650V SiC N-Channel MOSFET

V_{DS}	650V
I_D	81A (Tc=25℃)
$R_{DS(ON)}$	33mΩ

DESCRIPTION：

·High Speed Switching with Low Capacitances

·High Blocking Voltage with Low $R_{DS(ON)}$

·Easy to Parallel

·Simple to Drive

·RoHS compliant.

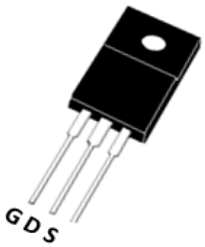
·Increased Power Density

·Faster Operating Freequency

·Reduction of Heat Sink Requirements

·Higher Efficiency

·Reduced EMI



ITO-220

TYPICAL APPLICATIONS：

·Power Factor Correction Modules

·Switch Mode Power Supplies

·DC-AC Inverters

·High Voltage DC-DC Converters

MAXIMUM RATINGS (at T_J = 25 °C, unless otherwise specified)

Characteristic	Condition	Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	650	V
Continuous Drain Current	Tc=25℃ Tc=100℃	I_D	81 56	A
Peak Drain Current	Pulse width tp limited by T_{jmax}	I_{DM}	150	A
Gate-Source Voltage		V_{GSmax}	-8/+22	V
Recommend Gate-Source Voltage		V_{GSop}	-4/+18	V
Power Dissipation	Tc=25℃ Tc=100℃	P_{TOT}	60 30	W
Operation Junction temperature		Tj	-40~+175	℃
Storage temperature		T_{STG}	-40~+175	℃

ELECTRICAL CHARATERISTICS (at T_J = 25 °C, unless otherwise specified)

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage VGS = 0V, ID = 100μA	$V_{(BR)DSS}$	650			V
Zero Gate Voltage Drain Current VDS = 650V, VGS = 0 V	I_{DSS}		1		uA
Gate-Source Leakage Current VGS = 18V, VDS = 0V	I_{GSS}			250	nA
Gate-Source Threshold Voltage VDS = VGS, ID = 10mA Tj=25℃ VDS = VGS, ID = 10mA Tj=150℃ VDS = VGS, ID = 5mA Tj=175℃	$V_{GS(th)}$	2	2.60 1.93 1.85	4	V
Drain-Source On-State Resistance VGS = 18V, ID = 30A Tj=25℃ VGS = 18V, ID = 20A Tj=175℃	$R_{DS(on)}$		33 35		mΩ
Input capacitance f=1MHz, VDS=600 V, VGS=0 V	C_{iss}		2200		pF
Output capacitance f=1MHz, VDS=600 V, VGS=0 V	C_{oss}		196		pF
Reverse transfer capacitance f=1MHz, VDS=600 V, VGS=0 V	C_{rss}		12		pF
Total Gate Charge VDS= 400V, ID= 30A,VGS= -4/18V	Q_G		96		nC
Gate to Source Charge VDS= 400V, ID= 30A,VGS= -4/18V	Q_{GS}		28		nC
Gate to Drain Charge VDS= 400V, ID= 30A,VGS= -4/18V	Q_{GD}		23		nC
Turn-on Delay Time VDD=400 V, ID=30A, VGS= -4/18V, RG=2.5Ω	$td_{(ON)}$		14		ns
Rise Time VDD=400 V, ID=30A, VGS= -4/18V, RG=2.5Ω	tr		16		ns
Turn-off Delay Time VDD=400 V, ID=30A, VGS= -4/18V, RG=2.5Ω	$td_{(OFF)}$		26		ns
Fall Time VDD=400 V, ID=30A, VGS= -4/18V, RG=2.5Ω	tf		8		ns
Turn-on Switching Energy VDD=400 V, ID=30A, VGS= -4/18V, RG=2.5Ω	$E_{(ON)}$		136		uJ
Turn-off Switching Energy VDD=400 V, ID=30A, VGS= -4/18V, RG=2.5Ω	$E_{(OFF)}$		24		uJ

THERMAL CHARACTERISTICS

Characteristic	Condition	Symbol	Typical	Unit
Thermal resistance, junction - case		$R_{th(j-C)}$	2.5	℃/W

Body Diode

ELECTRICAL CHARATERISTICS (at T_J = 25 °C, unless otherwise specified)

