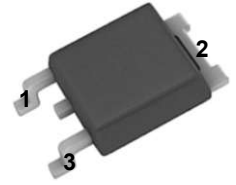
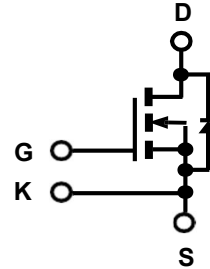


ICE180M80D Silicon Carbide Power MOSFET

Features

- 800V 180mohm SiC MOSFET
- Optimized switching performance
- Fast body diode with low Q_{rr} ensures robust commutation
- Superior thermal performance
- Low $R_{DS(on)}$ and weak temperature dependence of pulse current
- Compatible with Si-MOSFET drive
- Optimized design for high performance power systems

Product Summary			
I_D	$T_A=25^\circ\text{C}$	17.5A	Max
$V_{(BR)DSS}$	$T_C=25^\circ\text{C}$	800V	Min
$r_{DS(on)}$	$V_{GS}=18\text{V}$	180m Ω	Typ
Q_g	$V_{DS}=400\text{V}$	17nC	Typ



TO252

Standard Metal Heatsink

1=Gate, 2=Drain, 3=Source.



Maximum ratings^a, at $T_j=25^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	$T_c=25^\circ\text{C}$	17.5	A
		$T_c=100^\circ\text{C}$	12.4	
Pulsed drain current	$I_{D, \text{pulse}}$		54	A
Maximum gate source voltage	$V_{GS(max)}$		-10/+22	V
Operational gate source voltage	$V_{GS \text{ op}}$		-5...0/+18	V
Single pulsed Avalanche energy	E_{AS}	$L=10\text{mH}$, $V_{DD}=50\text{V}$, $I_{AS}=3.9\text{A}$, $R_G=50\Omega$	76	mJ
Power dissipation	P_{tot}		83.3	W
Storage temperature	T_{stg}		-55 to +175	$^\circ\text{C}$
Operating temperature	T_j			

^a Pulse width limited by T_{jmax}

Parameter	Symbol	Conditions	Values			Unit
			Min	Typ	Max	

Thermal characteristics

Thermal resistance, junction-case	R_{thJC}		-	-	1.8	°C/W
Thermal resistance, junction-ambient	R_{thJA}	leaded	-	-	60	
Soldering temperature, wave soldering only allowed at leads	T_{solder}	1.6mm (0.063in.) from case for 10 s	-	-	260	°C

Electrical characteristics^a, at $T_i=25^{\circ}\text{C}$, unless otherwise specified

Static characteristics

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=100\mu A$	800	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=2.6mA$	2.6	3.8	4.6	
		$V_{DS}=V_{GS}, I_D=2.6mA, T_j=175^{\circ}\text{C}$	-	2.7	-	
Zero gate voltage drain current	I_{DSS}	$V_{DS}=800V, V_{GS}=0V$	-	5	100	μA
Gate source leakage current	I_{GSS}	$V_{GS}=+18V, V_{DS}=0V$	-	-	250	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=18V, I_D=6.5A$	-	180	250	m Ω
		$V_{GS}=18V, I_D=6.5A, T_j=175^{\circ}\text{C}$	-	195	-	
Gate resistance	R_G	$f=1\text{ MHz}, V_{AC}=25mV$	-	4.7	-	Ω

Dynamic characteristics

Input capacitance	C_{iss}	$V_{DS}=400V, V_{GS}=0V, f=100\text{ kHz}, V_{AC}=25mV$	-	397	-	pF
Output capacitance	C_{oss}		-	38	-	
Reverse transfer capacitance	C_{rss}		-	6	-	
C_{OSS} stored energy	E_{oss}		-	3.8	-	μJ
Forward transconductance	g_{FS}	$V_{DS}=10V, I_D=6.5A$	-	2.8	-	S
Turn-on delay time	$t_{d(on)}$	$V_{DS}=400V, V_{GS}=-4/+18V, I_D=6.5A, R_G=20\Omega$ (External), $L=100\mu H$	-	10.3	-	ns
Rise time	t_r		-	19.5	-	
Turn-off delay time	$t_{d(off)}$		-	14.2	-	
Fall time	t_f		-	7.8	-	
Turn-on switching energy	E_{ON}	Diode: Body Diode at $V_{GS}=-4V$	-	46.7	-	μJ
Turn-off switching energy	E_{OFF}		-	10.5	-	

Parameter	Symbol	Conditions	Values			Unit
			Min	Typ	Max	

Dynamic characteristics

Turn-on delay time	$t_{d(on)}$	$V_{DS}=400V, V_{GS}=-4/+18V,$ $I_D=6.5A, R_G=20\Omega$ (External), $L=100\mu H,$ $T_j=175^\circ C$	-	10	-	ns
Rise time	t_r		-	19	-	
Turn-off delay time	$t_{d(off)}$		-	16.2	-	
Fall time	t_f		-	8	-	
Turn-on switching energy	E_{ON}	Diode: Body Diode at $V_{GS}=-4V$ $T_j=175^\circ C$	-	50.8	-	μJ
Turn-off switching energy	E_{OFF}		-	12	-	

