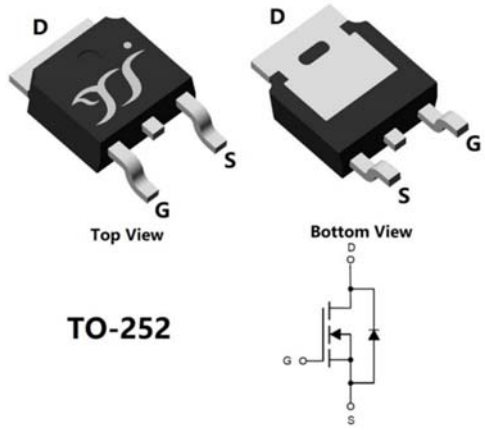
Silicon Carbide Power MOSFET （N-Channel Enhancement）

V_{DS}	750V
$I_{D\ (25°C)}$	22A
$R_{DS(on)}$	148mΩ



Features

- High speed switching
- Essentially no switching losses
- Reduction of heat sink requirements
- Maximum working temperature at 175 °C
- High blocking voltage
- Fast Intrinsic diode with low recovery current
- High-frequency operation
- Halogen free, RoHS compliant

Typical Applications

Typical applications are in power factor correction(PFC), solar inverter, uninterruptible power supply, motor drives, photovoltaic inverter, electric car and charger.

Mechanical Data

- **Package**: TO-252
- **Terminals**: Tin plated leads
- **Polarity**: As marked

■Maximum Ratings (Tc=25℃ unless otherwise specified)

PARAMETER	SYMBOL	UNIT	VALUE	TEST CONDITIONS	NOTE
Device marking code			D2075200DYG3		
Drain source voltage @ T_j=25°C	$V_{DS,max}$	V	750	V_{GS}=0V, I_D=100uA	
Gate source voltage @ T_j=25°C	$V_{GS,max}$	V	-8/+22	Absolute maximum values (AC f >1Hz, duty cycle < 1%)	
Gate source voltage @ T_j=25°C	$V_{GS,op}$	V	-5/+18	Recommended operational values	
Continuous drain current @ T_c=25°C	I_D	A	22	V_{GS}=18V, Tc=25℃	Fig.16
Continuous drain current @ T_c=100°C			14.2	V_{GS}=18V, Tc=100℃	
Pulsed drain current	$I_{D(pulsed)}$	A	39	Pulse width t_p limited by $T_{j,max}$	Fig.21
Avalanche energy, Single Pulse@ Tj=25°C	E_{AS}	mJ	140	V_{DD}=50V, L=10mH	
Power Dissipation	P_{TOT}	W	84.8	Tc=25°C , Tj = 175℃	Fig.15
Power Dissipation			43	Tc=100°C, Tj = 175℃	
Operating junction and Storage temperature range	Tj ,Tstg	°C	-55 to +175		
Soldering temperature	T_L	°C	260	1.6mm (0.063") from case for 10s	
Mounting torque	T_M	Nm	0.6	M3 screw Maximum of mounting process: 3	

■Static Electrical Characteristics (Tc=25℃ unless otherwise specified)

PARAMETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Gate threshold voltage	$V_{GS(th)}$	V	2	3.2	4	V_{DS}=V_{GS}, I_D= 1.8mA	Fig.4, 10
				2.4		V_{DS}=V_{GS}, I_D= 1.8mA, Tj=175℃	
Drain source breakdown voltage	$V_{(BR)DSS}$	V	750			V_{GS}=0V, I_D=100uA	
Drain source leakage current	I_{DSS}	uA		10	100	V_{DS}=750V, V_{GS}= 0V	
Gate source leakage current	I_{GSS}	nA		10	100	V_{GS}= 18V, V_{DS}=0V	
Current drain source on-state resistance	$R_{DS\ ON}$	mΩ		201		V_{GS}=15V, I_D=4.8A	Fig.5, 6, 7
				148		V_{GS}=18V, I_D=4.8A	
				197.7		V_{GS}=15V, I_D=4.8A,Tj=175℃	
				178.8		V_{GS}=18V, I_D=4.8A,Tj=175℃	
Transconductance	g_f	S		6.2		V_{DS}=20V,I_D=4.8A	Fig.4
				3.6		V_{DS}=20V,I_D=4.8A,Tj=175℃	

