

HCM2G0040120K

1200V N-Channel Silicon Carbide Power MOSFET

V_{DS}	=	1200 V
$R_{DS(on)}$	=	37 mΩ
I_D	=	75 A

Features

- Optimized package with separate driver source pin
- High blocking voltage with low on-resistance
- High-speed switching with low capacitances
- Fast intrinsic diode with low reverse recovery (Q_{rr})
- Easy to parallel
- RoHS compliant

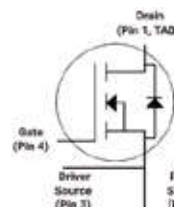
Benefits

- 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

Package



Part Number	Package	Marking
HCM2G0040120K	TO-247-3	HCM2G0040120K

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

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain-Source Breakdown Voltag	1200	V	$V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$	
I_D	Continuous Drain Current	75	A	$V_{GS} = 20\text{ V}, T_C = 25^{\circ}\text{C}$	Fig. 18
		53	A	$V_{GS} = 20\text{ V}, T_C = 100^{\circ}\text{C}$	
$I_{D(pluse)}$	Pulsed Drain Current	84	A	Pulsed width t_p limited by T_{Jmax}	Fig. 21
P_D	Power Dissipation	330	W	$T_C = 25^{\circ}\text{C}$	Fig. 19
$V_{GS,op}$	Recommend Gate Source Voltage (static)	-5/+20	V		
V_{GSmax}	Maximum Gate Source Voltage (dynamic)	-10/+25	V	AC ($f > 1\text{ Hz}$)	
T_J, T_{stg}	Operating Junction and Storage Temperature Range	-55 to +175	$^{\circ}\text{C}$		
T_L	Soldering Temperature	260	$^{\circ}\text{C}$		

Electrical Characteristics, at $T_J = 25^{\circ}\text{C}$, unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
Static							
BV _{DS}	Drain-Source Breakdown Voltag	1200	--	--	V	V _{GS} = 0 V, I _D = 100 μA	
I _{DSS}	Zero Gate Voltage Drain Current	--	1	100	μA	V _{DS} = 1200 V, V _{GS} = 0 V	
I _{GSS}	Gate-Source Leakage Current	--	10	250	nA	V _{GS} = 20 V	
V _{GS(th)}	Gate-Source Threshold Voltage	2	2.7	4	V	I _D = 10 mA, V _{GS} = V _{DS}	Fig. 11
		--	2.0	--	V	I _D = 10 mA, V _{GS} = V _{DS} , T _J = 175 °C	
R _{DS(on)}	Drain-Source On-Resistance	--	37	55	mΩ	V _{GS} = 20 V, I _D = 40 A	Fig. 7
		--	42	--	mΩ	V _{GS} = 18 V, I _D = 40 A	
		--	59	--	mΩ	V _{GS} = 15 V, I _D = 40 A	
		--	51	--	mΩ	V _{GS} = 20 V, I _D = 40 A, T _J = 175 °C	
		--	54	--	mΩ	V _{GS} = 18 V, I _D = 40 A, T _J = 175 °C	
		--	67	--	mΩ	V _{GS} = 15 V, I _D = 40 A, T _J = 175 °C	
Dynamic							
C _{iss}	Input Capacitance	--	2193	--	pF	V _{GS} = 0 V, V _{DS} = 1000 V f = 1.0 MHz, V _{AC} = 25 mV	Fig. 17
C _{oss}	Output Capacitance	--	153	--			
C _{rss}	Reverse Transfer Capacitance	--	8	--			
E _{OSS}	C _{OSS} Stored Energy	--	83	--	μJ		Fig. 16
Q _g	Total Gate Charge	--	99	--	nC	V _{DS} = 800 V	Fig. 12
Q _{gs}	Gate-Source Charge	--	32	--		I _D = 40 A	
Q _{gd}	Gate-Drain Charge	--	29	--		V _{GS} = -5/+20 V	
t _{d(on)}	Turn-on Delay Time	--	13	--	ns	V _{DS} = 800 V	Fig. 22 Fig. 23 Fig. 24
t _r	Turn-on Rise Time	--	30	--		V _{GS} = -5/+20 V	
t _{d(off)}	Turn-off Delay Time	--	27	--		I _D = 40 A	
t _f	Turn-off Fall Time	--	12	--		R _{G(ext)} = 2.5 Ω	
R _{G(int)}	Internal Gate Resistance	--	2.0	--	Ω	f = 1.0 MHz, V _{AC} = 25 mV	

Body Diode Characteristics, at $T_J = 25^{\circ}\text{C}$, unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
I_S	Continuous Diode Forward Current	--	--	75	A		
$I_{S(pluse)}$	Diode pulse Current	--	--	150	A		
V_{SD}	Diode Forward Voltage	--	4.0	--	V	$V_{GS} = 0\text{ V}, I_S = 20\text{ A}$	Fig. 8, 9, 10
		--	3.8	--	V	$V_{GS} = 0\text{ V}, I_S = 20\text{ A}, T_J = 175^{\circ}\text{C}$	
t_{rr}	Reverse Recovery Time	--	28	--	ns	$I_S = 20\text{ A}, V_{DS} = 800\text{ V}$ $V_{GS} = -5\text{ V}$ $di/dt = 2100\text{ A/us}$	
Q_{rr}	Reverse Recovery Charge	--	232	--	nC		
I_{rrm}	Peak Reverse Recovery Current	--	13	--	A		

Thermal Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	/	0.39	/	$^{\circ}\text{C/W}$	Fig. 20