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Diode Forward Voltage VGS = -4V, ISD = 30A Tj=25℃ VGS = -4V, ISD = 30A Tj=175℃	V_{SD}		5.4 4.8		V
Continuous Diode Forward Current VGS = -4V, Tc=25℃ VGS = -4V, Tc=100℃	I_S		42 18		A
Revers Recovery Time VR=400 V, ISD=30A, VGS= -4V,di/dt = 3500A/us	Trr		15		ns
Revers Recovery Charge VR=400 V, ISD=30A, VGS= -4V,di/dt = 3500A/us	Qrr		330		nC
Peak Revers Recovery Current VR=400 V, ISD=30A, VGS= -4V,di/dt = 3500A/us	I_{rrm}		40		A

Typical Characteristics

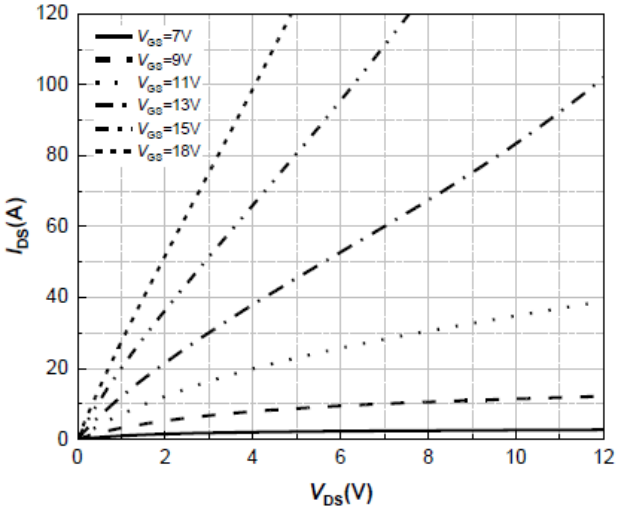


Figure 1. Output Characteristics (Tj=-40℃)

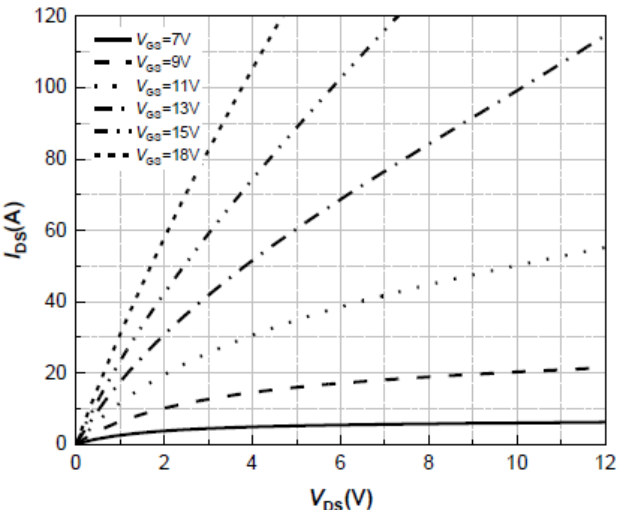


Figure 2. Output Characteristics (Tj=25℃)

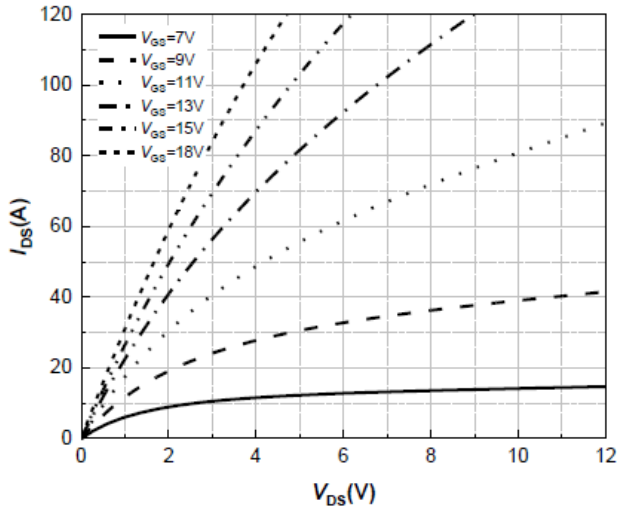


Figure 3. Output Characteristics(Tj=175℃)

