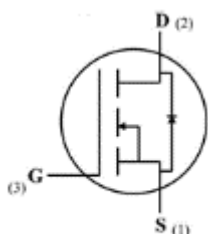


Silicon Carbide Power MOSFET (N-Channel Enhancement)

V_{DS}	750V
I_D (25°C)	55A
$R_{DS(on)}$	55mΩ



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-220-3L
- **Terminals:** Tin plated leads
- **Polarity:** As marked

■Maximum Ratings ($T_c=25^\circ\text{C}$ Unless otherwise specified)

PARAMETER	SYMBOL	UNIT	VALUE	TEST CONDITIONS	NOTE
Device marking code			D207570PYG3		
Drain source voltage @ $T_j=25^\circ\text{C}$	$V_{DS,max}$	V	750	$V_{GS}=0V, I_D=100\mu A$	
Gate source voltage @ $T_j=25^\circ\text{C}$	$V_{GS,max}$	V	-8/+22	Absolute maximum values (AC f >1Hz, duty cycle < 1%)	
Gate source voltage @ $T_j=25^\circ\text{C}$	$V_{GS,op}$	V	-5/+18	Recommended operational values	
Continuous drain current @ $T_c=25^\circ\text{C}$	I_D	A	55	$V_{GS}=18V, T_c=25^\circ\text{C}$	Fig.17
Continuous drain current @ $T_c=100^\circ\text{C}$			36	$V_{GS}=18V, T_c=100^\circ\text{C}$	
Pulsed drain current	$I_{D(pulsed)}$	A	130	Pulse width t_p limited by $T_{j,max}$	Fig.22
Avalanche energy,Single Pulse	E_{AS}	mJ	410	$V_{DD}=75V, L=10mH$	
Power Dissipation	P_{TOT}	W	170	$T_c=25^\circ\text{C}, T_j = 175^\circ\text{C}$	Fig.16
Power Dissipation			85	$T_c=100^\circ\text{C}, T_j = 175^\circ\text{C}$	
Operating junction and Storage temperature range	T_j, T_{stg}	$^\circ\text{C}$	-55 to +175		
Soldering temperature	T_L	$^\circ\text{C}$	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°C unless otherwise specified)

PARAMETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Gate threshold voltage	$V_{GS(th)}$	V	2.0	3.0	4.0	$V_{DS}=V_{GS}$, $I_D=8mA$	Fig.4, 11
				2.7		$V_{DS}=V_{GS}$, $I_D=8mA$, $T_J=175^\circ C$	
Drain source breakdown voltage	$V_{(BR)DSS}$	V	750			$V_{GS}=0V$, $I_D=100\mu A$	
Drain source leakage current	I_{DSS}	μA		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	$R_{DS\ ON}$	m Ω		67		$V_{GS}=15V$, $I_D=15A$	Fig.5, 6, 7
				55	70	$V_{GS}=18V$, $I_D=15A$	
				71		$V_{GS}=15V$, $I_D=15A$, $T_J=175^\circ C$	
				65		$V_{GS}=18V$, $I_D=15A$, $T_J=175^\circ C$	
Transconductance	g_f	S		15		$V_{DS}=20V$, $I_D=15A$	Fig.4
				14		$V_{DS}=20V$, $I_D=15A$, $T_J=175^\circ C$	

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

PARAMETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Input capacitance	C_{iss}	pF		1598		$V_{DS}=500V$, $V_{GS}=0V$, $T_J=25^\circ C$, $f=1MHz$, $V_{AC}=25mV$	Fig.13, 14
Output capacitance	C_{oss}			92			
Reverse capacitance	C_{rss}			3			
Coss stored energy	E_{oss}	μJ		24			Fig.15
Gate source charge	Q_{gs}	nC		18		$V_{DS}=500V$, $V_{GS}=-5/+18V$, $I_D=15A$	Fig.12
Gate drain charge	Q_{gd}			22			
Gate charge	Q_g			55			
Internal gate resistance	R_g	Ω		1.4		$f=1MHz$, $V_{AC}=25mV$	

■Switching Characteristics (Tc=25°C unless otherwise specified)

PARAMETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Turn on delay time	$t_{d(on)}$	ns		10		$V_{DD}=500V$, $V_{GS}=-5/+18V$, $I_D=15A$, $R_g=2.4\Omega$, $L=100\mu H$	Fig.21
Rise time	t_r			17			
Turn off delay time	$t_{d(off)}$	ns		16			
Fall time	t_f			8			



