NGTB40N120L3WG

IGBT - Ultra Field Stop

This Insulated Gate Bipolar Transistor (IGBT) features a robust and cost effective Ultra Field Stop Trench construction, and provides superior performance in demanding switching applications, offering both low on−state voltage and minimal switching loss. The IGBT is well suited for motor driver applications. Incorporated into the device is a soft and fast co−packaged free wheeling diode with a low forward voltage.

Features

- Extremely Efficient Trench with Field Stop Technology
- T_{Jmax} = 175°C
- Soft Fast Reverse Recovery Diode
- Optimized for Low V_{CEsat}
- These are Pb−Free Devices

Typical Applications

- Solar Inverter and UPS
- Industrial Switching
- Welding

ABSOLUTE MAXIMUM RATINGS

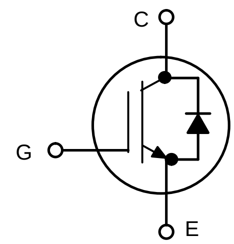
Rating	Symbol	Value	Unit
Collector−emitter voltage	V_{CES}	1200	V
Collector current @ TC = 25°C @ TC = 100°C	I_C	 160 40	A
Pulsed collector current, T_{pulse} limited by T_{Jmax}	I_{CM}	160	A
Diode forward current @ TC = 25°C @ TC = 100°C	I_F	 160 40	A
Diode pulsed current, T_{pulse} limited by T_{Jmax}	I_{FM}	160	A
Gate−emitter voltage Transient gate−emitter voltage (t_{pulse} = 5 μs, D < 0.10)	V_{GE}	±20 ±30	V
Power Dissipation @ TC = 25°C @ TC = 100°C	P_D	 454 227	W
Operating junction temperature range	T_J	−55 to +175	°C
Storage temperature range	T_{stg}	−55 to +175	°C
Lead temperature for soldering, 1/8″ from case for 5 seconds	T_{SLD}	260	°C

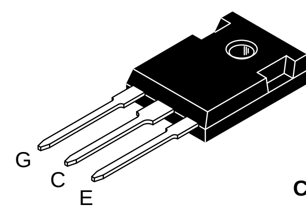
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

ON Semiconductor®

www.onsemi.com

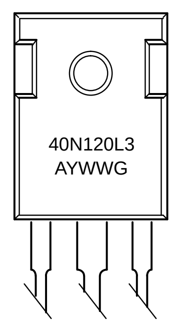
40 A, 1200 V
V_{CEsat} = 1.55 V
E_{off} = 1.5 mJ





TO−247
CASE 340AL

MARKING DIAGRAM



A	= Assembly Location
Y	= Year
WW	= Work Week
G	= Pb−Free Package

ORDERING INFORMATION

Device	Package	Shipping
NGTB40N120L3WG	TO−247 (Pb−Free)	30 Units / Rail

THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Thermal resistance junction−to−case, for IGBT	$R_{\theta JC}$	0.33	°C/W
Thermal resistance junction−to−case, for Diode	$R_{\theta JC}$	0.61	°C/W
Thermal resistance junction−to−ambient	$R_{\theta JA}$	40	°C/W

