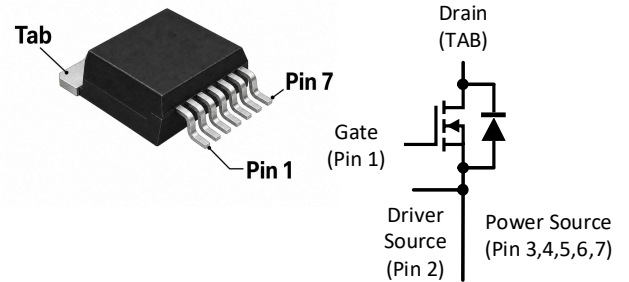


ICE30M120B7 Silicon Carbide Power MOSFET

Features

- 1200V 30mohm SiC MOSFET
- Low on-resistance
- Fast switching speed with low capacitances
- Fast intrinsic diode with low reverse recovery (Q_{rr})
- Optimized design for High Power SMPS, EV-Charging, Online UPS/HVDC, String Inverters and Solar power optimizer

Product Summary			
I_D	$T_A=25^\circ\text{C}$	76A	Max
$V_{(BR)DSS}$	$T_C=25^\circ\text{C}$	1200V	Min
$r_{DS(on)}$	$V_{GS}=18\text{V}$	30m Ω	Typ
Q_g	$V_{DS}=800\text{V}$	110nC	Typ



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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	$T_c=25^\circ\text{C}$	76	A
		$T_c=100^\circ\text{C}$	54	
Pulsed drain current	$I_{D, \text{pulse}}$		228	A
Maximum gate source voltage	$V_{GS(max)}$		-12/+24	V
Operational gate source voltage	$V_{GS \text{ op}}$		-5/+18	V
Single pulsed Avalanche energy	E_{AS}	$L=0.5\text{mH}$, $V_{DD}=50\text{V}$, $I_{AS}=45\text{A}$, $R_G=50\Omega$	506	mJ
Power dissipation	P_{tot}		375	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}		-	-	0.4	°C/W
Thermal resistance, junction-ambient	R_{thJA}	leaded	-	-	40	
Soldering temperature, wave soldering only allowed at leads	T_{sold}	1.6mm (0.063in.) from case for 10 s	-	-	260	°C

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

Static characteristics

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=100\mu A$	1200	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=13mA, T_j=25^{\circ}\text{C}$	2	3	4	
		$V_{DS}=V_{GS}, I_D=13mA, T_j=175^{\circ}\text{C}$	-	2.2	-	
Zero gate voltage drain current	I_{DSS}	$V_{DS}=1200V, V_{GS}=0V$	-	5	50	μA
Gate source leakage current	I_{GSS}	$V_{GS}=-12/+24V, V_{DS}=0V$	-	-	± 100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=18V, I_D=40A, T_j=25^{\circ}\text{C}$	-	30	36	m Ω
		$V_{GS}=18V, I_D=40A, T_j=175^{\circ}\text{C}$	-	54	-	
Gate resistance	R_G	$f=1\text{ MHz}, V_{AC}=25mV$	-	1.7	-	Ω

Dynamic characteristics

Input capacitance	C_{iss}	$V_{DS}=800V, V_{GS}=0V, f=100\text{ kHz}, V_{AC}=25mV$	-	2720	-	pF
Output capacitance	C_{oss}		-	108	-	
Reverse transfer capacitance	C_{rss}		-	6	-	
C_{OSS} stored energy	E_{oss}		-	47	-	μJ
Forward transconductance	g_{FS}	$V_{DS}=20V, I_D=40A$	-	22	-	S
Turn-on delay time	$t_{d(on)}$	$V_{DS}=800V, V_{GS}=-4/+18V, I_D=40A, R_G=2.5\Omega$ (External), $L=100\mu H, T_j=25^{\circ}\text{C}$	-	12	-	ns
Rise time	t_r		-	14	-	
Turn-off delay time	$t_{d(off)}$		-	24	-	
Fall time	t_f		-	9	-	
Turn-on switching energy	E_{ON}		-	315	-	μJ
Turn-off switching energy	E_{OFF}		-	46.2	-	

Parameter	Symbol	Conditions	Values			Unit
			Min	Typ	Max	

Dynamic characteristics

Turn-on delay time	$t_{d(on)}$	$V_{DS}=800V, V_{GS}=-4/+18V,$ $I_D=40A, R_G=2.5\Omega$ (External), $L=100\mu H,$ $T_j=175^\circ C$	-	11	-	ns
Rise time	t_r		-	16	-	
Turn-off delay time	$t_{d(off)}$		-	28	-	
Fall time	t_f		-	9	-	
Turn-on switching energy	E_{ON}		-	363	-	μJ
Turn-off switching energy	E_{OFF}		-	70	-	

Gate Charge Characteristics

Gate to source charge	Q_{gs}	$V_{DS}=800V, I_D=40A,$ $V_{GS}=-4$ to $+18V$	-	34	-	nC
Gate to drain charge	Q_{gd}		-	34	-	
Gate charge total	Q_g		-	110	-	