■Dynamic Electrical Characteristics (Tc=25℃ unless otherwise specified)

PARAMETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Input capacitance	Ciss	pF		594		VDS=500V, VGS=0V, Tj=25℃, f=1MHz, VAC = 25mV	Fig.12, 13
Output capacitance	Coss			55			
Reverse capacitance	Crss			2.6			
Coss stored energy	Eoss	uJ		8.2			Fig.14
Gate source charge	Qgs	nC		8.6		VDS=500V, VGS=-5/+18V, ID=5A	Fig.11
Gate drain charge	Qgd			12			
Gate charge	Qg			26.5			
Internal gate resistance	Rg	Ω		3.6		f=1MHz, VAC = 25mV	

■Switching Characteristics (Tc=25℃ unless otherwise specified)

PARAMETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Turn on delay time	$t_{d(on)}$	ns		20.1		V_{DD}=500V, V_{GS}=-5/+18V, I_D=5A, Rg=2.4Ω, L=100uH	Fig.20
Rise time	t_r			31			
Turn off delay time	$t_{d(off)}$	ns		12.1			
Fall time	t_f			46.1			
Turn on switching energy	E_{on}	uJ		242		V_{DD}=500V, V_{GS}=-5/+18V, I_D=5A, Rg=2.4Ω, L=100uH	Fig.18, 19
Turn off switching energy	E_{off}			9.8			

■Body diode characteristics (Tc=25℃ unless otherwise specified)

PARAMETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Diode forward voltage	V_{SD}	V		3		V_{GS}=0V,I_{SD}=2.4A	
				2.6		V_{GS}=0V, I_{SD}=2.4A, Tj=175℃	
Continuous diode forward current	I_S	A		13.8		V_{GS}=-5V,Tc=25℃	
Reverse recovery time	trr	nS		13.8		V_R=500V, V_{GS}=-5V, I_D=5A, di/dt=300A/uS	
Reverse recovery charge	Qrr	nC		16			
Peak reverse recovery current	Irrm	A		1.8			

■Thermal Characteristics (Ta=25℃ unless otherwise specified)

SYMBOL	PARAMETER	UNIT	Typ.
$R_{\theta J-C}$	Thermal Resistance from Junction to Case	°C /W	1.77

