

1200V SiC N-Channel MOSFET

MAIN CHARACTERISTICS

I_D	74A
V_{DSS}	1200V
$R_{DS(on)-typ}(@V_{GS}=18V)$	$<50m\Omega$ (Typ: 37mΩ)

FEATURES

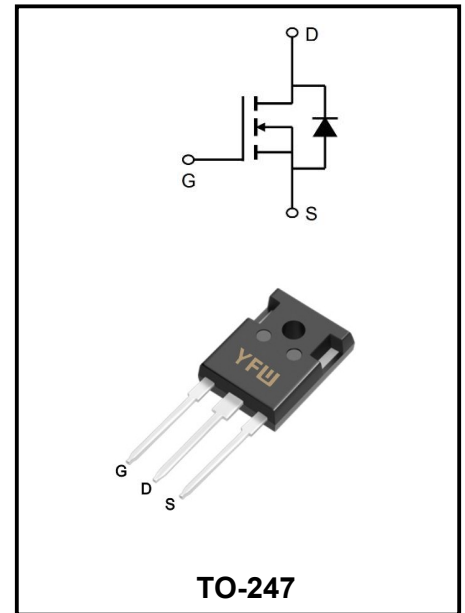
- ◆ High Speed Switching with Low Capacitances
- ◆ High Blocking Voltage with Low RDS(on)
- ◆ Easy to Parallel
- ◆ Simple to Drive
- ◆ RoHS Compliant

BENEFITS

- ◆ Increased Power Density
- ◆ Faster Operating Frequency
- ◆ Reduction of Heat Sink Requirements
- ◆ Higher Efficiency
- ◆ Reduced EMI

APPLICATIONS

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



Maximum Ratings at $T_c=25^\circ\text{C}$ unless otherwise specified

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	1200	V
Gate-Source Voltage	V_{GS}	-8/+22	V
Recommended Operation Value	V_{GSop}	-4/+18	V
Continue Drain Current $T_c=25^\circ\text{C}$	I_D	74	A
Continue Drain Current $T_c=100^\circ\text{C}$		52	
Pulsed Drain Current	I_{DM}	150	A
Power Dissipation $T_c=25^\circ\text{C}$	P_D	312	W
Power Dissipation $T_c=100^\circ\text{C}$		156	
Operating Temperature Range	T_J	-40 to +175	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-40 to +175	$^\circ\text{C}$
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.48	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	26.8	$^\circ\text{C/W}$