Reverse Diode

Continuous forward current	I_S	$V_{GS}=-4V$	-	76	-	A
Diode forward voltage	V_{SD}	$V_{GS}=-4V, I_{SD}=20A, T_j=25^\circ C$	-	4.2	-	V
		$V_{GS}=-4V, I_{SD}=20A,$ $T_j=175^\circ C$	-	3.7	-	
Reverse recovery time	t_{rr}	$V_{GS}=-4V, V_{RR}=800V,$ $I_{SD}=40A,$ $d_i f/d_t=1300 A/\mu s$	-	18.5	-	ns
Reverse recovery charge	Q_{rr}		-	175	-	nC
Peak reverse recovery current	I_{rm}		-	17.5	-	A

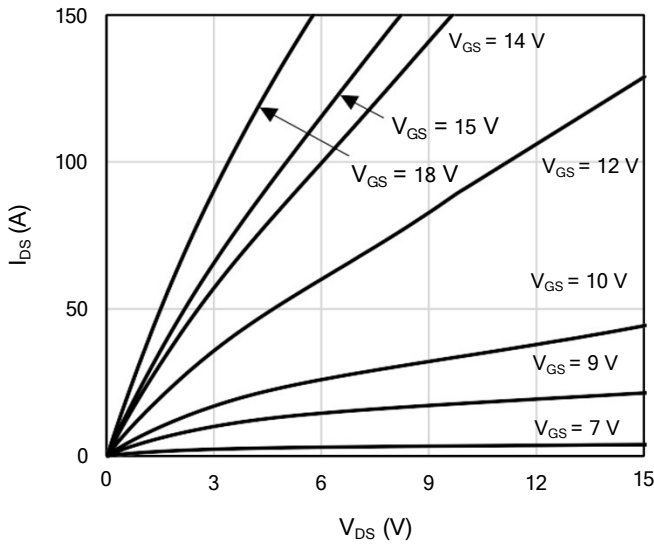


Figure 1: Output Characteristics $T_J = -40^\circ\text{C}$

