VIS30023

30V N-Channel Power Trench MOSFET

General Description

- Trench Power MOSFET Technology
- Low $R_{DS(ON)}$
- Optimized for High Reliable Switch Application
- High Current Capability
- RoHS and Halogen-Free Compliant

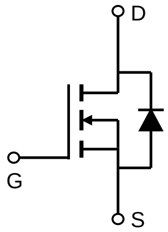
Applications

- Motor Drive
- Load Switch
- Battery Protection
- General DC/DC Converters

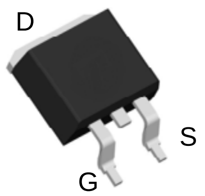
Product Summary

V_{DS}		30V
I_D	(at V_{GS}=10V)	183A
$R_{DS(ON)}$	(at V_{GS}=10V, typ)	2.3mΩ
$R_{DS(ON)}$	(at V_{GS}=4.5V, typ)	2.7mΩ

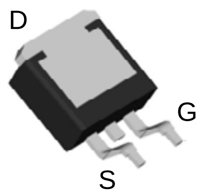
100% UIS Tested
100% R_G Tested



TOP VIEW



BOTTOM VIEW



Orderable Part Number	Package Type	Form	Minimum Order Quantity
VIS30023	TO-263	Tape & Reel	3000

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	30	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current (5)	T_C=25°C	I_D	183	A
	T_C=100°C		116	
Pulsed Drain Current (3)		I_{DM}	449	
Continuous Drain Current	T_A=25°C	I_{DSM}	40	A
	T_A=70°C		32	
Avalanche Current (3)		I_{AS}	65	A
Avalanche energy	L=0.1mH (3)	E_{AS}	211	mJ
Power Dissipation (2)	T_C=25°C	P_D	140	W
	T_C=100°C		56.1	
Power Dissipation (1)	T_A=25°C	P_{DSM}	6.8	W
	T_A=70°C		4.3	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient (1)	t ≤ 10s	$R_{θJA}$	15.3	18.4	°C/W
Maximum Junction-to-Ambient (1,4)	Steady-State		67.9	81.5	°C/W
Maximum Junction-to-Case	Steady-State	$R_{θJC}$	0.74	0.89	°C/W

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ	Max	Units
STATIC PARAMETERS							
BV_{DSS}	Drain-Source Breakdown Voltage	I_D=250mA, V_{GS}=0V		30			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=30V, V_{GS}=0V				1	μA
			T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±20V				±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=$V_{GS,}$ I_D=250mA		1.4	1.8	2.2	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=20A			2.3	2.8	mΩ
			T_J=125°C		2.5		
		V_{GS}=4.5V, I_D=20A			2.7	3.3	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=20A			120		S
V_{SD}	Diode Forward Voltage	I_S=1A, V_{GS}=0V			0.69		V
I_S	Maximum Body-Diode Continuous Current					140	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz			6335		pF
C_{oss}	Output Capacitance				756		pF
C_{rss}	Reverse Transfer Capacitance				367		pF
R_g	Gate resistance	f=1MHz			0.8		Ω
SWITCHING PARAMETERS							
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=15V, I_D=20A			104		nC
Q_g(4.5V)	Total Gate Charge				51		nC
Q_{gs}	Gate Source Charge				15		nC
Q_{gd}	Gate Drain Charge				18		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=0.75W, R_{GEN}=3W			8.6		ns
t_r	Turn-On Rise Time				9.6		ns
$t_{D(off)}$	Turn-Off DelayTime				58.4		ns
t_f	Turn-Off Fall Time				22.8		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=20A, di/dt=500A/ms			29.3		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=20A, di/dt=500A/ms			20.5		nC

1) $R_{\theta JA}$ is measured with the stand-alone device, without PCB, in a still air environment with T_A =25°C. The Power dissipation P_{DSM} is based on $R_{\theta JA}$ t≤ 10s and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design.
2) The power dissipation P_D is based on $T_{J(MAX)}$=150°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.
3) Single pulse width limited by junction temperature $T_{J(MAX)}$=150°C.
4) $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.
5) The maximum current rating is package limited.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

