

FEATURES

High Speed Switching
High Blocking Voltage with Low $R_{DS(on)}$
Easy to Parallel
Simple to Drive
RoHS Compliant

APPLICATION

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

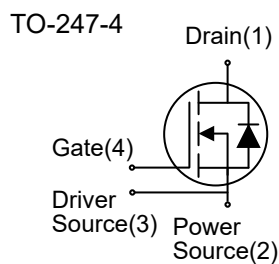
APPLICATION

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

V_{DSS} 1200V
 I_D 43 A
 $R_{DS(ON)}$ 59 mΩ



LOGO GK XXX CODE
K2 R 059
VDSS $R_{DS(on)}$



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

Symbol	Parameter	Test conditions	Value	Unit
V_{DS}	Drain-Source Voltage		1200	V
I_D	Continuous Drain Current	$T_c=25^\circ\text{C}$ $T_c=100^\circ\text{C}$	43 31	A
I_{DM}	Peak Drain Current	Pulse width t_p limited by T_{jmax}	105	A
V_{GSmax}	Gate-Source Voltage		-8/+22	V
V_{GSop}	Recommend Gate-Source Voltage		-4/+18	V
P_{tot}	Power Dissipation	$T_c=25^\circ\text{C}$ $T_c=100^\circ\text{C}$	250 125	W
T_j	Operating Junction Temperature		-40~175	$^\circ\text{C}$
T_{stg}	Storage Temperature		-40~175	$^\circ\text{C}$

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

Static Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$I_D=100\mu\text{A}$, $V_{GS}=0\text{V}$	1200			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=1200\text{V}$, $V_{GS}=0\text{V}$		1	100	μA
I_{GSS}	Gate-Source Leakage Current	$V_{DS}=0\text{V}$, $V_{GS}=18\text{V}$			250	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=5\text{mA}$ $T_J=25^{\circ}\text{C}$ $T_J=150^{\circ}\text{C}$ $T_J=175^{\circ}\text{C}$	2	2.8 2.2 2.1	4	V
$R_{DS(on)}$	Drain-Source On-State Resistance	$V_{GS}=15\text{V}$, $I_D=20\text{A}$ $T_J=25^{\circ}\text{C}$ $T_J=175^{\circ}\text{C}$ $V_{GS}=18\text{V}$, $I_D=20\text{A}$ $T_J=25^{\circ}\text{C}$ $T_J=150^{\circ}\text{C}$ $T_J=175^{\circ}\text{C}$		72 95 59 81 90	93	$\text{m}\Omega$

Dynamic Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	$V_{DS}=1000\text{V}$, $f=1\text{MHz}$, $V_{GS}=0\text{V}$		2415		pF
C_{oss}	Output Capacitance			79		pF
C_{rss}	Reverse Transfer Capacitance			6		pF
$R_{G(int)}$	Internal Gate Resistance	$f=1\text{MHz}$		0.98		Ω
Q_g	Total Gate Charge	$V_{DS}=800\text{V}$, $I_D=20\text{A}$, $V_{GS}=-4/18\text{V}$		103		nC
Q_{gs}	Gate to Source Charge			29		nC
Q_{gd}	Gate to Drain Charge			36		nC

Thermal Characteristics

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
$R_{th(j-c)}$	Thermal Resistance from Junction to Case		0.60		$^{\circ}\text{C/W}$

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

Switching Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-On Delay Time	$V_{DD}=800\text{V}$, $I_D=20\text{A}$, $V_{GS}=-4\text{V}/18\text{V}$, $R_{G(ext)}=0\Omega$, $L=200\mu\text{H}$		14		ns
t_r	Rise Time			10		ns
$t_{d(off)}$	Turn-Off Delay Time			22		ns
t_f	Fall Time			9		ns
E_{on}	Turn-On Energy			136		μJ
E_{off}	Turn-Off Energy			30		μJ

Reverse Diode Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
V_{SD}	Diode Forward Voltage	$V_{GS}=-4\text{V}$, $I_{SD}=20\text{A}$ $T_j=25^\circ\text{C}$ $T_j=175^\circ\text{C}$		4.6 4.2		V
I_S	Continuous Diode Forward Current	$V_{GS}=-4\text{V}$ $T_c=25^\circ\text{C}$ $T_c=100^\circ\text{C}$		43 23		A
t_{rr}	Reverse Recovery Time	$V_{GS}=-4\text{V}$, $I_{SD}=20\text{A}$, $V_R=800\text{V}$, $di/dt=5476\text{A}/\mu\text{s}$		8		ns
Q_{rr}	Reverse Recovery Charge			94		nC
I_{rrm}	Peak Reverse Recovery Current			18		A

