GP2T040A120J

V_{DS}	1200 V
$R_{DS,on}$	38 mΩ
$I_{D\ (TC=25C)}$	66 A
T_j,max	175°C

QSiC™ 1200V SiC MOSFET

Features

- High speed switching
- Reliable body diode
- All parts tested to greater than 1,400V
- Avalanche tested to 400mJ
- Driver source pin for gate driving

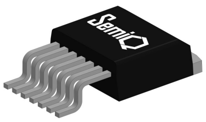
Benefits

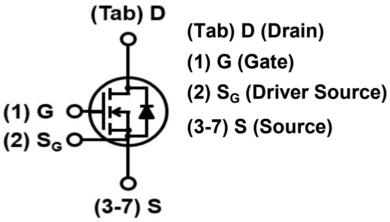
- Lower capacitance
- Higher system efficiency
- Easy to parallel
- Lower Switching Loss
- Longer clearance distance

Applications

- Solar Inverters
- Switch mode power supplies, UPS
- Induction heating and welding
- EV charging stations
- High voltage DC/DC converters
- Motor drives

Package





Part #	Package	Marking
GP2T040A120J	TO-263-7L	2T040A120J

Maximum Ratings, at T_j=25°C, unless otherwise specified

Characteristics	Symbol	Conditions	Values	Unit
Drain-Source Voltage	V_{rated}	V_{GS}=0V, I_{DS}=1μA	1200	V
Continuous Drain Current	I_D	T_C=25 °C, T_j=175 °C	66	A
		T_C=100 °C, T_j=175 °C	49	
Pulsed Drain Current	$I_{D,pulse}$*	T_C=25°C	160	
Gate Source Voltage	V_{GSmax}		-10/25	V
	V_{GSop}	Recommended operational	-5/20	
Power Dissipation	P_{tot}	T_C=25°C	357	W
Operating & Storage Temperature	T_j, $T_{storage}$	Continuous	-55...175	°C
Single Pulse Avalanche Energy	E_{AS}	L=1.0mH, I_{AS}=28.3A, V=50V	400	mJ

Thermal Characteristics

Characteristics	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal Resistance, Junction to Case	R_{thJC}		-	0.33	0.42	°C/W
Thermal Resistance, Junction to Ambient	R_{thJA}		-	-	40.0	

* Pulse width is limited by Tj_{max}

Static Electrical Characteristics, at T_j=25°C, unless otherwise specified

Characteristics	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Drain-Source Breakdown Voltage	BV_{DSS}	I_{DS}=1mA	1200	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=1200V, V_{GS}=0V	-	0.1	1.0	μA
		V_{DS}=1200V, V_{GS}=0V, T_j=175°C	-	1	-	
Gate-Source Leakage Current	I_{GSS+}	V_{GS}=20V, V_{DS}=0V	-	10	100	nA
	I_{GSS-}	V_{GS}=-5V, V_{DS}=0V	-	-10	-100	
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}=V_{DS}, I_{DS}=10mA	1.8	2.4	4	V
		V_{GS}=V_{DS}, I_{DS}=10mA, T_j=125°C	-	1.8	-	
		V_{GS}=V_{DS}, I_{DS}=10mA, T_j=175°C	-	1.6	-	
Drain-Source On-Resistance	R_{DSon}	V_{GS}=20V, I_{DS}=40A	-	38	52	mΩ
		V_{GS}=20V, I_{DS}=20A	-	35	45	
		V_{GS}=20V, I_{DS}=40A, T_j=125°C	-	56	-	
		V_{GS}=20V, I_{DS}=40A, T_j=175°C	-	73	-	
Transconductance	g_{fs}	V_{DS}=20V, I_{DS}=40A	-	16	-	S
Gate Input Resistance	R_G	f=1MHz, V_{AC}=25mV, D-S Short	-	1.9	-	Ω

AC Electrical Characteristics, at T_j=25°C, unless otherwise specified

Characteristics	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Input Capacitance	C_{ISS}	V_{GS}=0V, V_{DS}=1000V, f=200kHz, V_{AC}=25mV	-	3192	-	pF
Output Capacitance	C_{OSS}		-	132	-	
Reverse Transfer Capacitance	C_{RSS}		-	7	-	
Coss Stored Energy	E_{OSS}		-	77	-	μJ
Turn-On Switching Energy	E_{ON}	V_{DD}=800V, I_{DS}=40A, $R_{G(ext)}$=4.3, V_{GS}=-5/+20V, L=273μH, FWD=GP2T040A120J	-	515	-	μJ
Turn-Off Switching Energy	E_{OFF}		-	89	-	
Total Switching Energy	E_{TOT}		-	604	-	
Turn-On Delay Time	$t_{D(on)}$	V_{DD}=800V, I_{DS}=40A, $R_{G(ext)}$=4.3, V_{GS}=-5/+20V, L=273μH, FWD=GP2T040A120J	-	14	-	ns
Rise Time	t_R		-	5	-	
Turn-Off Delay Time	$t_{D(off)}$		-	28	-	
Fall Time	t_F		-	12	-	
Total Gate Charge	Q_G	V_{DD}=800V, I_{DS}=20A, V_{GS}=-5/+20V	-	112	-	nC
Gate to Source Charge	Q_{GS}		-	40	-	
Gate to Drain Charge	Q_{GD}		-	20	-	

Body Diode Characteristics, at Tj=25°C, unless otherwise specified

Characteristics	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Max Continuous Diode Fwd Current	I_S	V_{GS}=-5V, T_C=25°C	-	-	74	A
Diode Forward Voltage	V_{SD}	V_{GS}=-5V, I_{SD}=20A	-	3.8	-	V
Reverse Recovery Time	t_{RR}	I_{SD}=40A, V_R=800V, V_{GS}=-5V, di_F/dt=9.6A/ns	-	10	-	ns
Reverse Recovery Charge	Q_{RR}		-	394	-	nC
Peak Reverse Recovery Current	I_{RRM}		-	67	-	A