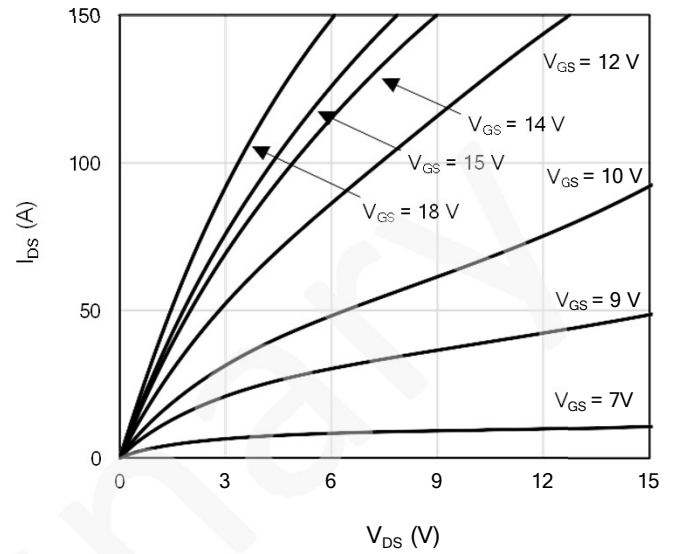


Figure 2: Output Characteristics $T_J = 25^\circ\text{C}$

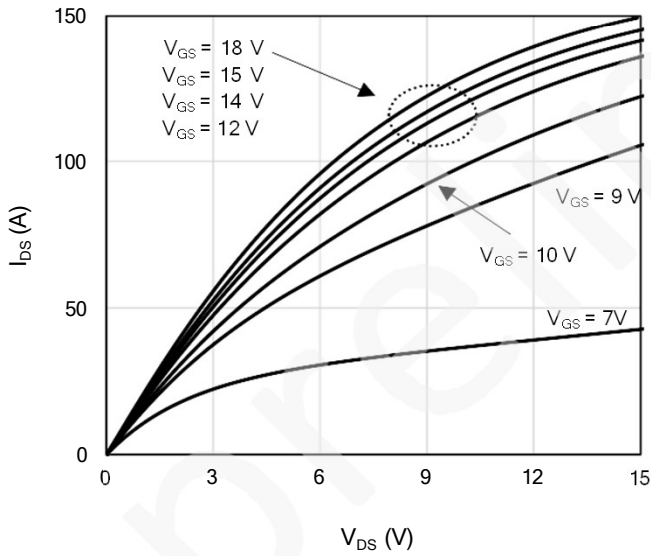


Figure 3: Output Characteristics $T_J = 175^\circ\text{C}$

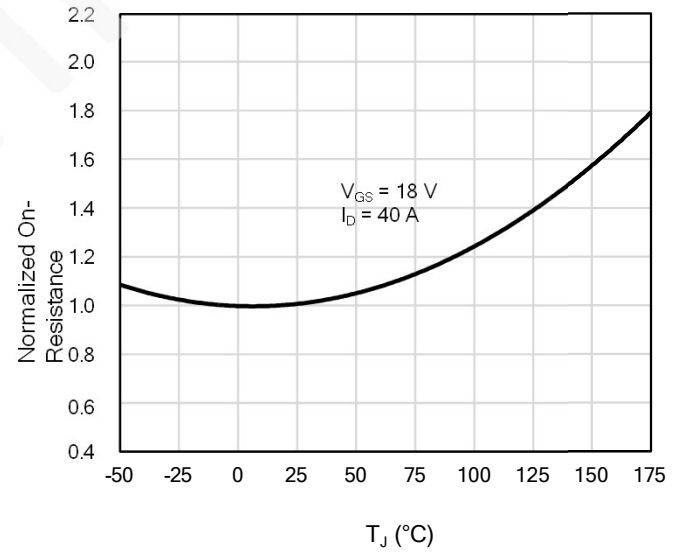


Figure 4: Normalized On-Resistance vs. Temperature

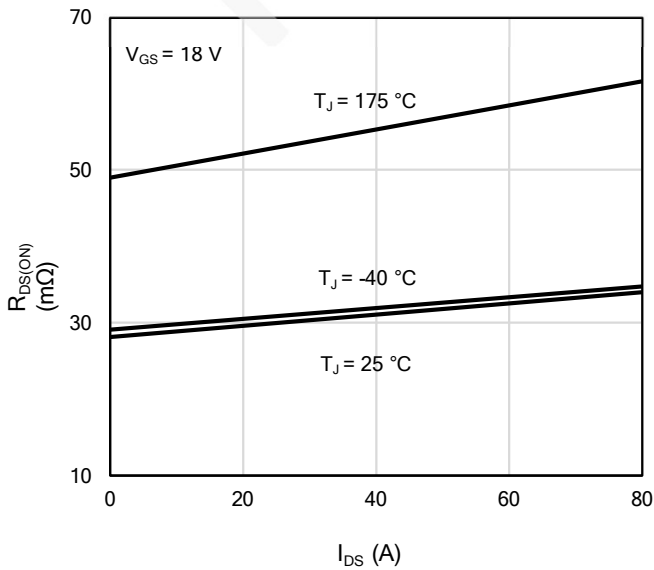


Figure 5: On-Resistance vs. Drain Current
For Various Temperatures

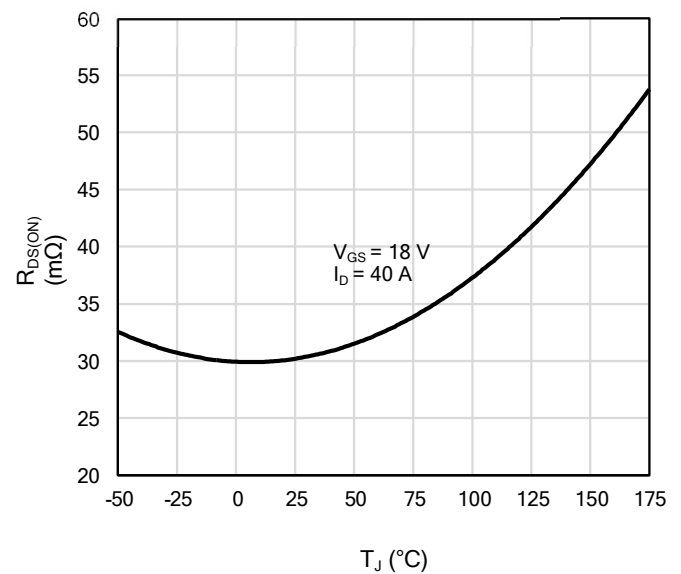


Figure 6: On-Resistance vs. Temperature