RATING AND CHARACTERISTIC CURVES

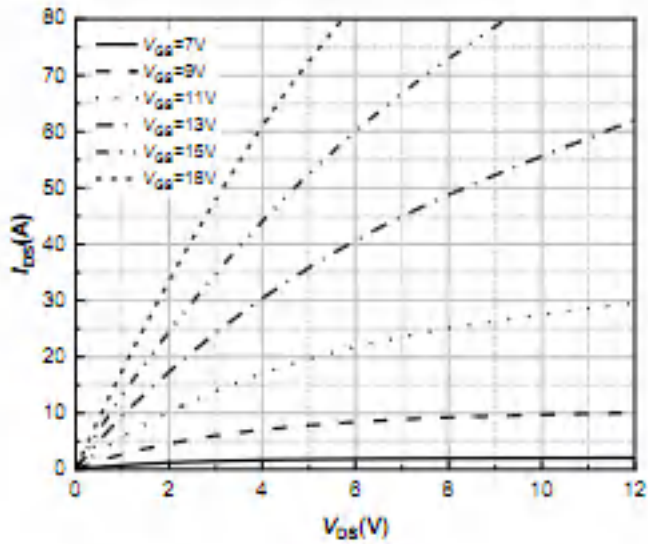


Figure 1. Output Characteristics
 $T_j = -40^\circ\text{C}$

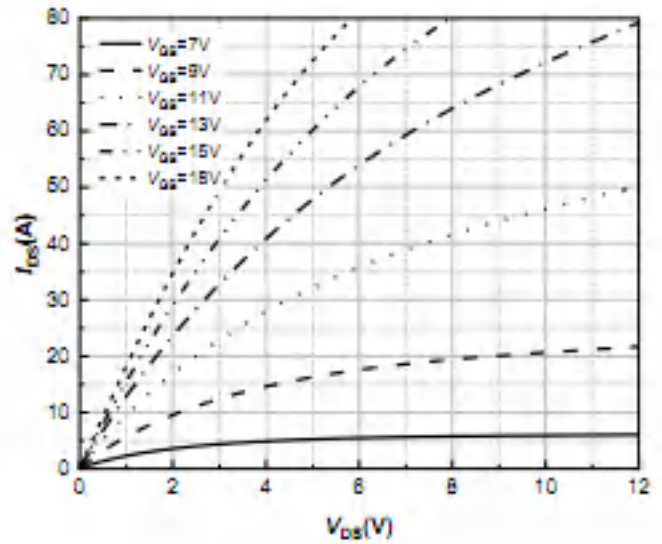


Figure 2. Output Characteristics
 $T_j = 25^\circ\text{C}$

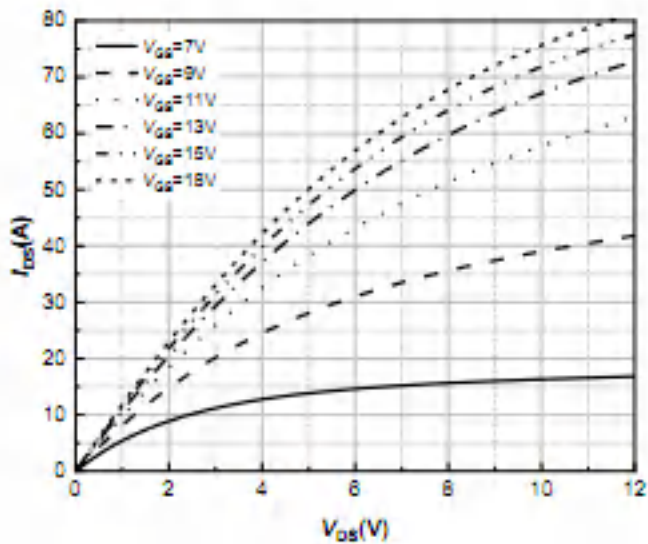


Figure 3. Output Characteristics
 $T_j = 175^\circ\text{C}$

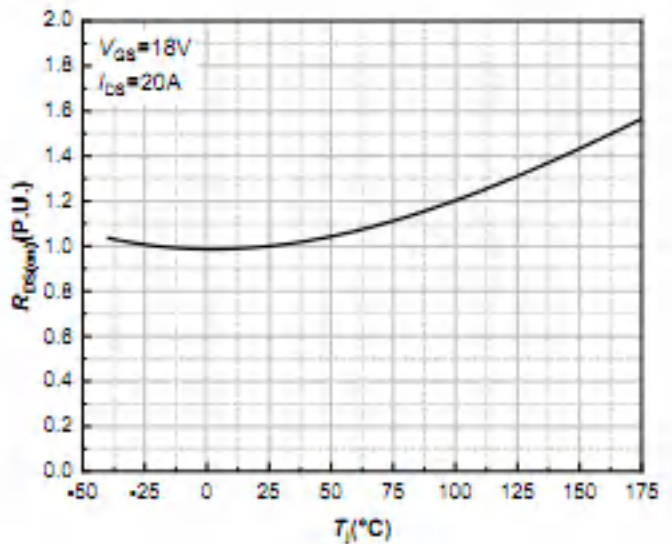


Figure 4. Normalized On-Resistance vs.
Temperature

RATING AND CHARACTERISTIC CURVES

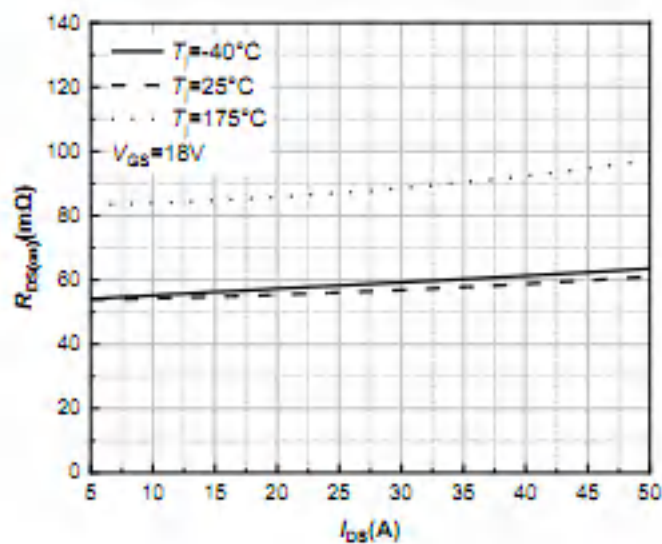


