

650V SiC N-Channel MOSFET

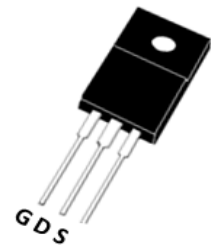
DESCRIPTION :

- High Speed Switching with Low Capacitances
- High Blocking Voltage with Low $R_{DS(ON)}$
- Easy to Parallel
- Simple to Drive
- RoHS compliant.

V_{DS}	650V
I_D	39A ($T_c=25^\circ\text{C}$)
$R_{DS(ON)}$	53m Ω

TYPICAL APPLICATIONS :

- Power Factor Correction Modules
- Switch Mode Power Supplies
- DC-AC Inverters
- High Voltage DC-DC Converters



ITO-220

MAXIMUM RATINGS (at $T_J = 25^\circ\text{C}$, unless otherwise specified)

Characteristic	Condition	Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	650	V
Continuous Drain Current	$T_c=25^\circ\text{C}$	I_D	39	A
	$T_c=100^\circ\text{C}$		28	
Peak Drain Current	Pulse width t_p limited by T_{jmax}	I_{DM}	80	A
Gate-Source Voltage		V_{GSmax}	-8/+22	V
Recommend Gate-Source Voltage		V_{GSop}	-4/+18	V
Power Dissipation	$T_c=25^\circ\text{C}$	P_{TOT}	98	W
	$T_c=100^\circ\text{C}$		49	
Operation Junction temperature		T_j	-40~+175	$^\circ\text{C}$
Storage temperature		T_{STG}	-40~+175	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS (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 = 5mA Tj=25°C VDS = VGS, ID = 5mA Tj=175°C	V _{GS(th)}	2	2.7 1.9	4	V
Drain-Source On-State Resistance VGS = 18V, ID = 20A Tj=25°C VGS = 18V, ID = 20A Tj=175°C	R _{DS(on)}		53 58	73	mΩ
Input capacitance f=1MHz, VDS=600 V, VGS=0 V	C _{iss}		1301		pF
Output capacitance f=1MHz, VDS=600 V, VGS=0 V	C _{oss}		138		pF
Reverse transfer capacitance f=1MHz, VDS=600 V, VGS=0 V	C _{rss}		14		pF
Internal Gate Resistance f=1MHz	R _{G(INT)}		2.1		Ω
Total Gate Charge VDS= 400V, ID= 20A,VGS= -4/18V	Q _G		68		nC
Gate to Source Charge VDS= 400V, ID= 20A,VGS= -4/18V	Q _{GS}		17		nC
Gate to Drain Charge VDS= 400V, ID= 20A,VGS= -4/18V	Q _{GD}		22		nC
Turn-on Delay Time VDD=400 V, ID=20A, VGS= -4/18V, RG=2.5Ω, L=200μH	t _{d(ON)}		13		ns
Rise Time VDD=400 V, ID=20A, VGS= -4/18V, RG=2.5Ω, L=200μH	t _r		20		ns
Turn-off Delay Time VDD=400 V, ID=20A, VGS= -4/18V, RG=2.5Ω, L=200μH	t _{d(OFF)}		20		ns
Fall Time VDD=400 V, ID=20A, VGS= -4/18V, RG=2.5Ω, L=200μH	t _f		9		ns
Turn-on Switching Energy VDD=400 V, ID=20A, VGS= -4/18V, RG=2.5Ω, L=200μH	E _(ON)		108		uJ
Turn-off Switching Energy VDD=400 V, ID=20A, VGS= -4/18V, RG=2.5Ω, L=200μH	E _(OFF)		35		uJ

THERMAL CHARACTERISTICS

Characteristic	Condition	Symbol	Typical	Unit
Thermal resistance, junction - case		$R_{th(j-c)}$	1.52	$^{\circ}C/W$

Body Diode

ELECTRICAL CHARACTERISTICS (at $T_J = 25^{\circ}C$, unless otherwise specified)