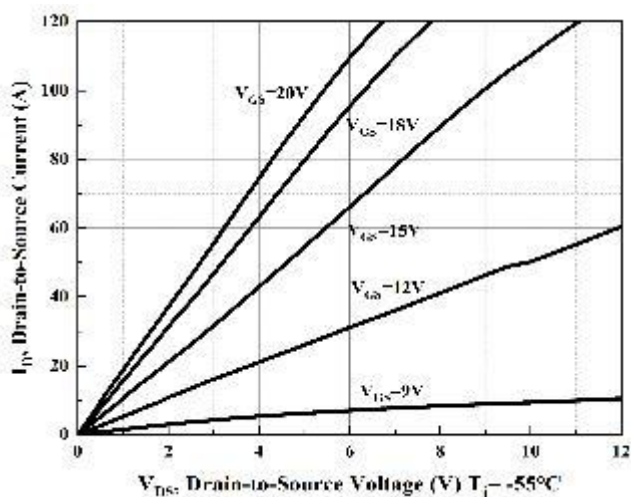
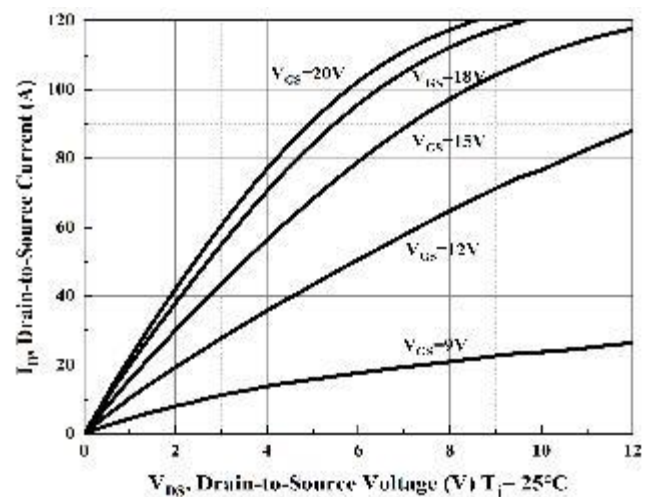
Turn on switching energy	E_{on}	uJ		95		$V_{DD}=500V, V_{GS}=-5/+18V, I_D=15A,$ $R_g=2.4\Omega, L=100\mu H$	Fig.19, 20
Turn off switching energy	E_{off}			23.7			

■Body diode characteristics ($T_c=25^\circ C$ unless otherwise specified)

PARAMETER	SYMBOL	UNIT	Min.	Typ.	Max.	Test Conditions	Note
Diode forward voltage	V_{SD}	V		3.4		$V_{GS}=0V, I_{SD}=7.5A$	Fig.8
				2.5		$V_{GS}=0V, I_{SD}=7.5A, T_j=175^\circ C$	Fig.9
Continuous diode forward current	I_S	A		30		$V_{GS}=-5V, T_c=25^\circ C$	
Reverse recovery time	t_{rr}	nS		15		$V_R=500V, V_{GS}=-5V, I_D=15A,$ $di/dt=2150A/\mu S$	
Reverse recovery charge	Q_{rr}	nC		112			
Peak reverse recovery current	I_{rrm}	A		7			

■Thermal Characteristics ($T_a=25^\circ C$ Unless otherwise specified)

PARAMETER	SYMBOL	UNIT	Typ.
Thermal resistance	$R_{\theta J-C}$	$^\circ C/W$	0.88

■Typical CharacteristicsFigure 1. Output Characteristics $T_j = -55^\circ C$ Figure2. Output Characteristics $T_j = 25^\circ C$