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
STATIC CHARACTERISTIC						
Collector−emitter breakdown voltage, gate−emitter short−circuited	V_{GE} = 0 V, I_C = 500 μA	$V_{(BR)CES}$	1200	−	−	V
Collector−emitter saturation voltage	V_{GE} = 15 V, I_C = 40 A V_{GE} = 15 V, I_C = 40 A, T_J = 175°C	V_{CEsat}	− −	1.55 2.0	1.8 −	V
Gate−emitter threshold voltage	V_{GE} = V_{CE}, I_C = 400 μA	$V_{GE(th)}$	4.5	5.5	6.5	V
Collector−emitter cut−off current, gate−emitter short−circuited	V_{GE} = 0 V, V_{CE} = 1200 V V_{GE} = 0 V, V_{CE} = 1200 V, T_J = 175°C	I_{CES}	− −	− 0.5	0.4	mA
Gate leakage current, collector−emitter short−circuited	V_{GE} = 20 V, V_{CE} = 0 V	I_{GES}	−	−	200	nA
Input capacitance	V_{CE} = 20 V, V_{GE} = 0 V, f = 1 MHz	C_{ies}	−	4912	−	pF
Output capacitance		C_{oes}	−	140	−	
Reverse transfer capacitance		C_{res}	−	80	−	
Gate charge total	V_{CE} = 600 V, I_C = 40 A, V_{GE} = 15 V	Q_g	−	220	−	nC
Gate to emitter charge		Q_{ge}	−	42	−	
Gate to collector charge		Q_{gc}	−	110	−	
SWITCHING CHARACTERISTIC, INDUCTIVE LOAD						
Turn−on delay time	T_J = 25°C V_{CC} = 600 V, I_C = 40 A R_g = 10 Ω V_{GE} = 15 V	$t_{d(on)}$	−	18	−	ns
Rise time		t_r	−	30	−	
Turn−off delay time		$t_{d(off)}$	−	150	−	
Fall time		t_f	−	131	−	
Turn−on switching loss		E_{on}	−	1.5	−	mJ
Turn−off switching loss		E_{off}	−	1.5	−	
Total switching loss		E_{ts}	−	3.0	−	
Turn−on delay time	T_J = 175°C V_{CC} = 600 V, I_C = 40 A R_g = 10 Ω V_{GE} = 15 V	$t_{d(on)}$	−	18	−	ns
Rise time		t_r	−	31	−	
Turn−off delay time		$t_{d(off)}$	−	156	−	
Fall time		t_f	−	220	−	
Turn−on switching loss		E_{on}	−	2.0	−	mJ
Turn−off switching loss		E_{off}	−	2.3	−	
Total switching loss		E_{ts}	−	4.3	−	
DIODE CHARACTERISTICS						
Forward voltage	V_{GE} = 0 V, I_F = 40 A V_{GE} = 0 V, I_F = 40 A T_J = 175°C	V_F	− −	3.0 2.8	3.4 −	V
Reverse recovery time	T_J = 25°C I_F = 40 A, V_R = 600 V di_F/dt = 500 A/μs	t_{rr}	−	86	−	ns
Reverse recovery charge		Q_{rr}	−	0.56	−	μc
Reverse recovery current		I_{rrm}	−	12	−	A
Diode peak rate of fall of reverse recovery current during tb		dI_{rrm}/dt	−	−210	−	A/μs

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
DIODE CHARACTERISTICS						
Reverse recovery time	T_J = 125°C I_F = 40 A, V_R = 600 V di_F/dt = 500 A/μs	t_{rr}	−	136	−	ns
Reverse recovery charge		Q_{rr}	−	1.47	−	μc
Reverse recovery current		I_{rrm}	−	20	−	A
Diode peak rate of fall of reverse recovery current during tb		dI_{rrm}/dt	−	−212	−	A/μs