Note1: Pulse test: 300 μs pulse width, 2 % duty cycle

Electrical Characteristics at Tc=25°C unless otherwise specified

Parameter	Test Condition	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 100\mu\text{A}$	BV_{DSS}	1200	-	-	V
Drain-Source Leakage Current	$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}$	I_{DSS}	-	1	5	μA
Gate Leakage Current	$V_{GS} = 18\text{ V}, V_{DS} = 0\text{ V}$	I_{GSS}	-	-	250	nA
Gate-Source Threshold Voltage	$V_{DS} = V_{GS}, I_D = 10\text{ mA}$	$V_{GS(th)}$	2	2.6	4	V
	$V_{DS} = V_{GS}, I_D = 10\text{ mA}, T_J = 175^\circ\text{C}$		-	2	-	V
Drain-Source On-State Resistance	$V_{GS} = 18\text{ V}, I_D = 40\text{ A}$	$R_{DS(on)}$	-	37	50	mΩ
	$V_{GS} = 18\text{ V}, I_D = 40\text{ A}, T_J = 175^\circ\text{C}$		-	47	-	mΩ
Internal Gate Resistance	f=1MHz	$R_{G(int)}$	-	2.1	-	Ω
Input Capacitance	$V_{DS} = 1000\text{ V}$ $V_{GS} = 0\text{ V}$ f=100kHz	C_{iss}	-	2975	-	pF
Output Capacitance		C_{oss}	-	119	-	pF
Reverse Transfer Capacitance		C_{rss}	-	12	-	pF
Coss Stored Energy		E_{oss}	-	175	-	μJ
Total Gate Charge(Note2)	$I_D = 40\text{ A}$ $V_{DD} = 800\text{ V}$ $V_{GS} = -4/+18\text{ V}$	Q_g	-	117	-	nC
Gate to Source Charge(Note2)		Q_{gs}	-	38	-	nC
Gate to Drain Charge(Note2)		Q_{gd}	-	27	-	nC
Turn-on Switching Energy	$V_{DS} = 800\text{ V},$ $I_D = 40\text{ A}$ $V_{GS} = -4/+18\text{ V}$ $R_{G(int)} = 2.5\text{ }\Omega$ $L = 200\mu\text{H}$	E_{on}	-	485	-	μJ
Turn-off Switching Energy		E_{off}	-	75	-	μJ
Turn-on Delay Time(Note2)		$t_{d(on)}$	-	18	-	ns
Rise Time(Note2)		t_r	-	21	-	ns
Turn-Off Delay Time(Note2)		$t_{d(OFF)}$	-	31	-	ns
Fall Time(Note2)		t_f	-	9	-	ns
Maximun Body-Diode Continuous Current	$V_{GS} = -4\text{ V}, T_c = 25^\circ\text{C}$	I_S	-	45	-	A
	$V_{GS} = -4\text{ V}, T_c = 100^\circ\text{C}$		-	20	-	A
Maximun Body-Diode Pulsed Current(Note2)		I_{SM}	-	150	-	A
Drain-Source Diode Forward Voltage	$V_{GS} = -4\text{ V}, I_{SD} = 20\text{ A}$	V_{SD}	-	5	6.6	V
	$V_{GS} = -4\text{ V}, I_{SD} = 20\text{ A}, T_J = 175^\circ\text{C}$		-	4.4	-	V
Reverse Recovery Time(Note2)	$V_{GS} = -4\text{ V}, I_{SD} = 20\text{ A},$ $V_R = 800\text{ V}, dI_F/dt = 3900\text{ A}/\mu\text{s}$	t_{rr}	-	19	-	ns
Reverse Recovery Charge(Note2)		Q_{rr}	-	500	-	nC
Peak Reverse Recovery Current		I_{rrm}	-	50	-	A