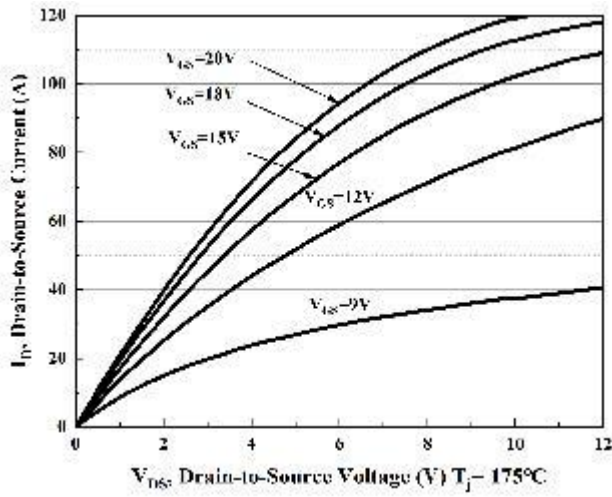


Figure 3. Output Characteristics $T_j = 175^\circ\text{C}$

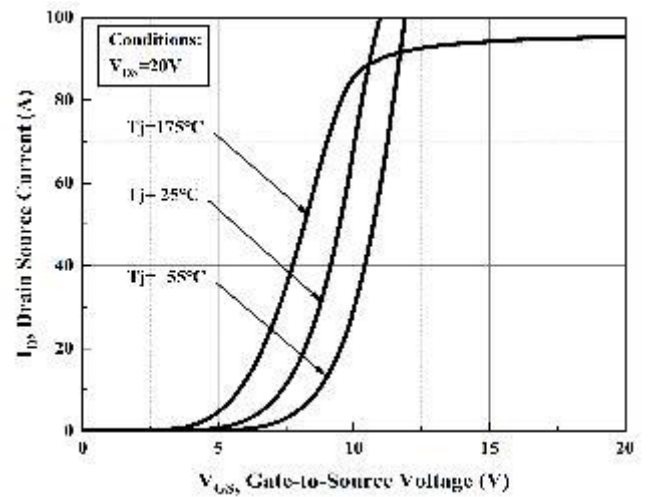


Figure 4. Transfer Characteristics for Various Junction Temperature

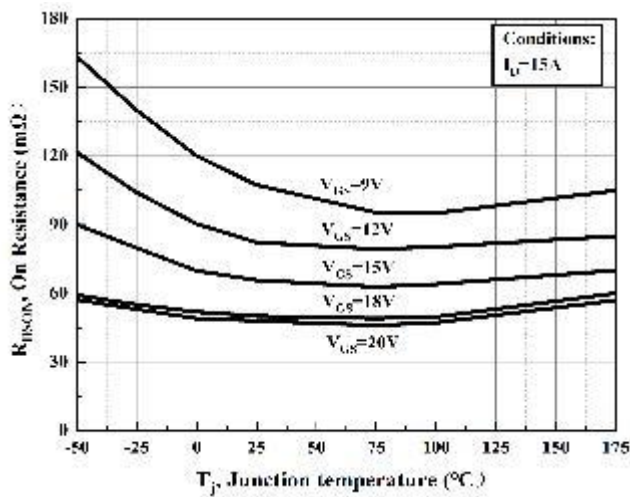


Figure 5. On-resistance vs. Temperature for Various Gate Voltage

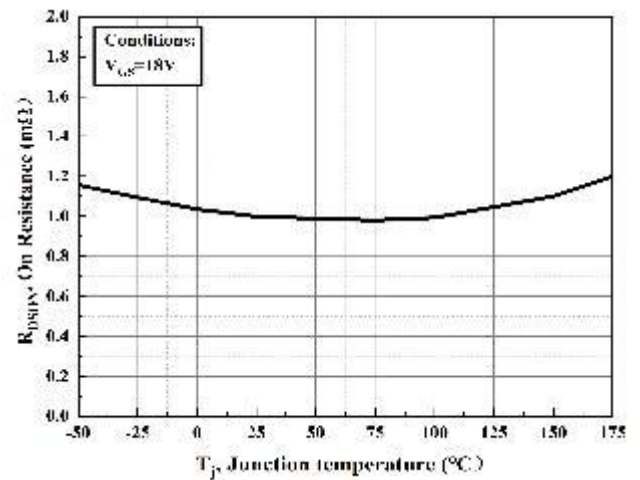