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TYPICAL CHARACTERISTICS

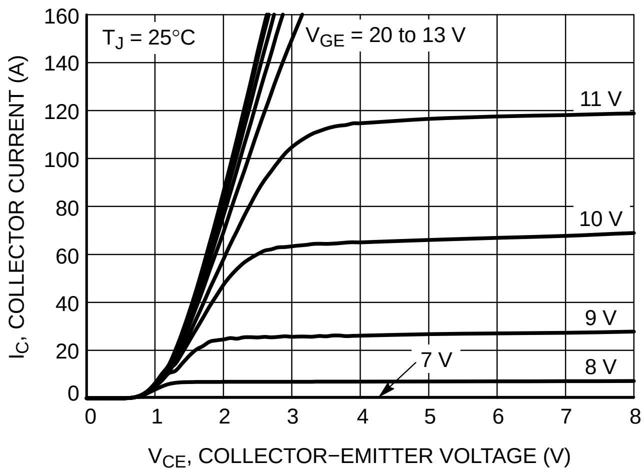


Figure 1. Output Characteristics

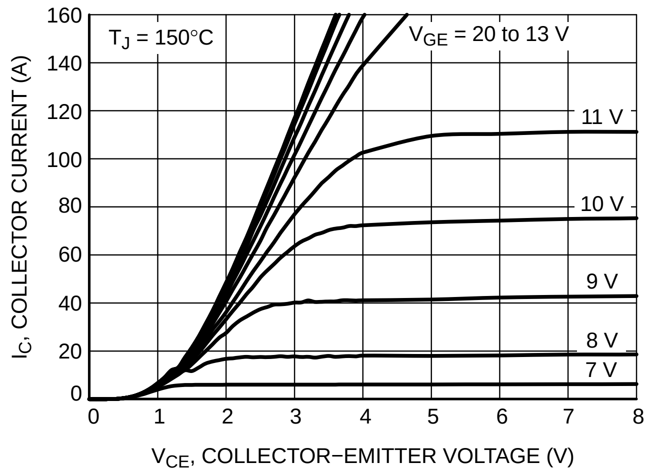


Figure 2. Output Characteristics

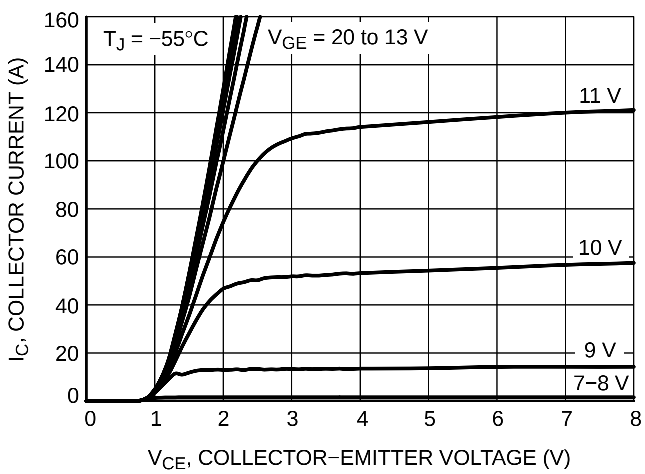


Figure 3. Output Characteristics

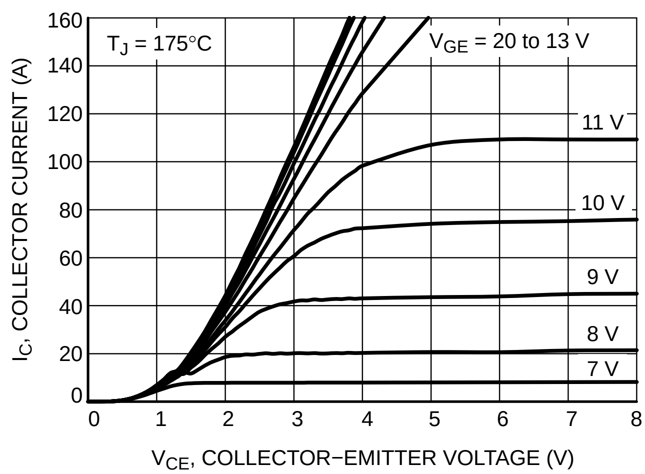