RATINGS AND CHARACTERISTIC CURVES

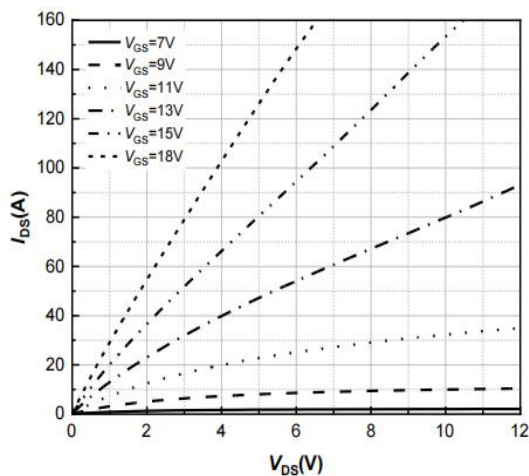


Figure 1. Output Characteristics
 $T_j = -40^\circ\text{C}$

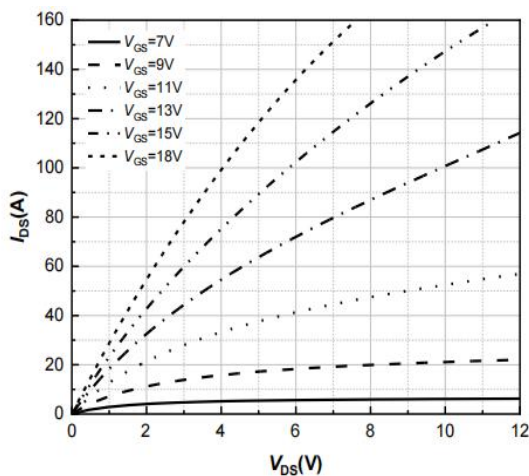


Figure 2. Output Characteristics
 $T_j = 25^\circ\text{C}$

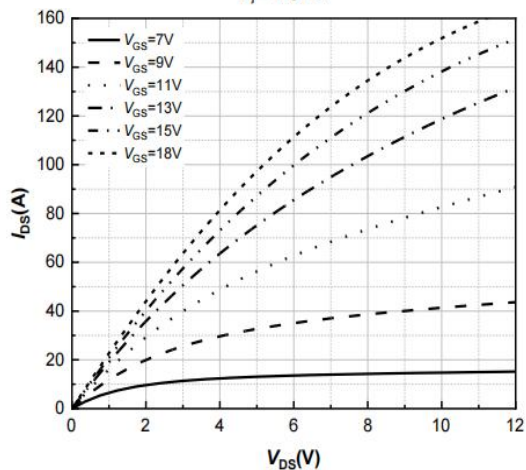


Figure 3. Output Characteristics
 $T_j = 175^\circ\text{C}$

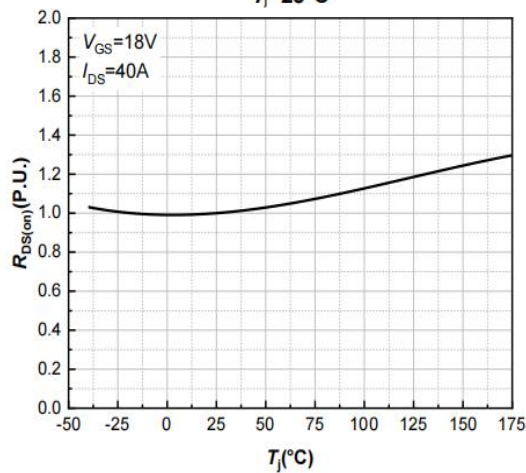


Figure 4. Normalized On-Resistance vs. Temperature

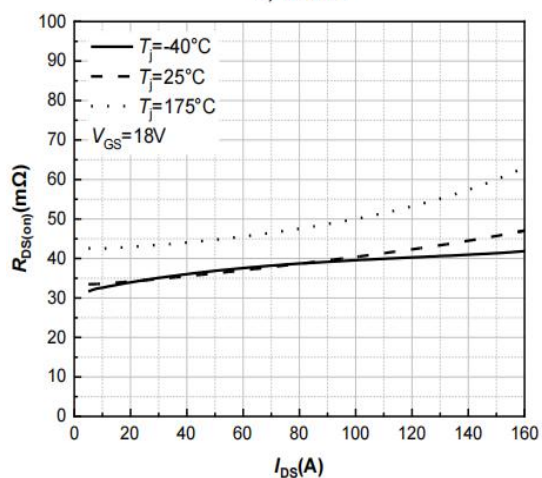


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