Figure 6. Normalized on-resistance vs. Temperature

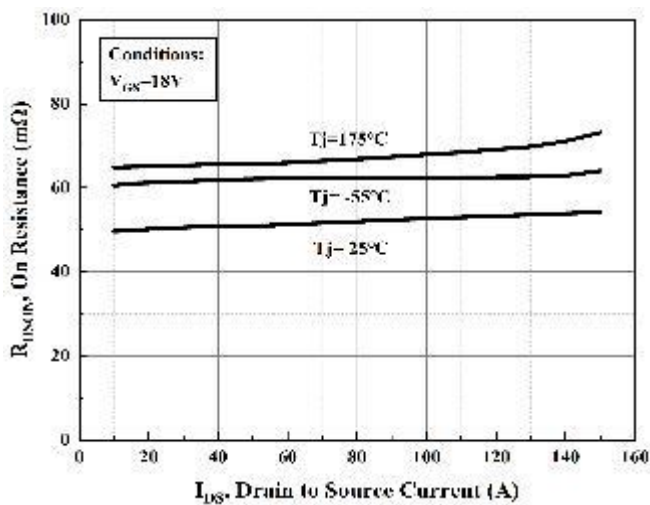


Figure 7. On-resistance vs. Drain Current

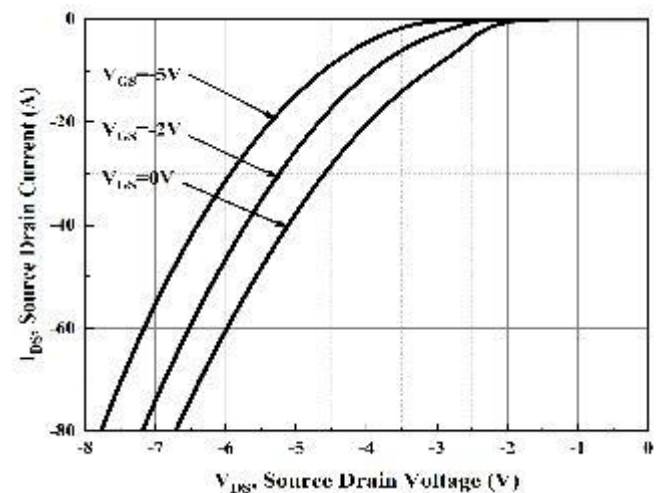


Figure 8. Body Diode Characteristic at $T_j = 25^\circ\text{C}$

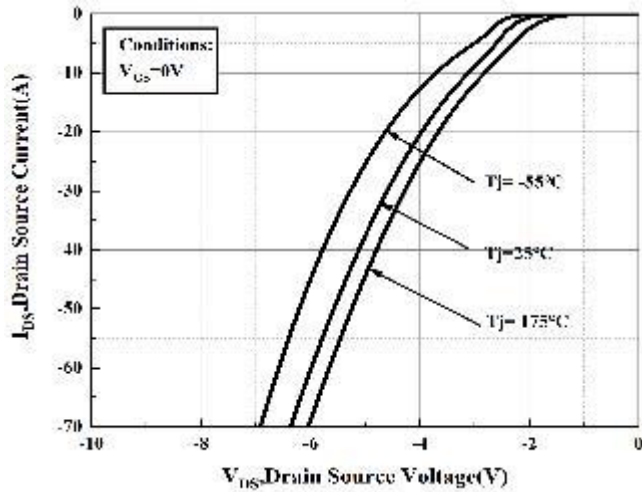


Figure 9. Body Diode Characteristic

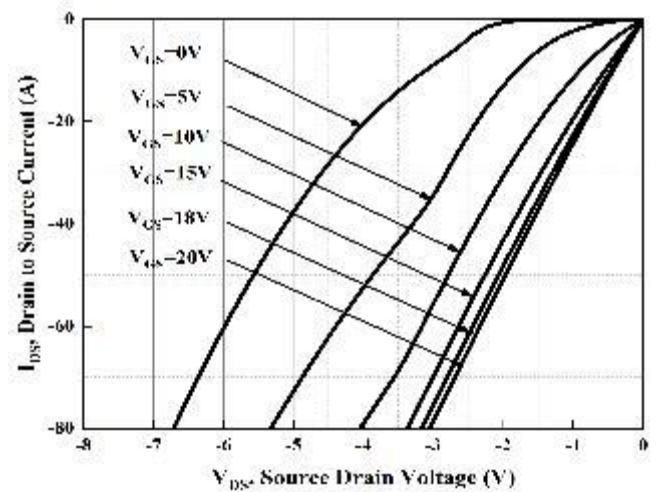
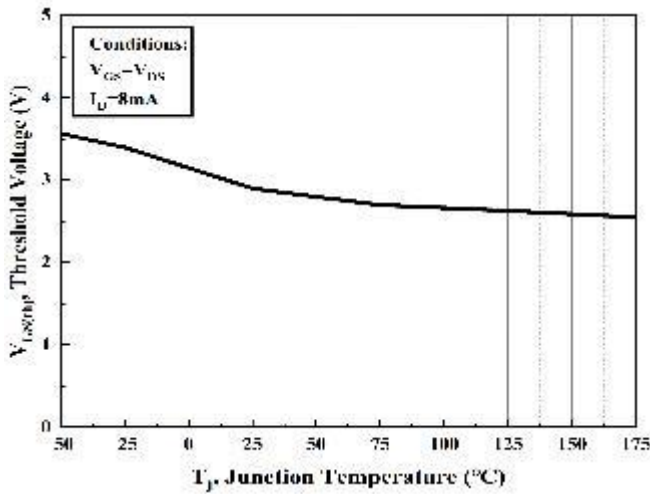