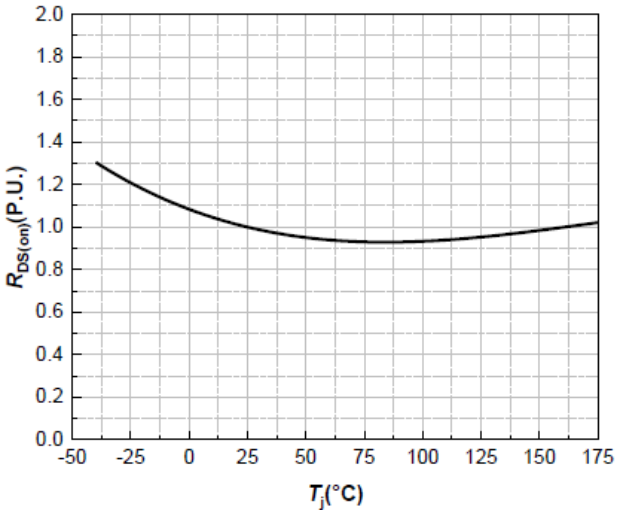


Figure 4. Normalized On-Resistance vs. Temperature

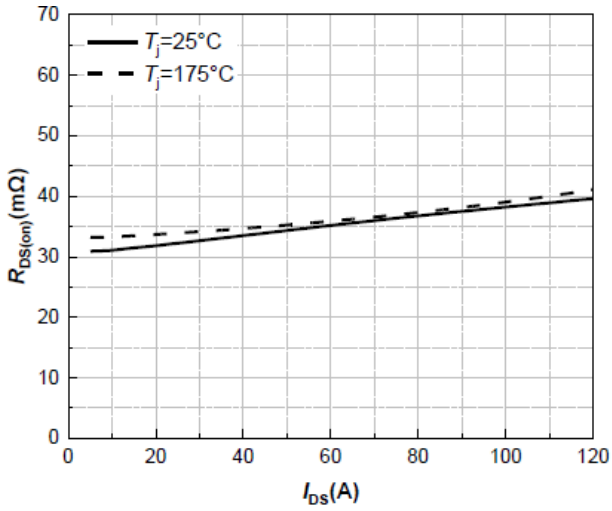


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

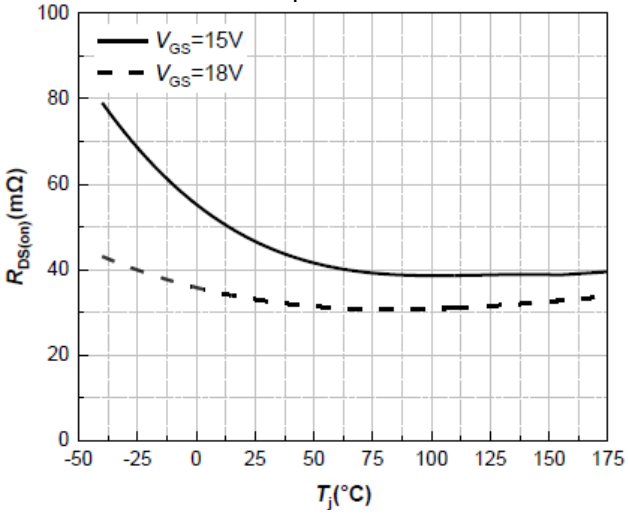


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage

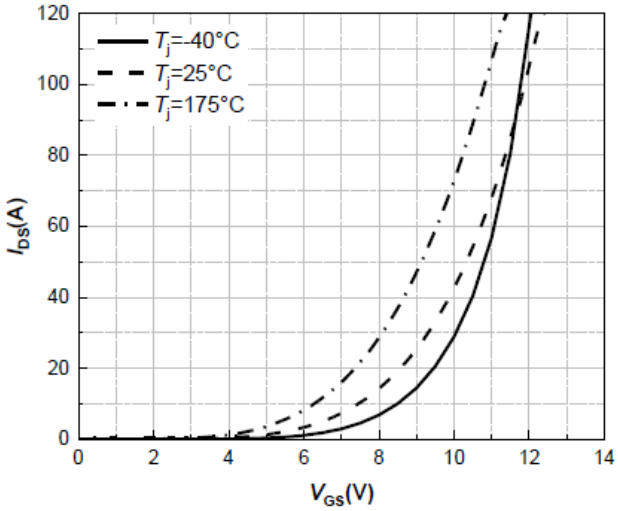


