HCM2G0650170F

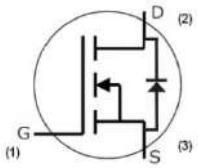
1700V N-Channel Silicon Carbide Power MOSFET

V_{DS} =1700 V
$R_{DS(on)}$ =750 mΩ(V_{GS}=15V)
$R_{DS(on)}$ = 550mΩ (V_{GS}=20V)
$T_{J,\ max}$ = 175℃

Features

- High blocking voltage
- Low on-resistance with high junction temperature
- High-speed switching with low capacitances
- Fast intrinsic diode with low reverse recovery (Q_{rr})
- RoHS compliant

RoHS



Benefits

- Higher System Efficiency
- Reduce cooling requirements
- Increased power density
- Enabling higher frequency
- Minimize gate ringing
- Reduction of system complexity and cost

Applications

- Switch Mode Power Supplies
- DC/DC converters
- Solar Inverters
- Battery Chargers
- Motor Drives

Part Number	Package	Marking
HCM2G0650170F	TO-220F-3	HCM2G0650170F

Maximum Ratings, at T_J = 25℃, unless otherwise specified

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain-Source Breakdown Voltage	1700	V	V_{GS} = 0 V, I_D = 100 μA	
I_D	Continuous Drain Current	6	A	V_{GS} = 15 V, T_C = 25 ℃	
I_D	Continuous Drain Current	6.7	A	V_{GS} = 20 V, T_C = 25 ℃	Fig. 18
$I_{D(pulse)}$	Pulsed Drain Current	12	A	Pulse width t_P limited by T_{jmax}	Fig. 21
P_D	Power Dissipation	42	W	T_C = 25 ℃	Fig. 19
$V_{GS,op1}$	Gate- Source Voltage (Static)	-5/+20	V		
$V_{GS,op2}$	Gate- Source Voltage (Static)	-5/+15	V		
V_{GSmax}	Gate- Source Voltage (Dynamic)	-10/+25	V	AC (f ＞1Hz)	
T_J, T_{stg}	Operating Junction and Storage Temperature Range	-55 to +175	℃		
T_L	Soldering Temperature	260	℃		

Electrical Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
Static							
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	1700	--	--	V	V_{GS} = 0 V, I_D = 100 μA	
I_{DSS}	Zero Gate Voltage Drain Current	--	0.9	100	μA	V_{DS} = 1700 V, V_{GS} = 0 V	
I_{GSS}	Gate -Source Leakage Current	--	2	250	nA	V_{GS} = 20 V	
$V_{GS(th)}$	Gate-Source Threshold Voltage	1.8	--	4.0	V	I_D = 0.5 mA, V_{GS} = V_{DS}	Fig. 11
$R_{DS(on)}$	Drain-Source On-Stage Resistance	--	750	1000	mΩ	V_{GS} = 15 V, I_D = 2 A	Fig. 6
		--	650	--	mΩ	V_{GS} = 18 V, I_D = 2 A	
		--	550	--	mΩ	V_{GS} = 20 V, I_D = 2 A	
Dynamic							
C_{iss}	Input Capacitance	--	183	--	pF	V_{GS} = 0 V, V_{DS} = 1000 V f = 1.0 MHz, V_{AC} = 25 mV	Fig. 17
C_{oss}	Output Capacitance	--	17.1	--			
C_{rss}	Reverse Transfer Capacitance	--	2.1	--			
E_{oss}	C_{oss} Stored Energy	--	10.1	--	μJ		Fig. 16
Q_g	Total Gate Charge	--	13.2	--	nC	V_{DS} = 1200 V I_D = 2 A V_{GS} = -5/+20 V	Fig. 12
Q_{gs}	Gate - Source Charge	--	5.0	--			
Q_{gd}	Gate - Drain Charge	--	4.5	--			
E_{On}	Turn -On Switching Energy	--	170	--	μJ	V_{DS} = 1000 V, V_{GS} = -5/+20 V I_D = 2 A, $R_{G(ext)}$ = 2.5 Ω, L = 70 mH	Fig. 22
E_{Off}	Turn Off Switching Energy	--	68	--			
$t_{d(on)}$	Turn-on Delay Time	--	5	--	ns	V_{DS} = 1000 V V_{GS} = -5/+20 V I_D = 2 A, L = 70 mH $R_{G(ext)}$ = 2.5 Ω	Fig. 24
t_r	Turn- on Rise Time	--	17	--			
$t_{d(off)}$	Turn- off Delay Time	--	13	--			
t_f	Turn- off Fall Time	--	55.6	--			
$R_{G(int)}$	Internal Gate Resistance	--	25.2	--	Ω	f = 1.0 MHz, V_{AC} = 25 mV	

Body Diode Characteristics, at T_J = 25℃, unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
I_S	Continuous Diode Forward Current		--	--	4	A	
V_{SD}	Diode Forward Voltage	--	4.0	--	V	V_{GS} = 0 V, I_S = 1A	Fig. 8, 9, 10
t_{rr}	Reverse Recovery Time	--	33	--	ns	I_S = 2A, V_{DS} = 1200 V V_{GS} = -5 V di/dt = 1200 A/us	
Q_{rr}	Reverse Recovery Charge	-	32	--	nC		
I_{rrm}	Peak Reverse Recovery Current	--	3	--	A		