■Typical Characteristics

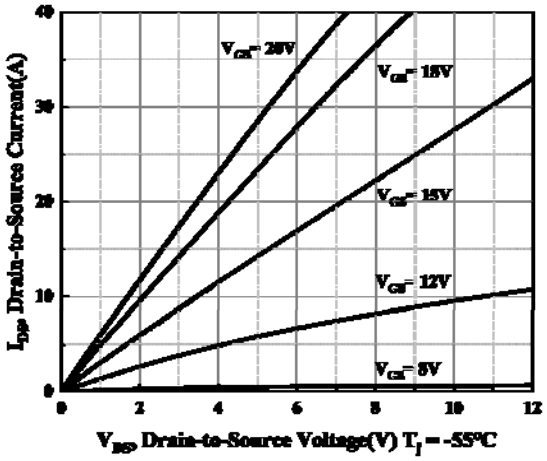


Figure 1. Output Characteristics T_j = -55℃

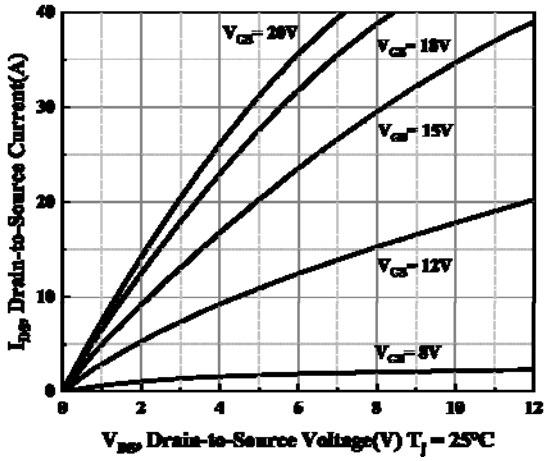


Figure2. Output Characteristics T_j = 25℃

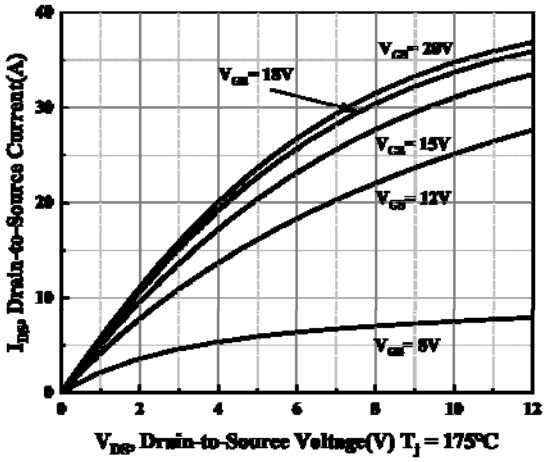


Figure 3. Output Characteristics T_j = 175℃

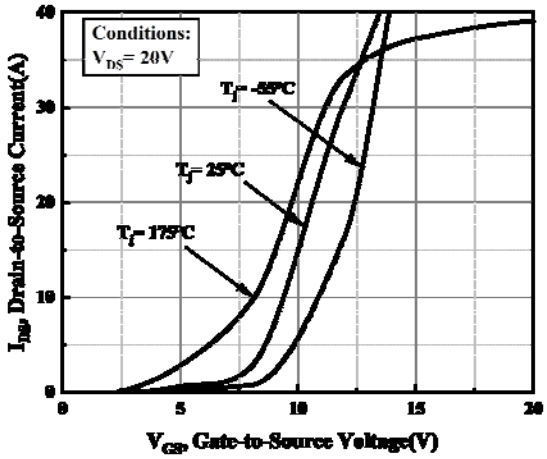


Figure 4. Transfer Characteristics for Various Junction Temperature