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

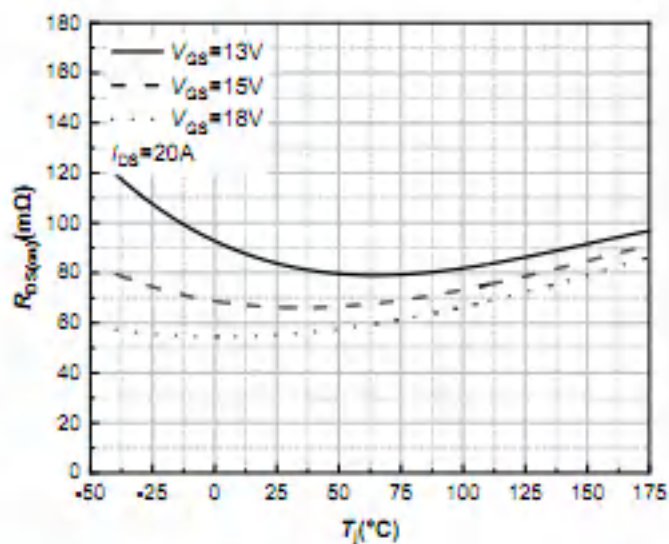


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage

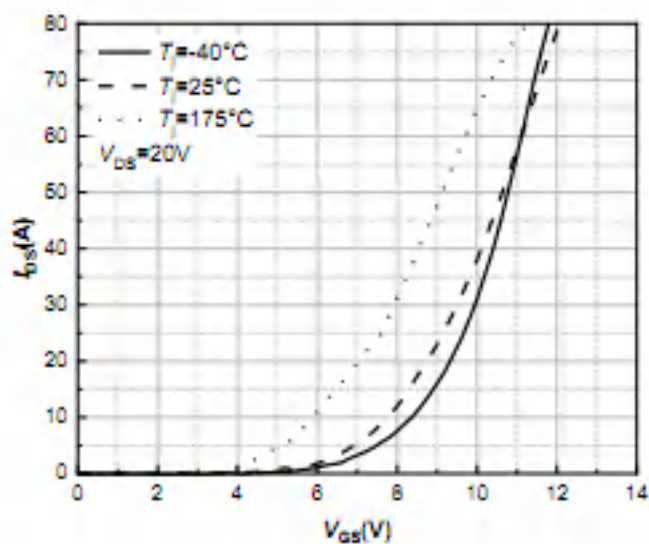


Figure 7. Transfer Characteristic for Various Junction Temperatures

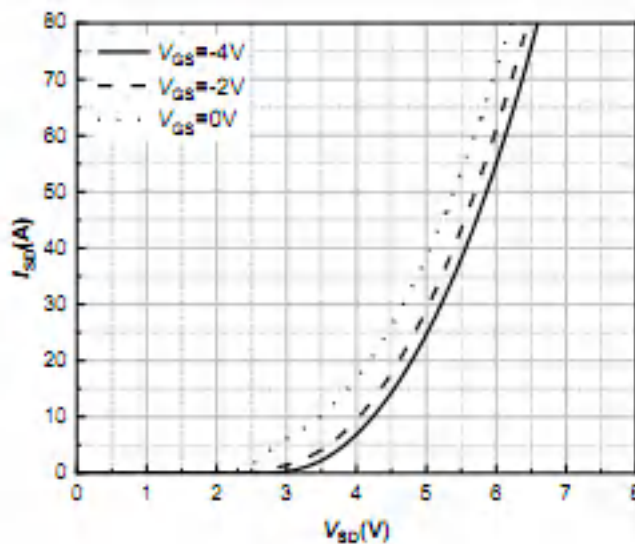


Figure 8. Body Diode Characteristic $T_J = -40^{\circ}\text{C}$

RATING AND CHARACTERISTIC CURVES

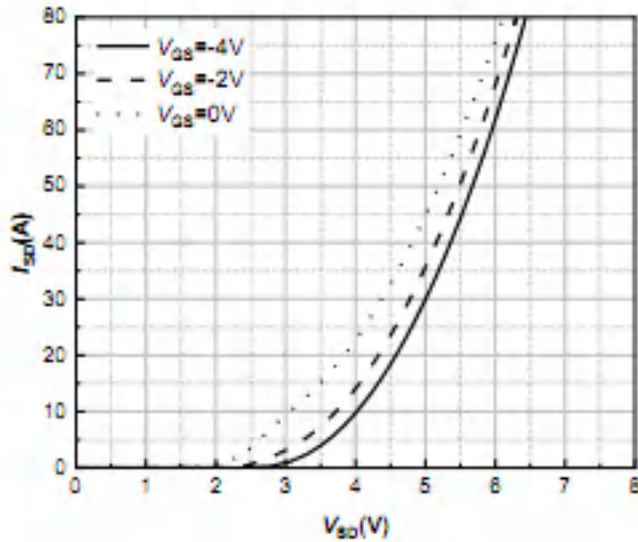


Figure 9. Body Diode Characteristic
 $T_j = 25^\circ\text{C}$