Figure 10. 3rd quadrant Characteristic at Tj= 25 °C


Figure 11. Threshold Voltage vs. Temperature

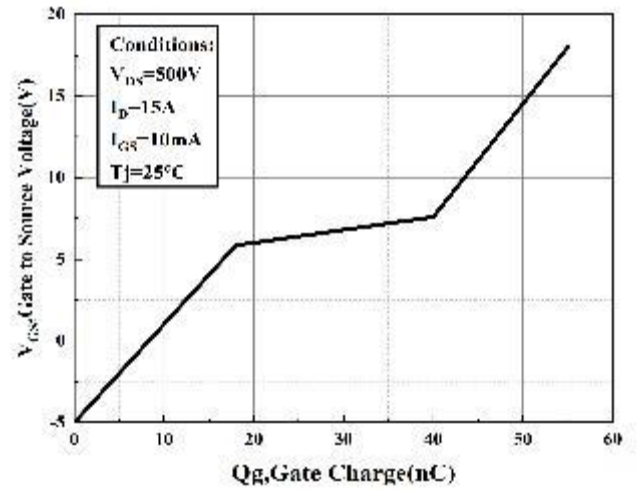


Figure 12. Gate Charge Characteristic

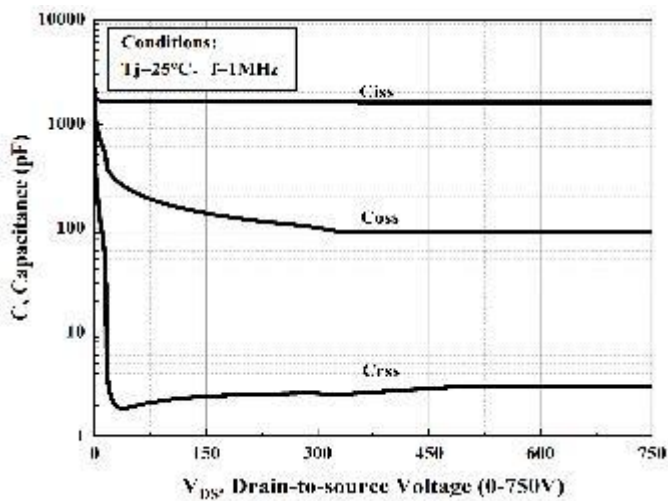


Figure 13. Capacitances vs. Drain Source Voltage (0-750V)

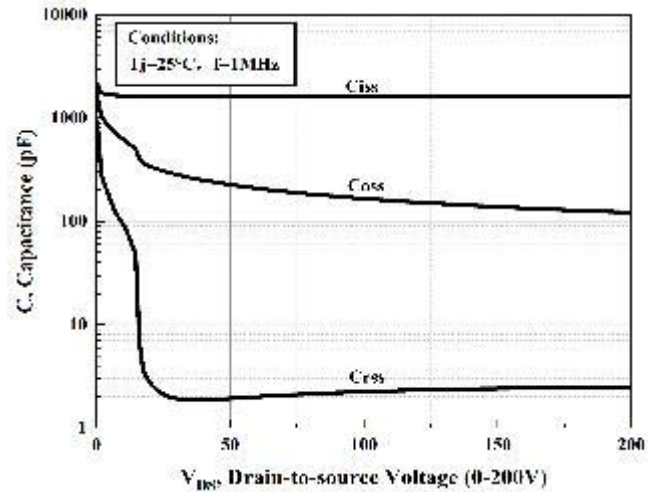


Figure 14. Capacitances vs. Drain Source Voltage (0-200V)