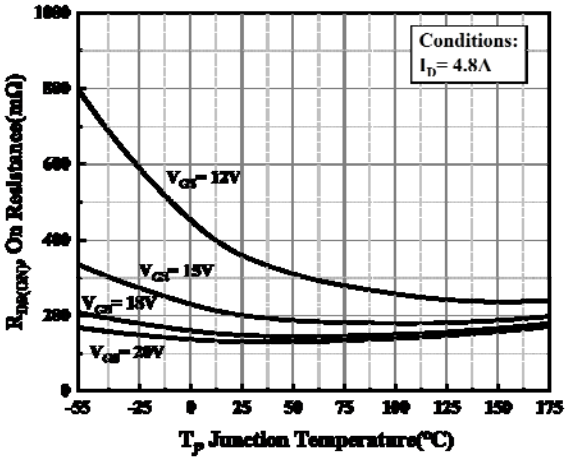


Figure 5. On-resistance vs. Temperature for Various Gate Voltage

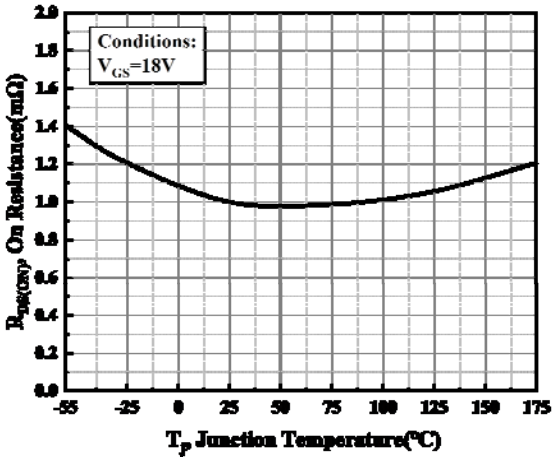


Figure 6. Normalized on-resistance vs. Temperature

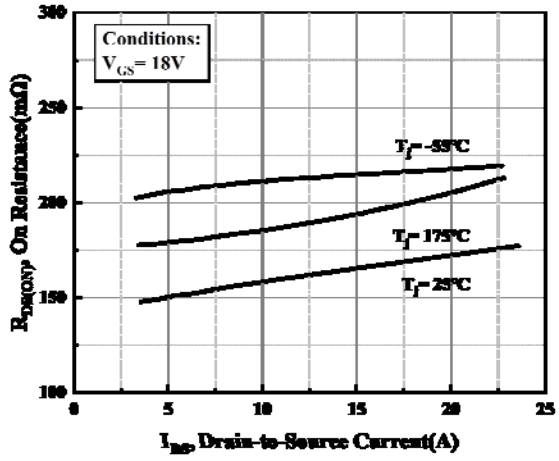


Figure 7. On-resistance vs. Drain Current

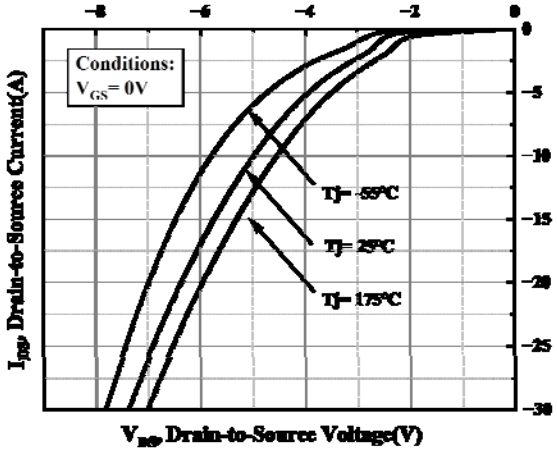


Figure 8. Body Diode Characteristic

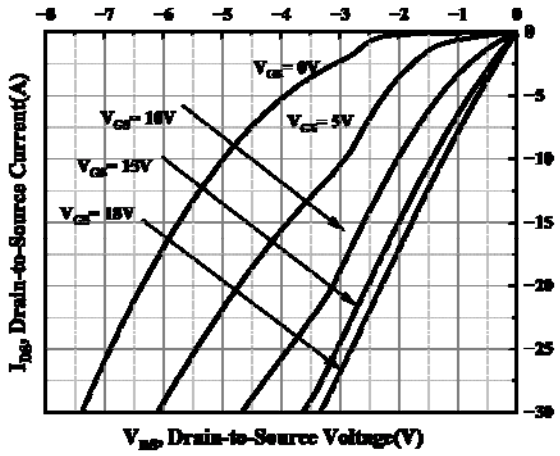