Typical Performance

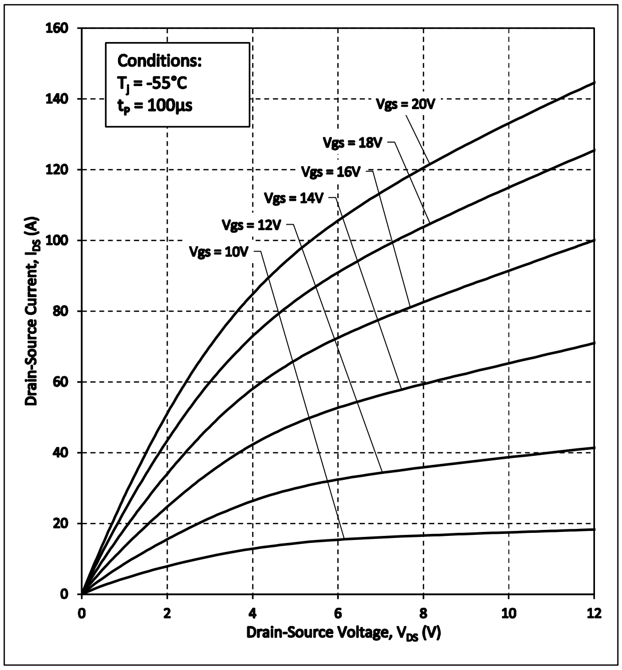


Figure 1. Output Characteristics T_j = -55°C

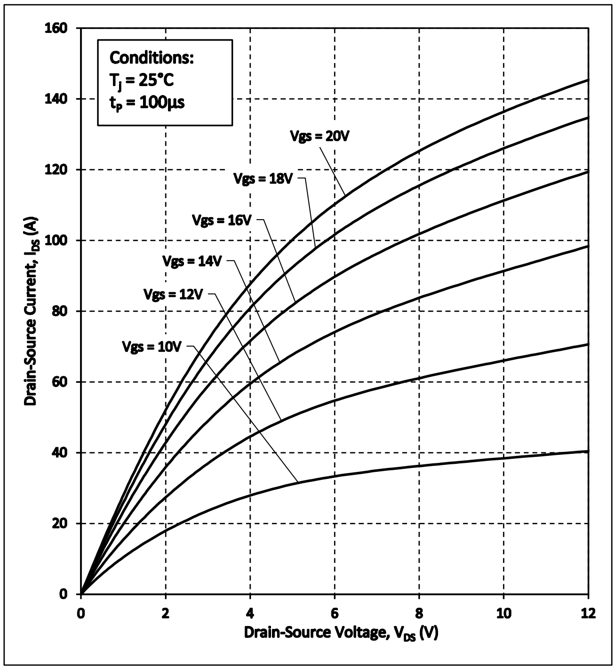


Figure 2. Output Characteristics T_j = 25°C

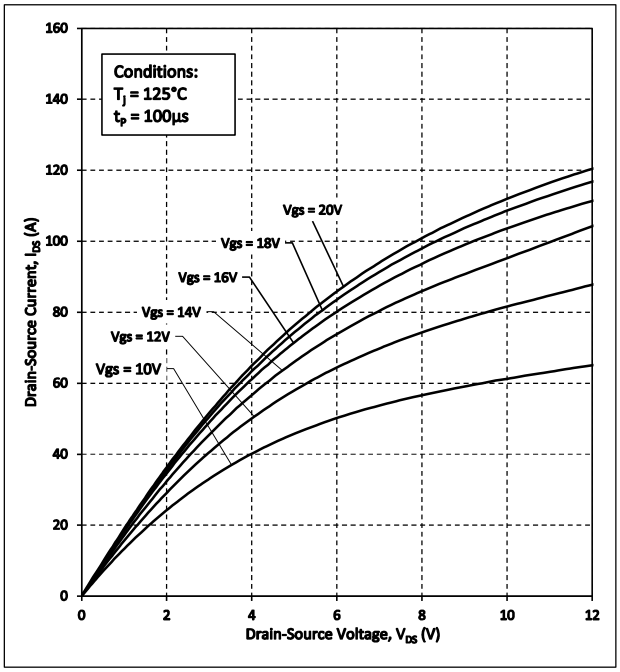


Figure 3. Output Characteristics T_j = 125°C

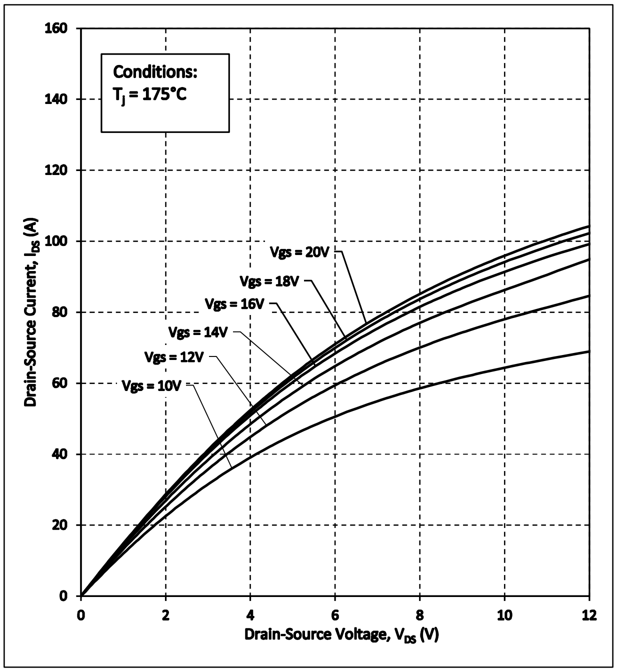


Figure 4. Output Characteristics T_j = 175°C

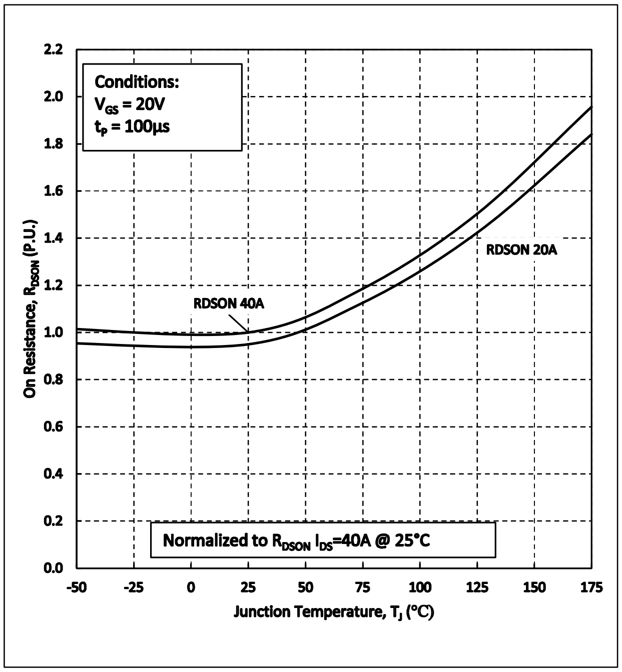