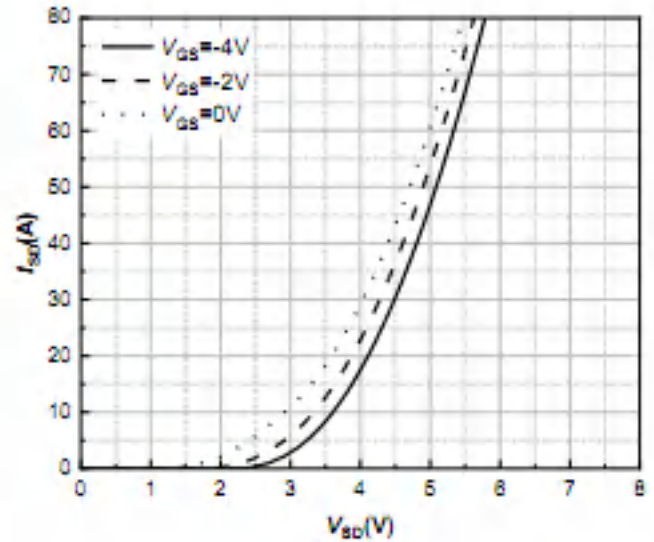


Figure 10. Body Diode Characteristic
 $T_j = 175^\circ\text{C}$

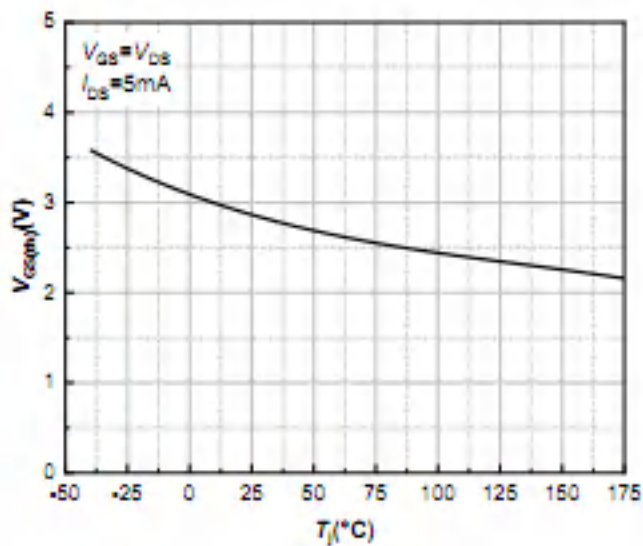


Figure 11. Threshold Voltage vs.
Temperature

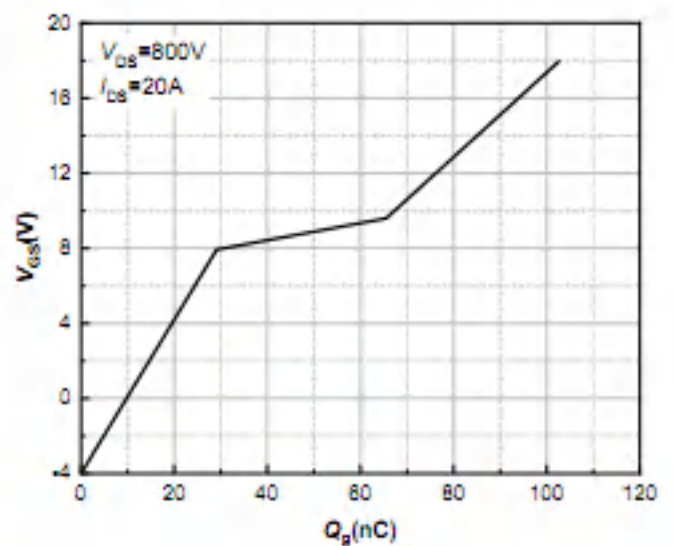


Figure 12. Gate Charge Characteristics

RATING AND CHARACTERISTIC CURVES

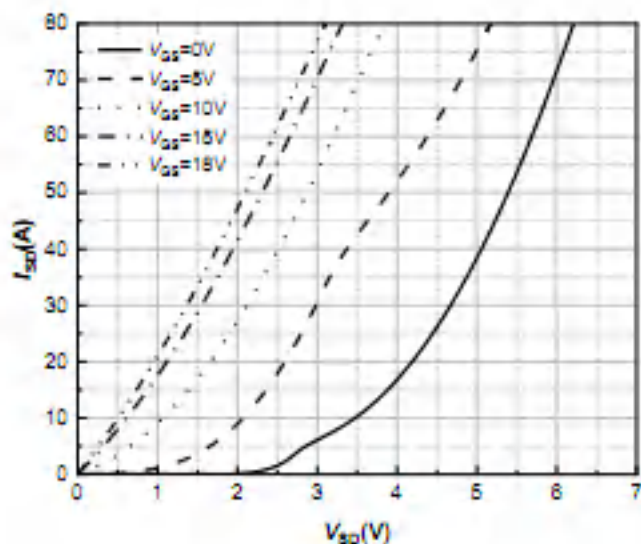


Figure 13. 3rd Quadrant Characteristic
 $T_j = -40^{\circ}\text{C}$

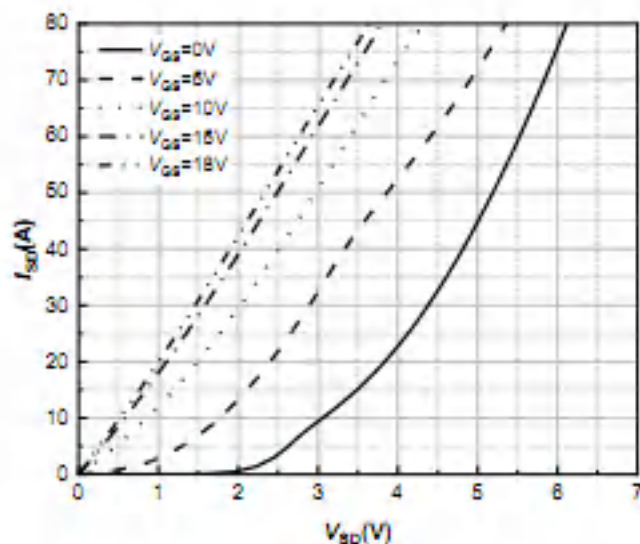


Figure 14. 3rd Quadrant Characteristic
 $T_j = 25^{\circ}\text{C}$