Figure 7. Transfer Characteristic for Various Junction Temperatures VDS=20V

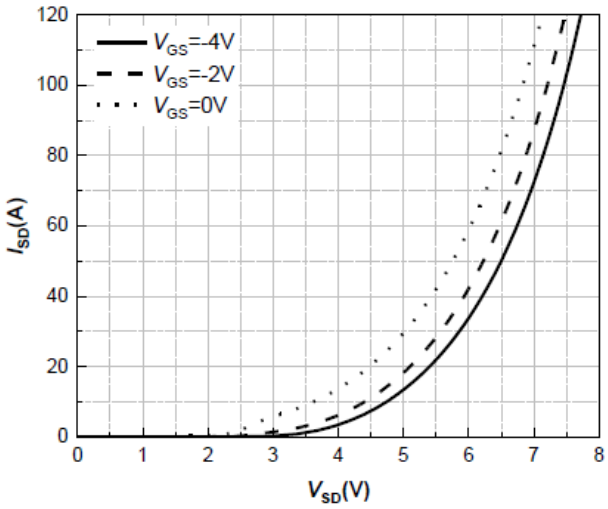


Figure 8. Body Diode Characteristic Tj=-40°C

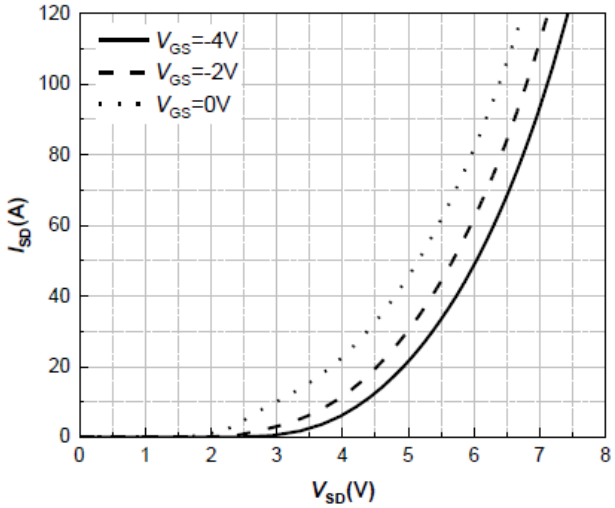


Figure 9. Body Diode Characteristic (Tj=25°C)

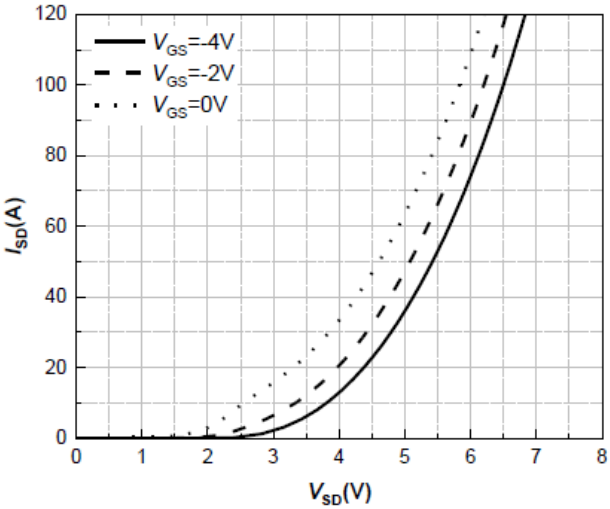


Figure 10. Body Diode Characteristic (Tj=175°C)