Figure 4. Output Characteristics

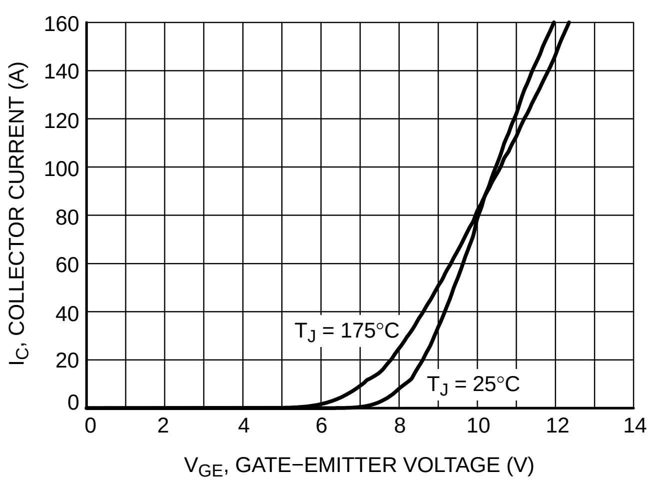


Figure 5. Typical Transfer Characteristics

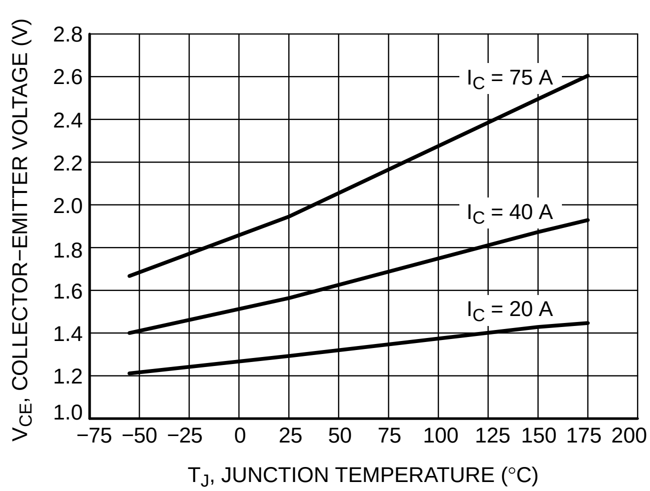


Figure 6. $V_{CE(sat)}$ vs. T_J

TYPICAL CHARACTERISTICS

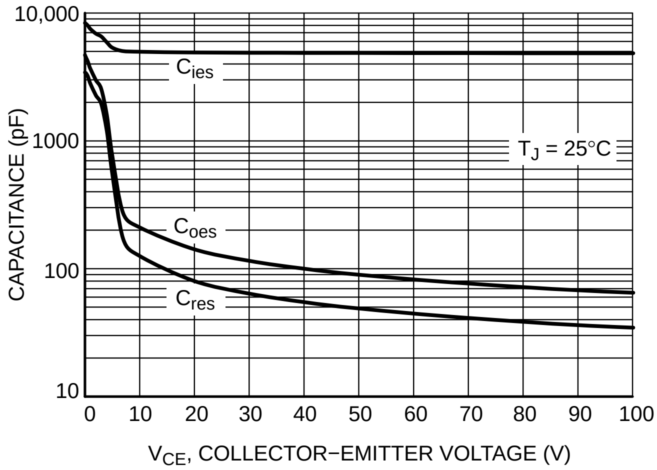


Figure 7. Typical Capacitance

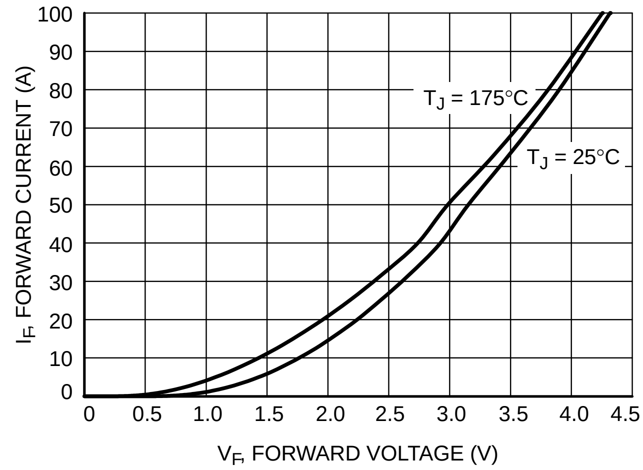


Figure 8. Diode Forward Characteristics