Thermal Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	/	3.5	/	℃/W	Fig. 20

Typical Performance

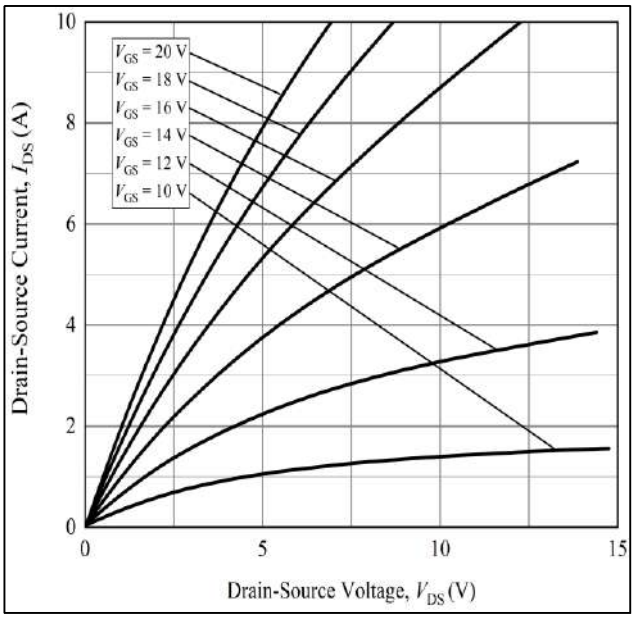


Figure 1: Typical Output Characteristics at T_J = -55 ℃

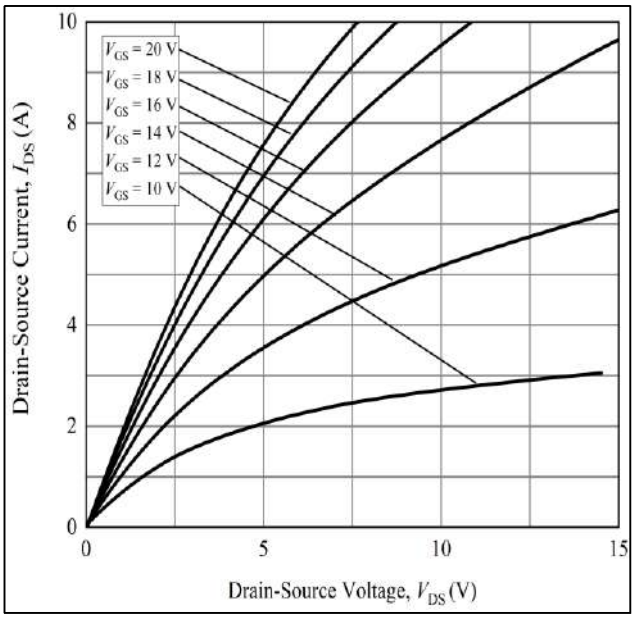


Figure 2: Typical Output Characteristics at T_J = 25 ℃

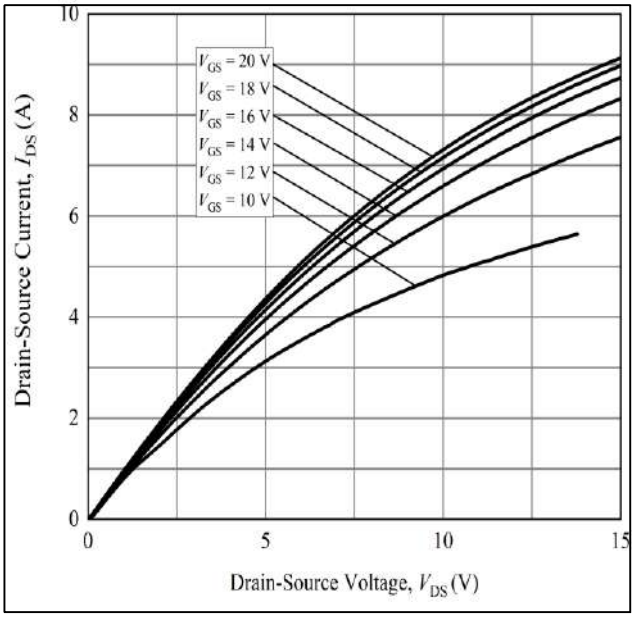


Figure 3: Typical Output Characteristics at T_J = 175 ℃

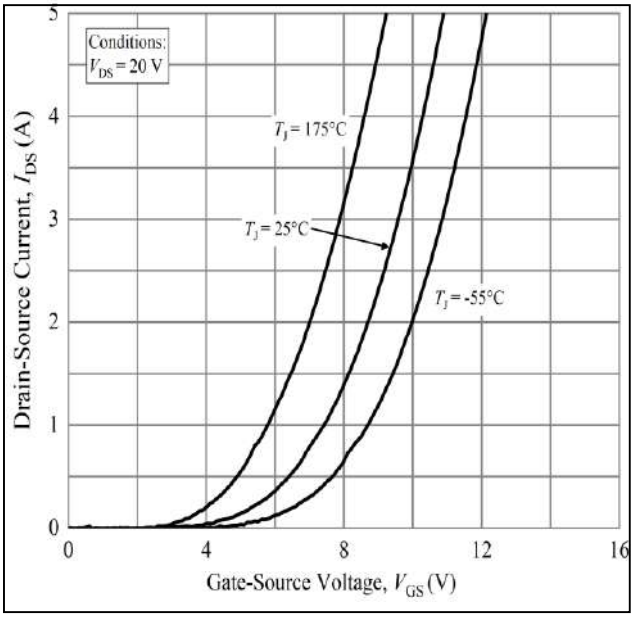


Figure 4: Typical Transfer Characteristics for Various Temperature