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Diode Forward Voltage VGS = -4V, ISD = 10A $T_j=25^{\circ}C$ VGS = -4V, ISD = 10A $T_j=175^{\circ}C$ VGS = -4V, ISD = 20A $T_j=25^{\circ}C$ VGS = -4V, ISD = 20A $T_j=175^{\circ}C$	V_{SD}		4.6 4.0 5.4 4.6		V
Continuous Diode Forward Current VGS = -4V, $T_c=25^{\circ}C$ VGS = -4V, $T_c=100^{\circ}C$	I_s		18 12		A
Revers Recovery Time VR=400 V, ISD=20A, VGS= -4V, di/dt = 989A/us	T_{rr}		18		ns
Revers Recovery Charge VR=400 V, ISD=20A, VGS= -4V, di/dt = 989A/us	Q_{rr}		104		nC
Peak Revers Recovery Current VR=400 V, ISD=20A, VGS= -4V, di/dt = 989A/us	I_{rrm}		10.2		A

Typical Characteristics

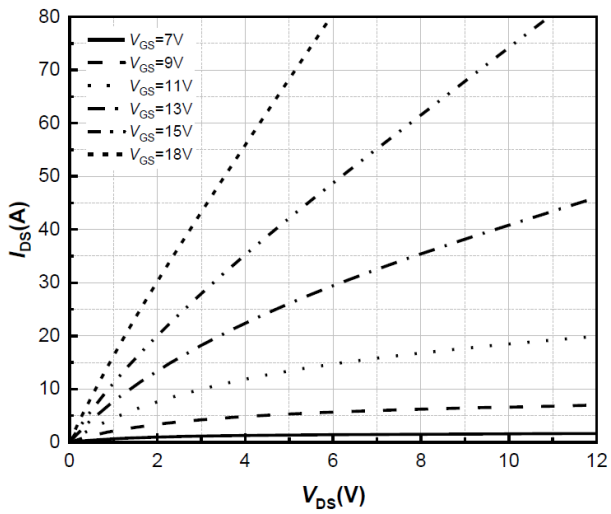


Figure 1. Output Characteristics (Tj=-40°C)

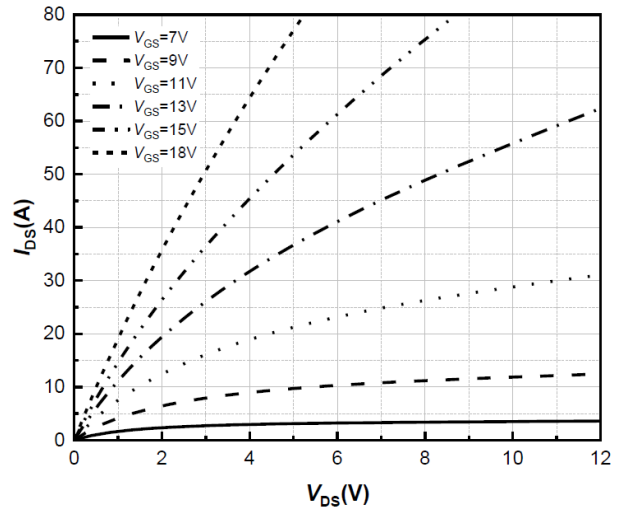


Figure 2. Output Characteristics (Tj=25°C)

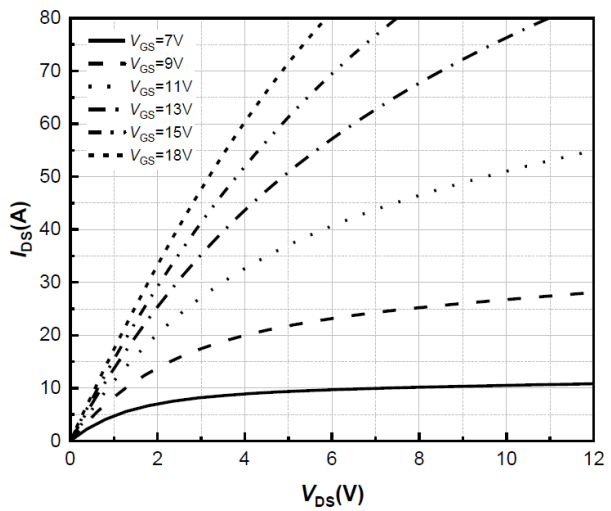


Figure 3. Output Characteristics (Tj=175°C)