Gate Charge Characteristics

Gate to source charge	Q_{gs}	$V_{DS}=400V, I_D=6.5A,$ $V_{GS}=-4$ to $+18V$	-	4	-	nC
Gate to drain charge	Q_{gd}		-	9.5	-	
Gate charge total	Q_g		-	17	-	

Reverse Diode

Continuous forward current	I_S	$V_{GS}=-4V$	-	-	17.5	A
Diode forward voltage	V_{SD}	$V_{GS}=-4V, I_{SD}=3.5A$	-	3.8	-	V
		$V_{GS}=-4V, I_{SD}=3.5A,$ $T_j=175^\circ C$	-	3.3	-	
Reverse recovery time	t_{rr}	$V_{GS}=-4V, V_{RR}=400V,$ $I_{SD}=6.5A,$ $d_{iF}/d_t=1000 A/\mu s$	-	19.8	-	ns
Reverse recovery charge	Q_{rr}		-	30	-	nC
Peak reverse recovery current	I_{rm}		-	3.2	-	A

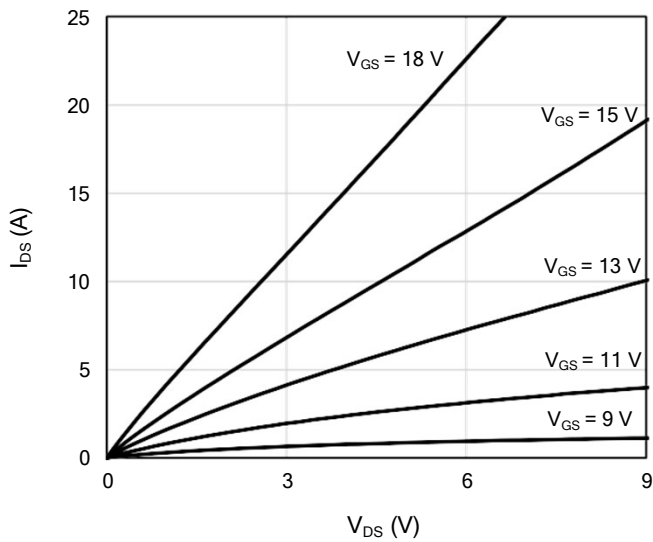


Figure 1: Output Characteristics $T_J = -40^\circ\text{C}$

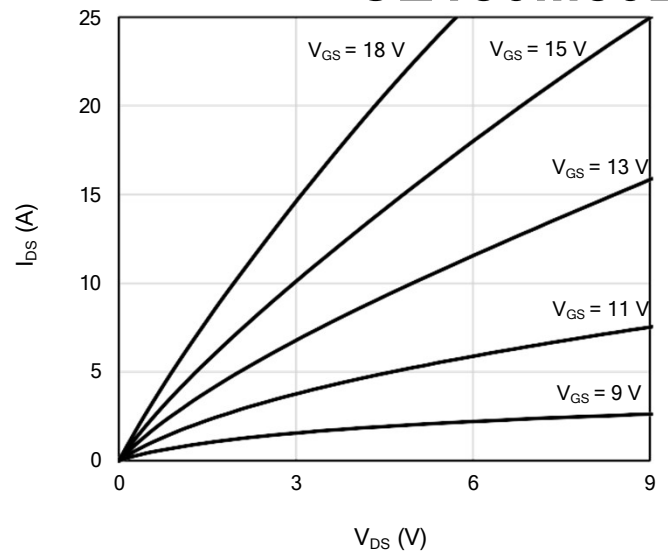


Figure 2: Output Characteristics $T_J = 25^\circ\text{C}$

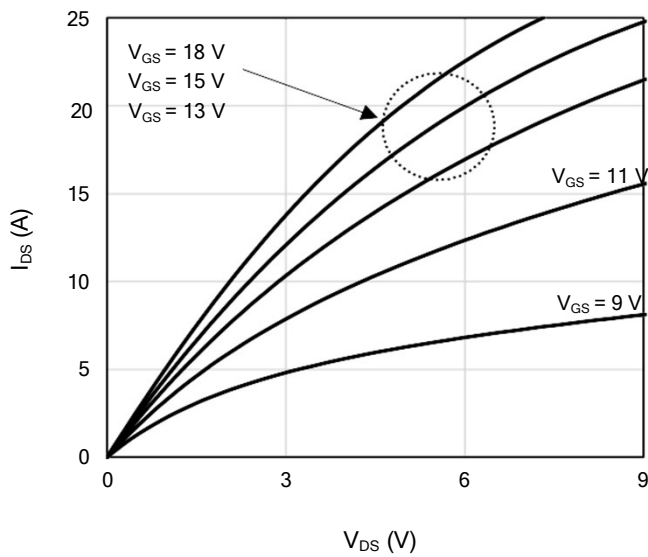


Figure 3: Output Characteristics $T_J = 175^\circ\text{C}$

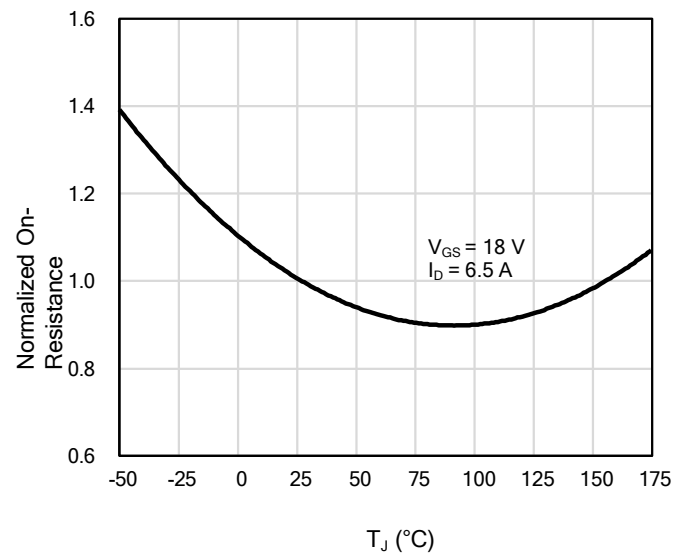