Figure 5. Normalized On-Resistance vs. Temperature

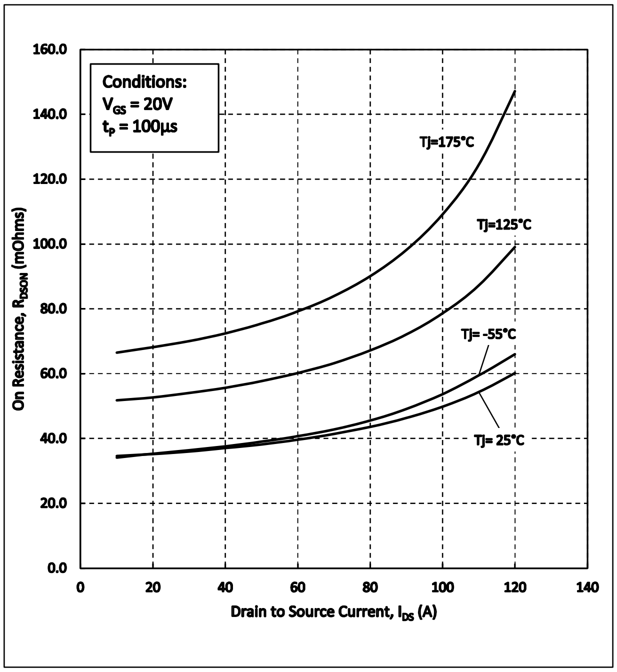


Figure 6. On-Resistance vs. Drain Current For Various Temperature

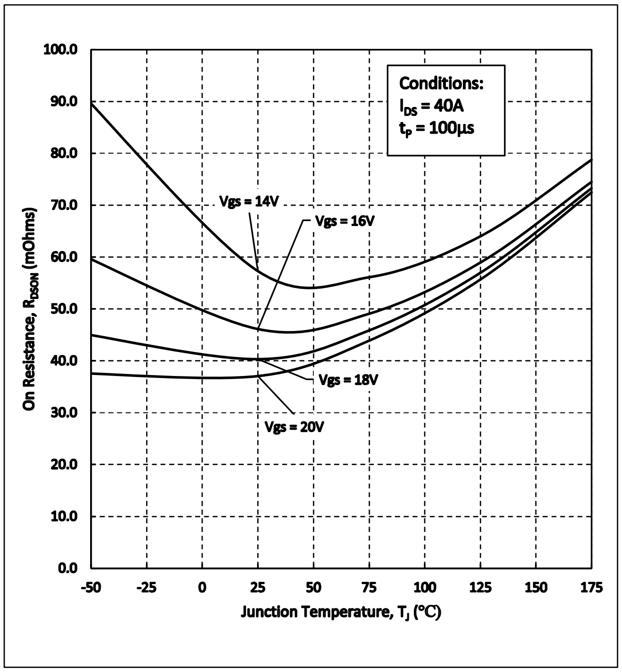


Figure 7. On-Resistance vs. Temperature For Various Gate Voltages

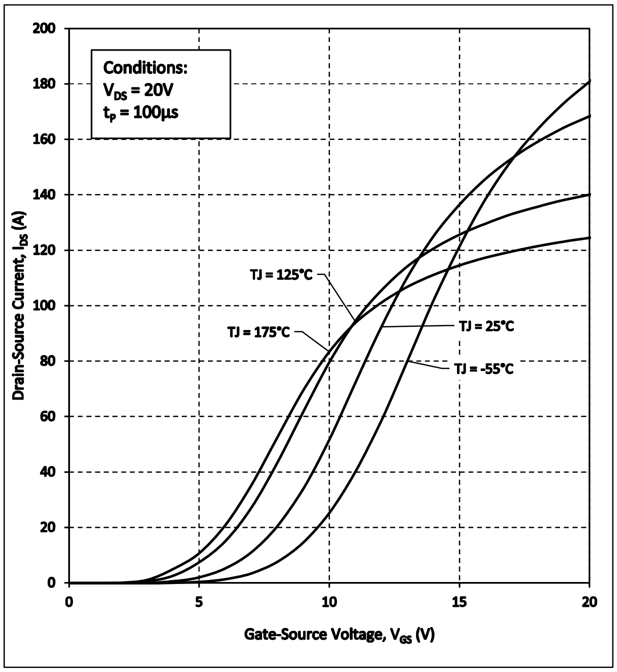


Figure 8. Transfer Characteristic for Various Junction Temperatures

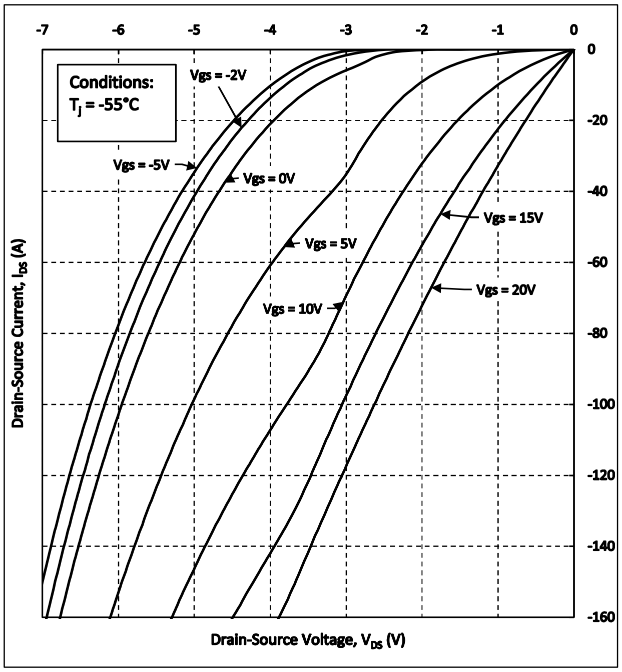


Figure 9. Body Diode Characteristics at T_j = -55°C