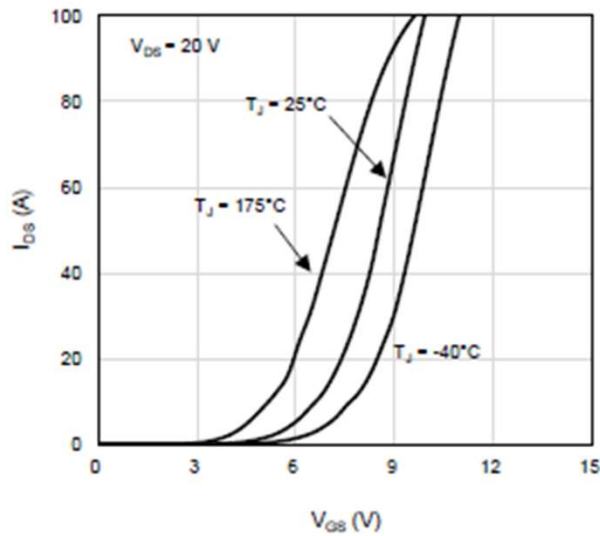


Figure 7: Transfer Characteristics For Various Junction Temperature

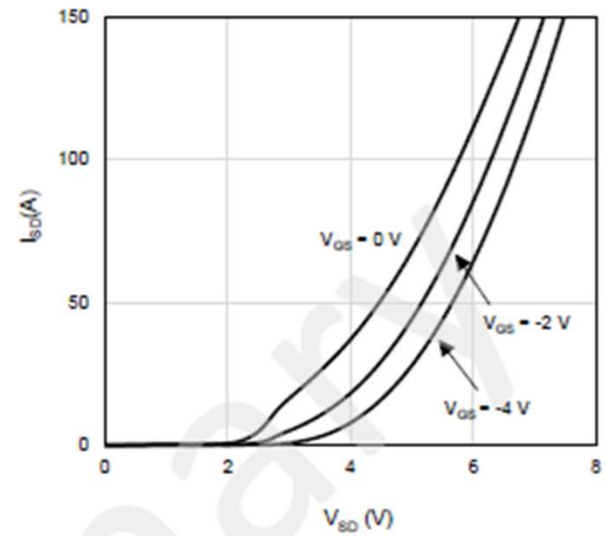


Figure 8: Body Diode Characteristics at -40°C

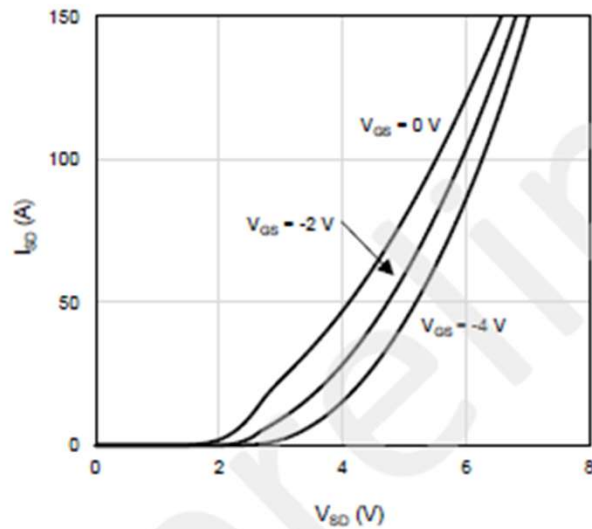


Figure 9: Body Diode Characteristics at 25°C

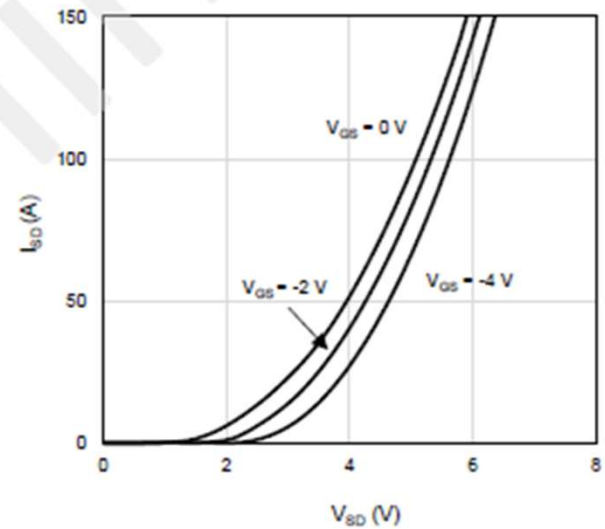


Figure 10: Body Diode Characteristics at 175°C

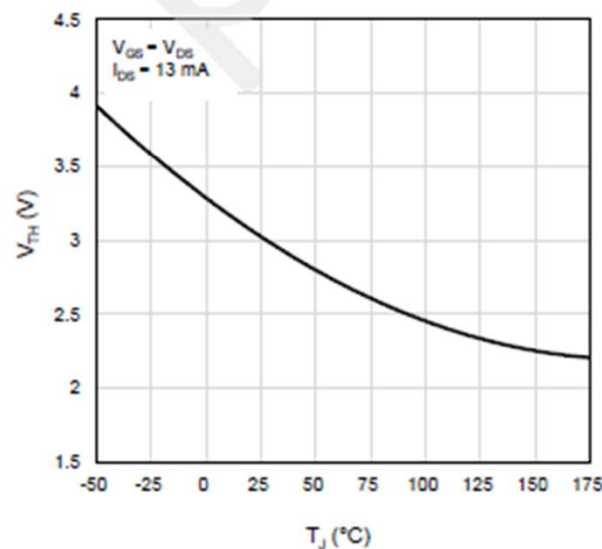


Figure 11: Threshold Voltage vs. Temperature

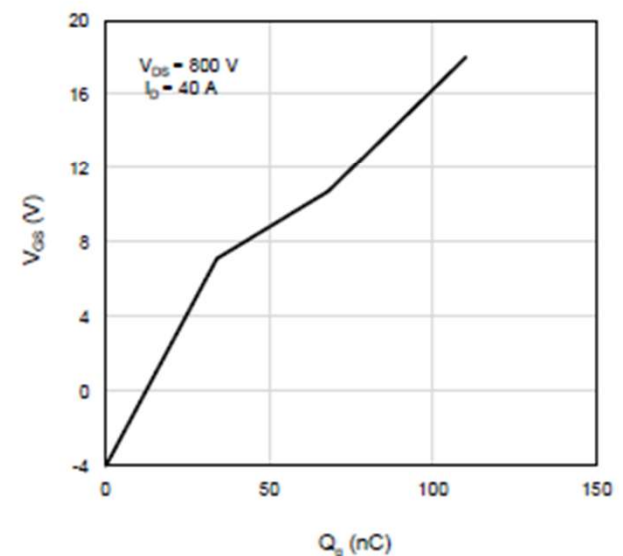