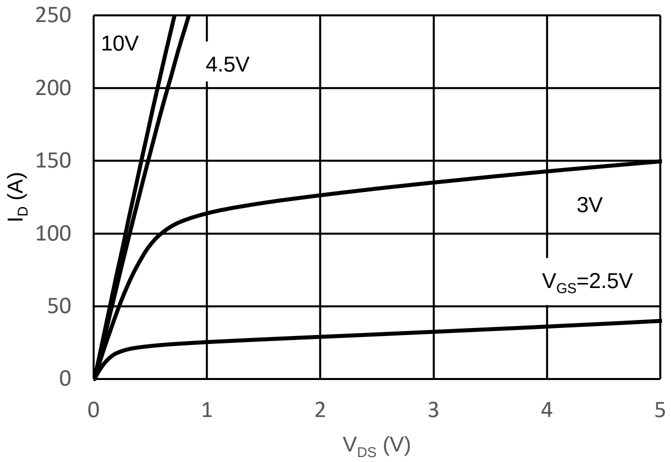


Fig 1. Typical Output Characteristics

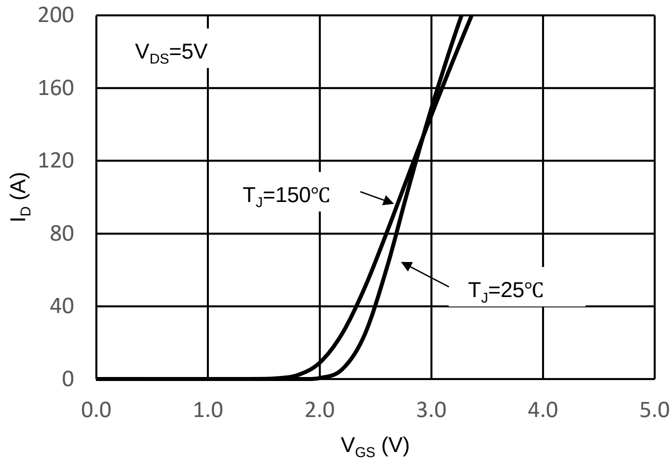


Fig 2. Typical Transfer Characteristics

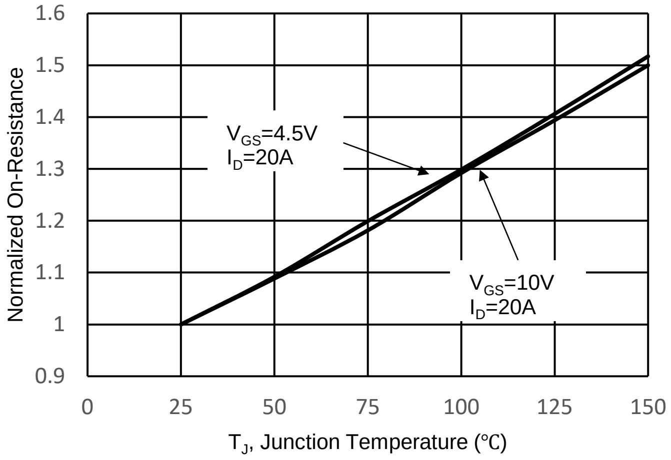


Fig 3. Normalized On-Resistance vs. Temperature

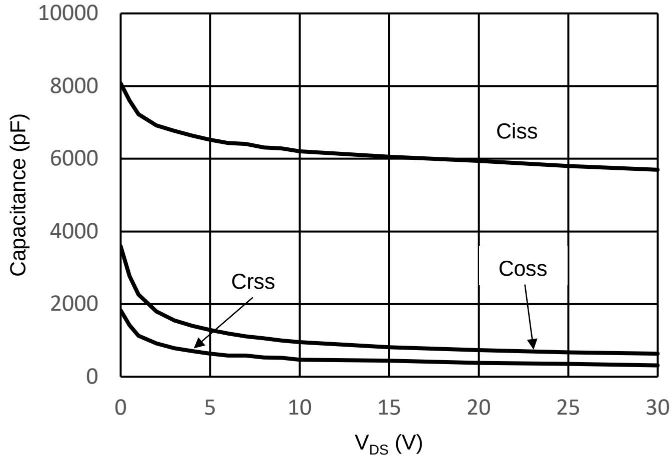


Fig 4. Typical Capacitance vs. V_{DS}

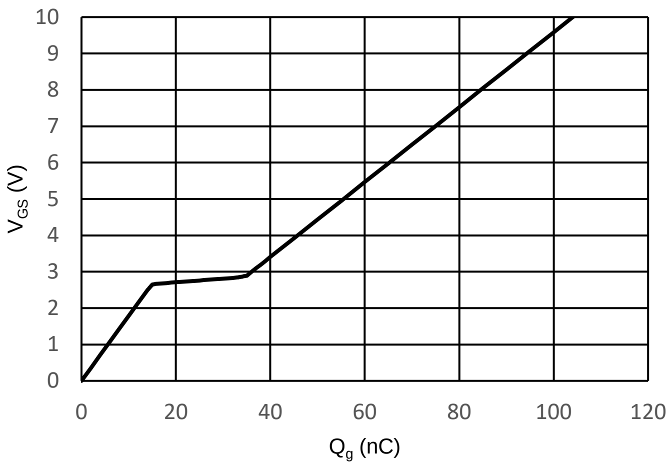


Fig 5. Typical Gate Charge vs. V_{GS}