Figure 9. 3rd quadrant Characteristic at T_j= 25 ℃

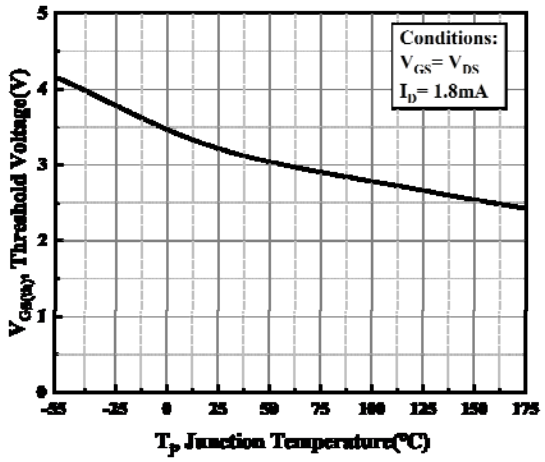


Figure 10. Threshold Voltage vs. Temperature

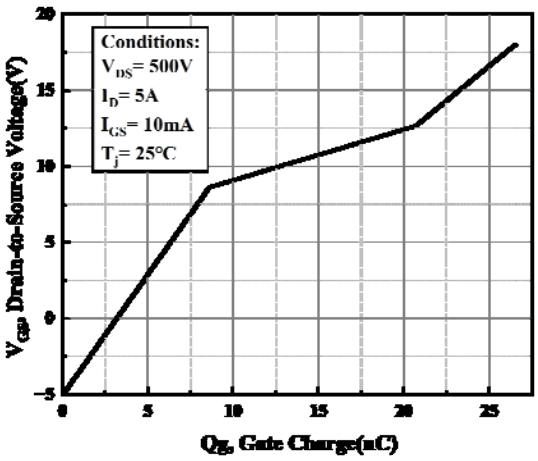


Figure 11. Gate Charge Characteristic Figure

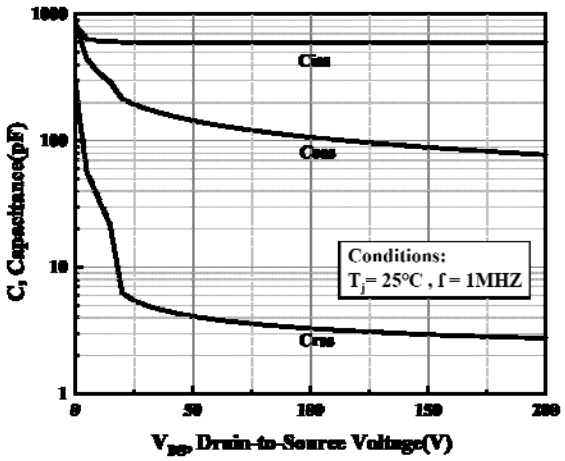


Figure 12. Capacitances vs. Drain Source Voltage (0-200V)

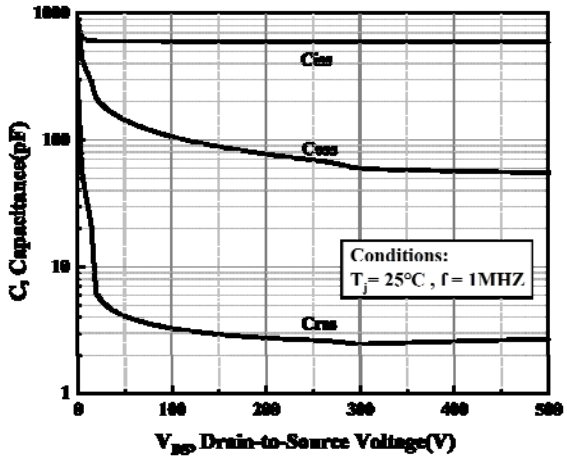


Figure 13. Capacitances vs. Drain Source Voltage (0-500V)