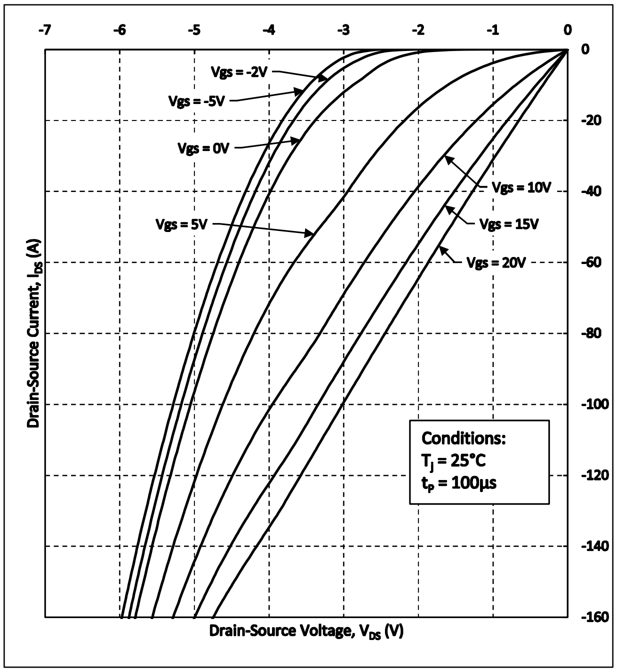


Figure 10. Body Diode Characteristics at T_j = 25°C

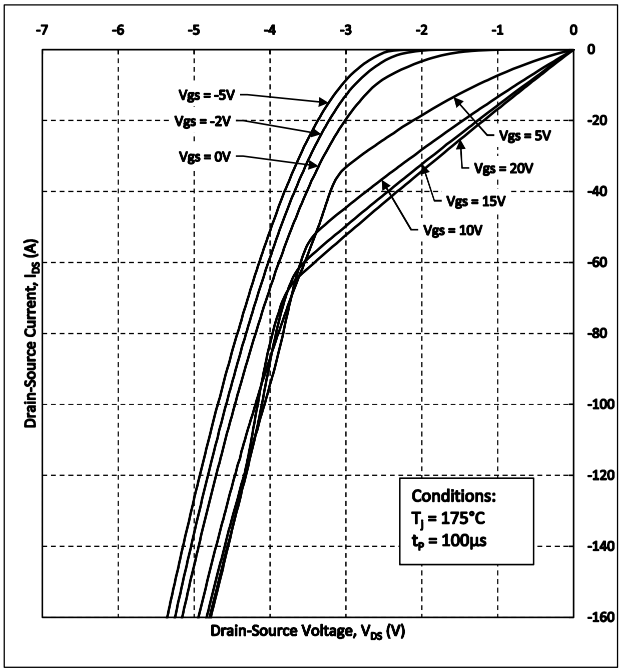


Figure 11. Body Diode Characteristics at T_j = 175°C

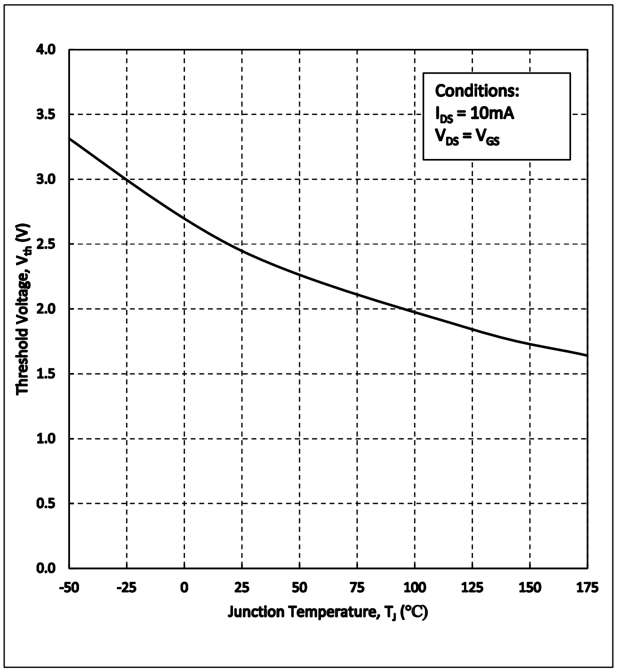


Figure 12. Threshold Voltage vs. Temperature

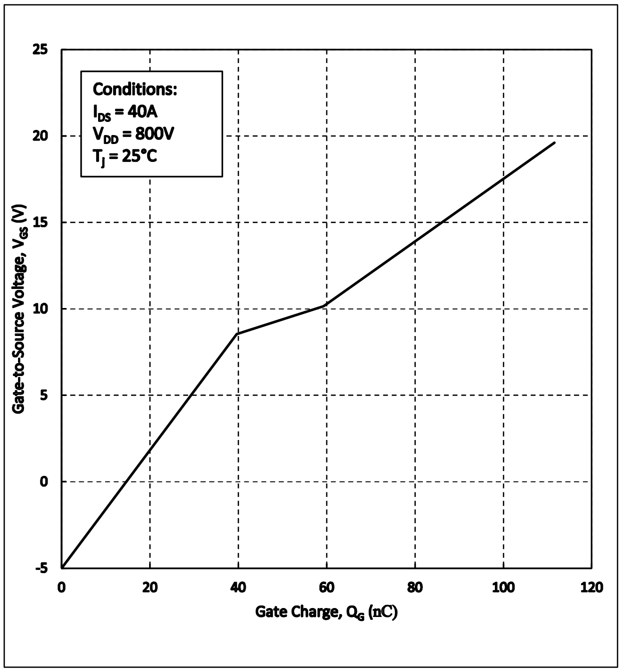


Figure 13. Gate Charge Characteristics

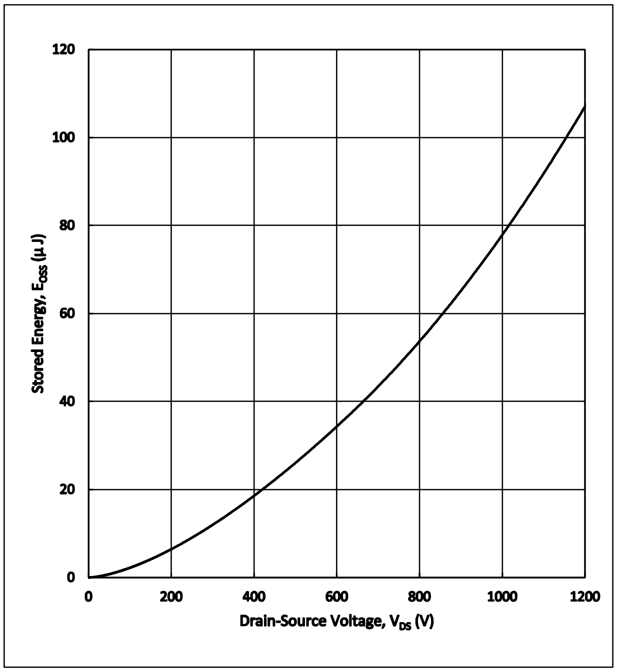