Typical Performance

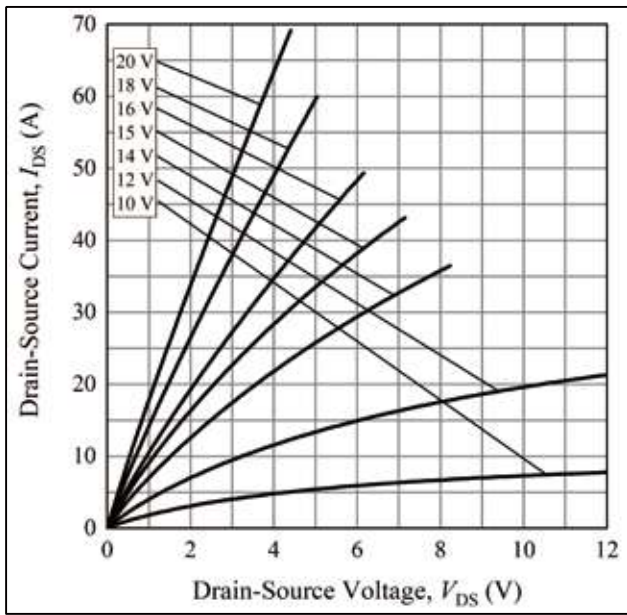


Figure 1: Typical Output Characteristics at $T_J = -55\text{ }^{\circ}\text{C}$

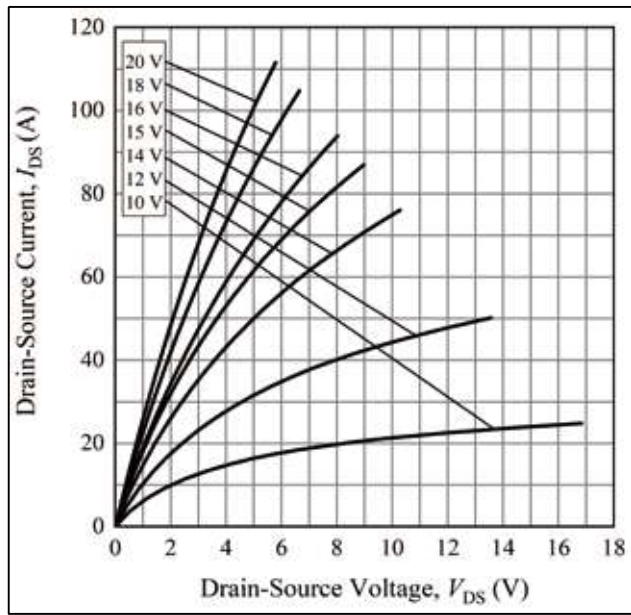


Figure 2: Typical Output Characteristics at $T_J = 25\text{ }^{\circ}\text{C}$

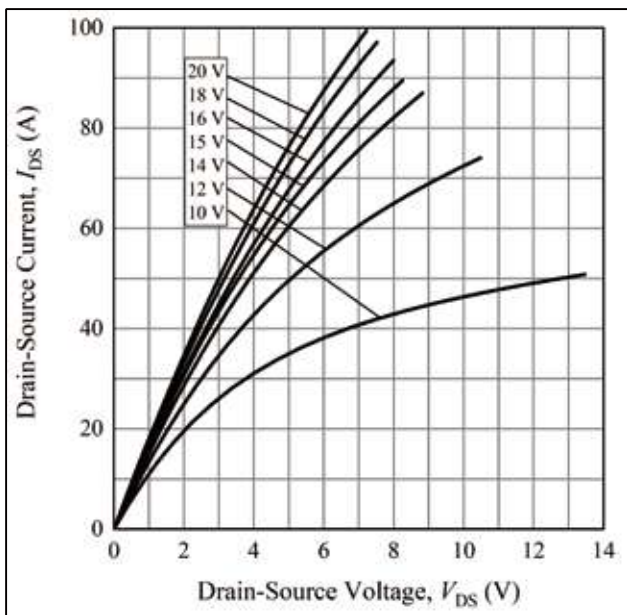


Figure 3: Typical Output Characteristics at $T_J = 175\text{ }^{\circ}\text{C}$

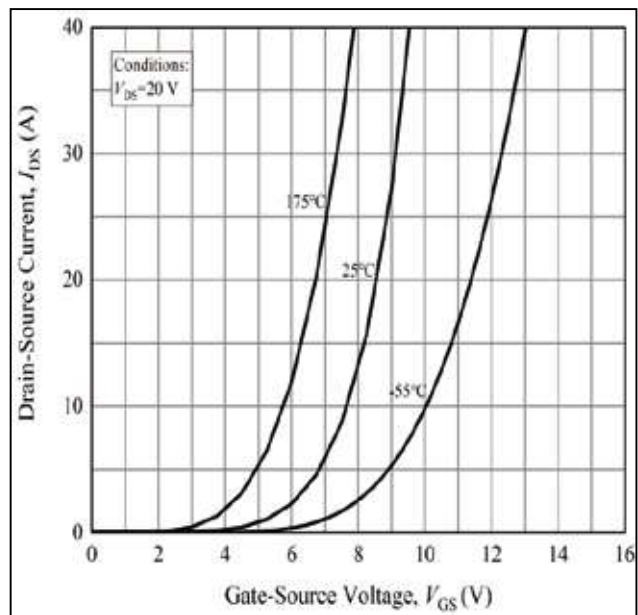


Figure 4: Typical Transfer Characteristics for Various Temperature

Typical Performance

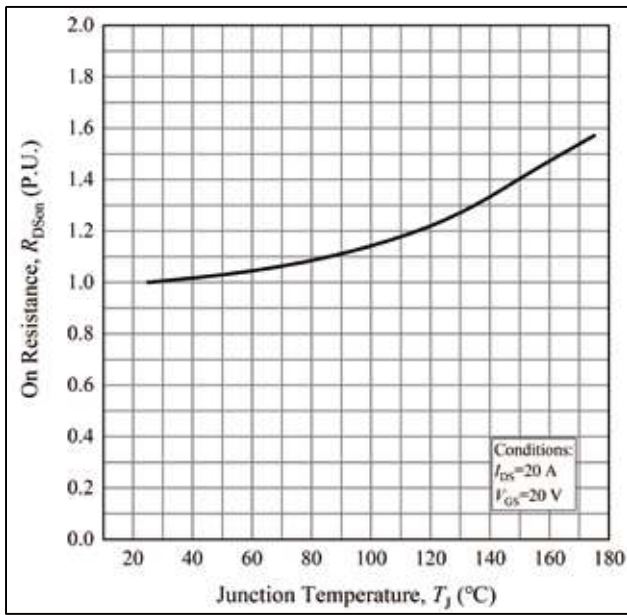