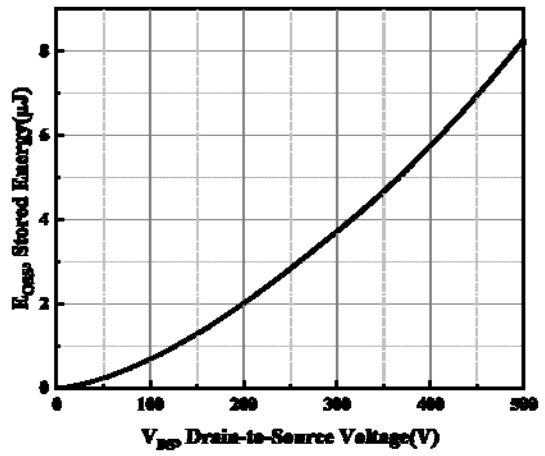


Figure 14. Output Capacitor Stored Energy

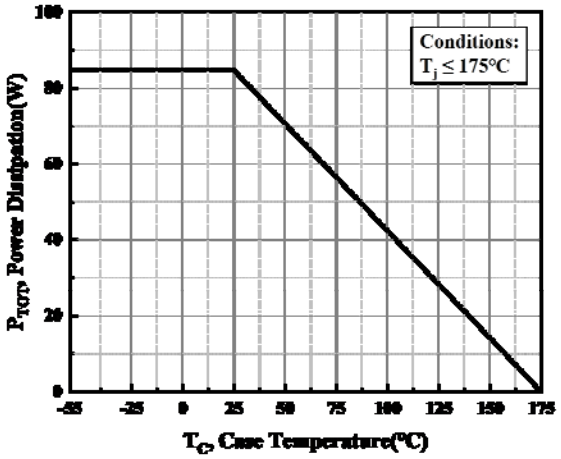


Figure 15. Maximum Power Dissipation Derating vs. Case Temperature

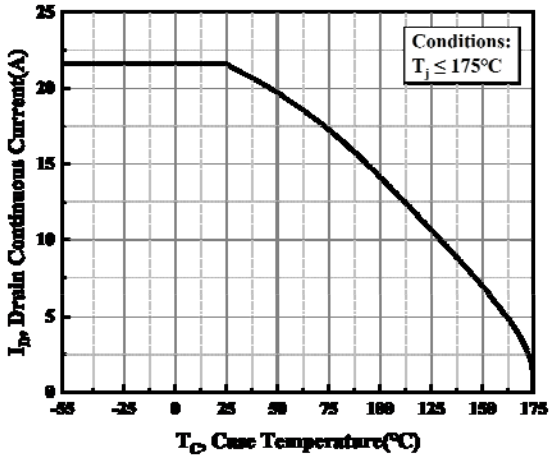


Figure 16. Coutinuous Drain Current Derating vs. Case Temperature

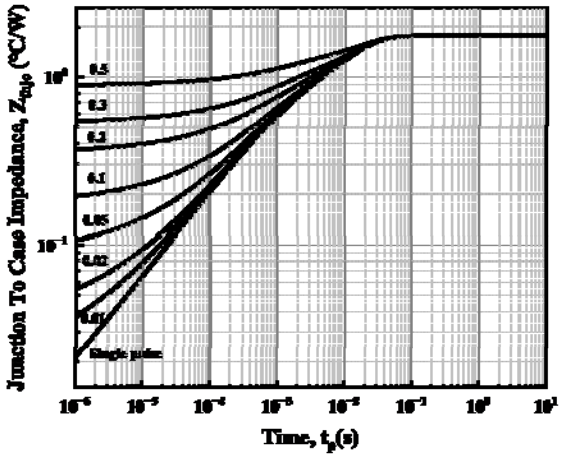


Figure17. Transient Thermal Impedance (Junction - Case)