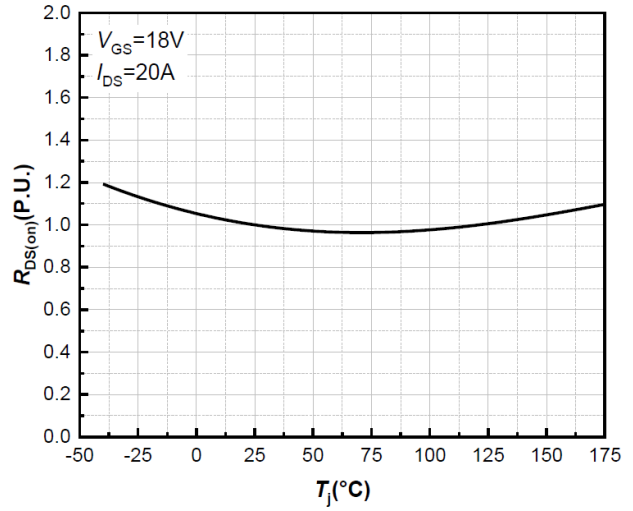


Figure 4. Normalized On-Resistance vs. Temperature

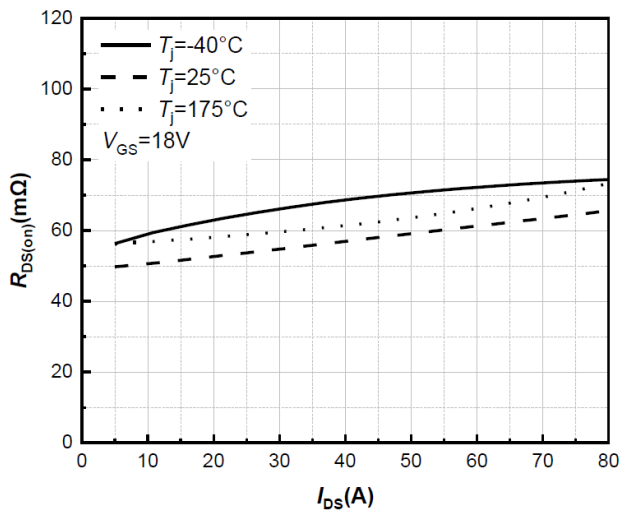


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

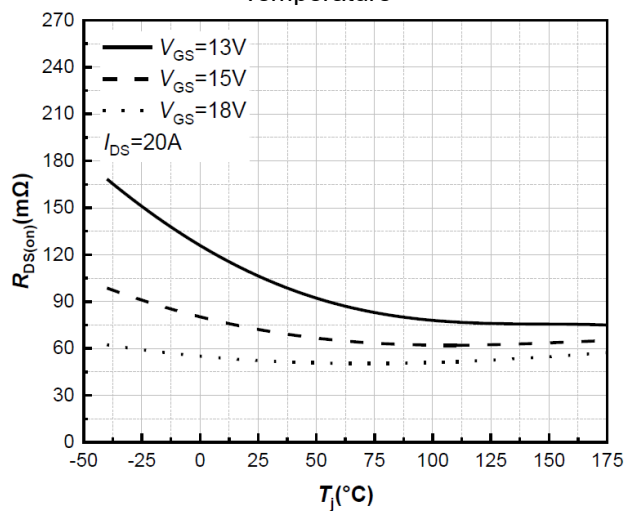


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage

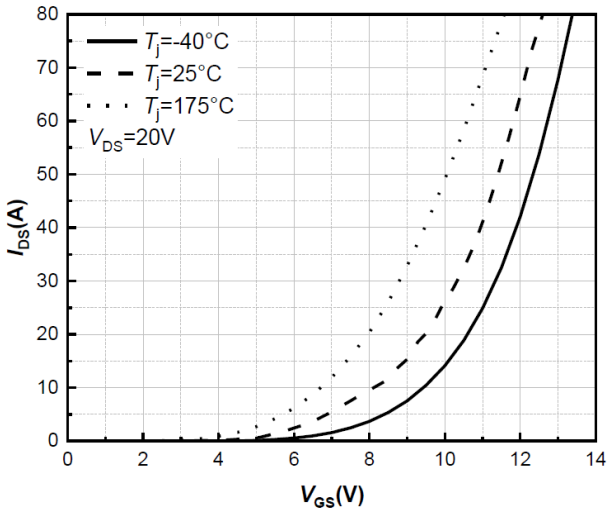