Figure 5: Normalized On-Resistance vs. Temperature

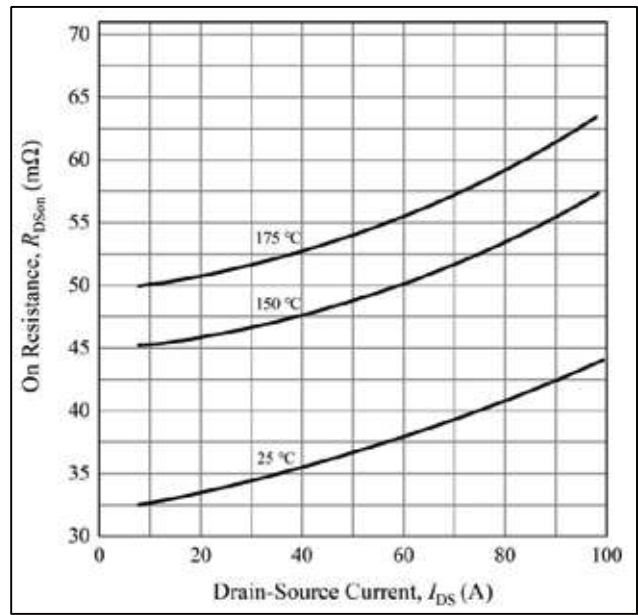


Figure 6: On-Resistance vs. Drain Current for Gate Various Temperatures

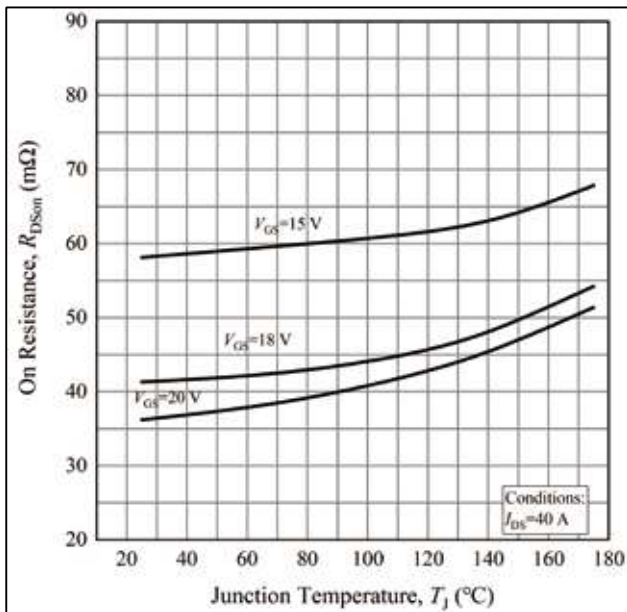


Figure 7: On-Resistance vs. Temperature for Various Voltage

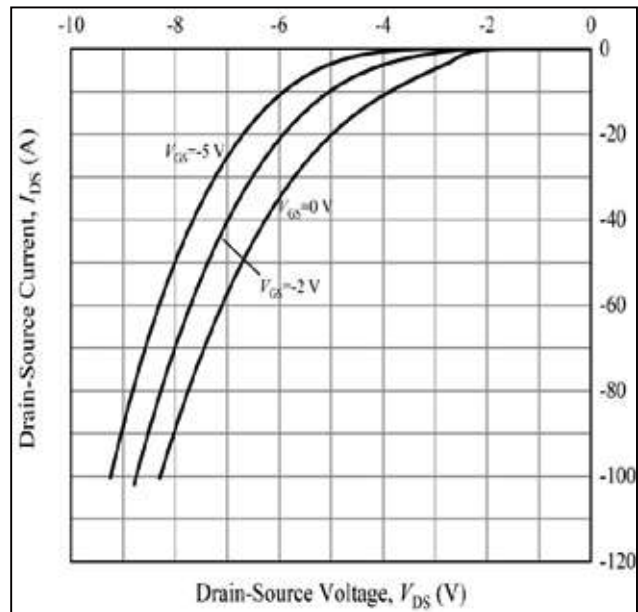


Figure 8: Typical Body Diode Characteristics at $T_J = -55\text{ }^{\circ}\text{C}$

Typical Performance

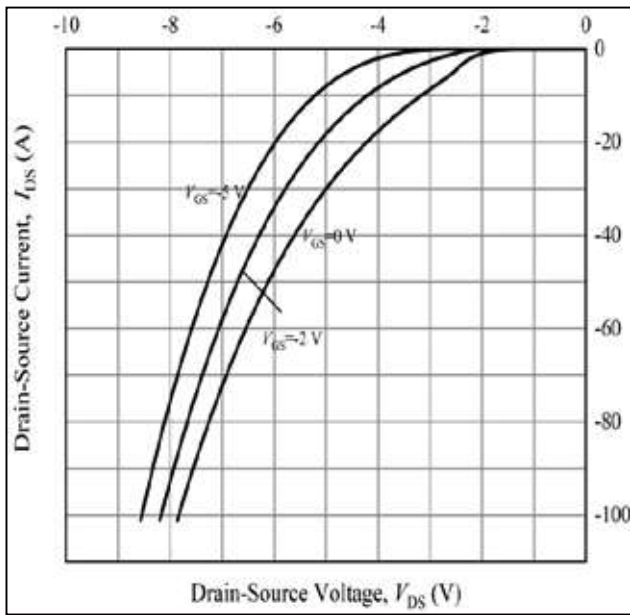


Figure 9: Typical Body Diode Characteristics at $T_J = 25\text{ }^{\circ}\text{C}$