Typical Performance

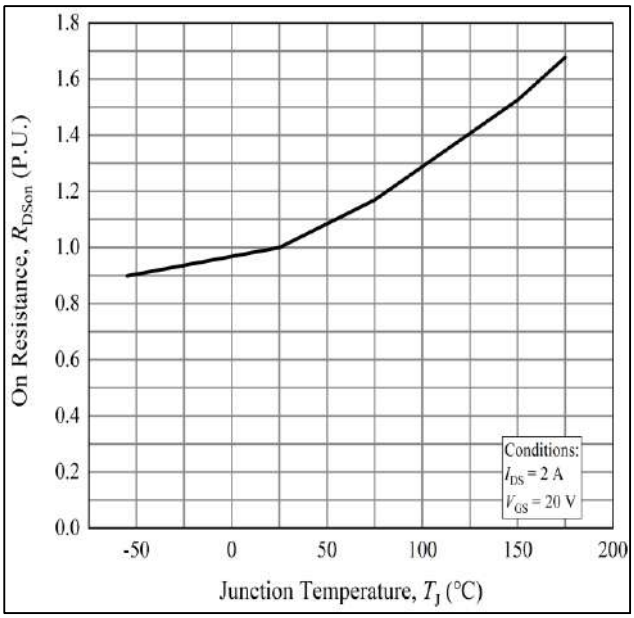


Figure 5: Normalized On-Resistance vs. Temperature

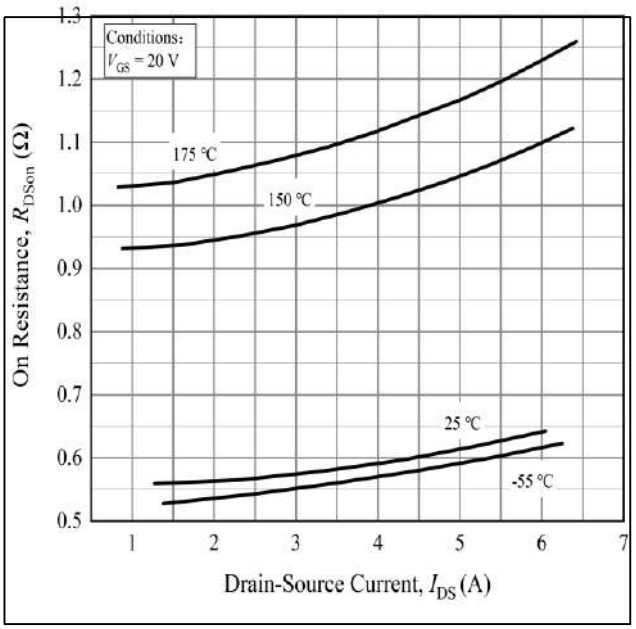


Figure 6: On-Resistance vs. Drain Current for Gate Various Temperatures

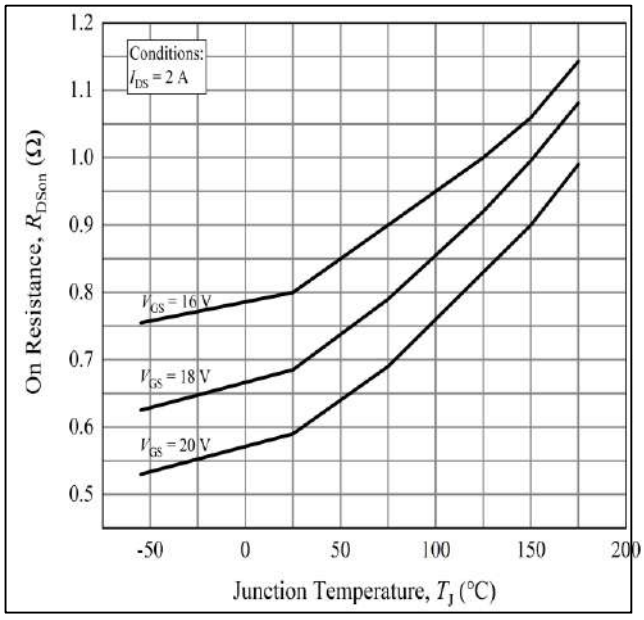


Figure 7: On-Resistance vs. Temperature for Various Voltage

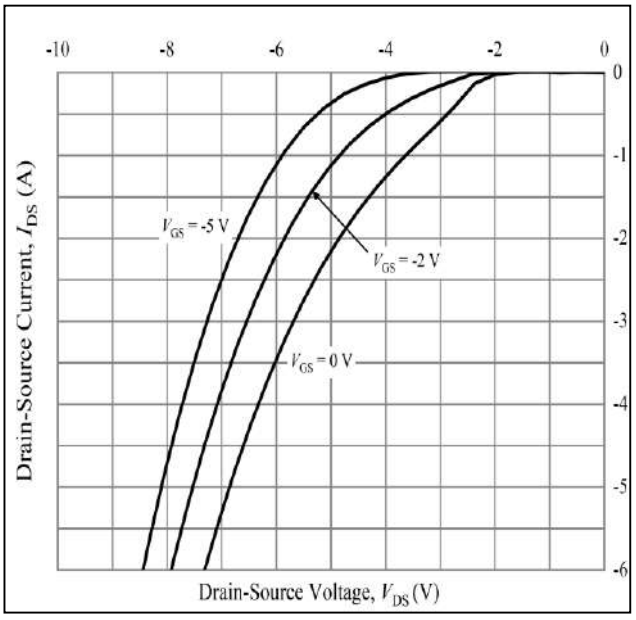


Figure 8: Typical Body Diode Characteristics at T_J = -55 ℃

Typical Performance