Figure 7. Transfer Characteristic for Various Junction Temperatures

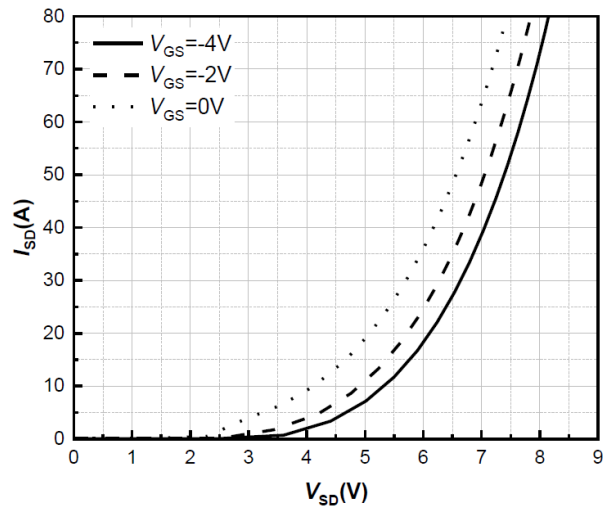


Figure 8. Body Diode Characteristic T_J=-40°C

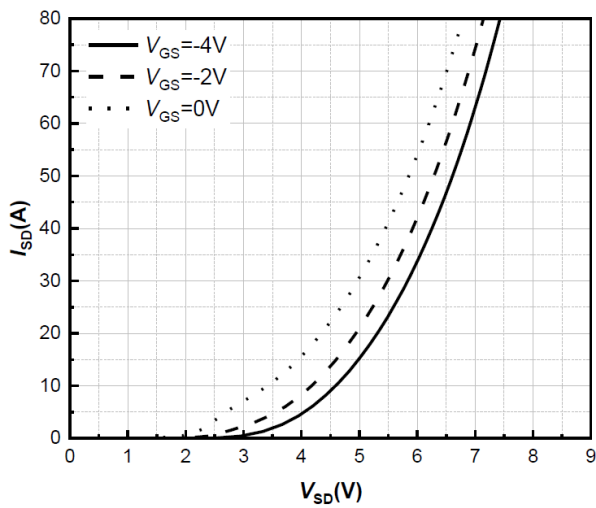


Figure 9. Body Diode Characteristic (T_J=25°C)

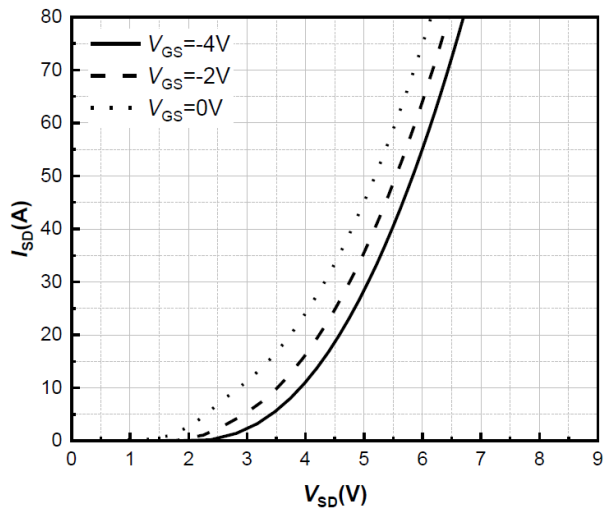


Figure 10. Body Diode Characteristic (T_J=175°C)