Figure 14. Output Capacitor Stored Energy

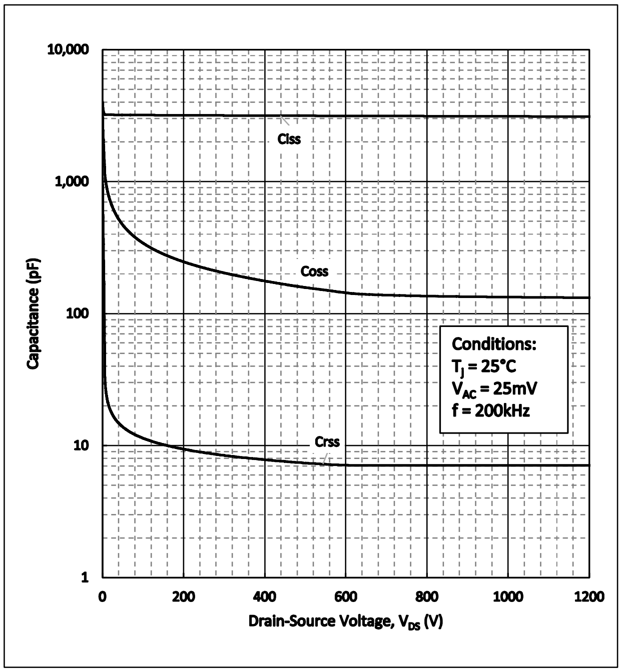


Figure 15. Capacitance vs Drain-Source Voltage

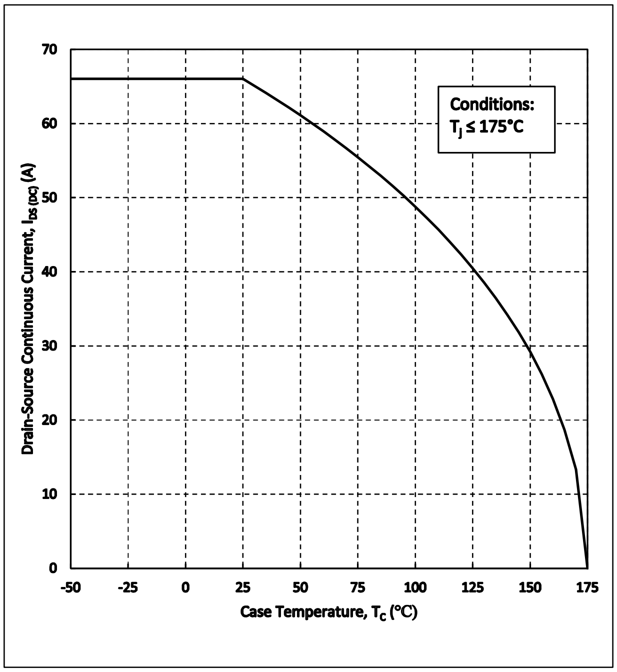


Figure 16. Continuous Drain Current Derating vs. Case Temperature

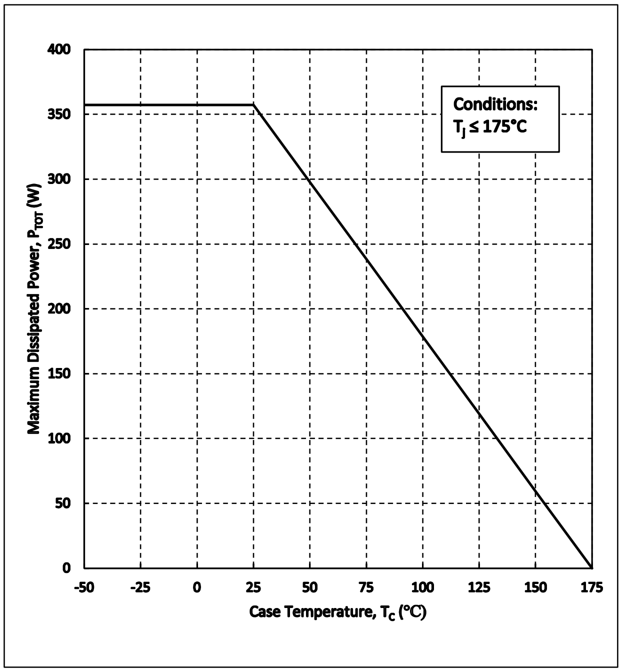


Figure 17. Maximum Power Dissipation Derating vs Case Temperature

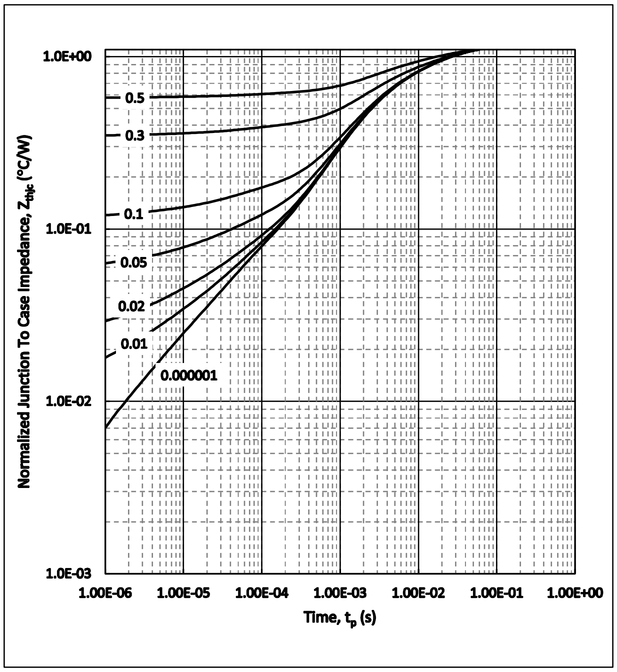


Figure 18. Transient Thermal impedance (Junction to Case)