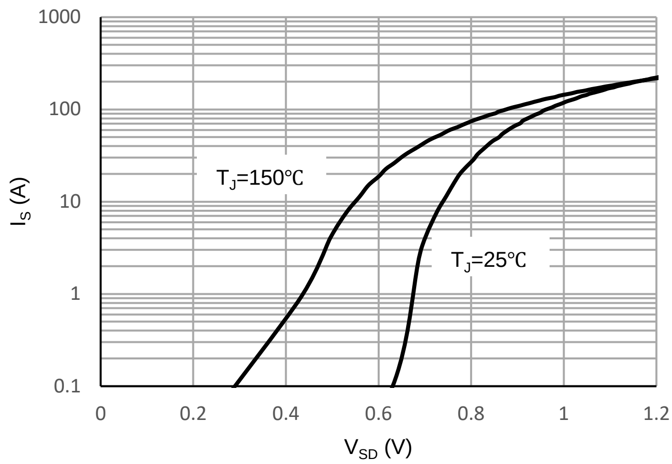


Fig 6. Typical Sourse-Drain Diode Forward Voltage

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

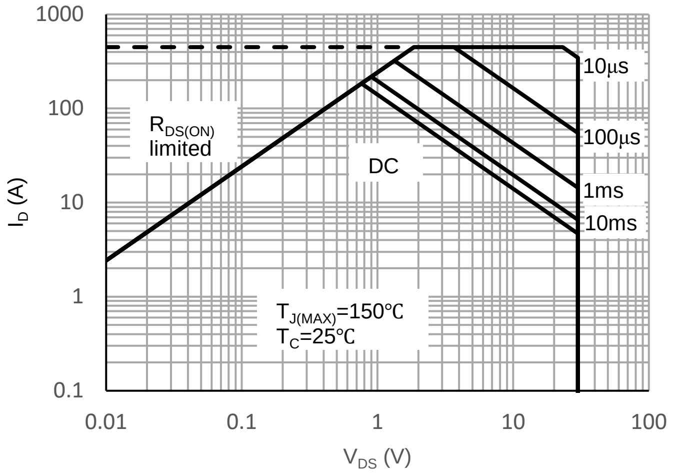


Fig 7. Maximum Safe Operating Area

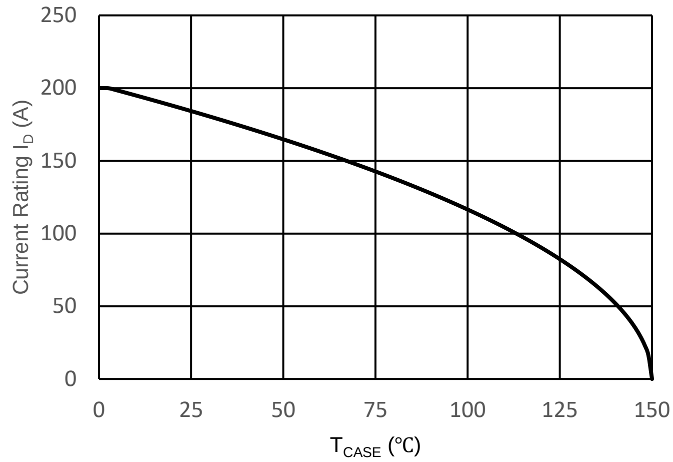


Fig 8. Maximum Drain Current vs. Case Temperature

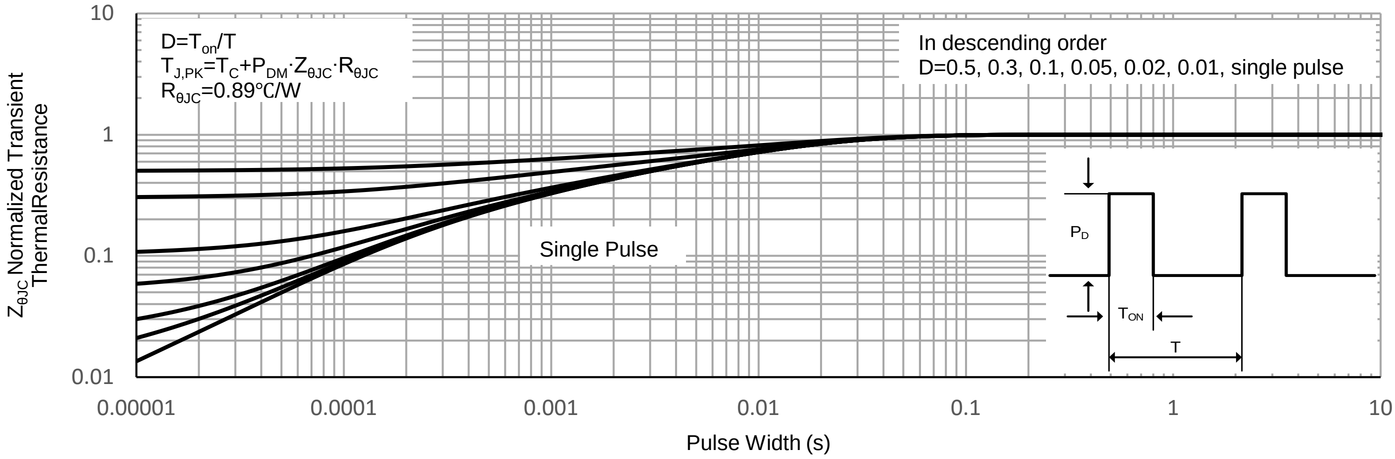


Fig 9. Normalized Maximum Transient Thermal Impedance, Junction-to-Case