Figure 4: Normalized On-Resistance vs. Temperature

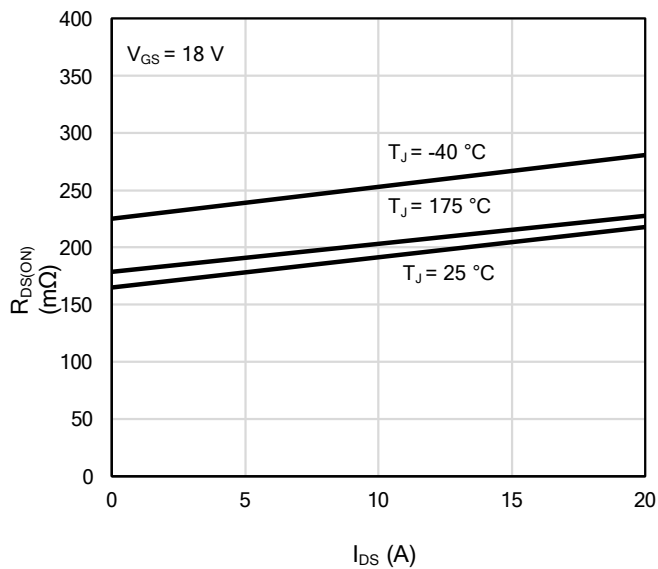


Figure 5: On-Resistance vs. Drain Current
For Various Temperatures

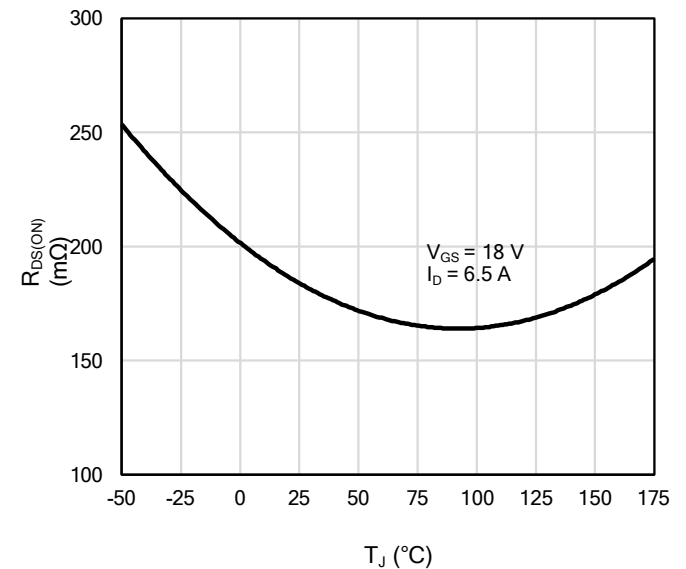


Figure 6: On-Resistance vs. Temperature

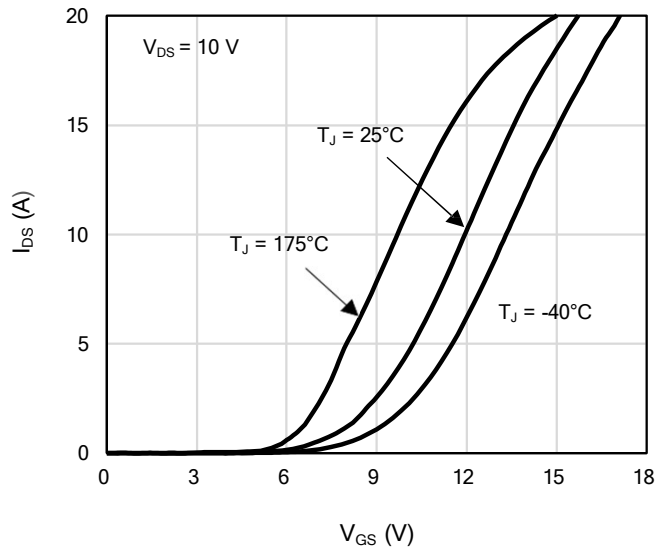


Figure 7: Transfer Characteristics For Various Junction Temperature

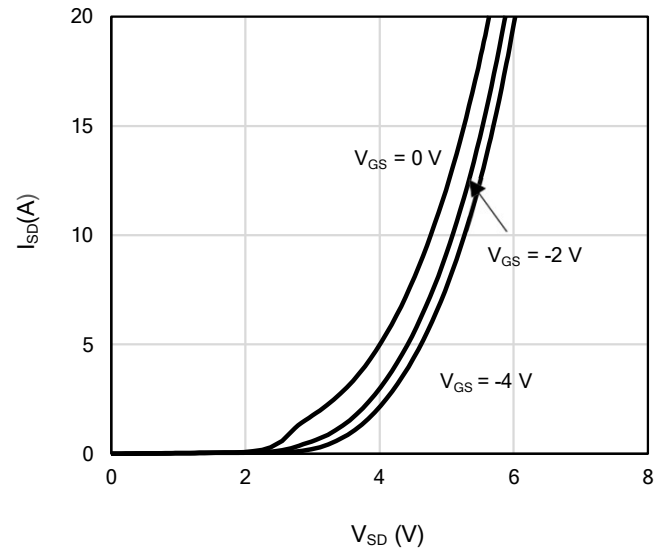


Figure 8: Body Diode Characteristics at -40°C