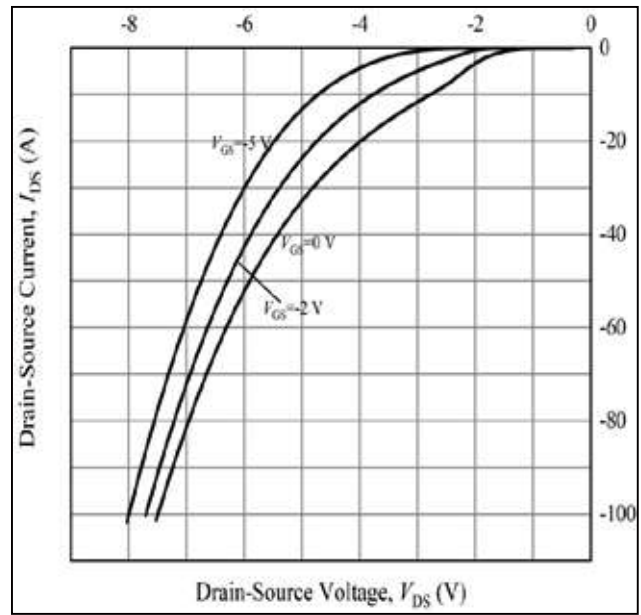


Figure 10: Typical Body Diode Characteristics at $T_J = 175\text{ }^{\circ}\text{C}$

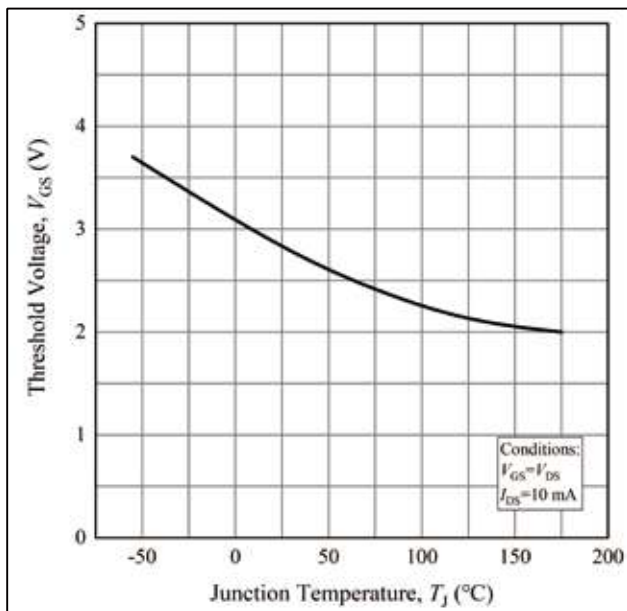


Figure 11: Typical Threshold Voltage vs. Temperature

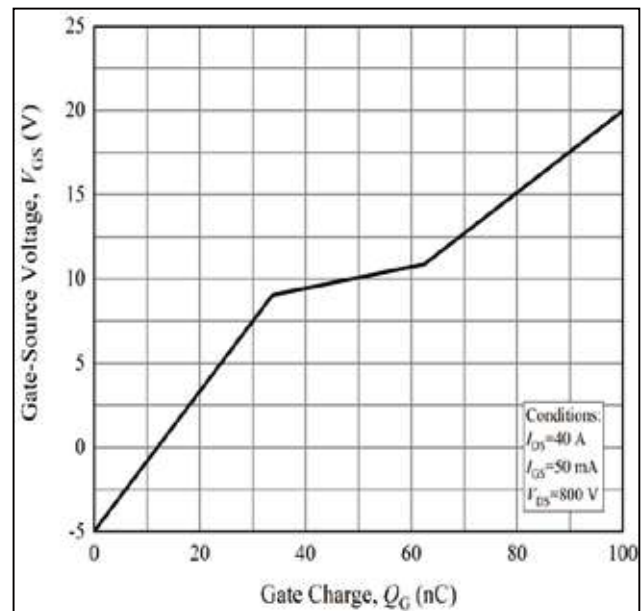


Figure 12: Typical Gate Charge Characteristics at $T_J = 25\text{ }^{\circ}\text{C}$

Typical Performance

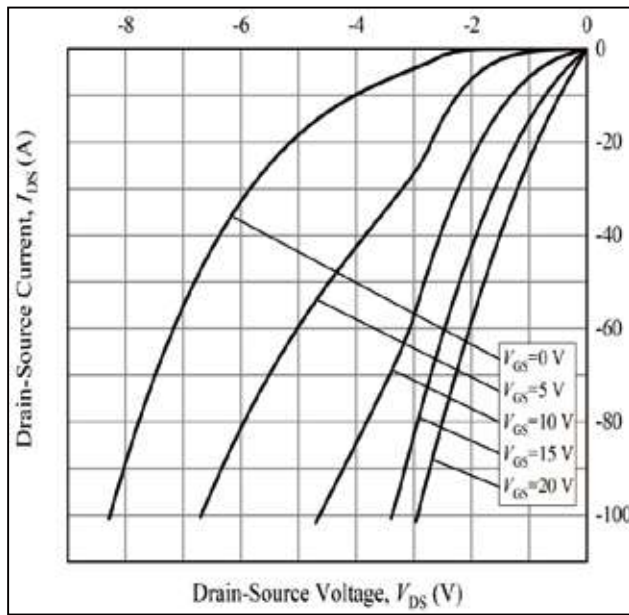


Figure 13: Typical 3rd Quadrant Characteristics
 $T_J = -55\text{ }^{\circ}\text{C}$