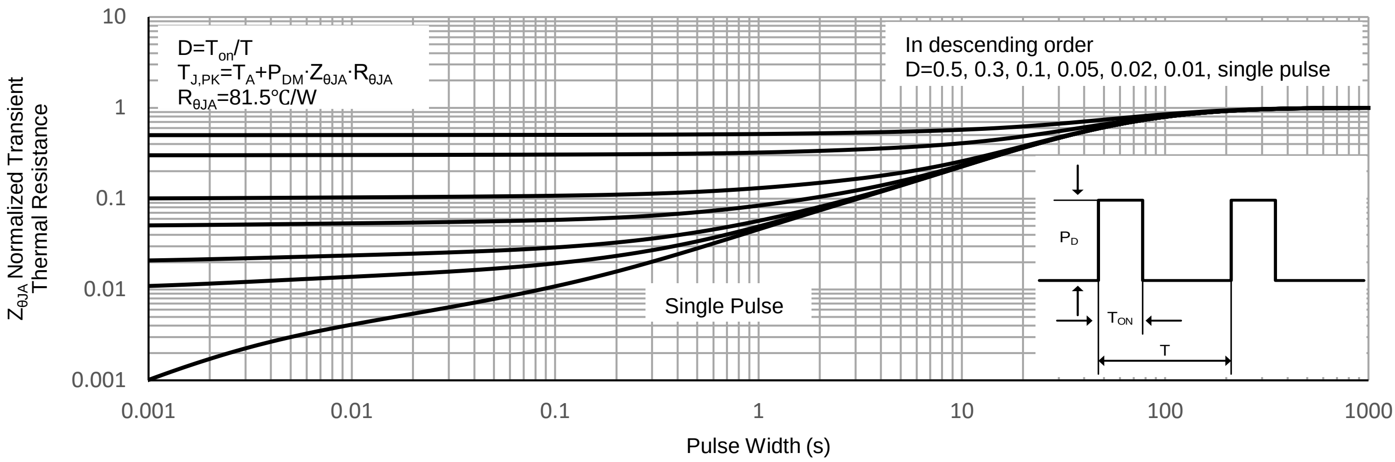


Fig 10. Normalized Maximum Transient Thermal Impedance, Junction-to-Ambient

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

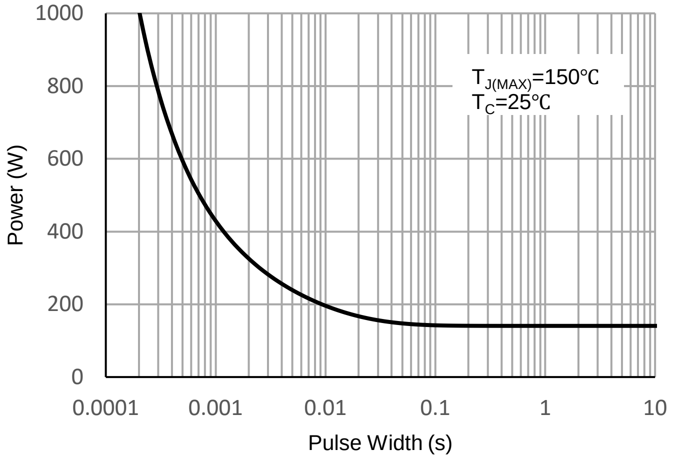


Fig 11. Single Pulse Power Rating Junction-to-Case

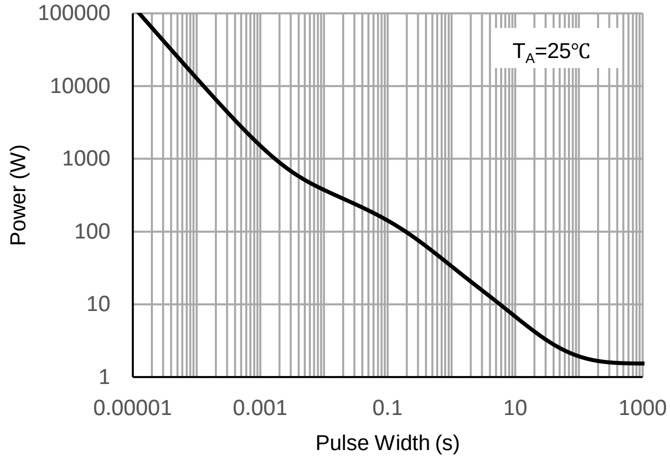


Fig 12. Single Pulse Power Rating Junction-to-Ambient

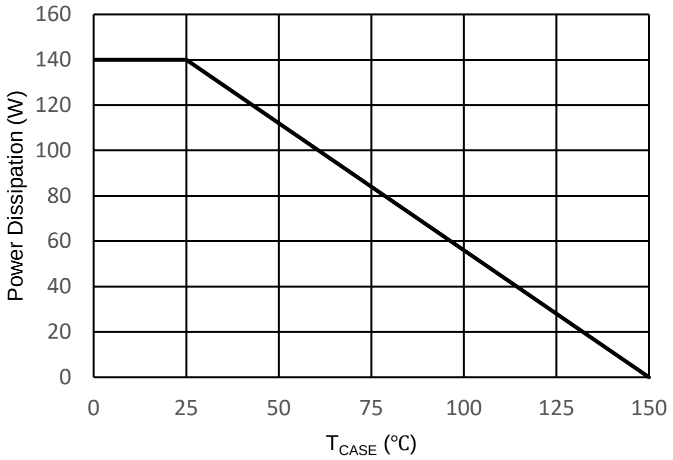