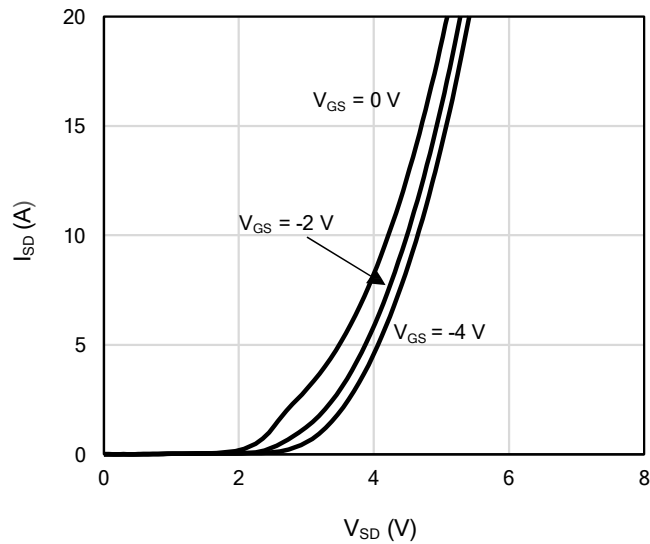


Figure 9: Body Diode Characteristics at 25°C

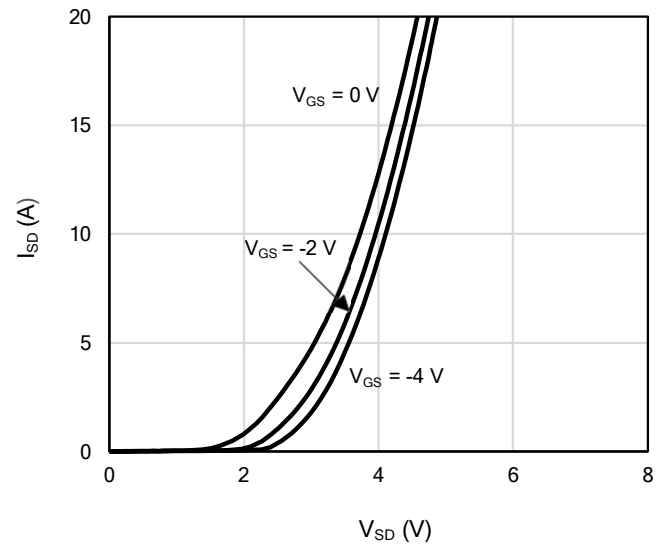


Figure 10: Body Diode Characteristics at 175°C

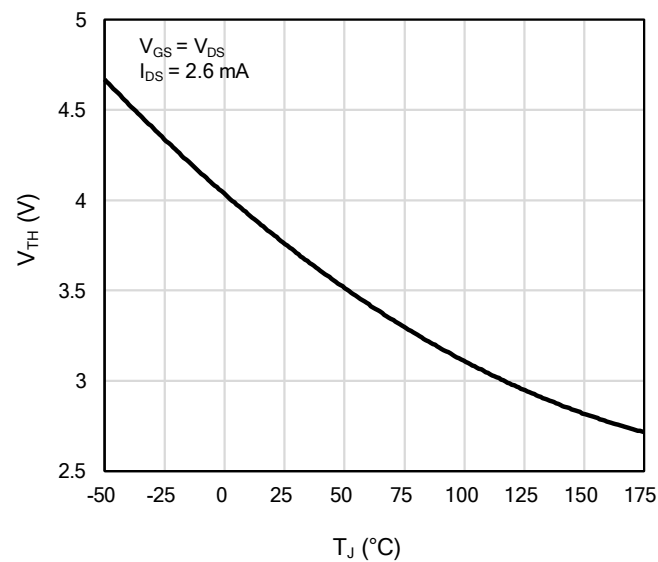


Figure 11: Threshold Voltage vs. Temperature

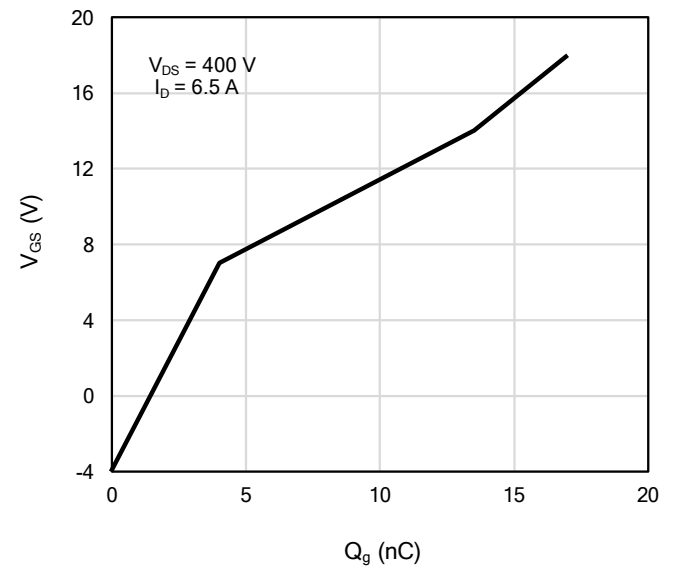


Figure 12: Gate-Charge Characteristics

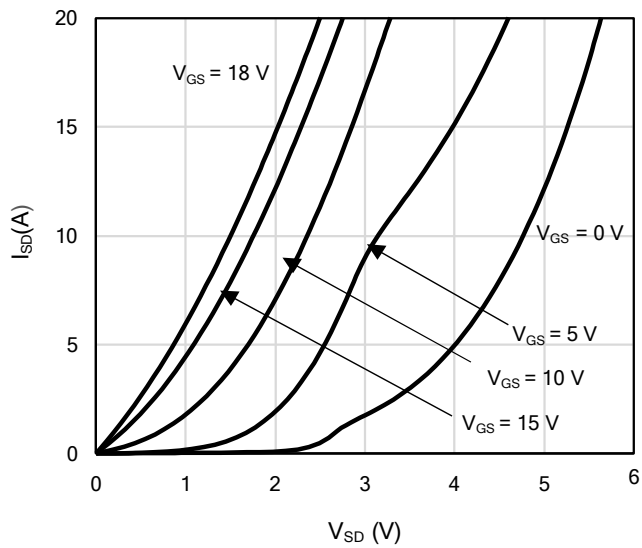


Figure 13: 3rd Quadrant Characteristics at -40°C