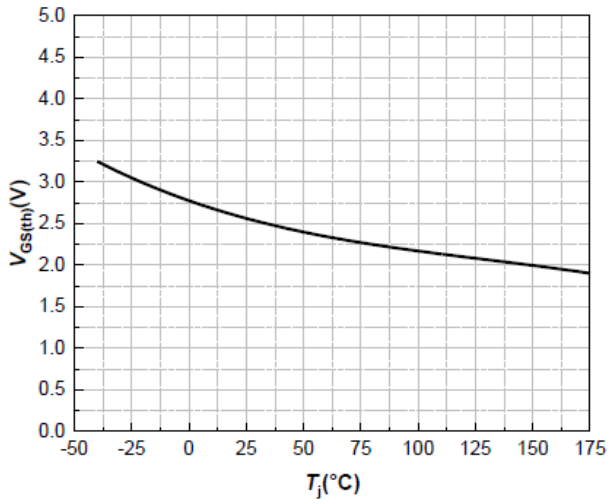


Figure 11. Threshold Voltage vs. Temperature

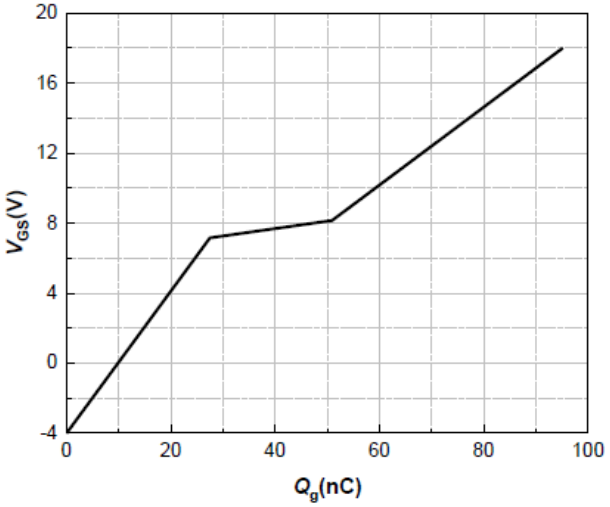


Figure 12. Gate Charge Characteristics

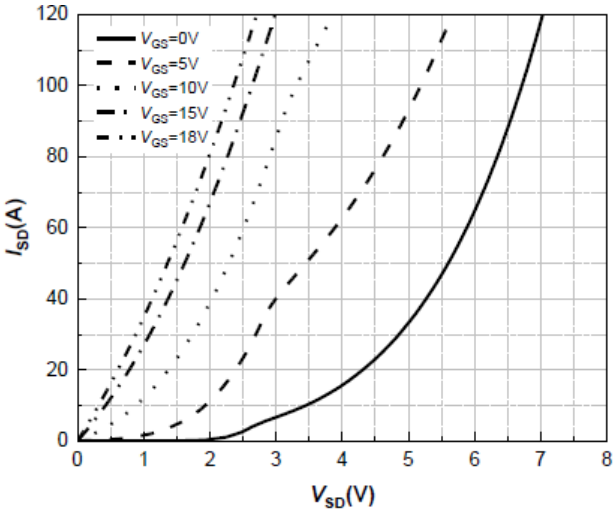


Figure 13. 3rd Quadrant Characteristic (Tj=-40°C)

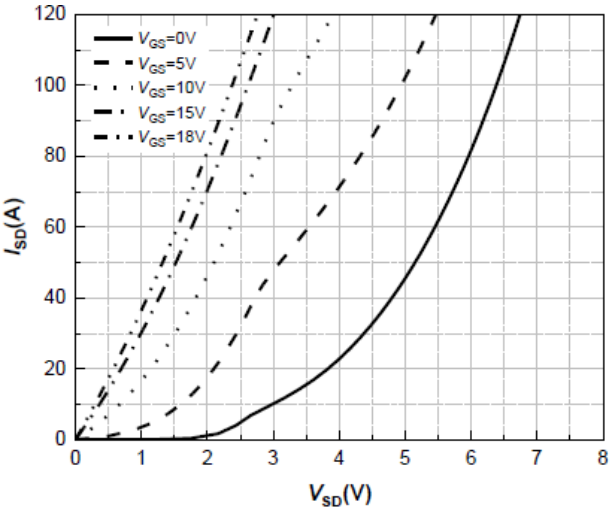


Figure 14. 3rd Quadrant Characteristic (Tj=25°C)