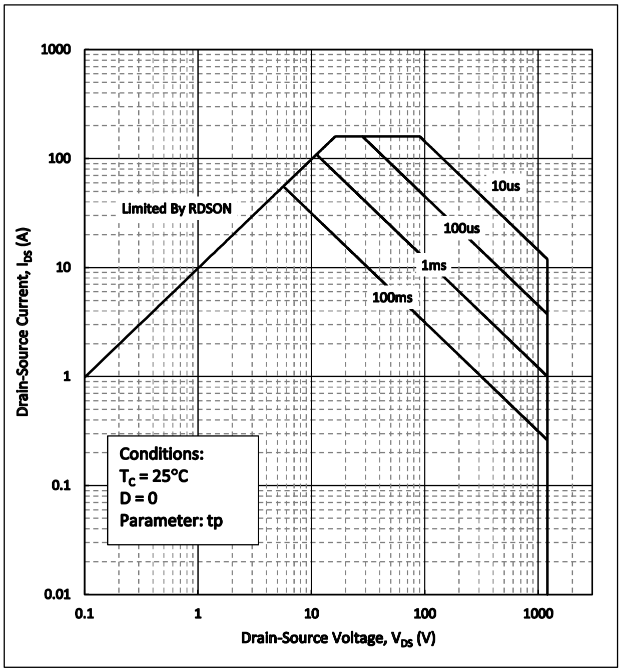


Figure 19. Safe Operating Area

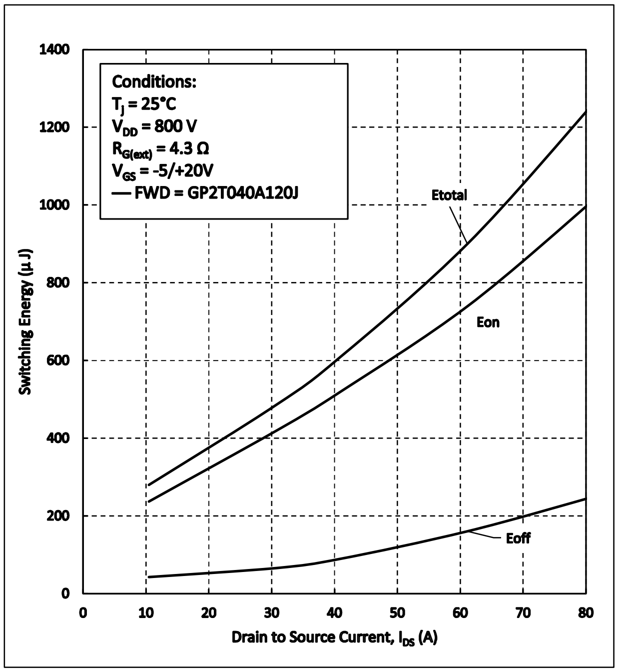


Figure 20. Clamped Inductive Switching Energy vs. Drain Current

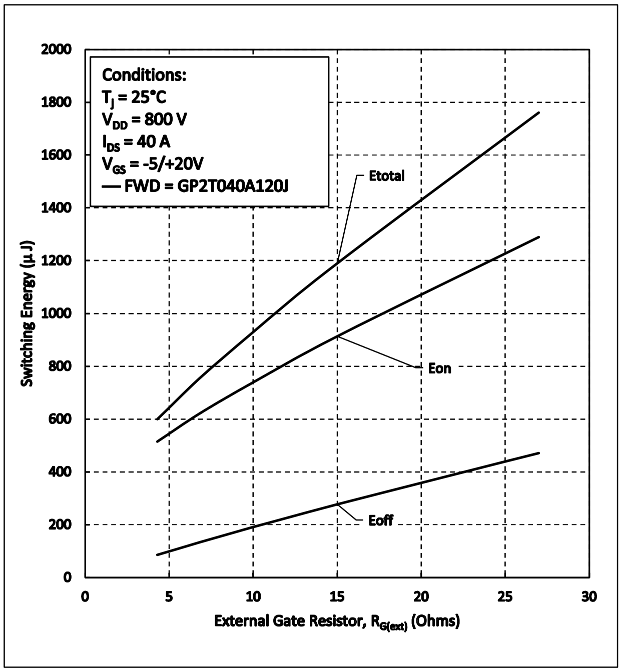


Figure 21. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

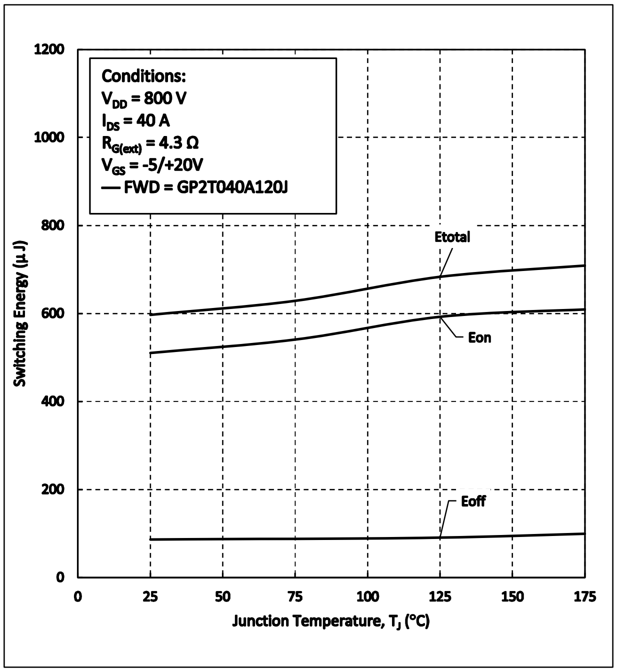


Figure 22. Clamped Inductive Switching Energy vs. Temperature

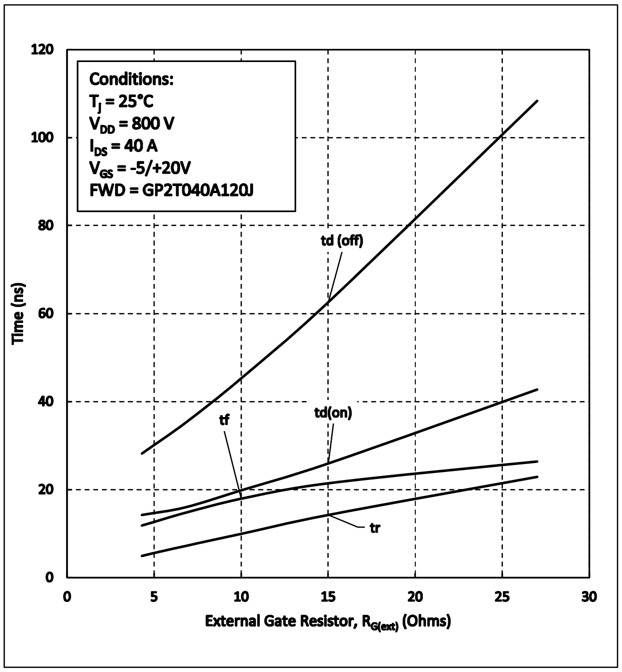


Figure 23. Switching Times vs $R_{G(ext)}$

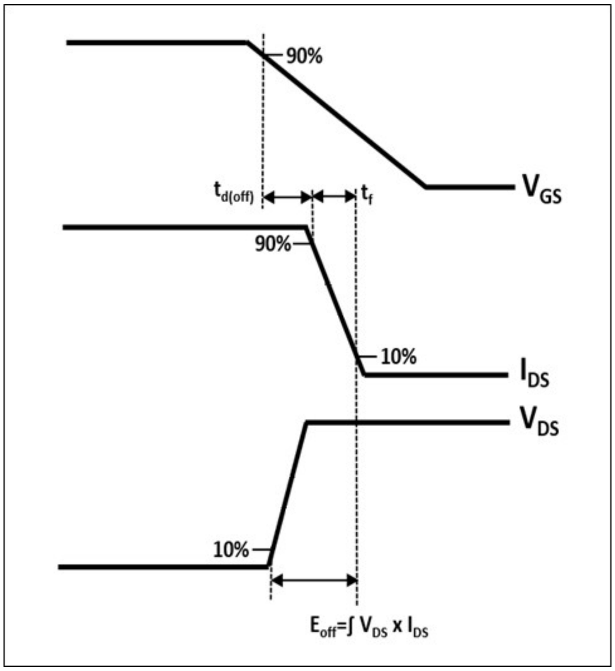


Figure 24. Turn-off Transient Definitions

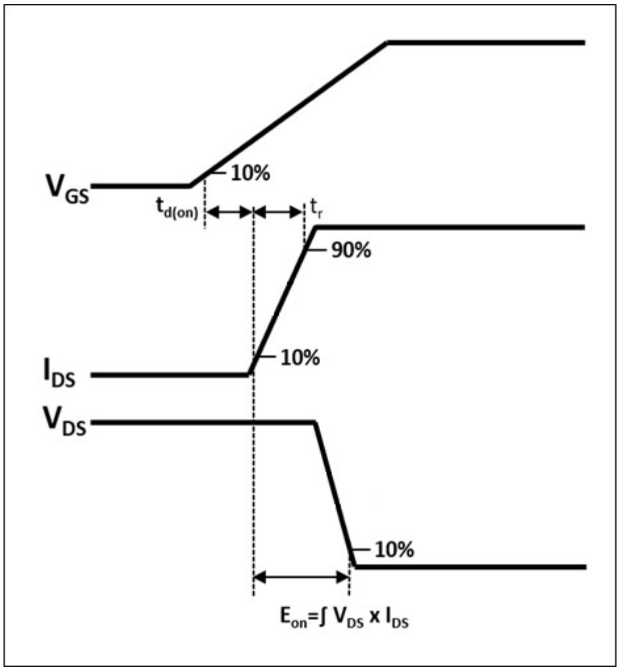


Figure 25. Turn-on Transient Definitions

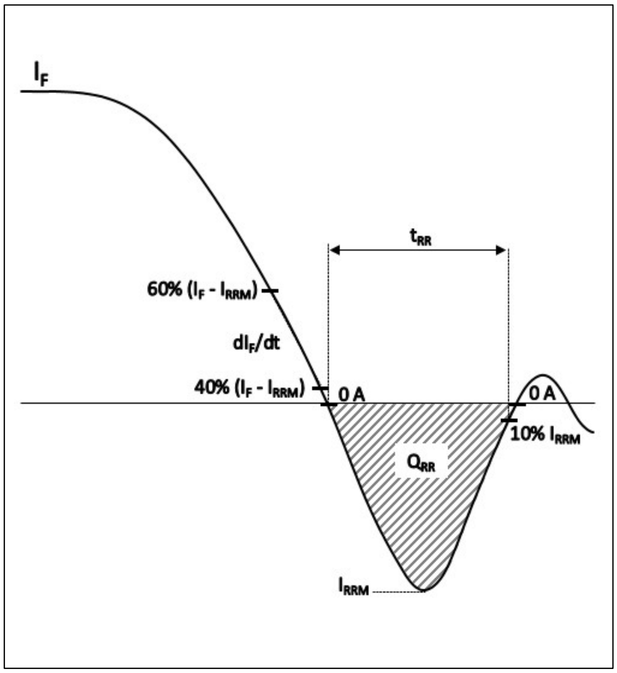