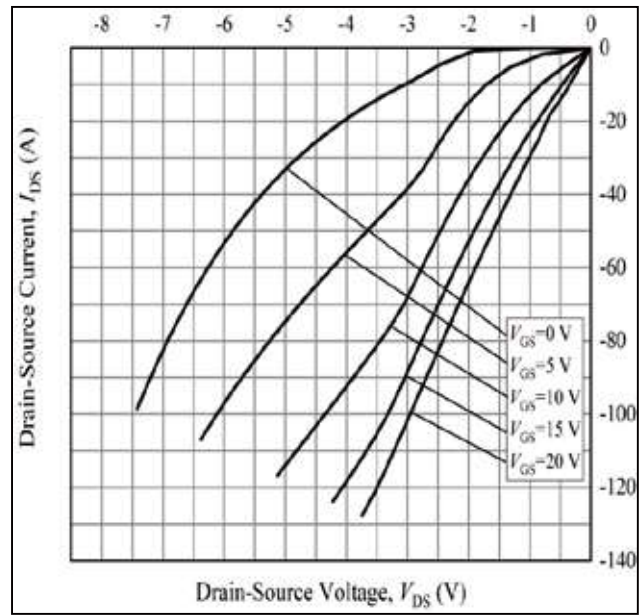


Figure 14: Typical 3rd Quadrant Characteristics at
 $T_J = 25\text{ }^{\circ}\text{C}$

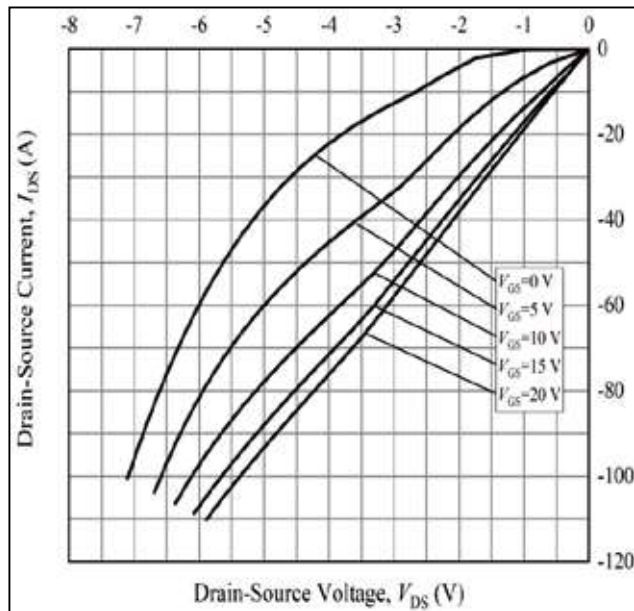


Figure 15: Typical 3rd Quadrant Characteristics
at $T_J = 175\text{ }^{\circ}\text{C}$