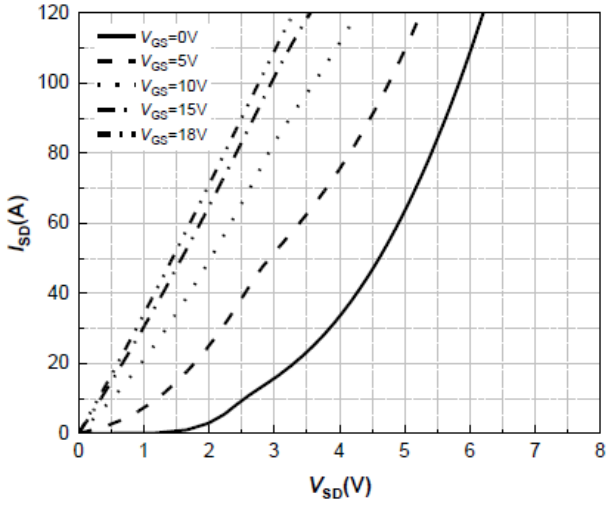


Figure 15. 3rd Quadrant Characteristic (Tj=175°C)

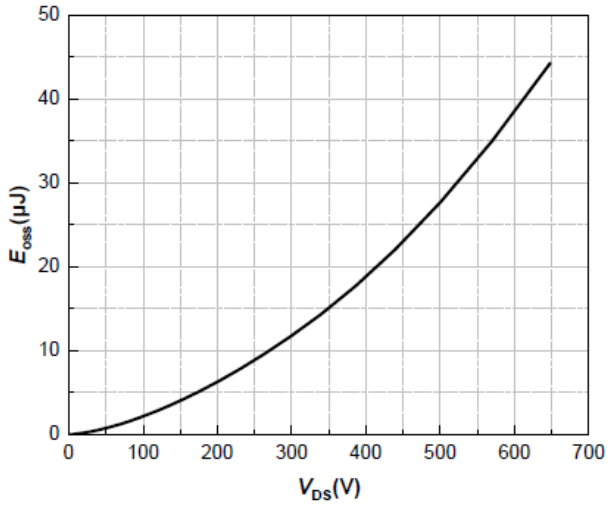


Figure 16. Output Capacitor Stored Energy

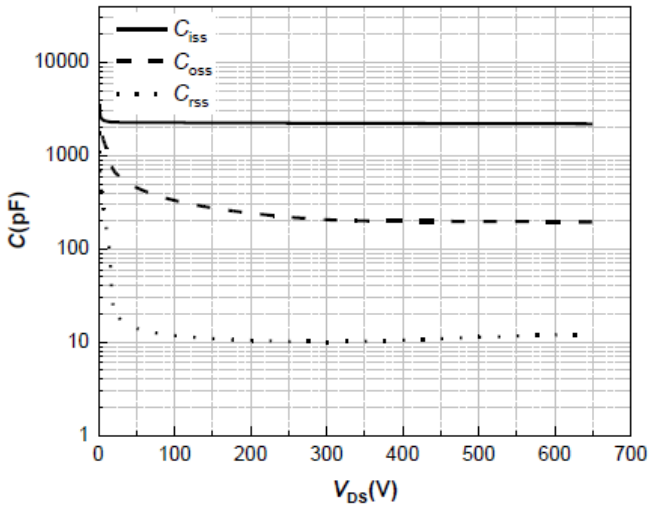


Figure 17. Capacitances vs. Drain-Source

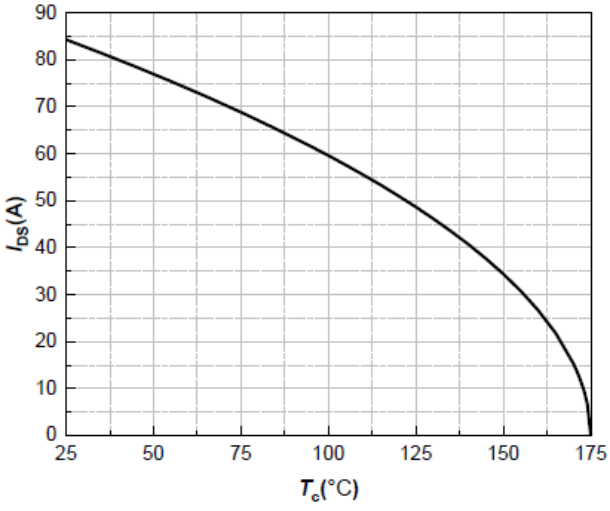


Figure 18. Continuous Drain Current Derating vs. Case Temperature

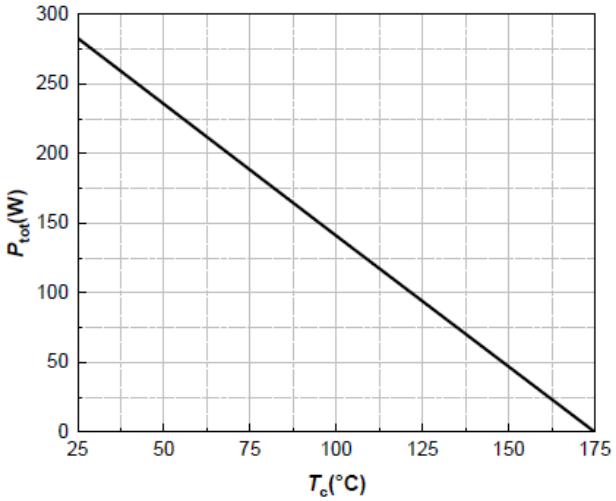


Figure 19. Maximum Power Dissipation Derating vs. Case Temperature