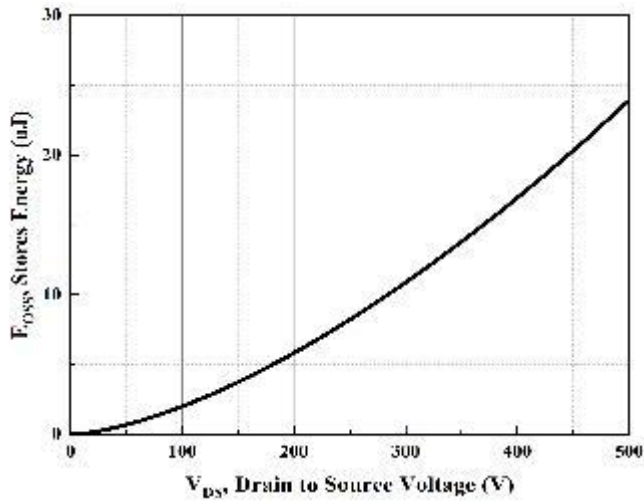


Figure 15. Output Capacitor Stored Energy

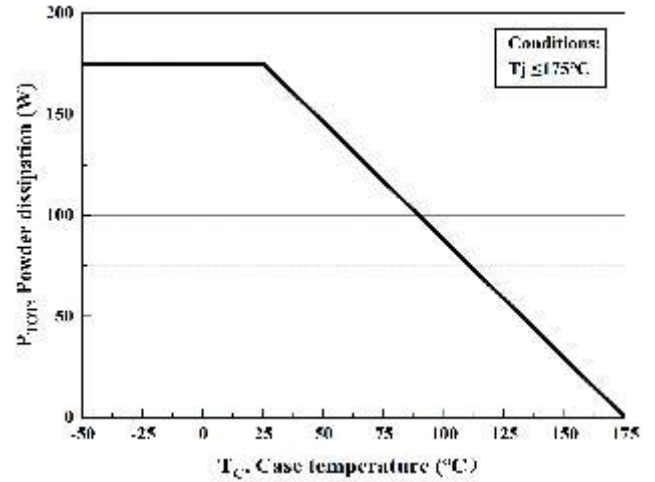


Figure 16. Maximum Power Dissipation Derating vs. Case Temperature

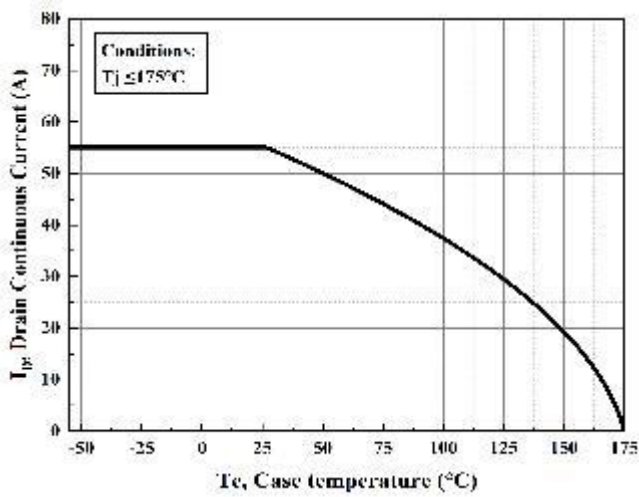


Figure 17. Continuous Drain Current Derating vs. Case Temperature

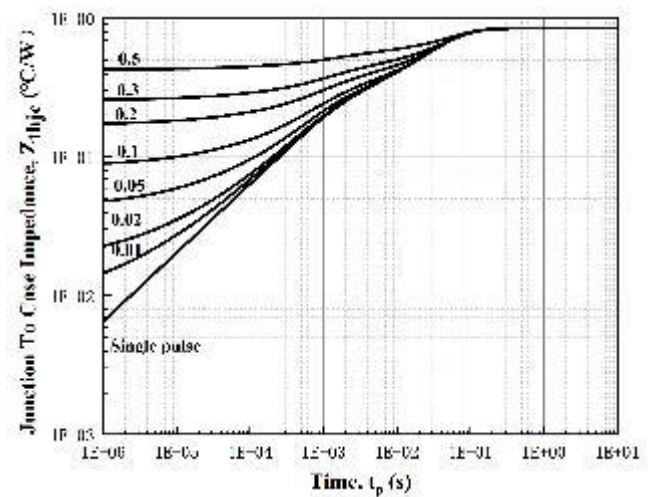


Figure18 Transient Thermal Impedance (Junction - Case)