Fig 13. Maximum Power Rating vs. Temperature

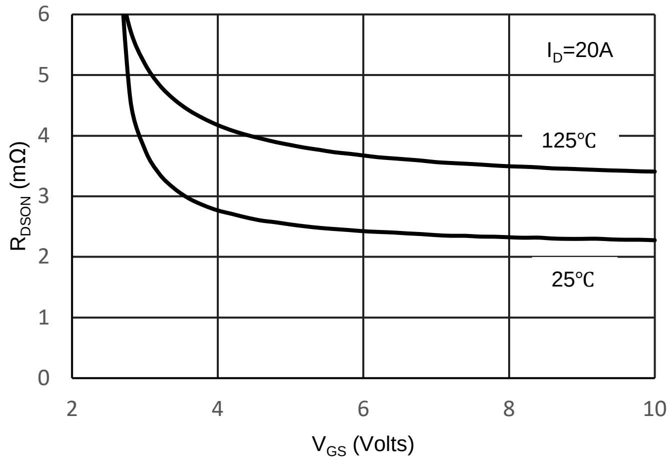


Fig 14. Maximum Power Rating vs. V_{GS}

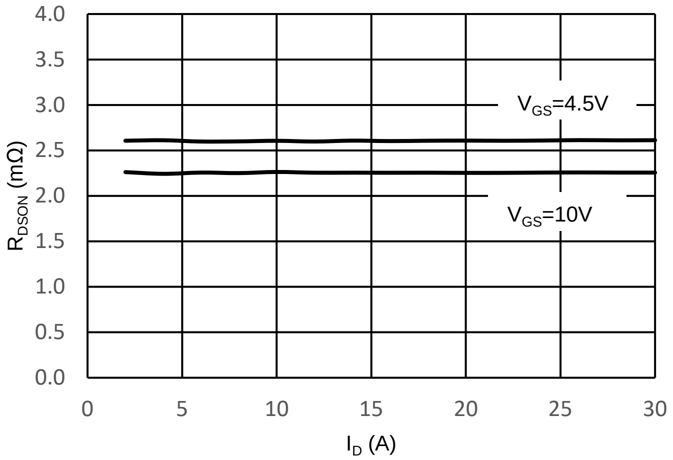


Fig 15. On-Resistance vs. Drain Current

TEST CIRCUIT

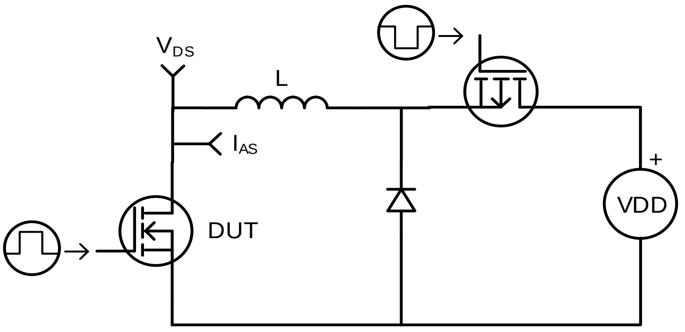


Fig16. Unclamped Inductive Test Circuit

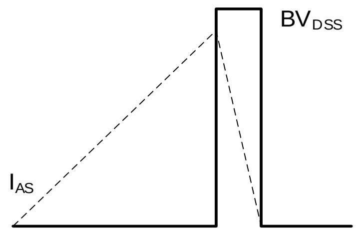


Fig17. Unclamped Inductive Waveform

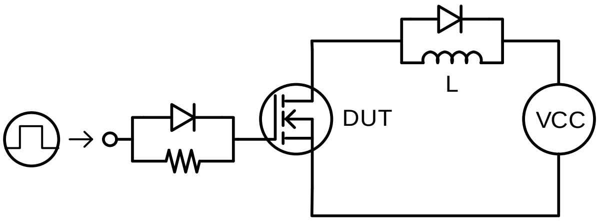