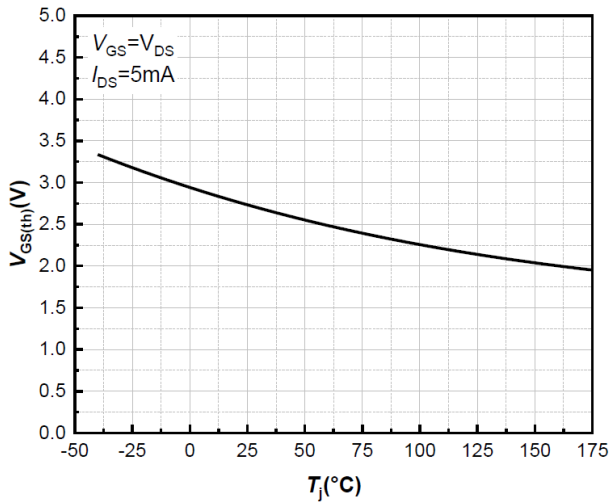


Figure 11. Threshold Voltage vs. Temperature

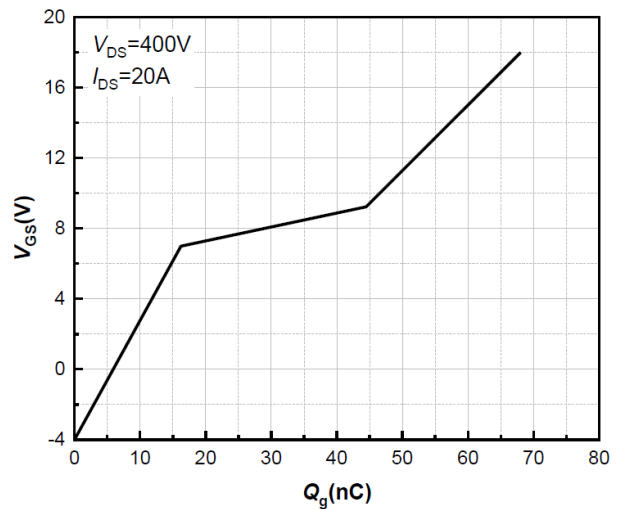


Figure 12. Gate Charge Characteristics

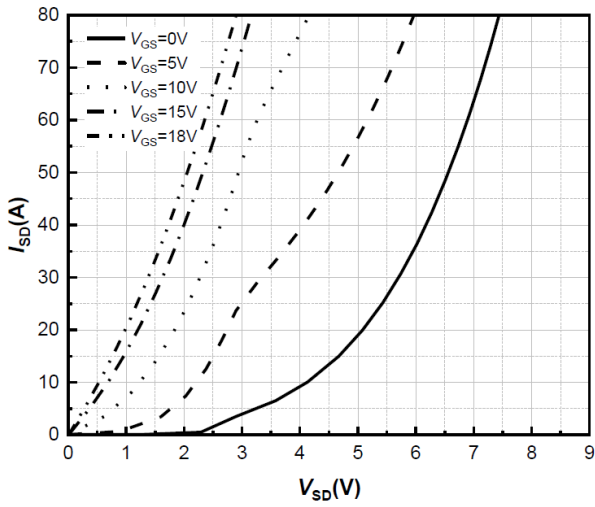


Figure 13. 3rd Quadrant Characteristic (Tj=-40°C)

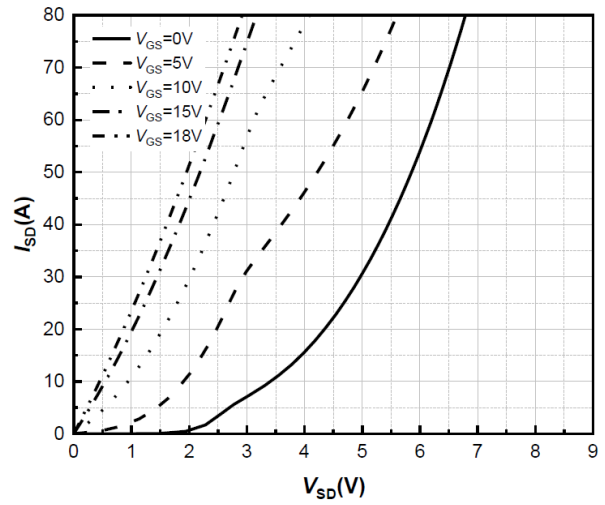


Figure 14. 3rd Quadrant Characteristic (Tj=25°C)

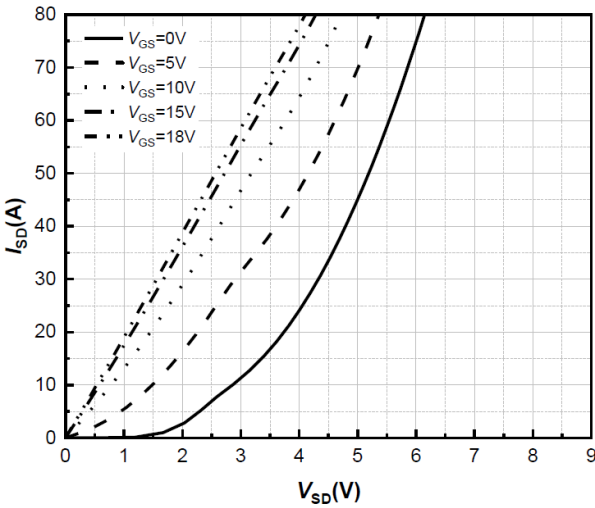


Figure 15. 3rd Quadrant Characteristic (Tj=175°C)