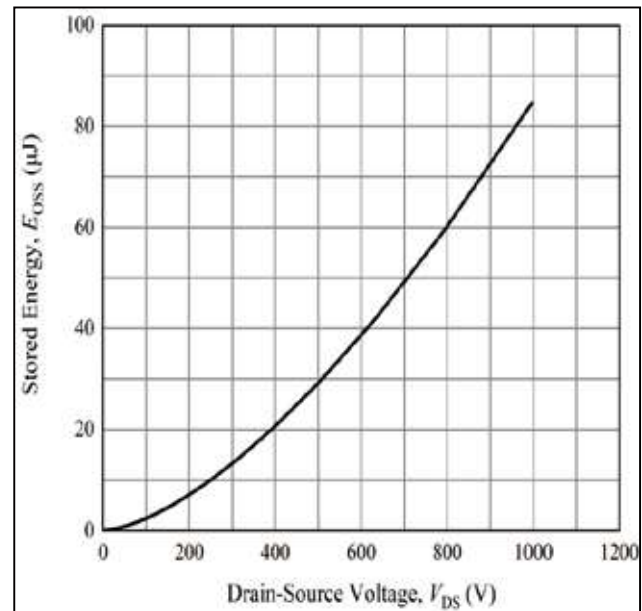


Figure 16: Typical Output Capacitor Stored Energy

Typical Performance

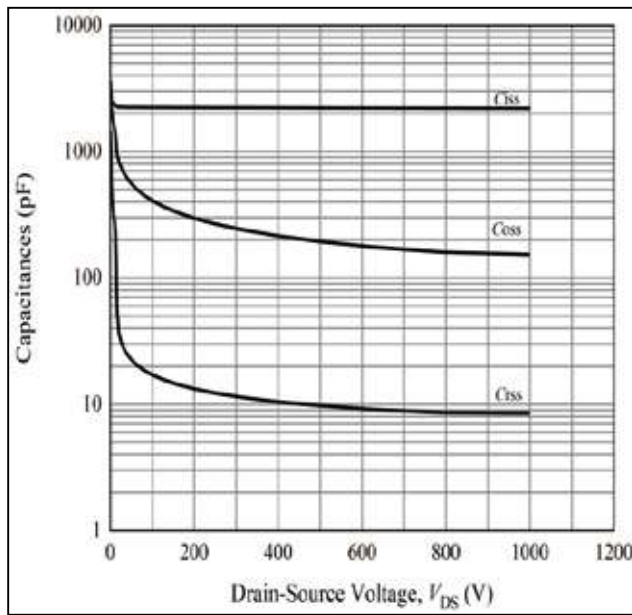


Figure 17: Typical Capacitances vs. Drain-Source Voltage

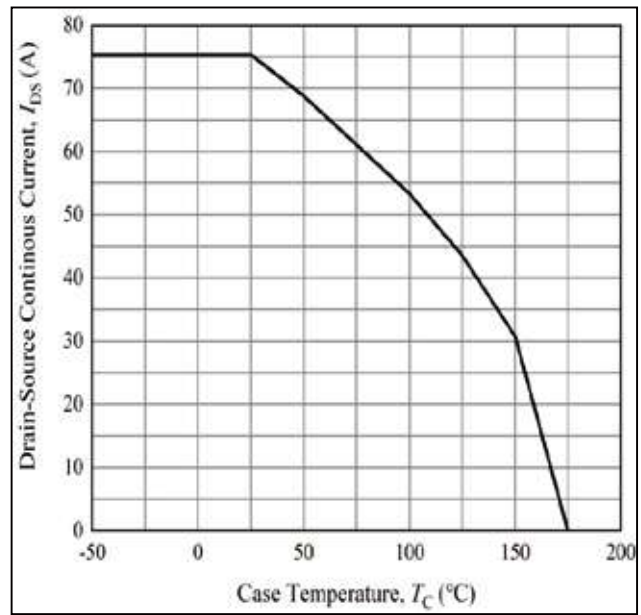


Figure 18: Continuous Drain Current Derating Curve

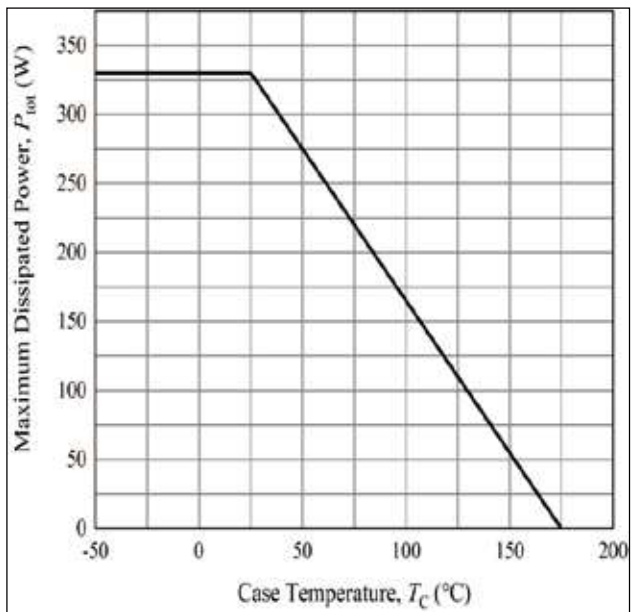


Figure 19: Power Dissipation Derating Curve

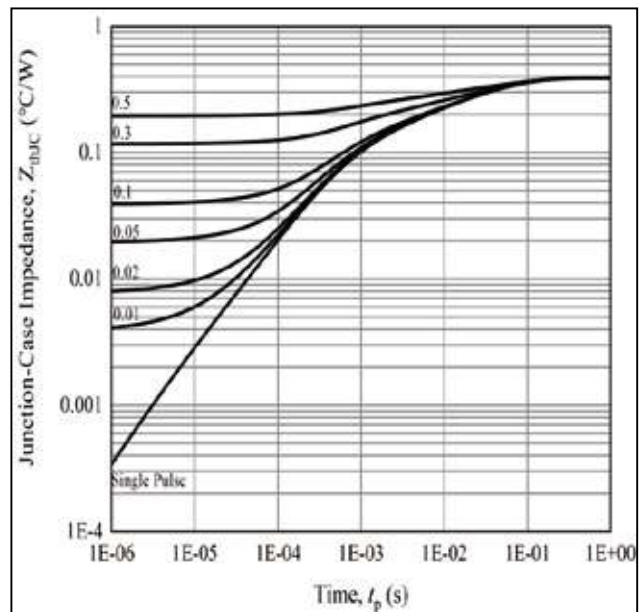


Figure 20: Typical Transient Thermal Impedance (Junction – Case) with Duty Cycle

Typical Performance

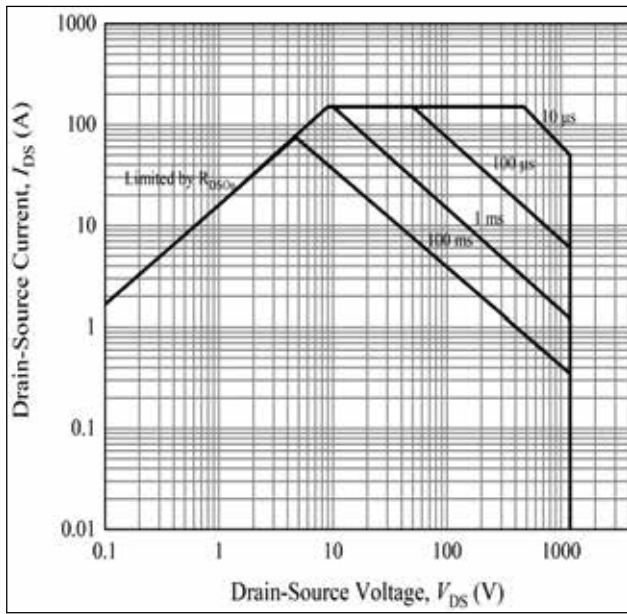


Figure 21: Safe Operate Area

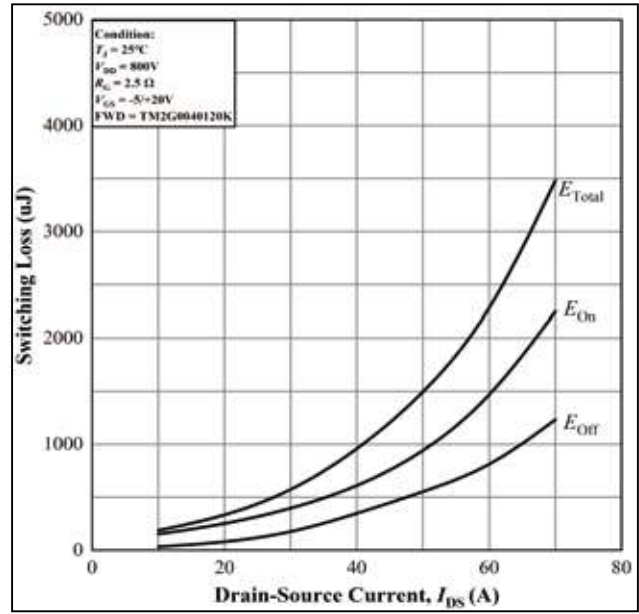


Figure 22: Resistive Switching Time Description

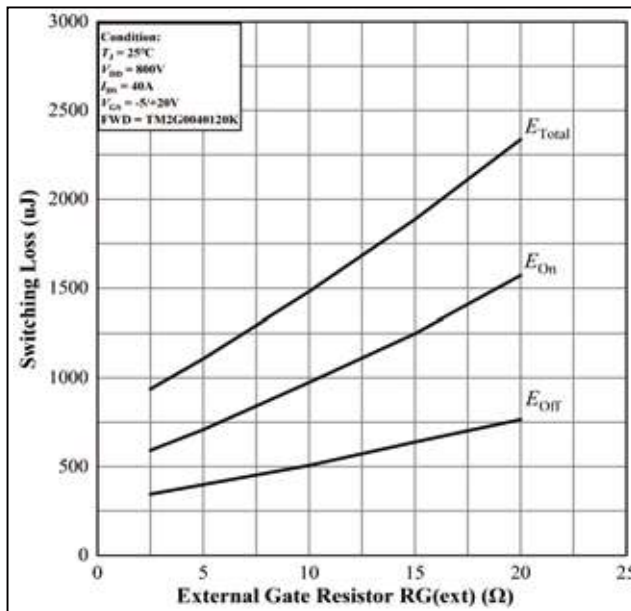


Figure 23 Clamped Inductive Switching Energy VS. $R_{G(ext)}$

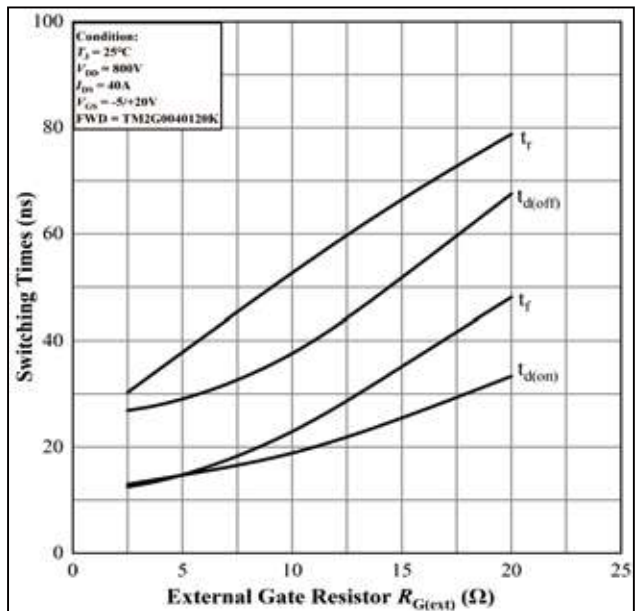


Figure 24: Switching Time VS. $R_{G(ext)}$