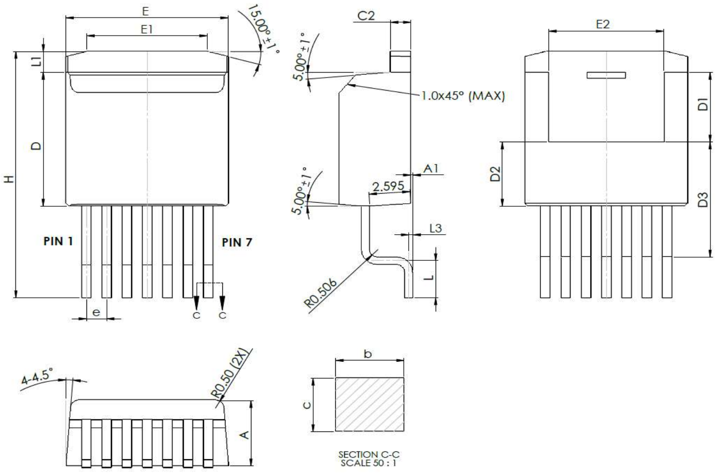


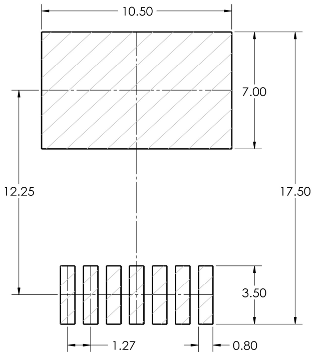
Figure 26. Reverse Recovery Definitions

Package Dimensions TO-263-7L



Sym	Millimeters		Inches	
	Min	Max	Min	Max
A	4.30	4.57	0.169	0.180
A1	0.00	0.25	0.000	0.010
b	0.50	0.70	0.020	0.028
c	0.33	0.65	0.013	0.026
C2	1.17	1.40	0.046	0.055
D	9.03	9.13	0.355	0.359
D1	4.66	4.81	0.183	0.189
D2	4.255 BSC		0.168 BSC	
D3	7.170 BSC		0.282 BSC	
E	10.13	10.23	0.399	0.403
E1	6.50	8.60	0.256	0.339
E2	6.78	7.67	0.267	0.302
e	1.22	1.32	0.048	0.052
H	15.04	17.12	0.592	0.674
L3	0.254 BSC		0.010 BSC	

Recommended Minimum Pad Dimensions



Notes

RoHS Compliance

The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2011/65/EC (RoHS2), as implemented March, 2013. RoHS Declarations for this product can be obtained from the Product Documentation sections of www.SemiQ.com.

REACh Compliance

REACh substances of high concern (SVHC) information is available for this product. Since the European Chemicals Agency (ECHA) has published notice of their intent to frequently revise the SVHC listing for the foreseeable future,please contact our office at SemiQ Headquarters in Lake Forest, California to insure you get the most up-to-date REACh SVHC Declaration. REACh banned substance information (REACh Article 67) is also available upon request.

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