Fig18. Q_g Test Circuit

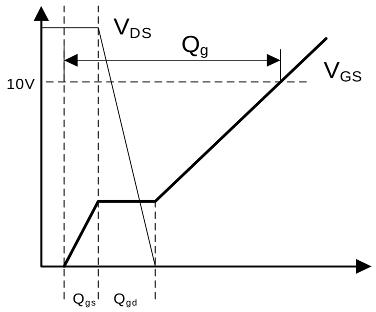


Fig19. Q_g Waveform

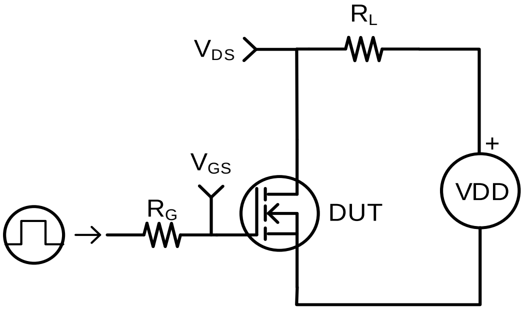


Fig18. Resistive Switching Test Circuit

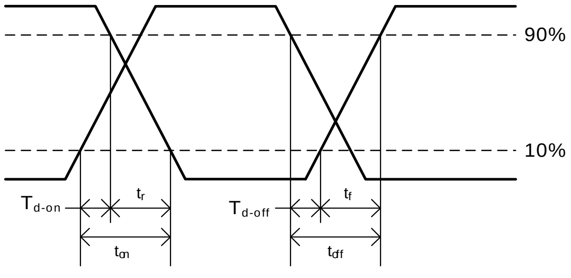


Fig19. Switching Time Waveform

TEST CIRCUIT

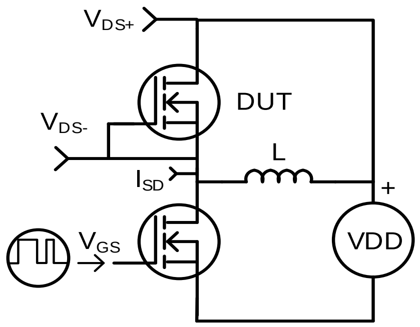


Fig20. Diode Recovery Test Circuit

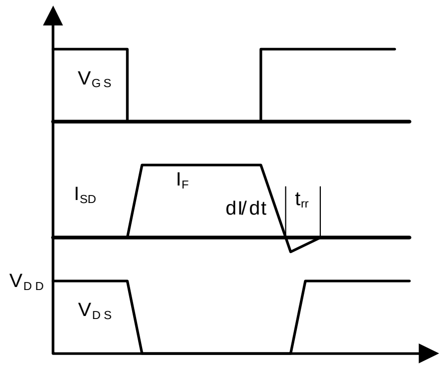
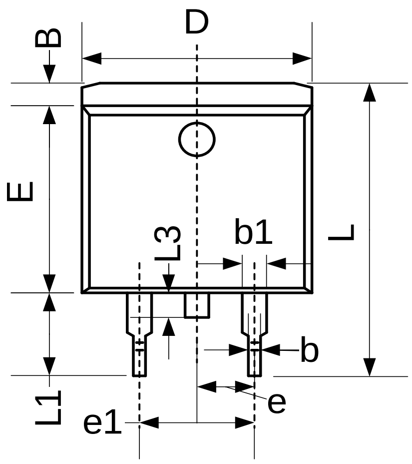