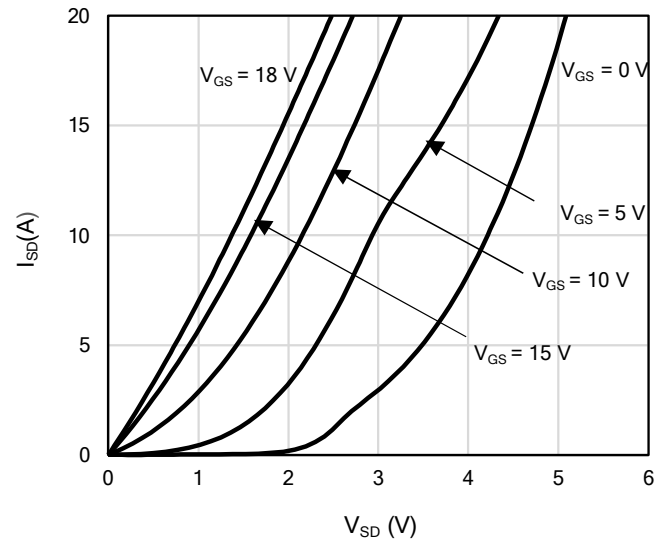


Figure 14: 3rd Quadrant Characteristics at 25°C

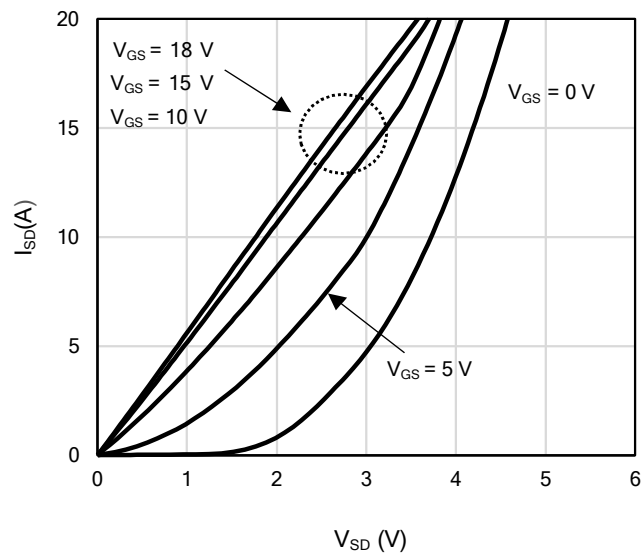


Figure 15: 3rd Quadrant Characteristics at 175°C

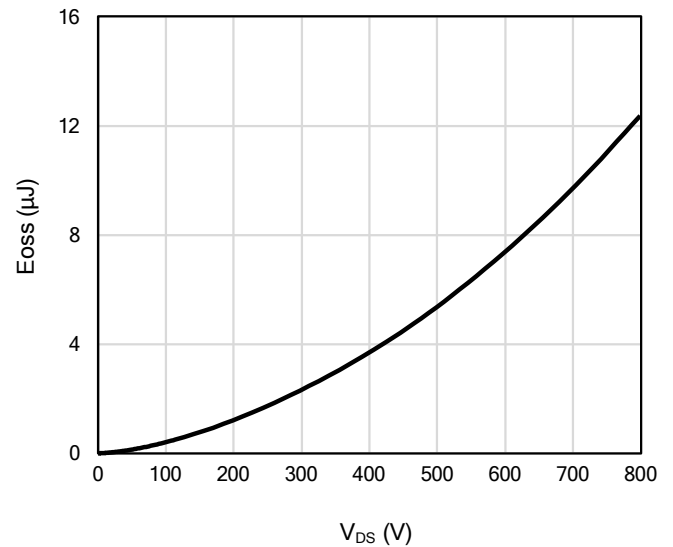


Figure 16: Output Capacitor Stord Energy

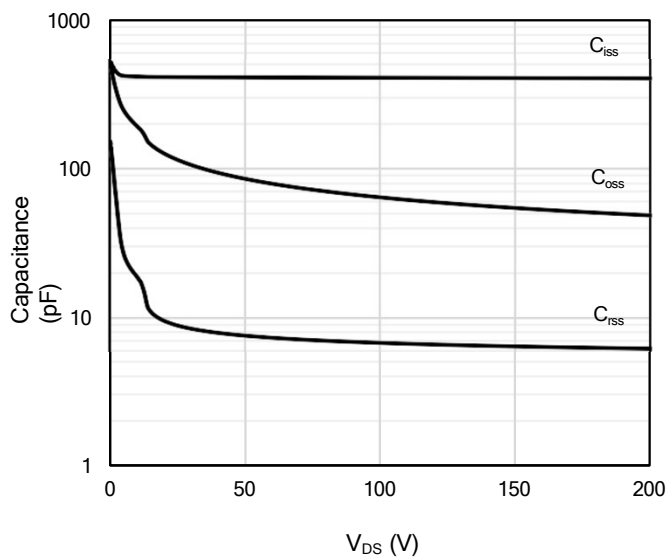


Figure 17: Capacitance Characteristics (0 - 200 V)

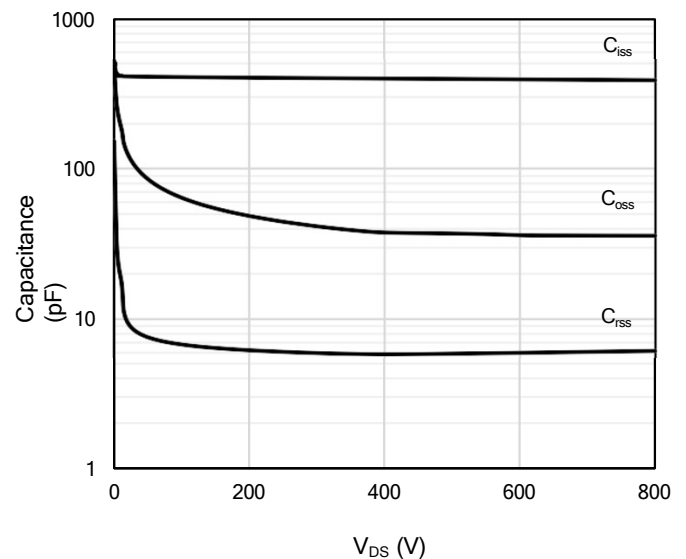


Figure 18: Capacitance Characteristics (0 - 800 V)