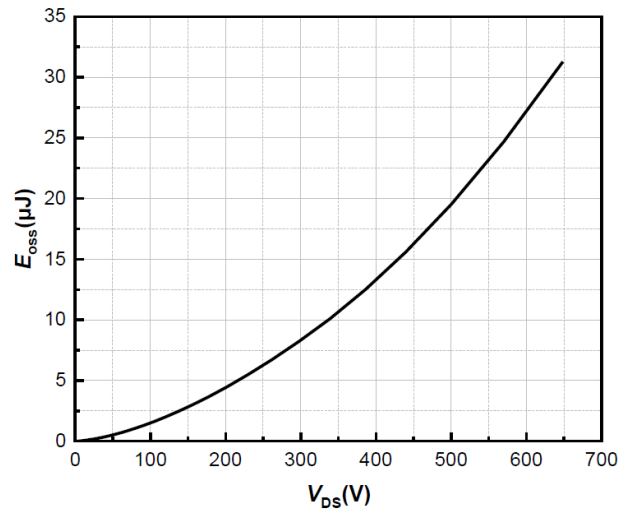


Figure 16. Output Capacitor Stored Energy

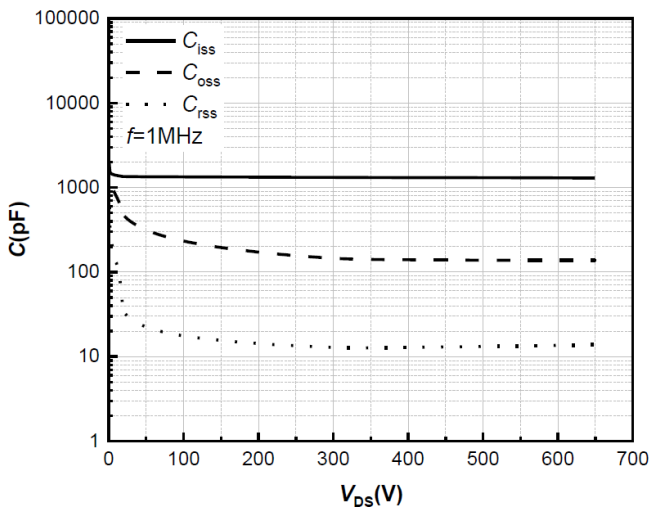


Figure 17. Capacitances vs. Drain-Source

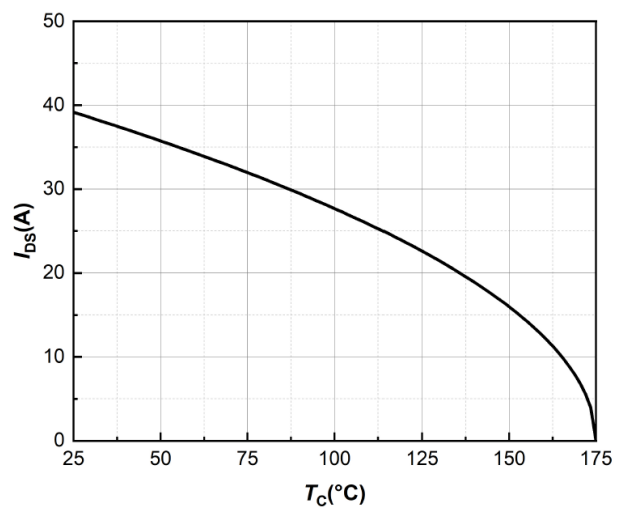


Figure 18. Continuous Drain Current Derating vs. Case Temperature

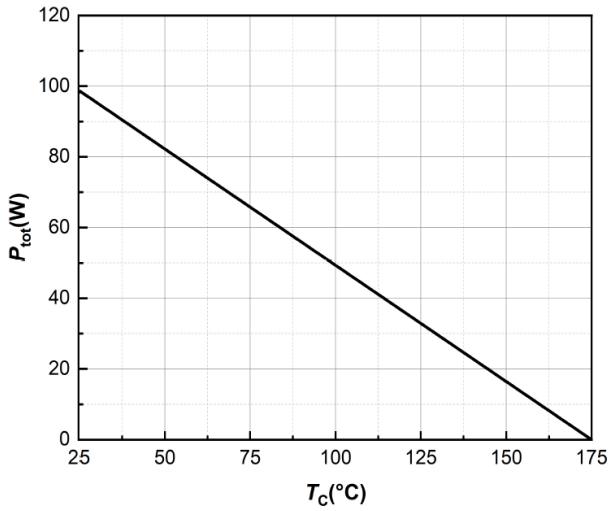


Figure 19. Maximum Power Dissipation Derating vs. Case Temperature

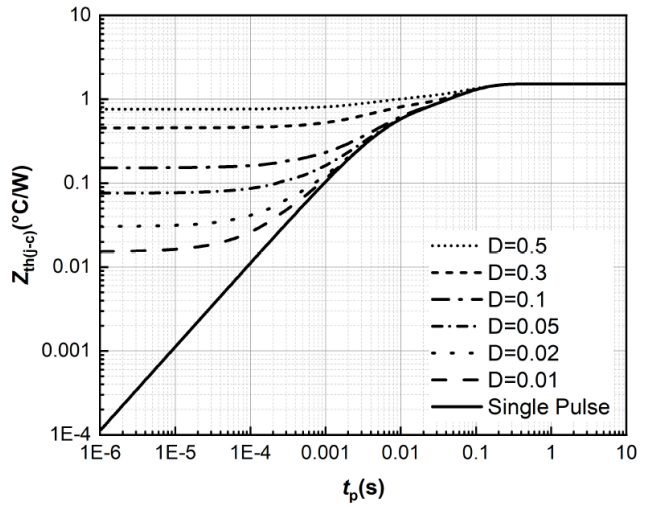


Figure 20. Transient Thermal Impedance

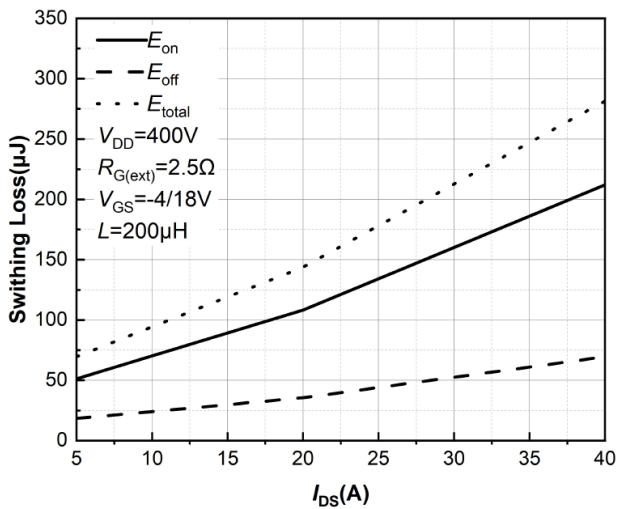


Figure 21. Clamped Inductive Switching Energy vs. Drain Current

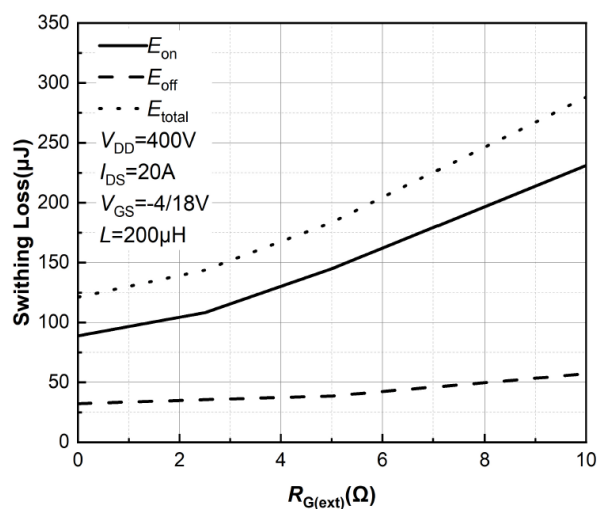


Figure 22. Clamped Inductive Switching Energy vs. R_G

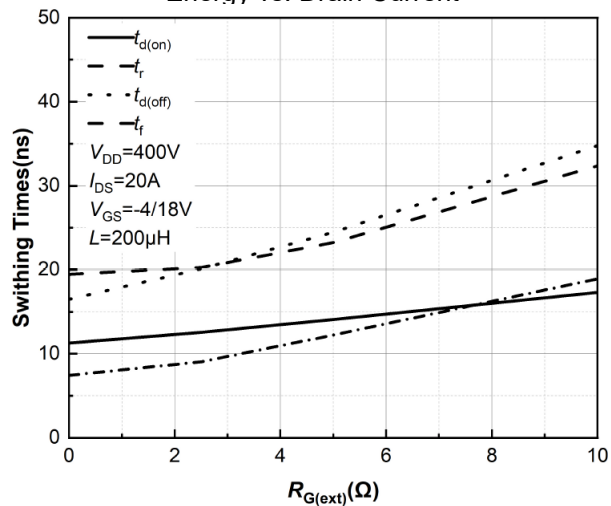


Figure 23. Switching Times vs. R_G