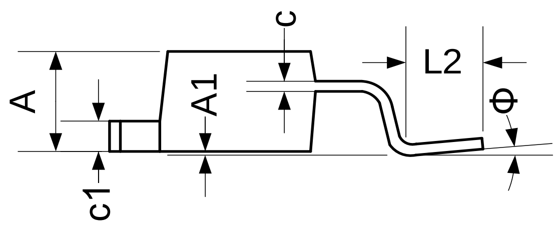
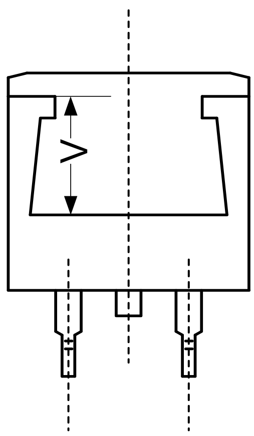


Fig21. Diode Recovery Test Waveform







SYMBOL	MILLIMITERS	
	MIN [mm]	MAX [mm]
A	4.470	4.670
A1	0.000	0.150
B	1.120	1.420
b	0.710	0.910
b1	1.170	1.370
c	0.310	0.530
c1	1.170	1.370
D	10.010	10.310
E	8.500	8.900
e	2.540 TYP.	
e1	4.980	5.180
L	14.940	15.500
L1	4.950	5.450
L2	2.340	2.740
L3	1.300	1.700
Φ	0°	8°
V	5.600 REF.	