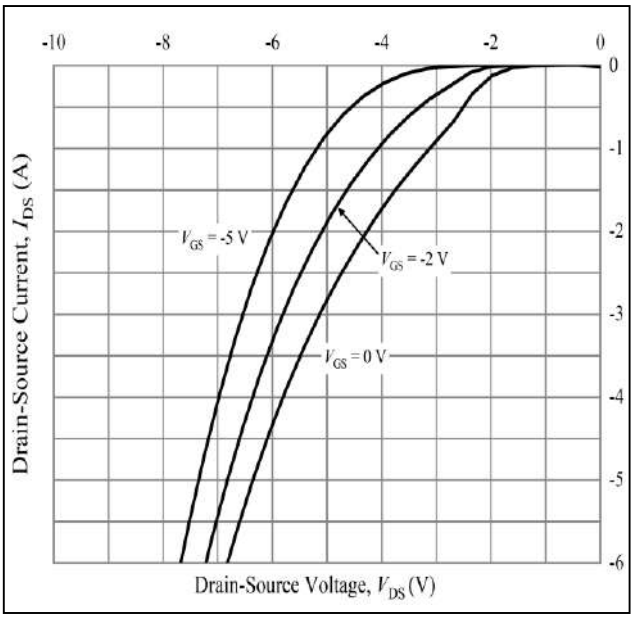


Figure 9: Typical Body Diode Characteristics at T_J= 25 ℃

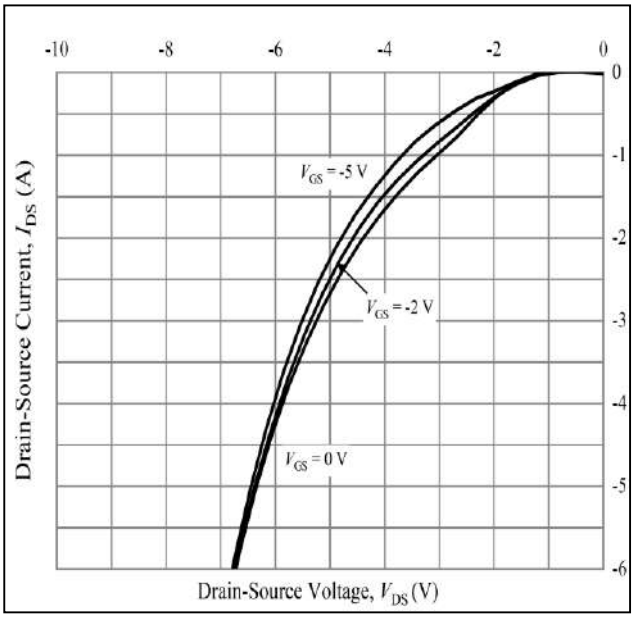


Figure 10: Typical Body Diode Characteristics at T_J= 175 ℃

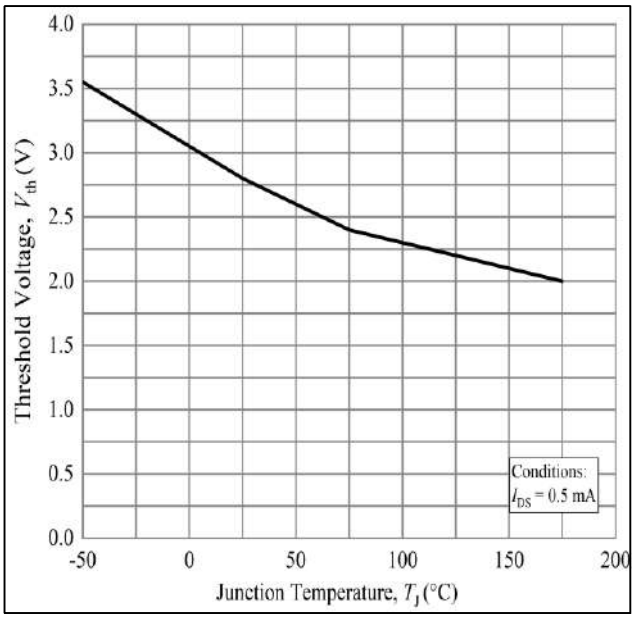


Figure 11: Typical Threshold Voltage vs. Temperature

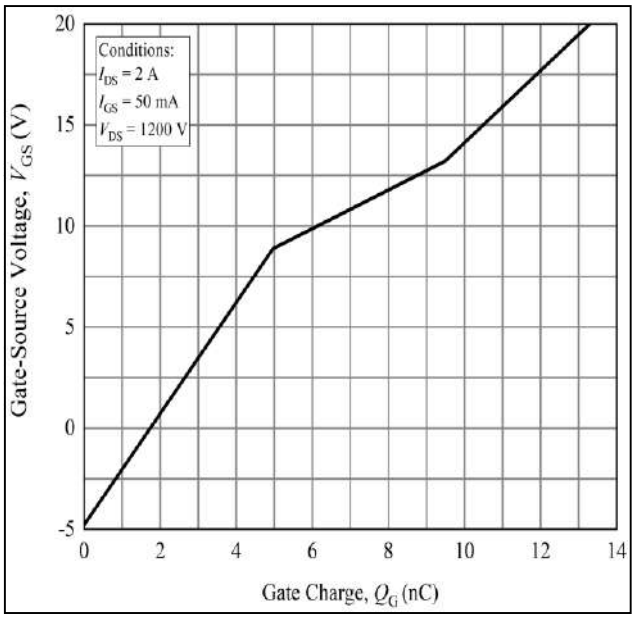


Figure 12: Typical Gate Charge Characteristics at T_J= 25 ℃

Typical Performance

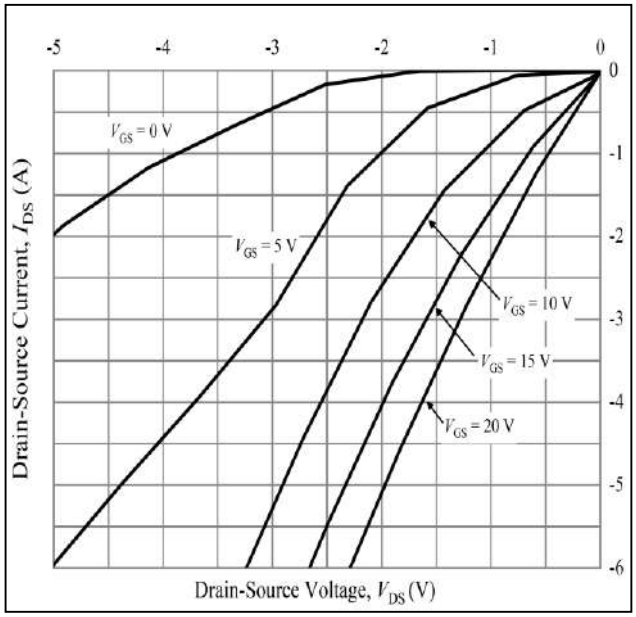