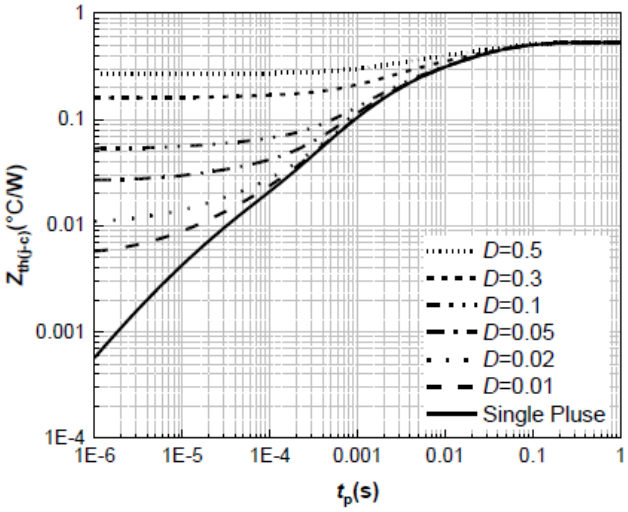


Figure 20. Transient Thermal Impedance

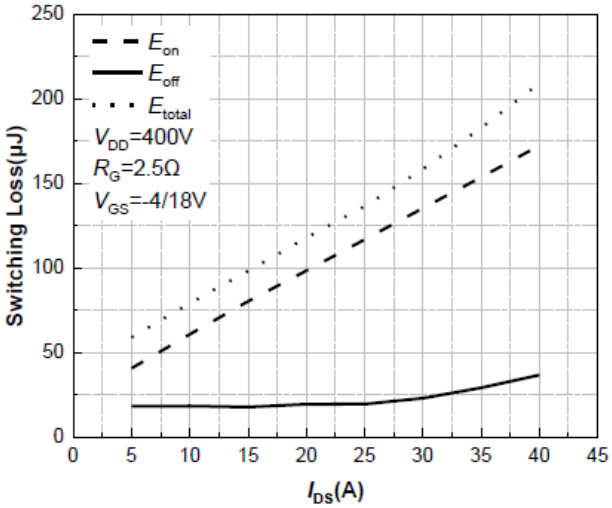


Figure 21. Clamped Inductive Switching Energy vs. Drain Current

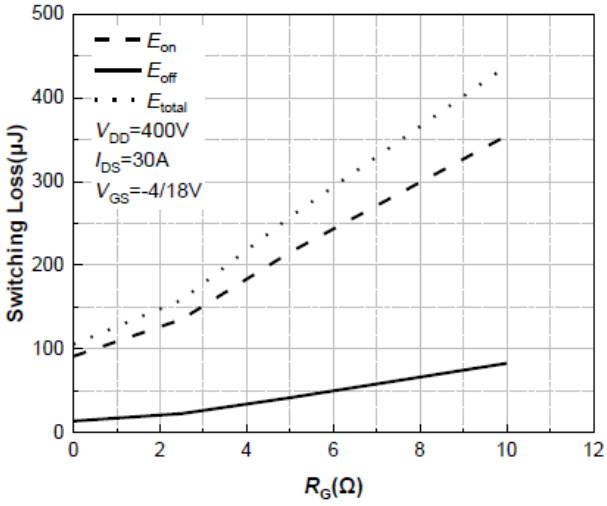


Figure 22. Clamped Inductive Switching Energy vs. RG

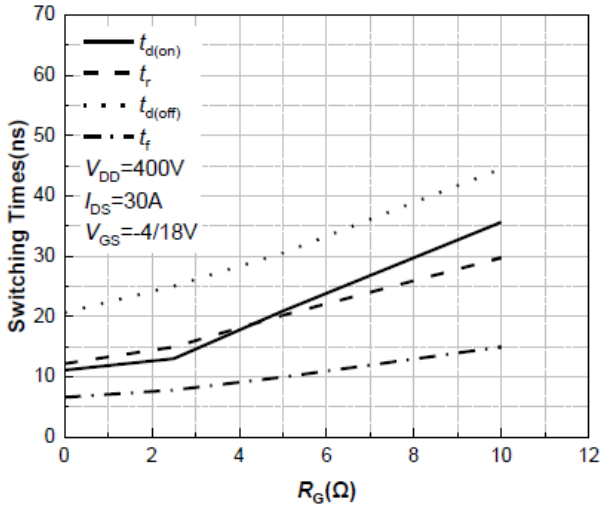


Figure 23. Switching Times vs. RG

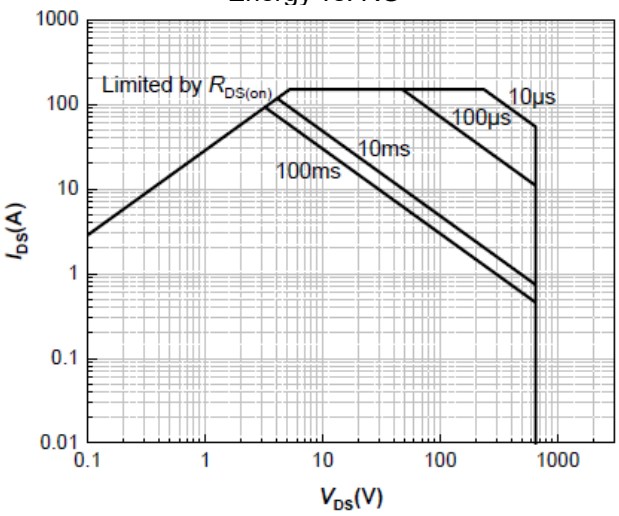
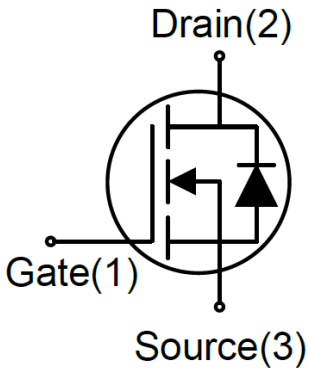