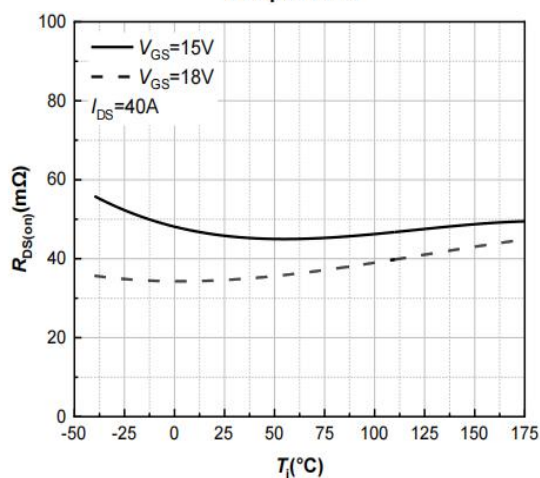


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

RATINGS AND CHARACTERISTIC CURVES

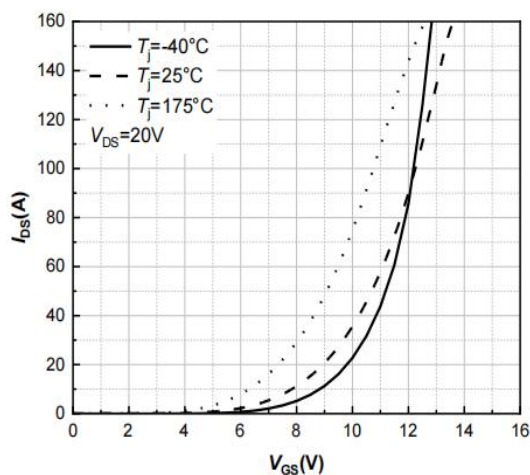


Figure 7. Transfer Characteristic for Various Junction Temperatures

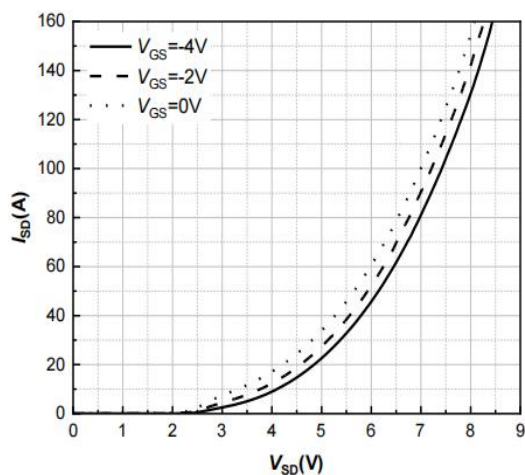


Figure 8. Body Diode Characteristic $T_J = -40^\circ\text{C}$

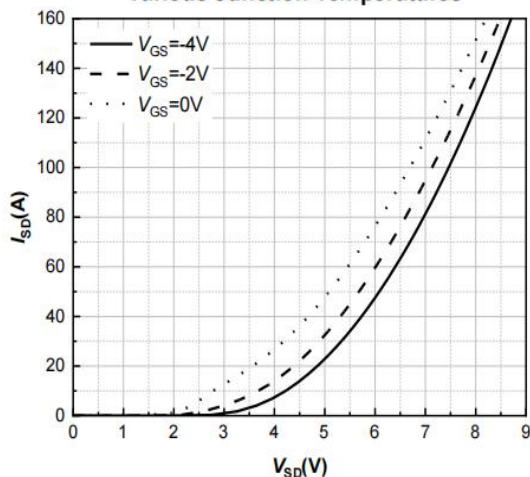


Figure 9. Body Diode Characteristic $T_J = 25^\circ\text{C}$

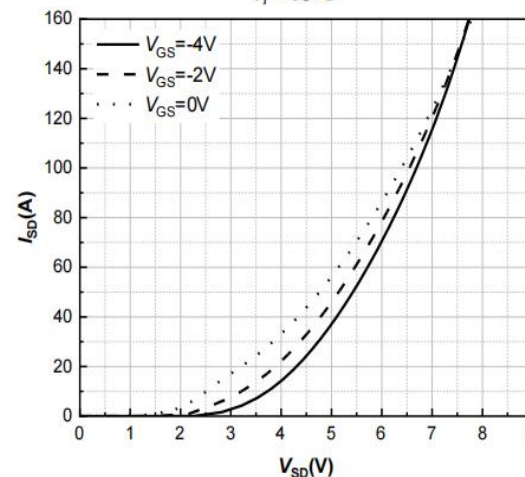


Figure 10. Body Diode Characteristic $T_J = 175^\circ\text{C}$