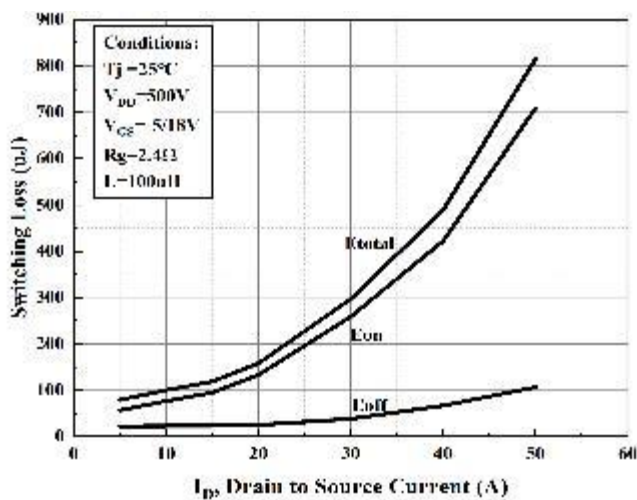


Figure 19. Clamped Inductive Switching Energy vs. Drain Current

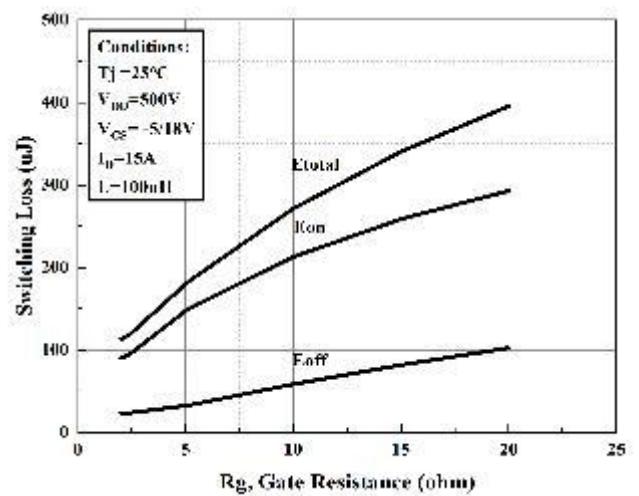


Figure 20. Clamped Inductive Switching Energy vs. Rg

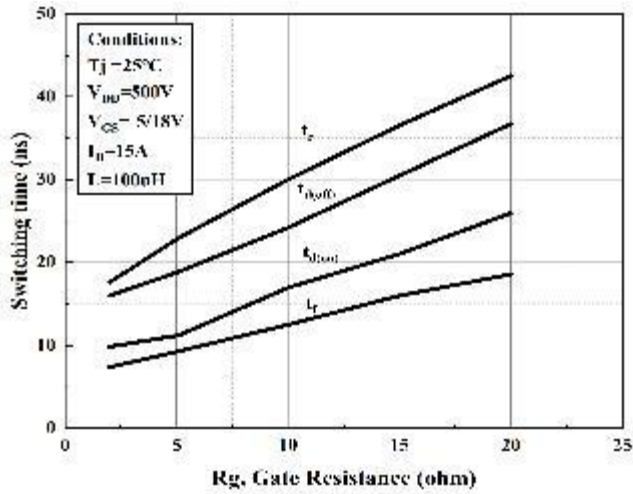


Figure 21. Switching Times vs. R_g

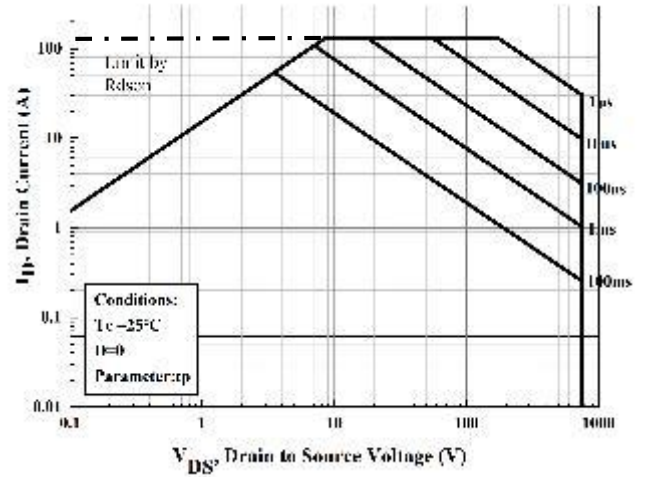


Figure 22. Safe Operating Area

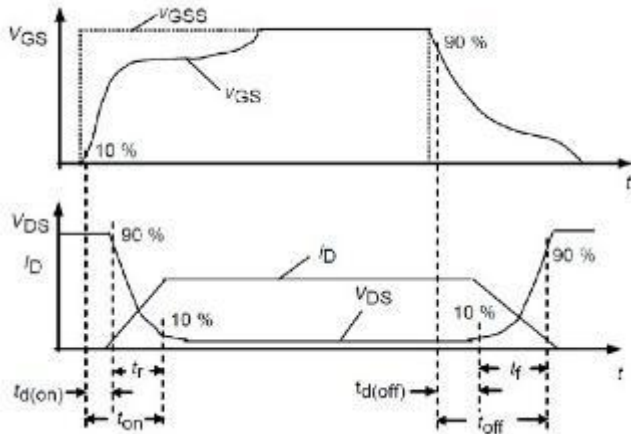