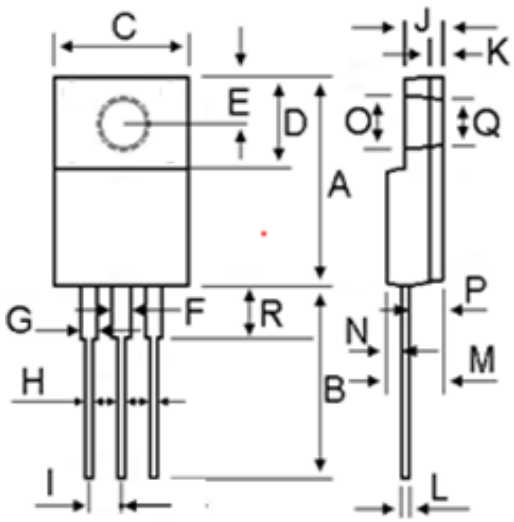


Figure 24. Safe Operating Area

·Circuit diagram



·ITO-220 Package outlines : Dimensions in (mm)



DIM	MILLIMETERS	
	MIN	MAX
A	14.80	16.10
B	12.65	14.40
C	9.70	10.36
D	4.60	6.80
E	2.50	3.50
F	0.90	1.55
G	0.90	1.55
H	0.50	0.90
I	2.40	2.70
J	2.34	3.30
K	0.55	1.30
L	0.36	0.80
M	4.20	4.90
N	1.10	1.80
O	2.90	3.50
P	2.30	3.15
Q	2.90	3.50
R	2.80	4.85

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