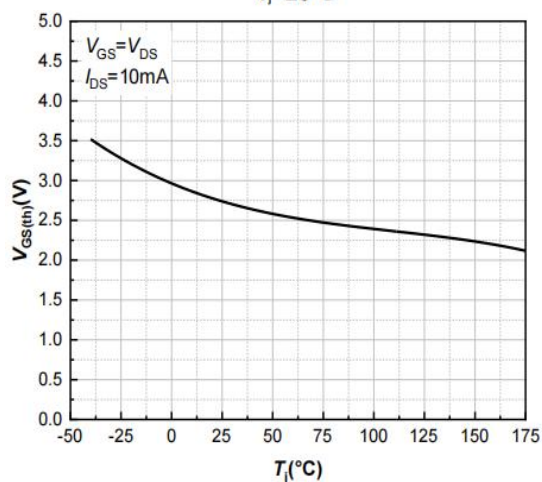


Figure 11. Threshold Voltage vs. Temperature

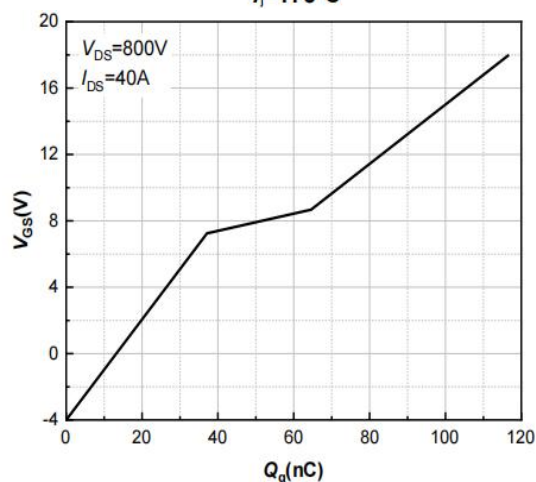


Figure 12. Gate Charge Characteristics

RATINGS AND CHARACTERISTIC CURVES

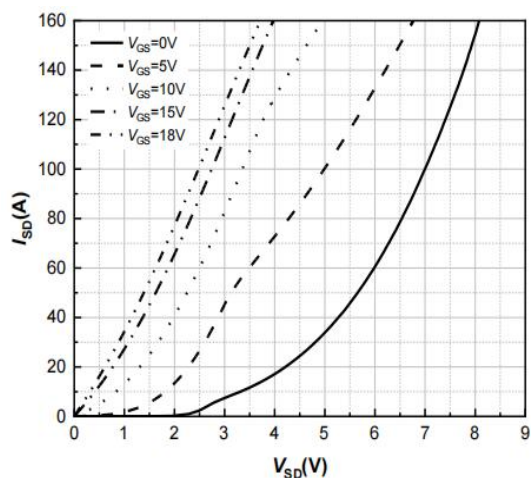


Figure 13. 3rd Quadrant Characteristic
 $T_j = -40^{\circ}\text{C}$

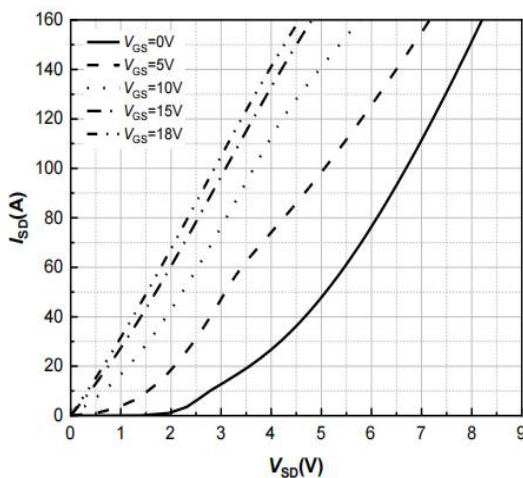


Figure 14. 3rd Quadrant Characteristic
 $T_j = 25^{\circ}\text{C}$

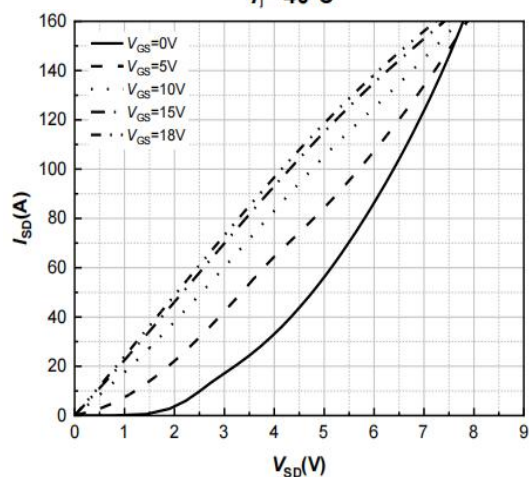


Figure 15. 3rd Quadrant Characteristic
 $T_j = 175^{\circ}\text{C}$