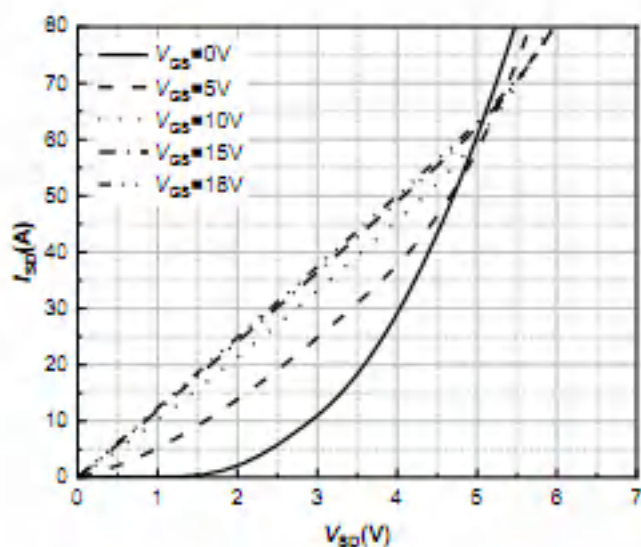


Figure 15. 3rd Quadrant Characteristic
 $T_j = 175^{\circ}\text{C}$

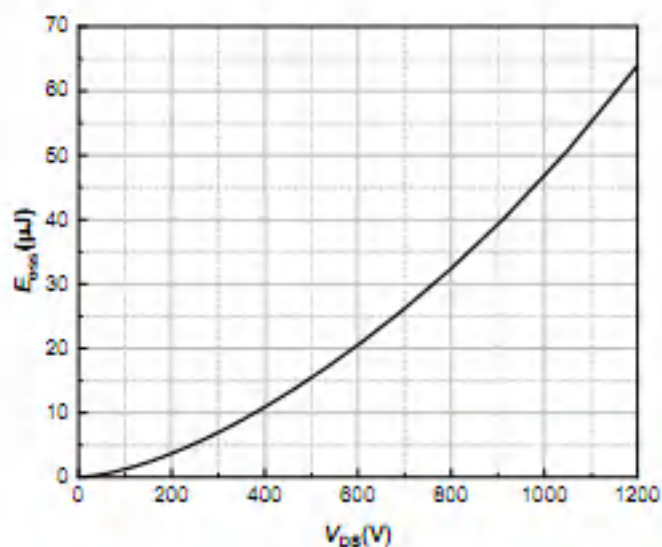


Figure 16. Output Capacitor Stored
Energy

RATING AND CHARACTERISTIC CURVES

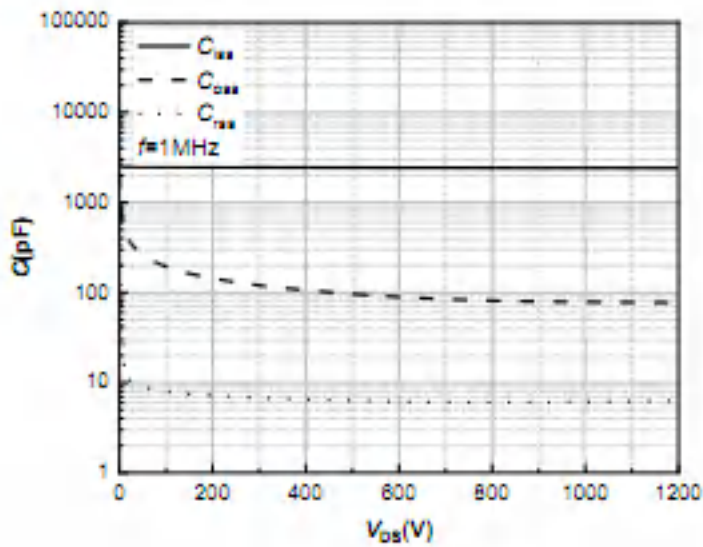


Figure 17. Capacitances vs. Drain-Source

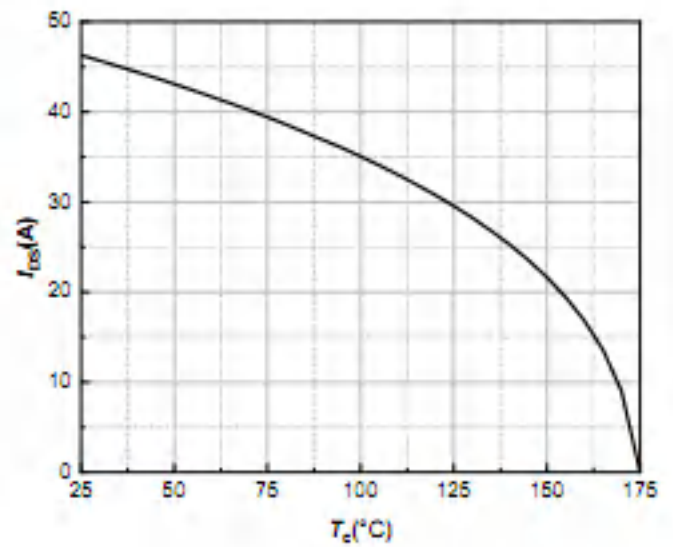


Figure 18. Continuous Drain Current
Derating vs. Case Temperature

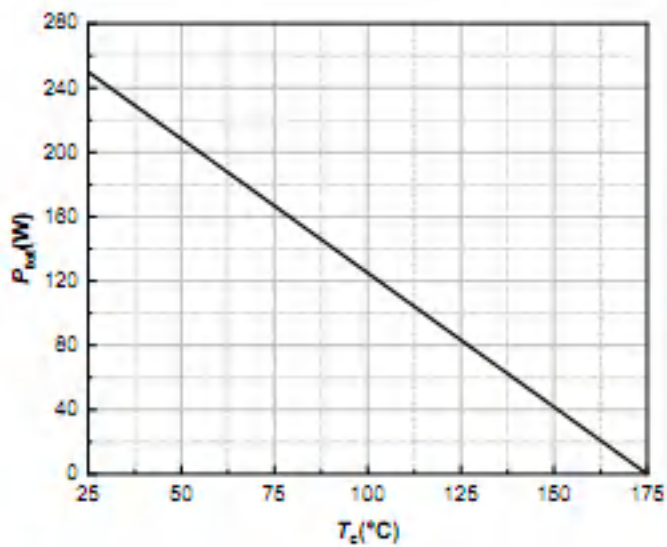


Figure 19. Maximum Power Dissipation
Derating vs. Case Temperature