Package Dimensions

Package TO-247-3

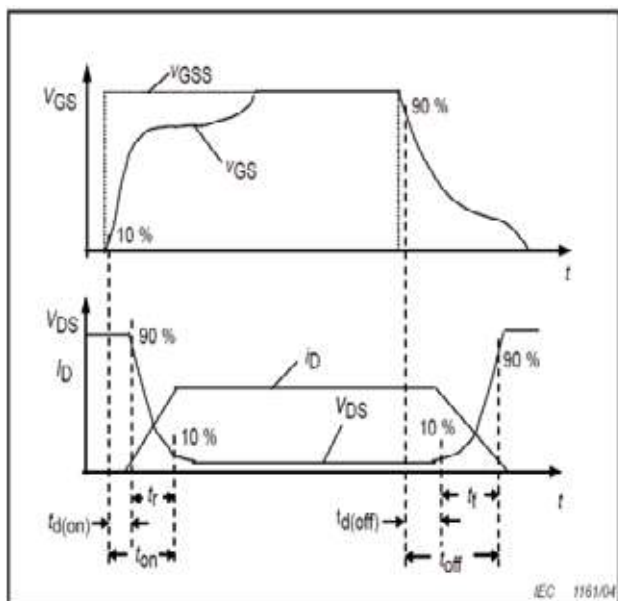


Figure 2 5 : Resistive Switching Time Description

Test Circuit Schematic

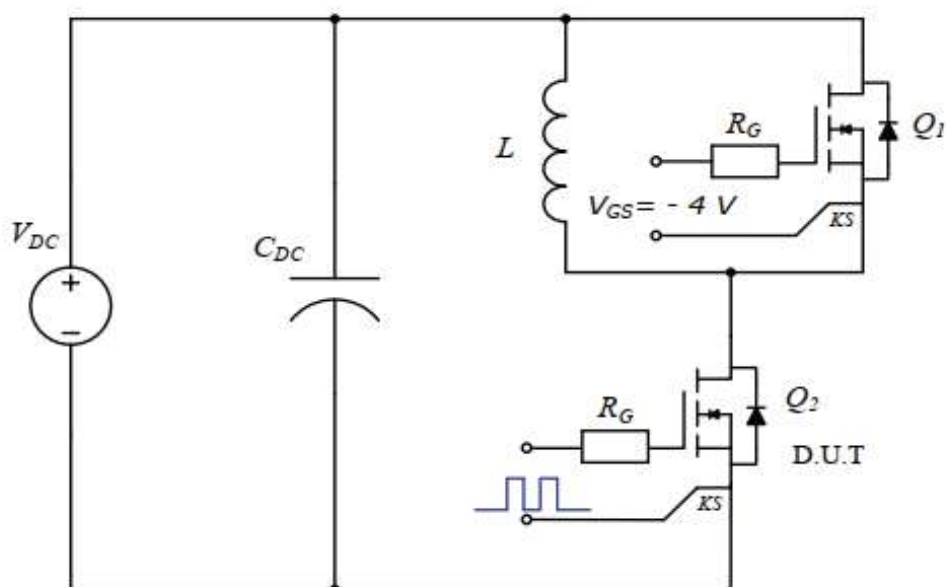
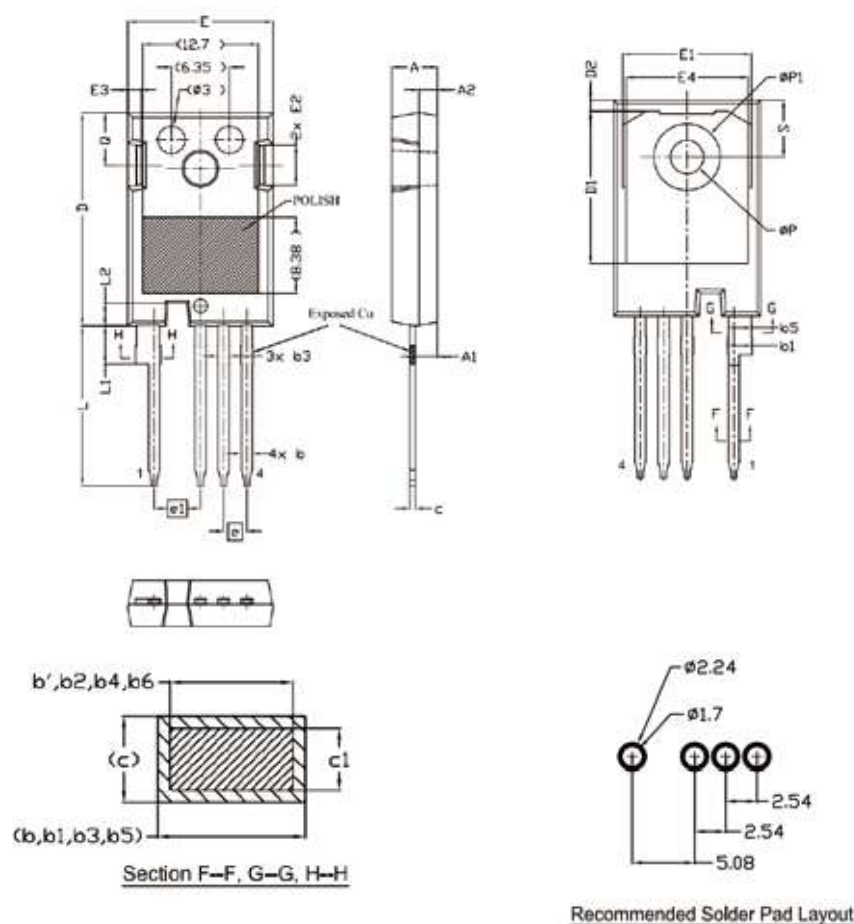


Figure 23: Clamped Inductive Switching Waveform Test Circuit

Package Dimensions

Package : TO-247-4



SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	4.83	5.02	5.21
A1	2.29	2.41	2.54
A2	1.91	2.00	2.16
b'	1.07	1.20	1.28
b	1.07	1.20	1.33
b1	2.39	2.67	2.94
b2	2.39	2.67	2.84
b3	1.07	1.30	1.60
b4	1.07	1.30	1.50
b5	2.39	2.53	2.69
b6	2.39	2.53	2.64
c	0.55	0.60	0.68
c1	0.55	0.60	0.65
D	23.30	23.45	23.60
D1	16.25	16.55	17.65
D2	0.95	1.19	1.25
E	15.75	15.94	16.13
E1	13.10	14.02	14.15
E2	3.68	4.40	5.10
E3	1.00	1.45	1.90
E4	12.38	13.26	13.43
e	2.54 BSC		
e1	5.08 BSC		
L	17.31	17.57	17.82
L1	3.97	4.19	4.37
L2	2.35	2.50	2.65
ϕP	3.51	3.61	3.65
$\phi P1$	7.19 REF.		
Q	5.49	5.79	6.00
S	6.04	6.17	6.30

Note:

1. All Dimensions Are In mm.
2. Slot Required, Notch May Be Rounded
3. Dimension D & E Do Not Include Mold Flash. Mold Flash Shall Not Exceed 0.127mm Pre Side. These Dimensions Are Measured At The Outermost Extreme Of The Plastic Body.
4. Thermal Pad Contour Optional Within Dimension D1 & E1.
5. Lead Finish Uncontrolled In L1.
6. ϕP To Have A Maximum Draft Angle Of 1.5° To The Top Of The Part With A Maximum Hole Diameter Of 3.91 mm.

Revision History

Document Version	Description of Changes
Rev.1.0	Released
Rev.2.0	Static parameters at different temperatures are added
Rev.21	Package Outline Updated
Rev.22	Clamped Inductive Switching Graph Updated

Zhejiang HIITIO New Energy Co., Ltd

ADD : NO.1125 Zhixing Road,Qiaonan District, Xiaoshan Economic and
Technological Development Zone, Hangzhou, Zhejiang

TEL :400-667-9977