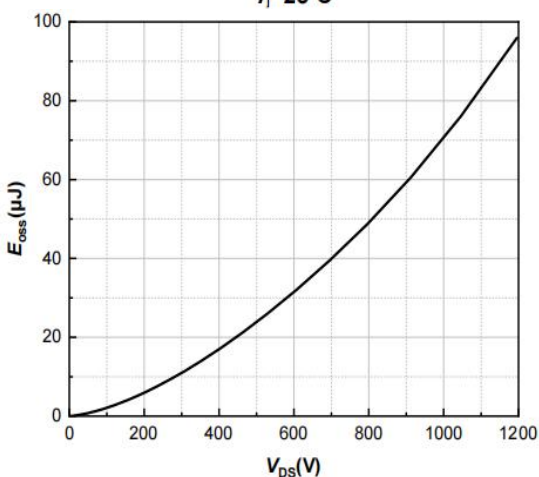


Figure 16. Output Capacitor Stored Energy

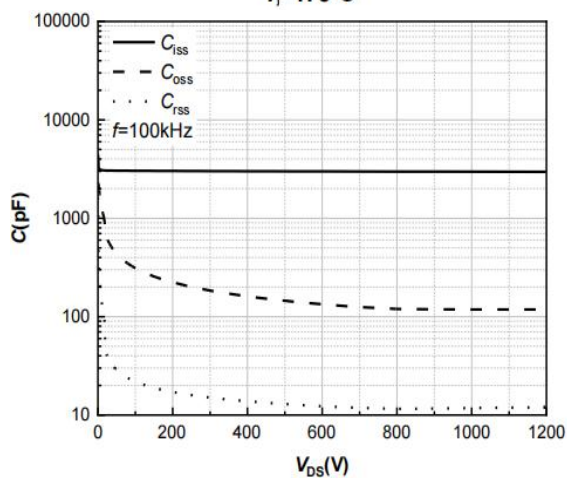


Figure 17. Capacitances vs. Drain-Source

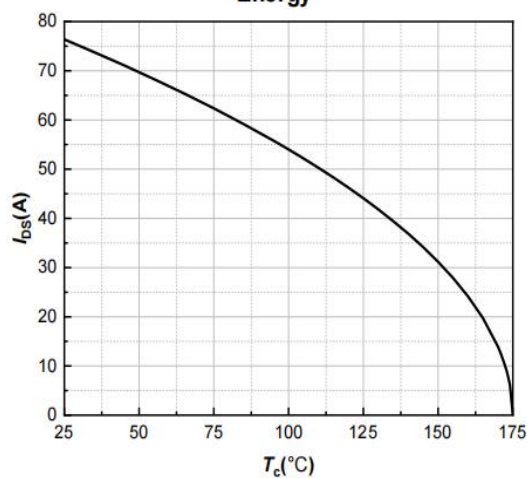


Figure 18. Continuous Drain Current Derating vs. Case Temperature

RATINGS AND CHARACTERISTIC CURVES

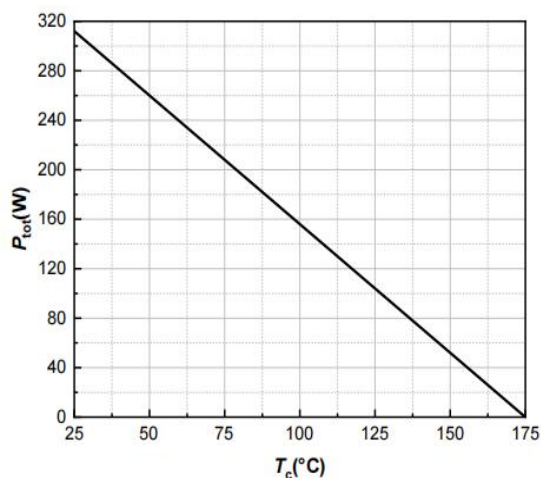


Figure 19. Maximum Power Dissipation Derating vs. Case Temperature

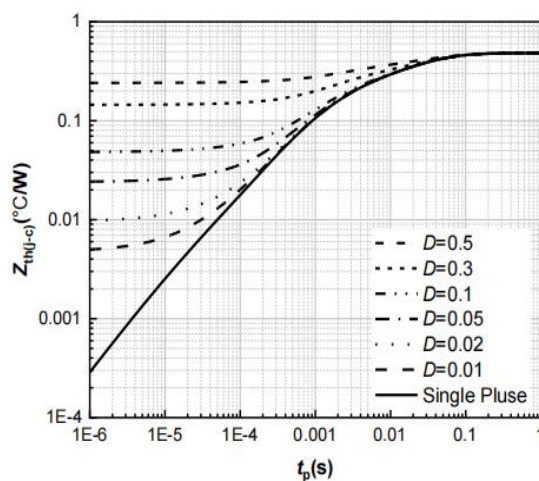


Figure 20. Transient Thermal Impedance

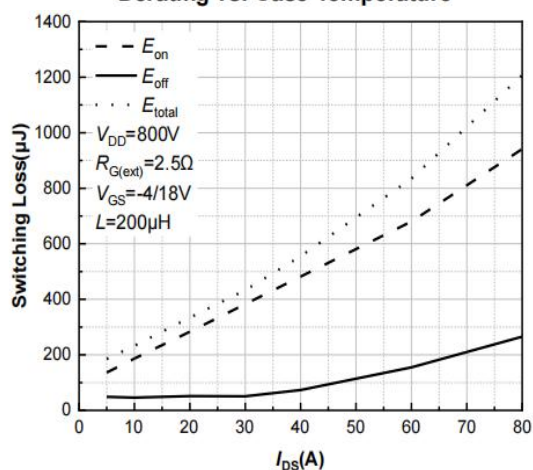