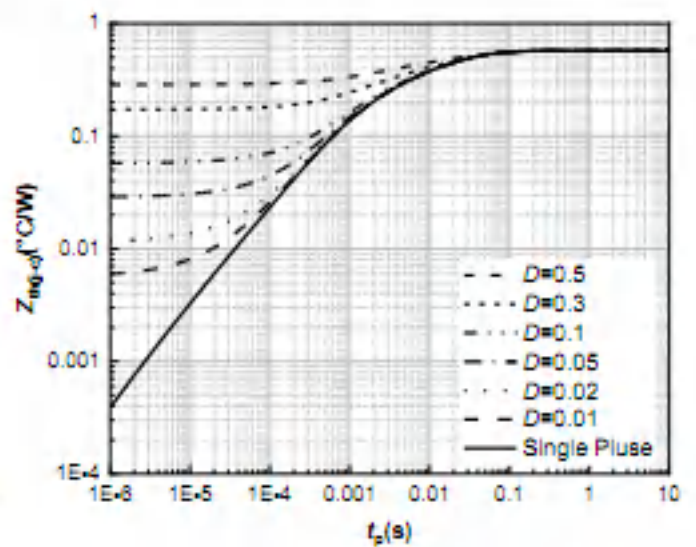


Figure 20. Transient Thermal Impedance

RATING AND CHARACTERISTIC CURVES

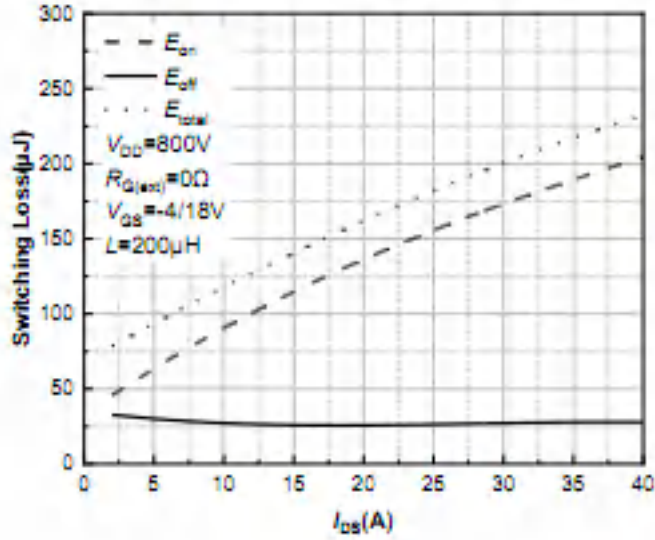


Figure 21. Clamped Inductive Switching Energy vs. Drain Current

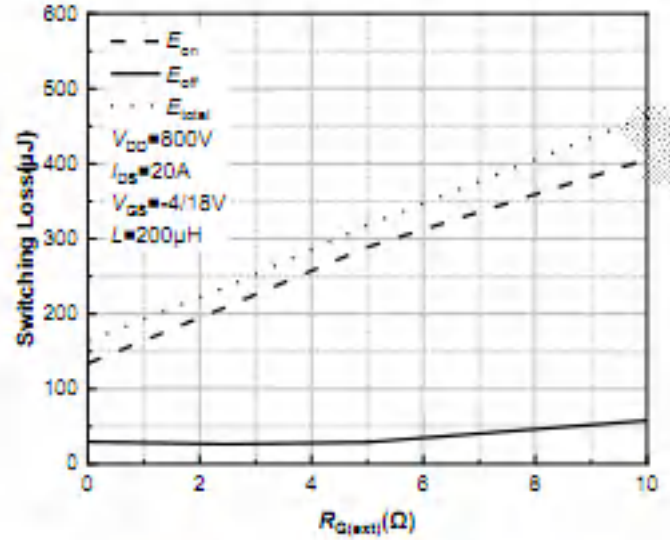


Figure 22. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

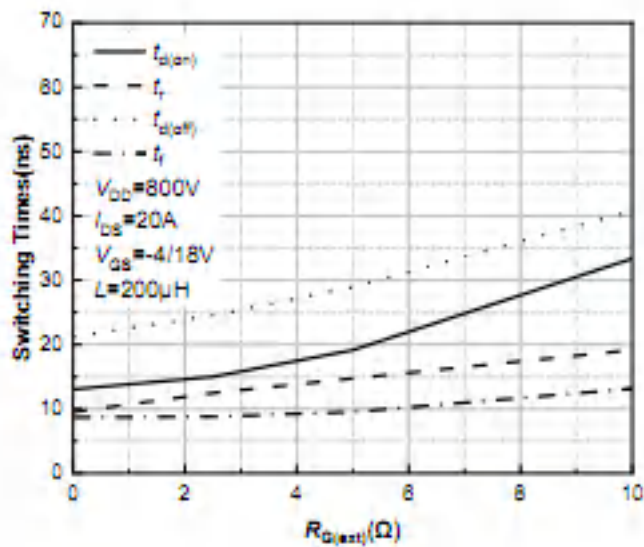


Figure 23. Switching Times vs. $R_{G(ext)}$

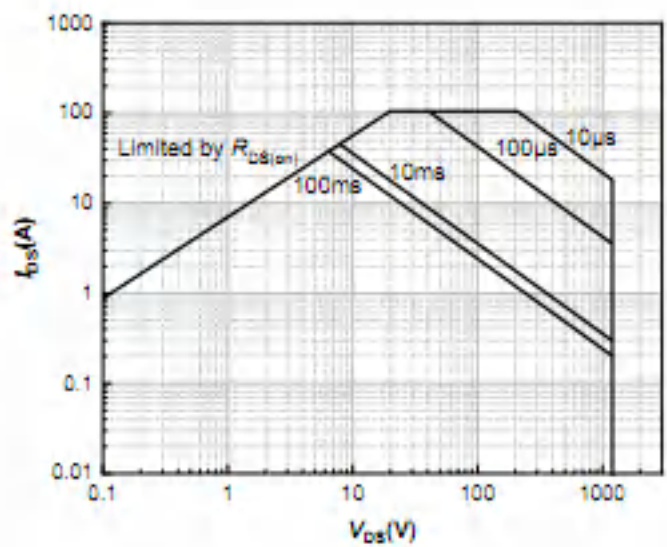
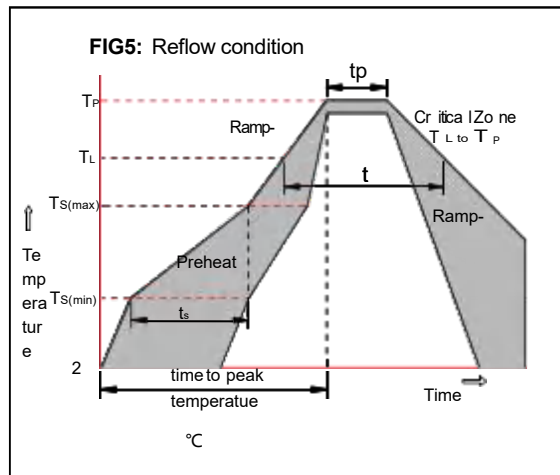


Figure 24. Safe Operating Area