Figure 13: Typical 3rd Quadrant Characteristics T_J = -55 ℃

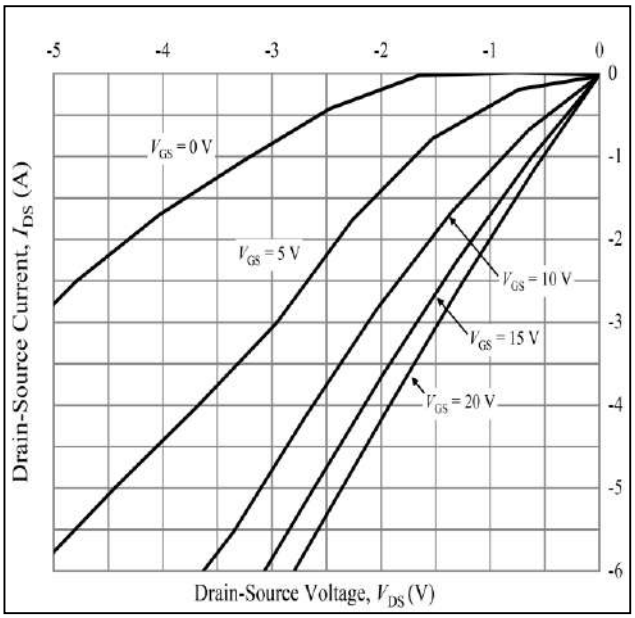


Figure 14: Typical 3rd Quadrant Characteristics at T_J=25 ℃

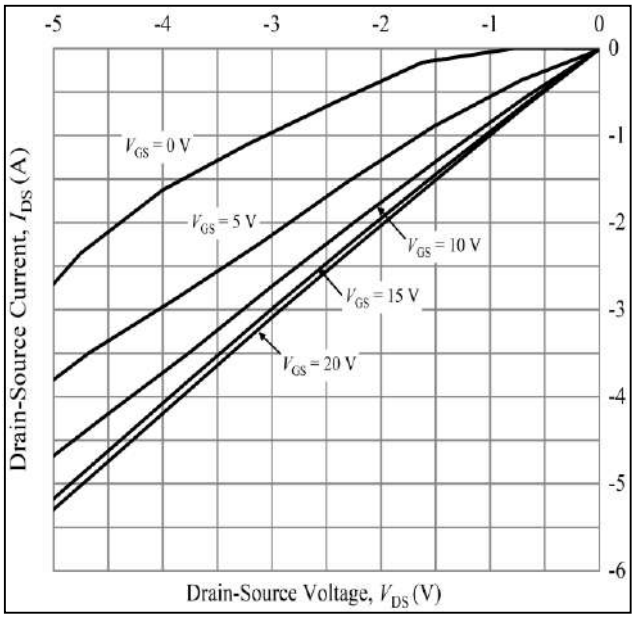


Figure 15: Typical 3rd Quadrant Characteristics at T_J = 175 ℃

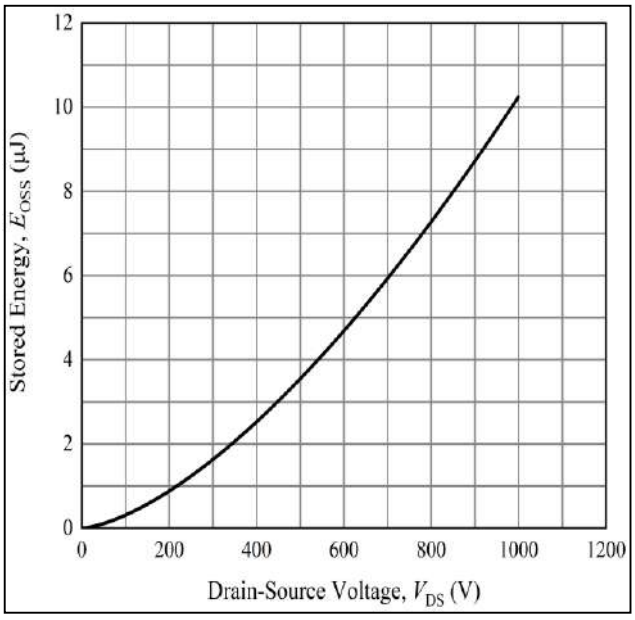


Figure 16: Typical Output Capacitor Stored Energy

Typical Performance

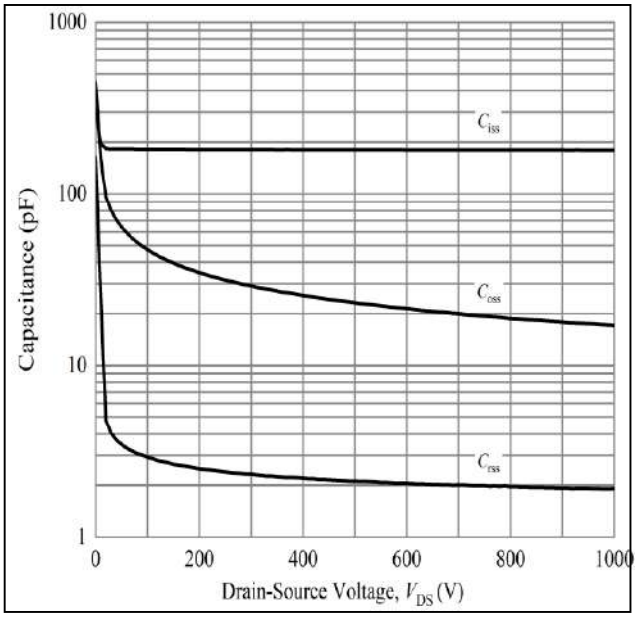


Figure 17: Typical Capacitances vs. Drain-Source Voltage

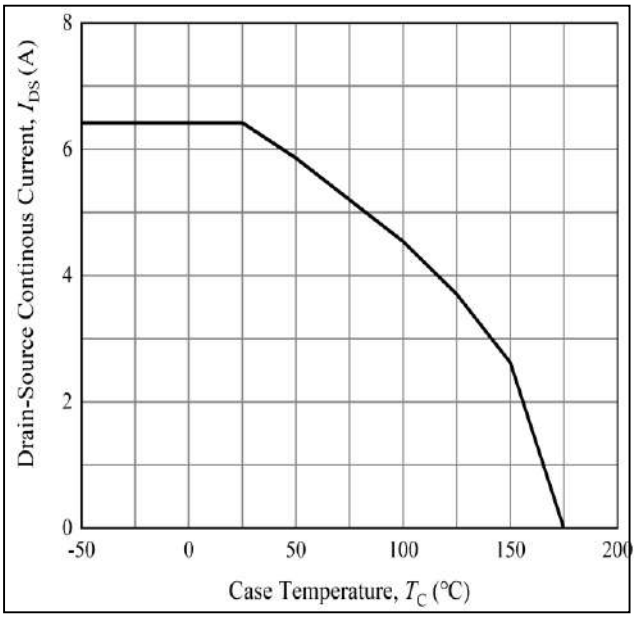