Figure 12: Gate-Charge Characteristics

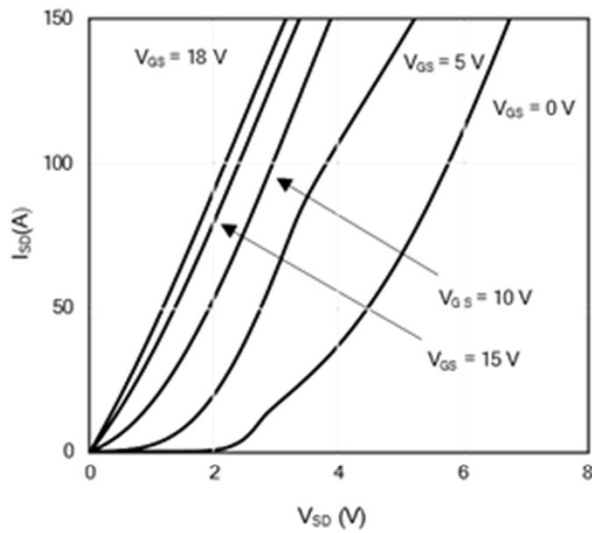


Figure 13: 3rd Quadrant Characteristics at -40°C

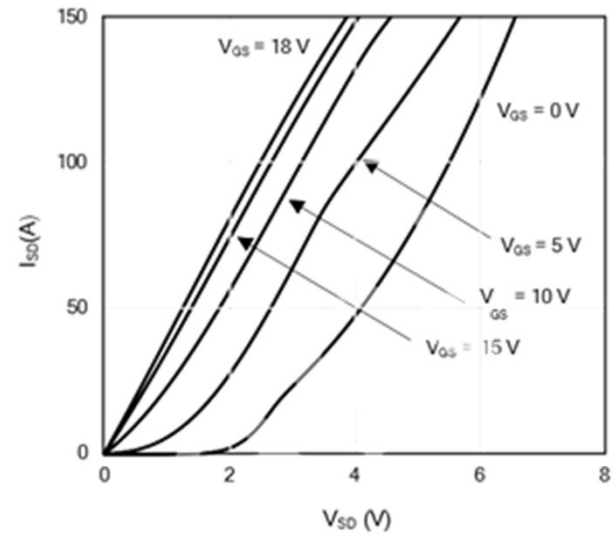


Figure 14: 3rd Quadrant Characteristics at 25°C

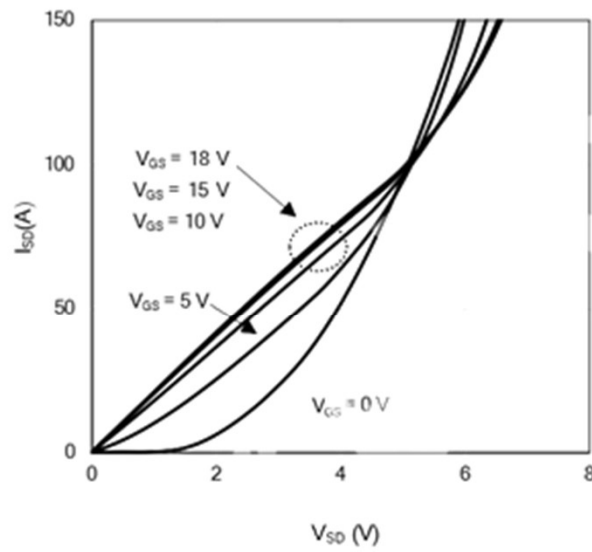


Figure 15: 3rd Quadrant Characteristics at 175°C

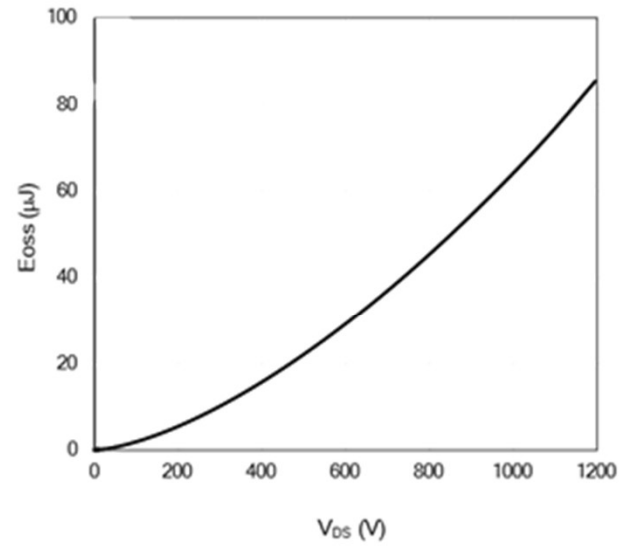


Figure 16: Output Capacitor Stored Energy

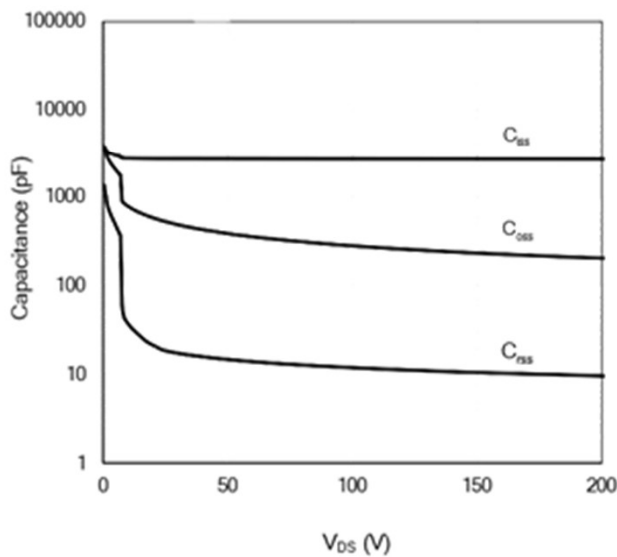


Figure 17: Capacitance Characteristics (0 - 200 V)