Figure 21. Clamped Inductive Switching Energy vs. Drain Current

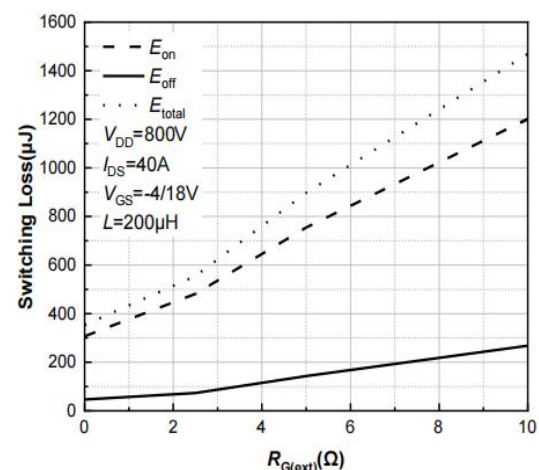


Figure 22. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

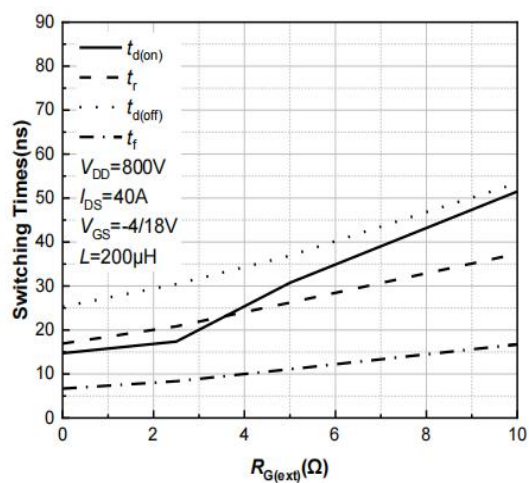


Figure 23. Switching Times vs. $R_{G(ext)}$

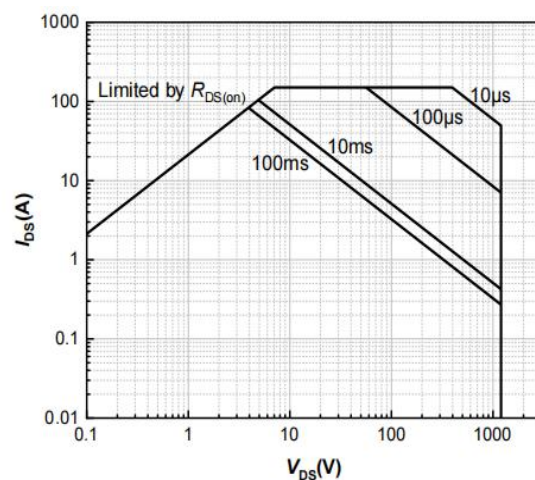
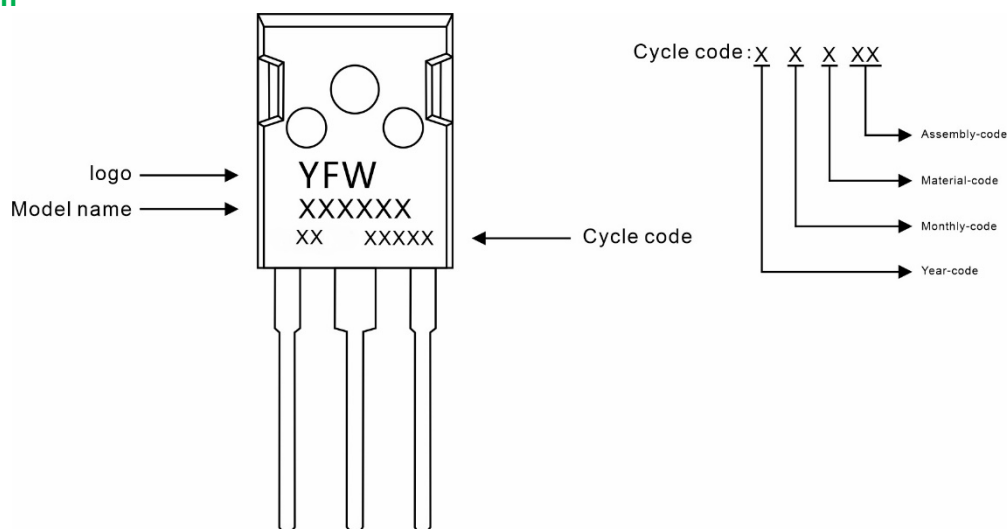


Figure 24. Safe Operating Area

Marking Diagram



Ordering information

Model name	Package	Unit Weight	Base Quantity	Packing Quantity
YFWM3040120APG3	TO-247	0.209oz(5.93g)	30pcs/tube	600PCS/Box 2400PCS/Carton

Package Dimensions

TO-247

Symbol	Dimensions in mm		Dimensions in Inch	
	Min.	Max.	Min.	Max.
A	4.90	5.10	0.193	0.201
A1	1.90	2.10	0.075	0.083
A2	2.29	2.54	0.090	0.100
b	1.00	1.40	0.039	0.055
b1	2.00	2.20	0.079	0.087
b2	3.00	3.20	0.118	0.126
c	0.50	0.70	0.020	0.028
D	15.75	16.05	0.620	0.632
E	20.20	20.80	0.795	0.819
e	5.45 (BSC)		0.215 (BSC)	
e1	10.90 (BSC)		0.429 (BSC)	
F	6.05	6.25	0.238	0.246
F1	5.80	6.00	0.228	0.236
L	20.10	20.40	0.791	0.803
L1	4.05	4.35	0.159	0.171
Φ	3.50	3.70	0.138	0.146

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