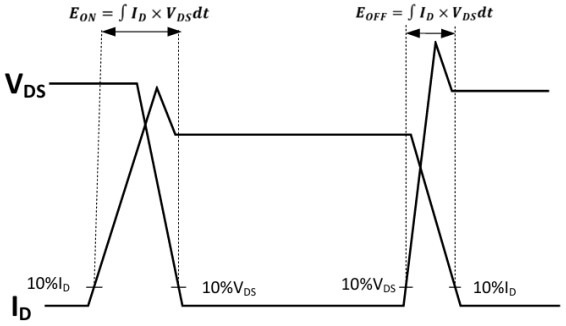
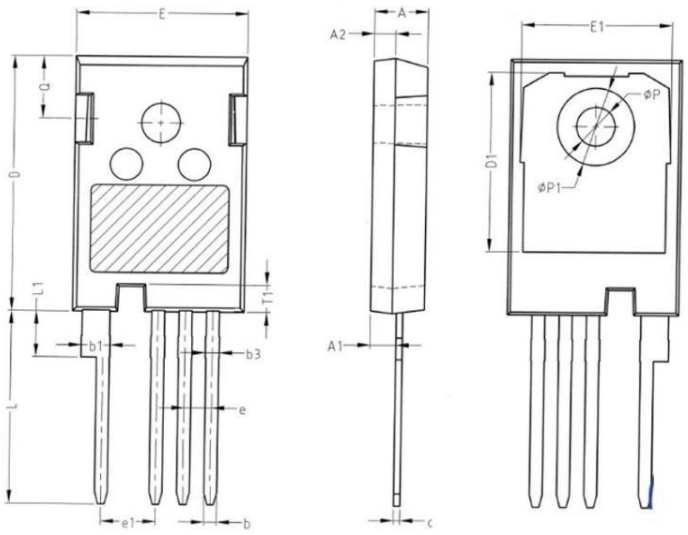


Fig 30. Definition of switching losses



PACKAGE INFORMATION

Dimension in TO-247-4 (Unit: mm)



Symbol	Millimeters (mm)	
	Min.	Max.
A	4.800	5.200
A1	2.210	2.610
A2	1.800	2.200
b	1.060	1.360
b1	2.330	2.930
b2	2.390	2.940
b3	1.070	1.600
c	0.510	0.750
D	23.300	23.600
D1	16.250	16.850
E	15.740	16.140
E1	13.720	14.320
T1	2.350	2.650
Q	5.490	6.090
e	2.540 BSC.	
e1	5.080 BSC.	
N	4.000	
L	17.270	17.870
L1	3.990	4.390
ΦP	3.400	3.800
ΦP1	7.190 REF.	

IMPORTANT NOTICE

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