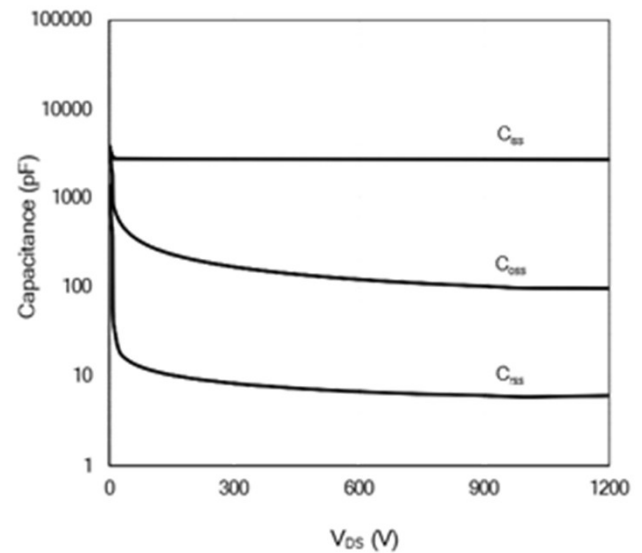


Figure 18: Capacitance Characteristics (0 - 1200 V)

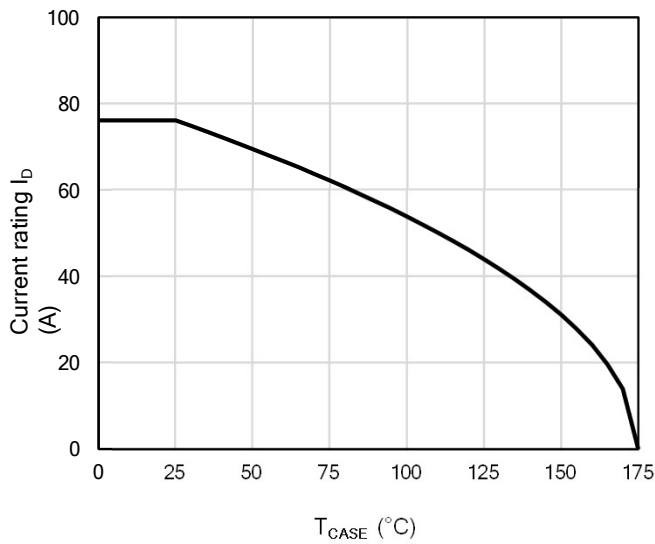


Figure 19: Current De-rating

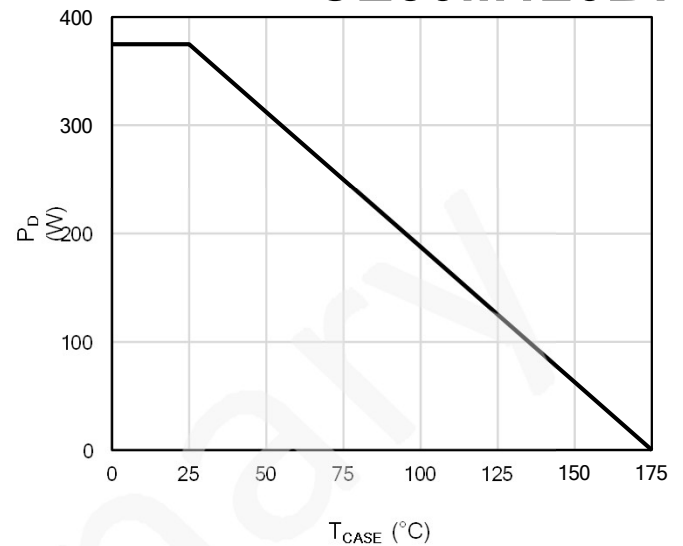


Figure 20: Maximum Power Dissipation Derating vs. CaseTemperature

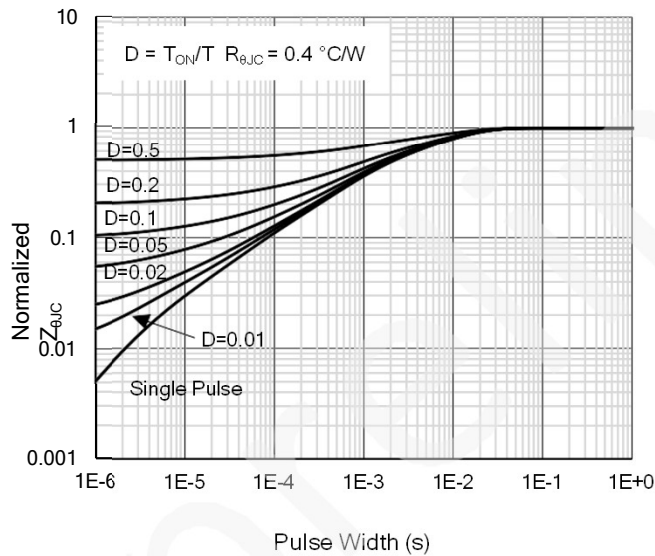


Figure 21: Normalized Maximum Transient Thermal Impedance