Figure 18: Continuous Drain Current Derating Curve

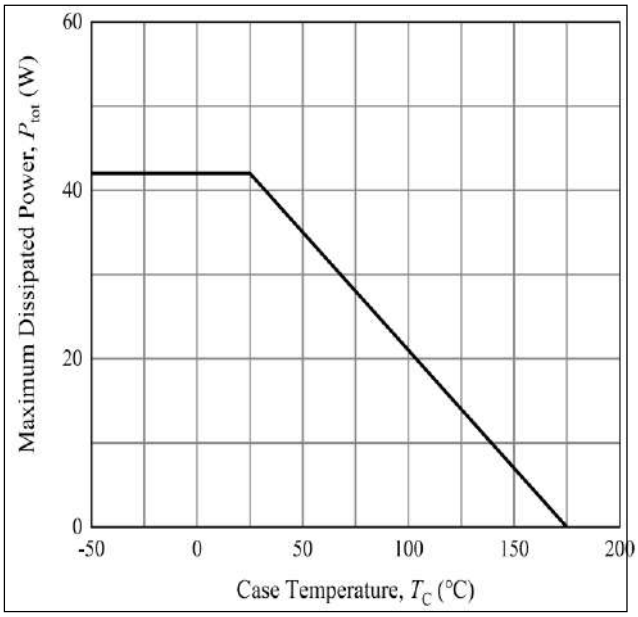


Figure 19: Power Dissipation Derating Curve

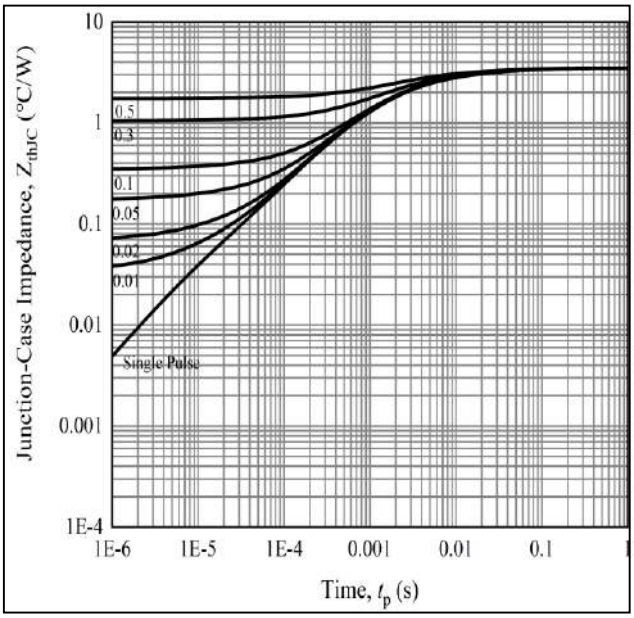


Figure 20: Typical Transient Thermal Impedance (Junction – Case) with Duty Cycle

Typical Performance

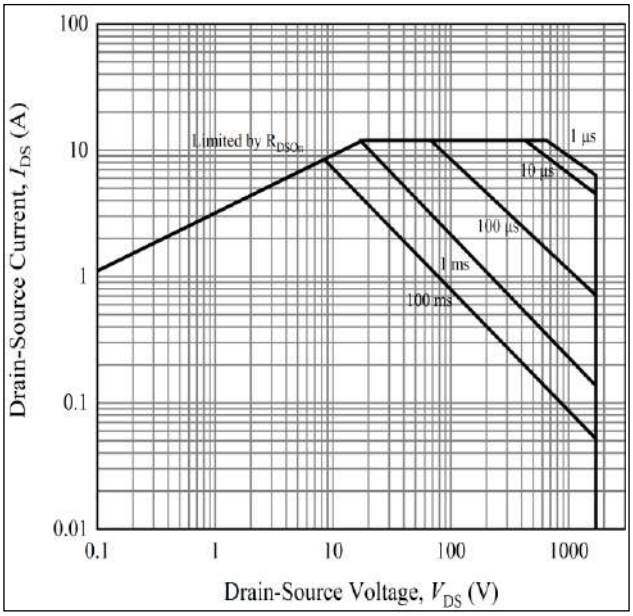


Figure 21: Safe Operate Area

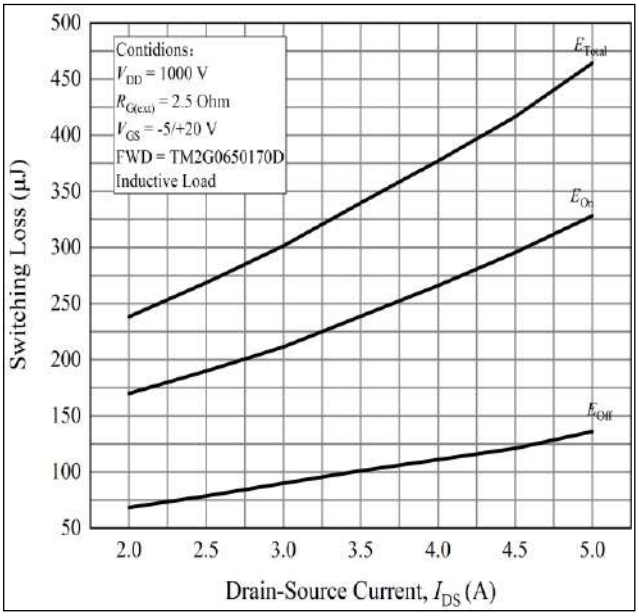


Figure 2 2: Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 1000 V)