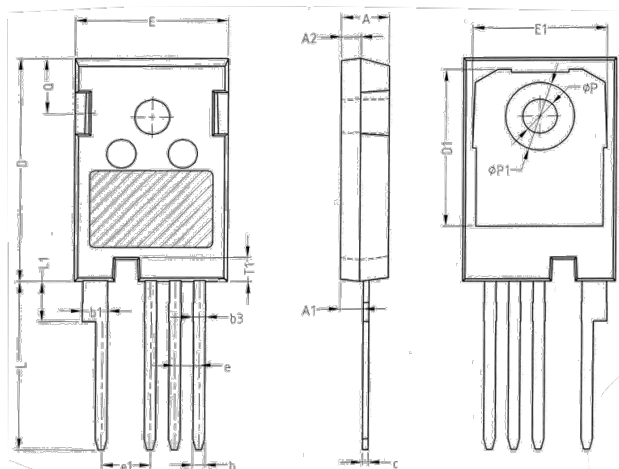
Soldering parameters

Reflow Condition		Pb-Free assembly (see as below)
Pre Heat	-Temperature Min ($T_{s(min)}$)	+150 °C
	-Temperature Max($T_{s(max)}$)	+200 °C
	-Time (Min to Max) (ts)	60-180 secs.
Average ramp up rate (Liquid us Temp (T_L) to peak)		3 °C/sec. Max
$T_{s(max)}$ to T_L - Ramp-up Rate		3 °C/sec. Max
Reflow	-Temperature(T_L)(Liquid us)	+217 °C
	-Temperature(t_L)	60-150 secs.
Peak Temp (T_P)		+260(+0/-5) °C
Time within 5 °C of actual Peak Temp (t_P)		30 secs. Max
Ramp-down Rate		6 °C/sec. Max
Time 25 °C to Peak Temp (T_P)		8 min. Max
Do not exceed		+260 °C



Package Dimensions & Suggested Pad Layout

TO-247-4



SYMBOL	Unit: mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.80	2.00	2.20
b	1.06	1.21	1.36
b1	2.33	2.63	2.93
b3	1.07	1.30	1.60
c	0.51	0.61	0.75
D	23.30	23.45	23.60
D1	16.25	16.55	16.85
E	15.74	15.94	16.14
E1	13.72	14.02	14.32
T1	2.35	2.50	2.65
e	2.54 BSC		
e1	5.08 BSC		
Q	5.49	5.79	6.09
L	17.27	17.57	17.87
L1	3.99	4.19	4.39
ΦP	3.40	3.60	3.80
ΦP1	7.19 REF		