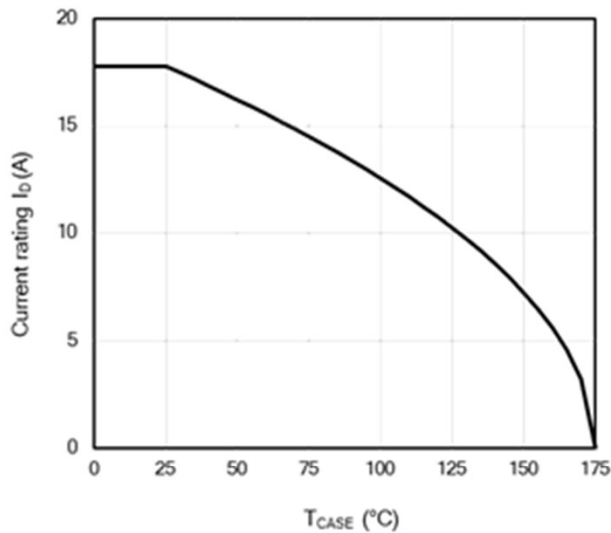


Figure 19: Current De-rating

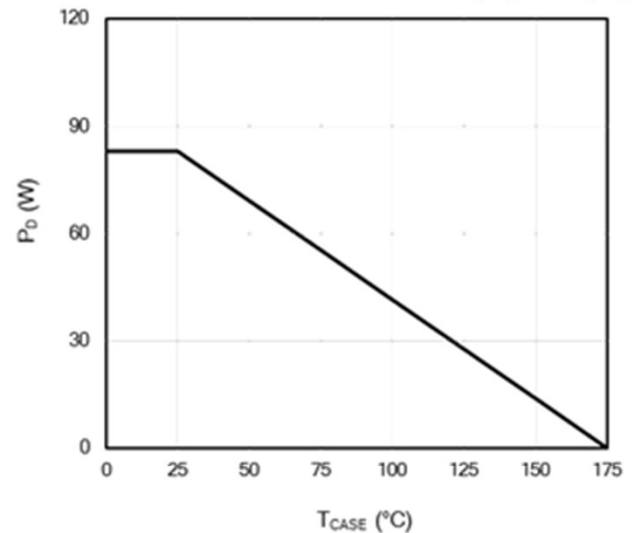


Figure 20: Maximum Power Dissipation Derating vs. Case Temperature

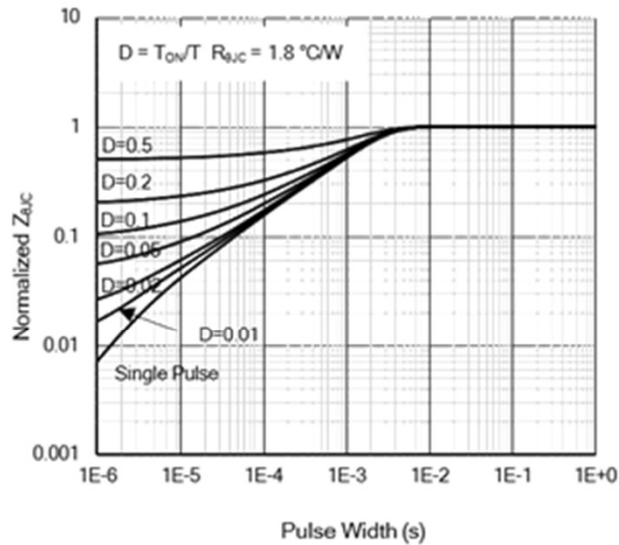


Figure 21: Normalized Maximum Transient Thermal Impedance

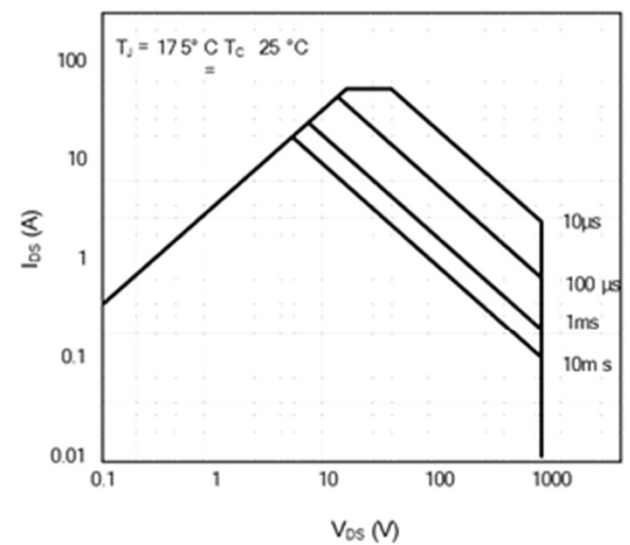


Figure 22: Maximum Forward Biased Safe Operating Area

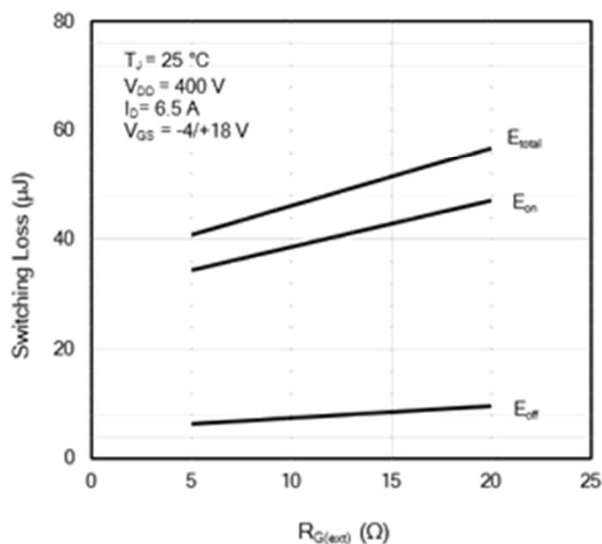


Figure 23: Clamped Inductive Switching Energy vs. $R_{G(ext)}$

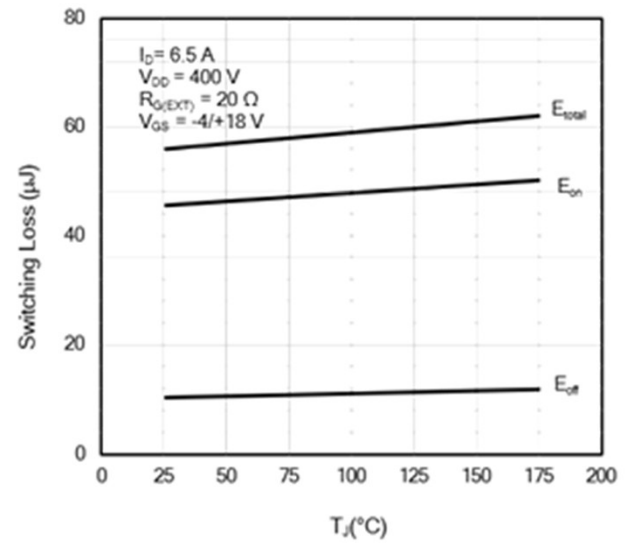