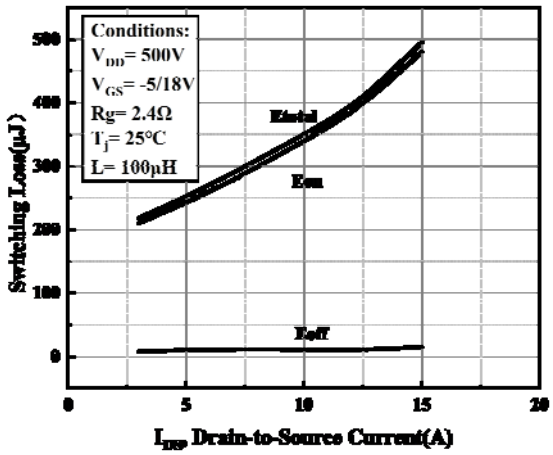


Figure 18. Clamped Inductive Switching Energy vs. Darin Current

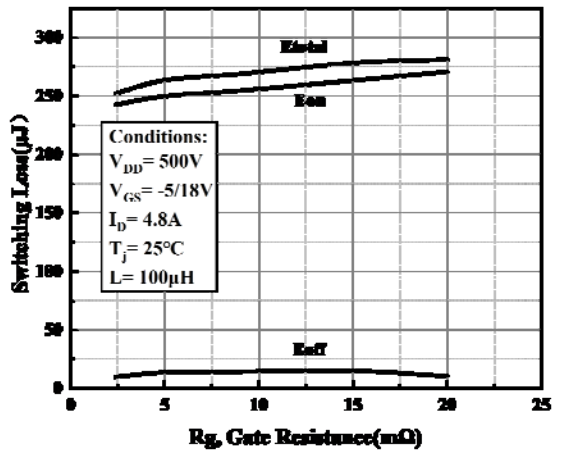


Figure 19. Clamped Inductive Switching Energy vs. Rg

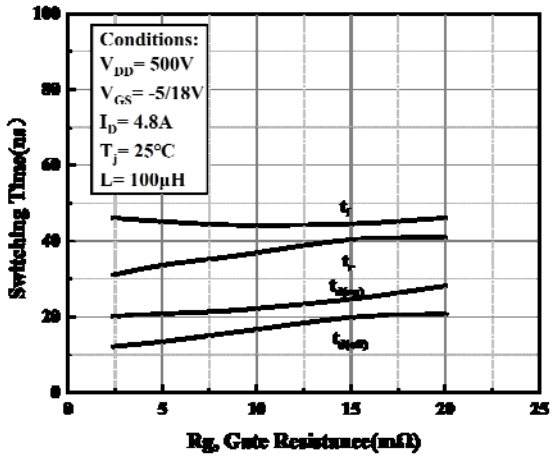


Figure 20. Switching Times vs. Rg

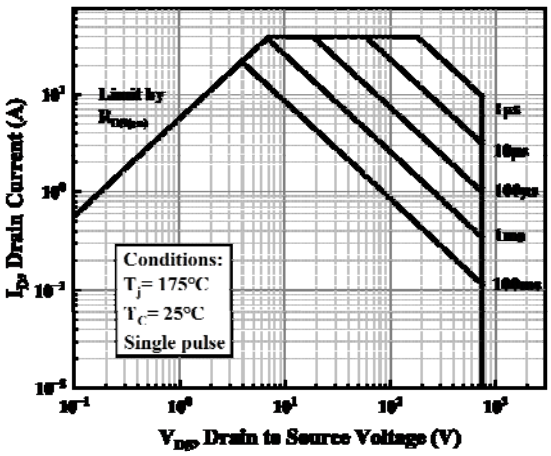


Figure 21. Safe Operating Area

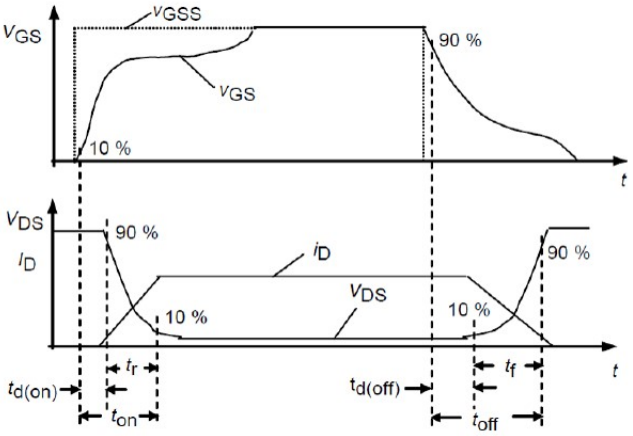


Figure 22. Switching Times Definition