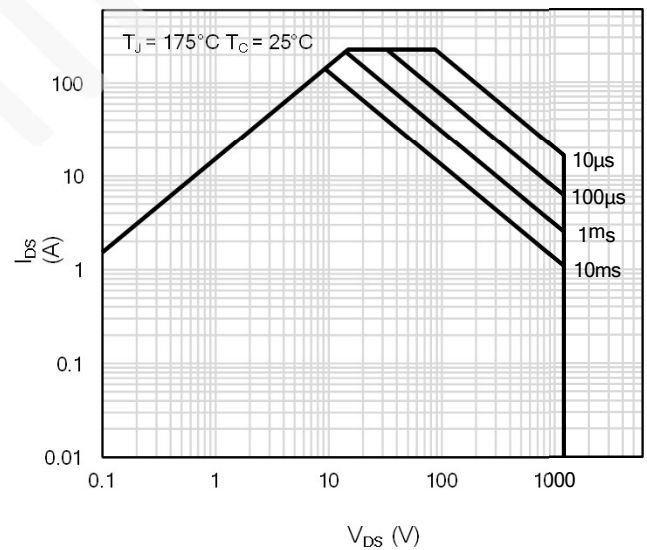


Figure 22: Maximum Forward Biased Safe Operating Area

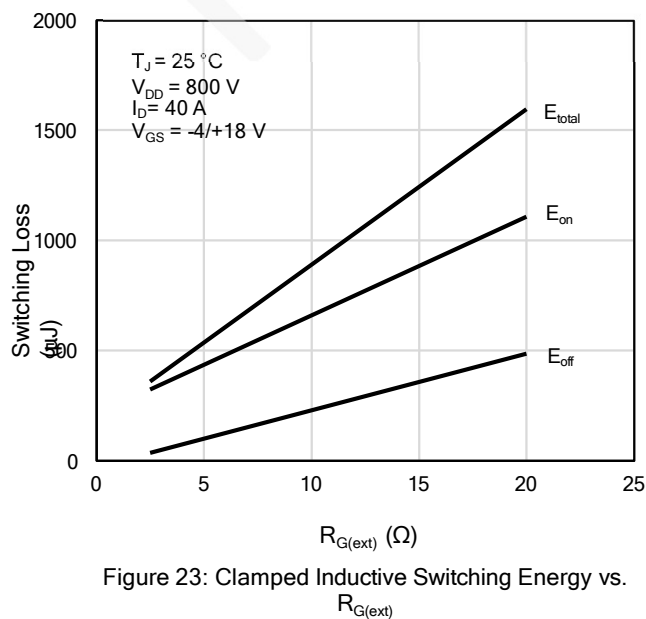


Figure 23: Clamped Inductive Switching Energy vs. R_G(ext)

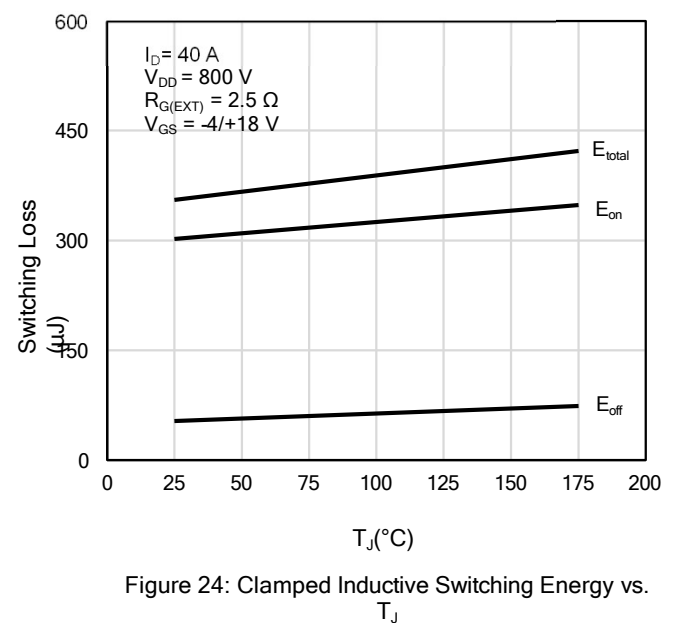


Figure 24: Clamped Inductive Switching Energy vs. T_J

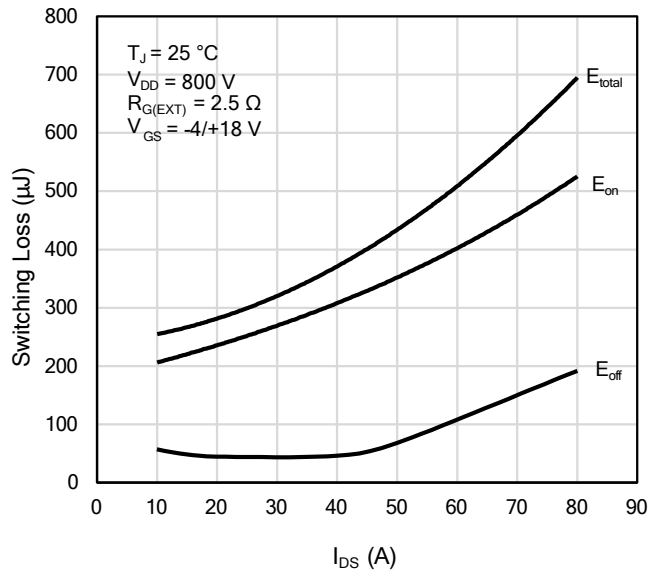


Figure 25: Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 800\text{ V}$)