Figure 24: Clamped Inductive Switching Energy vs. T_J

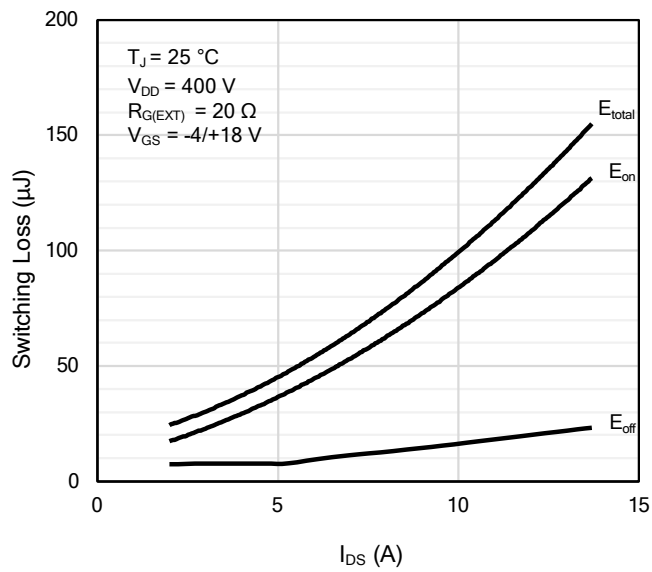


Figure 25: Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 400\text{ V}$)

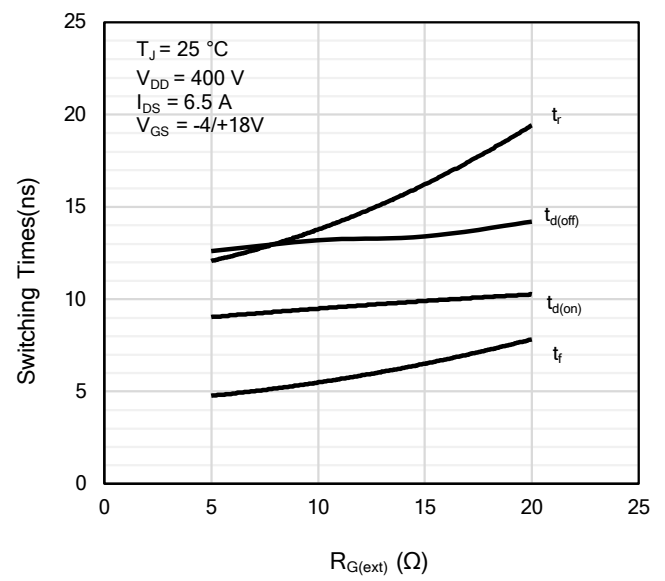


Figure 26: Switching Time vs. $R_{G(EXT)}$

Marking Information

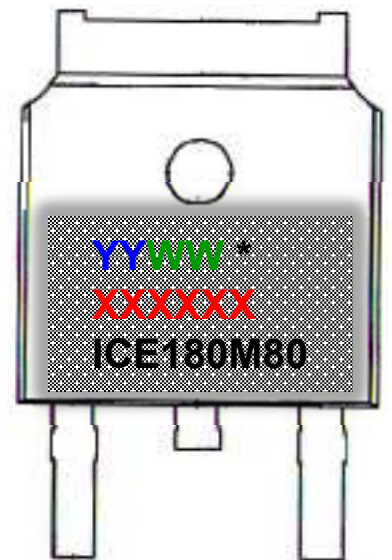
YY = Last two digits of the year

WW = Work week

***** = Site ID

XXXXXX = Lot ID

ICE180M80 = ICE is IceMOS logo and 180M80 is a designated device part number



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