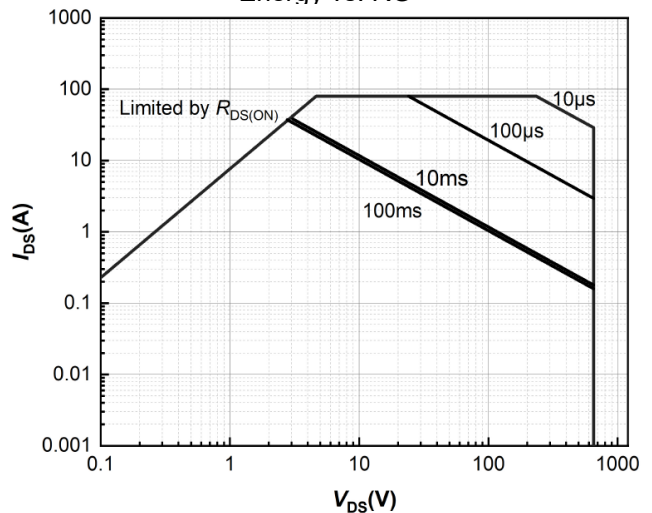
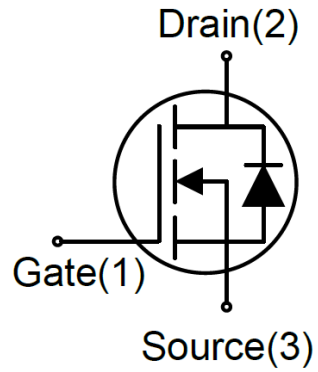
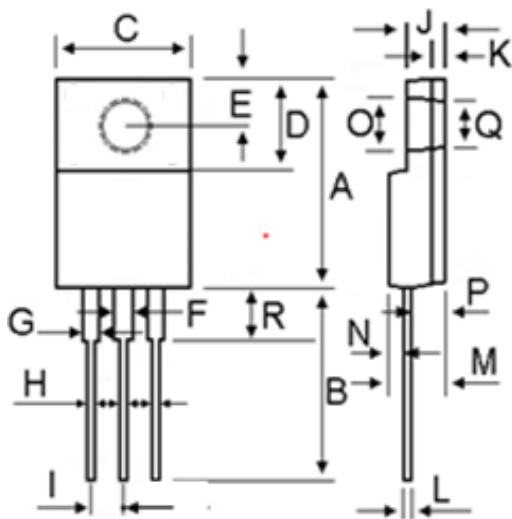


Figure 24. Safe Operating Area

·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

Notice

MOSPEC reserves the rights to make changes of the content herein the document anytime without notification. MOSPEC or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies. Please refer to MOSPEC website for the last document.

MOSPEC disclaims any and all liability arising out of the application or use of any product including damages incidentally and consequentially incurred.

Application shown on the herein document are examples of standard use and operation. Customers are responsible for comprehending suitable use in particular applications. MOSPEC makes no representation or warranty that such application will be suitable for the specified use without further testing or modification.

The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by MOSPEC for any infringements of patents or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of MOSPEC or others.

These MOSPEC products are intended for usage in general electronic equipment. Please make sure to consult with MOSPEC before you use these MOSPEC products in equipment which require specialized quality and/or reliability, and in equipment which could have major impact to the welfare of human life (atomic energy control, aeronautics , traffic control, combustion control, safety devices etc.)