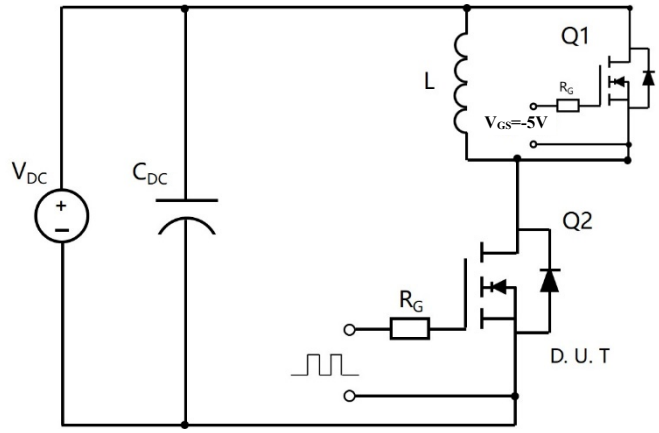
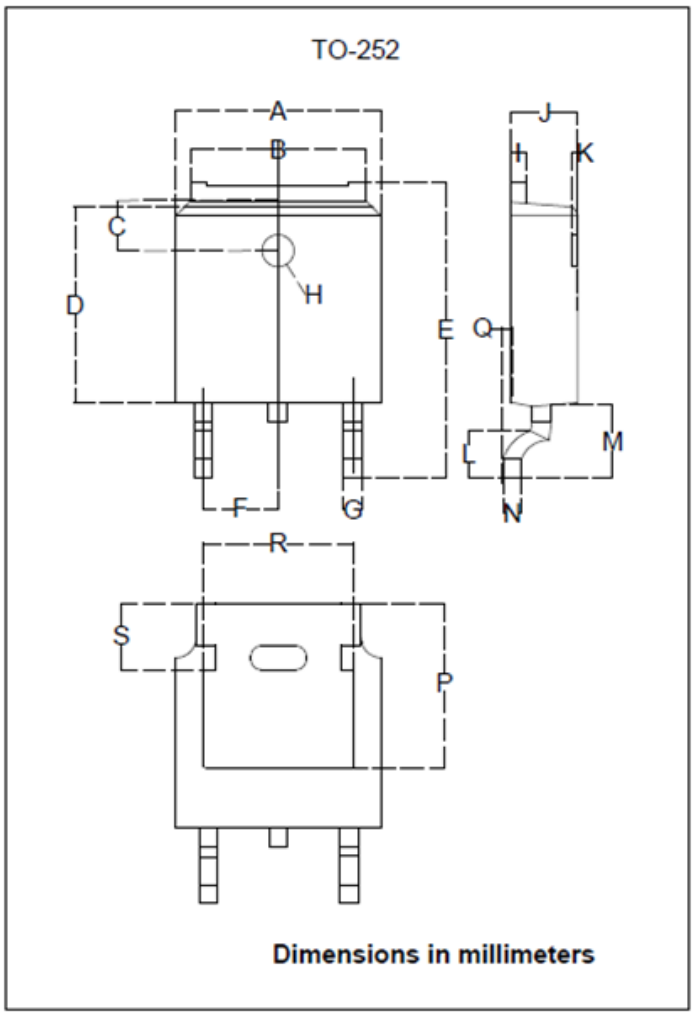


Figure 23. Clamped Inductive Switching Waveform Test Circuit

■Outline Dimensions



TO-252		
Dim	Min	Max
A	6.5	6.7
B	5.1	5.46
C	1.4	1.8
D	6	6.2
E	10	10.4
F	2.166	2.366
G	0.66	0.86
H	1.05	1.35
I	0.46	0.58
J	2.2	2.4
K	0	0.3
L	0.89	2.29
M	2.73	3.08
N	0.43	0.58
P	5.15	5.45
Q	0	0.2
R	4.5	5.1
S	1.6	2.4

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