Figure 23. Switching Times Definition

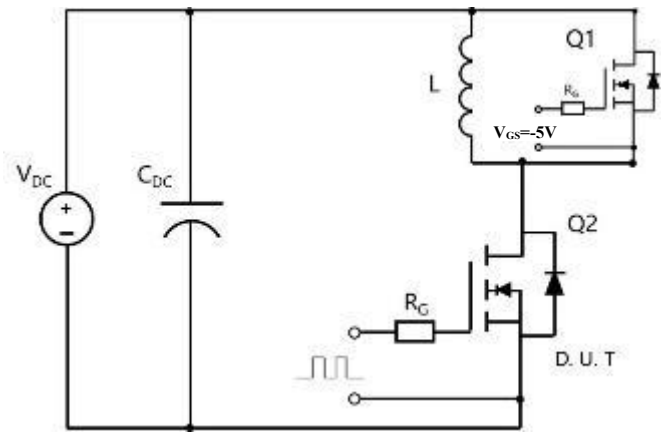
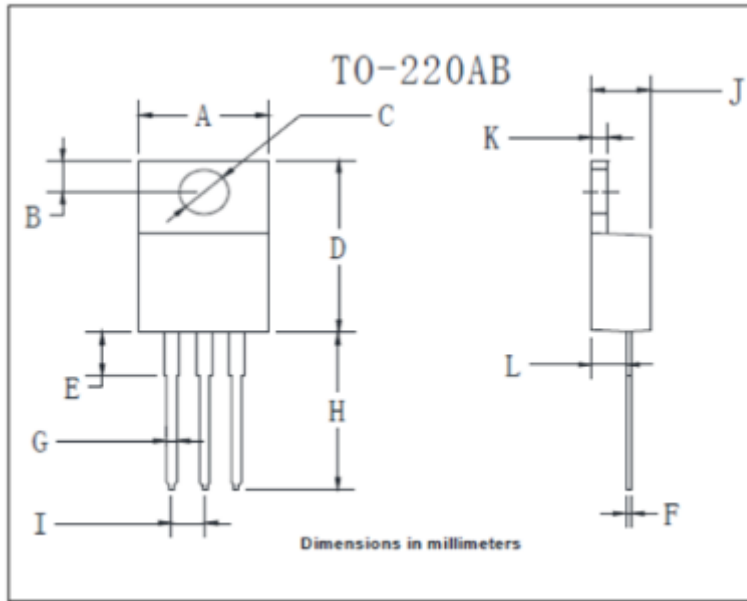


Figure 24. Clamped Inductive Switching Waveform Test Circuit

■Outline Dimensions



TO-220AB		
Dim	Min	Max
A	9.95	10.35
B	2.55	2.95
C	3.8	4.0
D	14.95	15.25
E	3.75	4.25
F	0.26	0.5
G	0.68	0.94
H	13.4	13.9
I	2.35	2.65
J	4.38	4.78
K	1.14	1.4
L	2.37	2.79



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