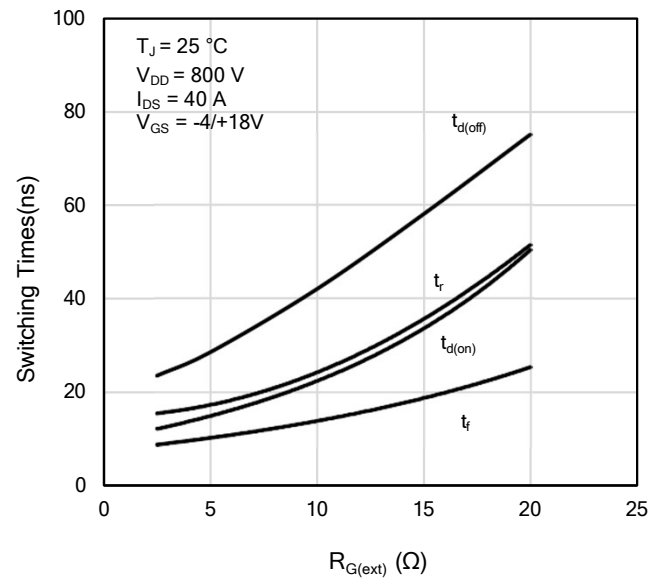
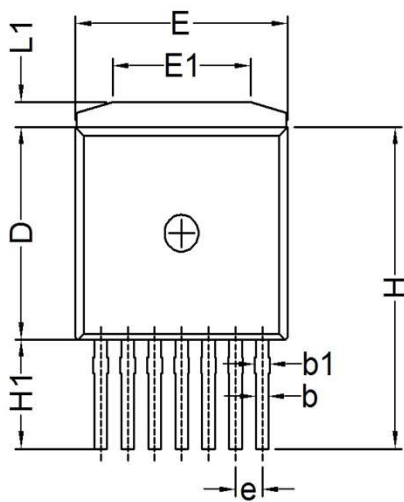
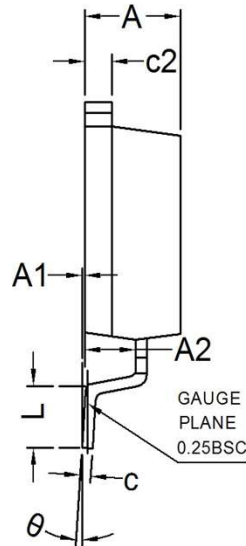


Figure 26: Switching Time vs. $R_{G(EXT)}$

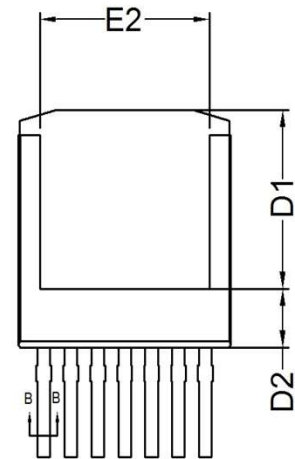
PACKAGE OUTLINE DRAWING



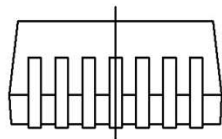
Top View



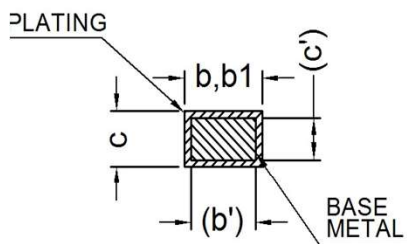
Side View



Bottom View



Side View



View B-B

SIMBOL	MIN	MAX
A	4.30	4.70
A1	-	0.25
A2	2.20	2.60
b	0.52	0.72
b'	0.50	0.70
b1	0.60	0.80
c	0.42	0.62
c'	0.40	0.60
c2	1.07	1.47
D	9.05	9.45
D1	7.58	7.98
D2	2.05	2.45
E	9.80	10.20
E1	6.30	6.70
E2	7.80	8.20
e	1.27 BSC	
L	2.48	2.88
L1	0.87	1.27
H	14.87	15.27
H1	4.55	4.95
θ	0°	8°

Unit in mm

Marking Information

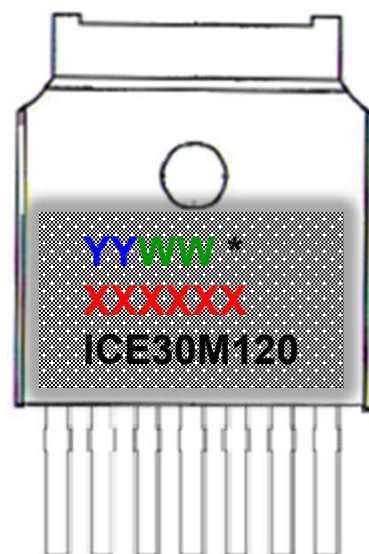
YY = Last two digits of the year

WW = Work week

***** = Site ID

XXXXXX = Lot ID

ICE30M120 = ICE is IceMOS logo and 30M120 is a designated device part number



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