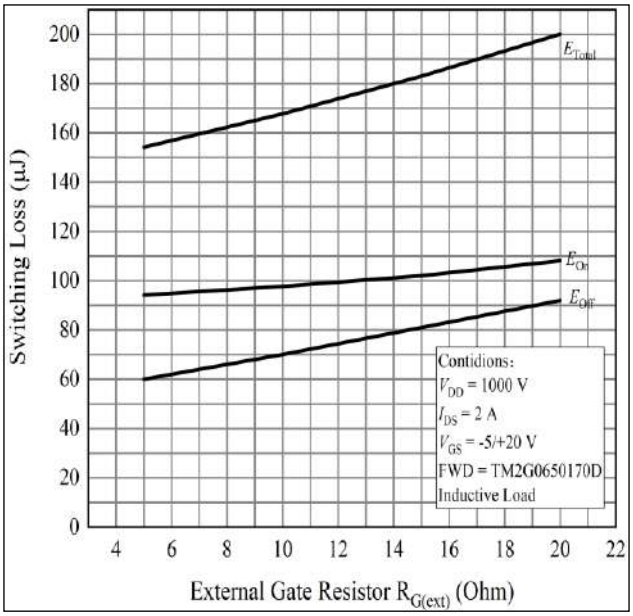


Figure 2 3: Clamped Inductive Switching Energy vs. $R_{G(ext)}$

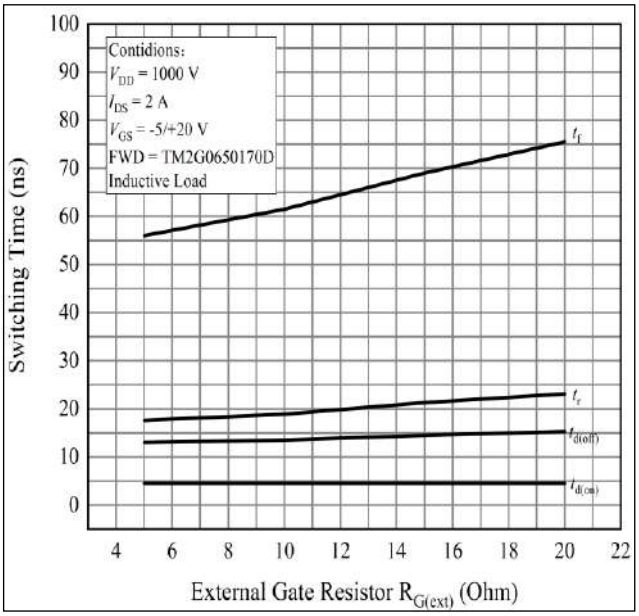


Figure 24:Switching Times vs.$R_{G(ext)}$

Package Dimensions

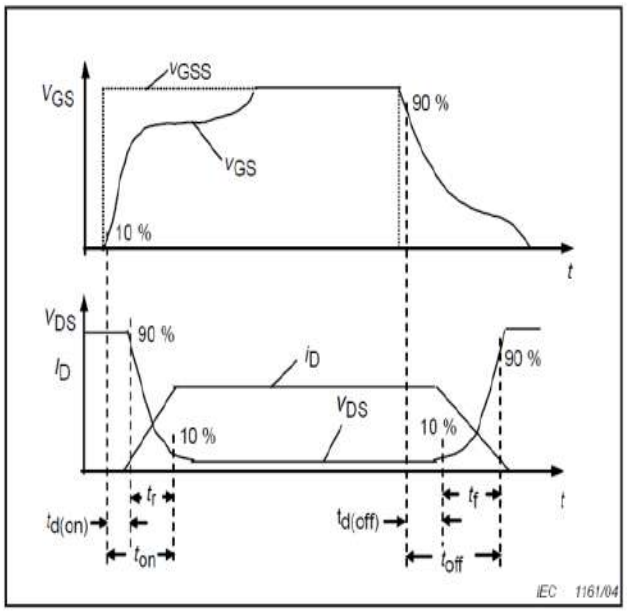


Figure 25: Resistive Switching Time Description

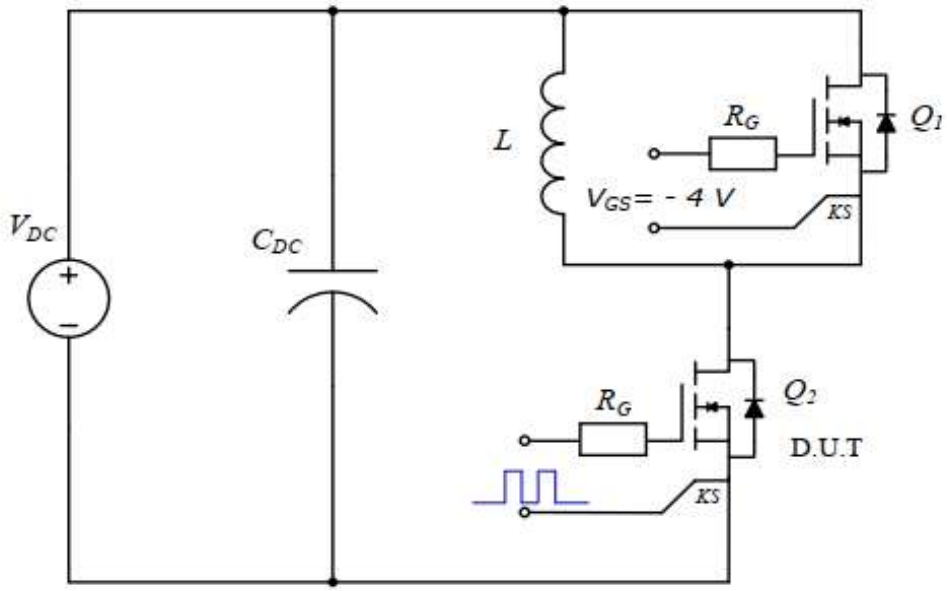
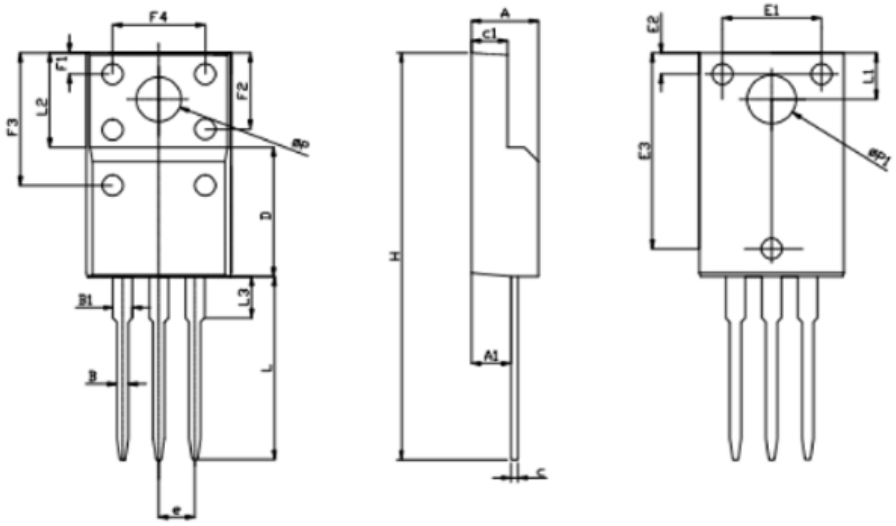


Figure 26: Clamped Inductive Switching Waveform Test Circuit

Package Dimensions

Package :TO-220F - 3



SYMBOL	DIMENSIONS			NOTES
	Min.	NOM	Max.	
A	4.50	4.70	4.90	
A1	2.63	2.76	2.89	
B	0.75	0.80	0.90	
B1	1.15	1.35	1.55	
c	0.40	0.50	0.60	
c 1	2.34	2.54	2.74	
D	8.87	9.17	9.47	
E	9.86	10.16	10.46	
E1	6.68	6.96	7.06	
E2	1.40	1.50	1.60	
E3	13.80	13.90	14.00	
F1	1.40	1.50	1.60	
F2	5.15	5.40	5.65	
F3	9.10	9.40	9.70	
F4	6.70	7.00	7.30	
H	28.50	29.00	29.50	
L	12.58	12.98	13.38	
L1	3.15	3.30	3.45	
L2	6.70 REF			
L3	2.63	2.93	3.23	
e	2.54 REF			
ØP	2.90	3.18	3.48	
ØP1	3.15	3.45	3.75	

Revision History

Document Version	Description of Changes
Rev.1.0	Released
Rev.2.0	Static parameters at different temperatures are added

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