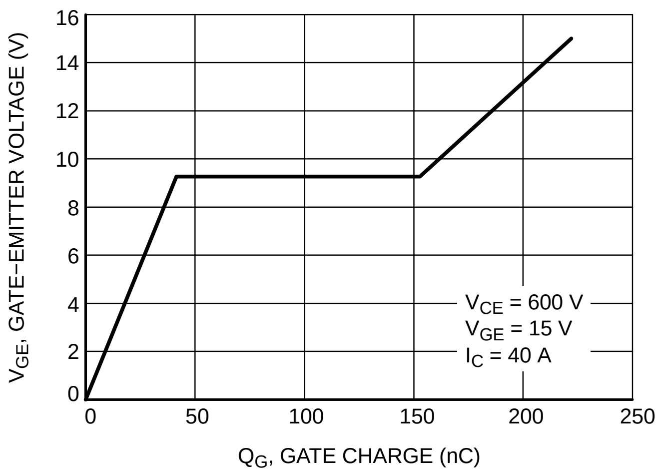


Figure 9. Typical Gate Charge

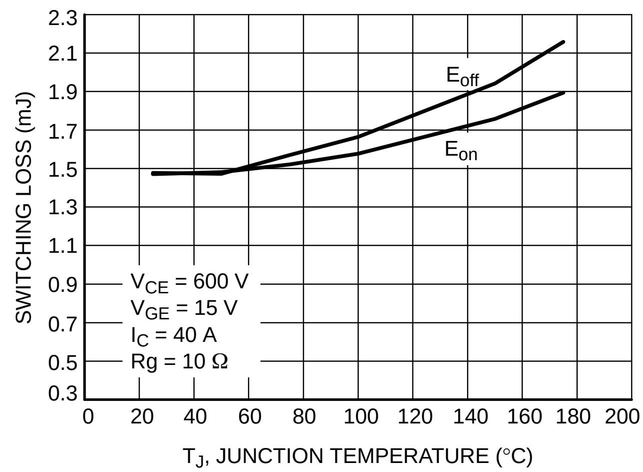


Figure 10. Switching Loss vs. Temperature

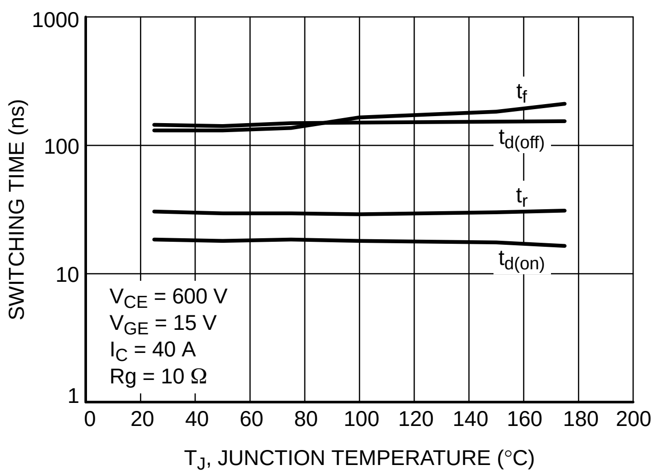


Figure 11. Switching Loss vs. Temperature

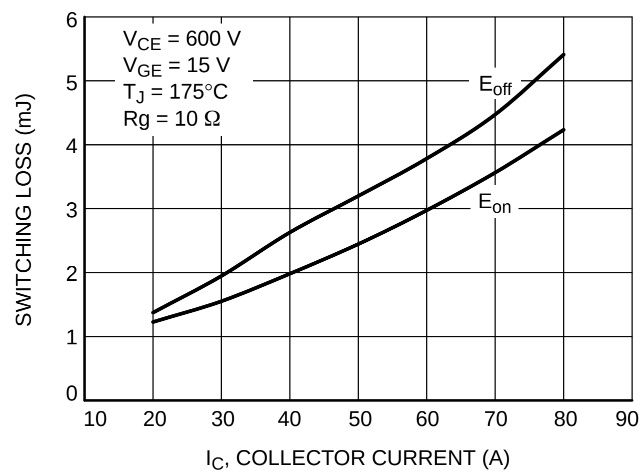


Figure 12. Switching Loss vs. I_C

TYPICAL CHARACTERISTICS

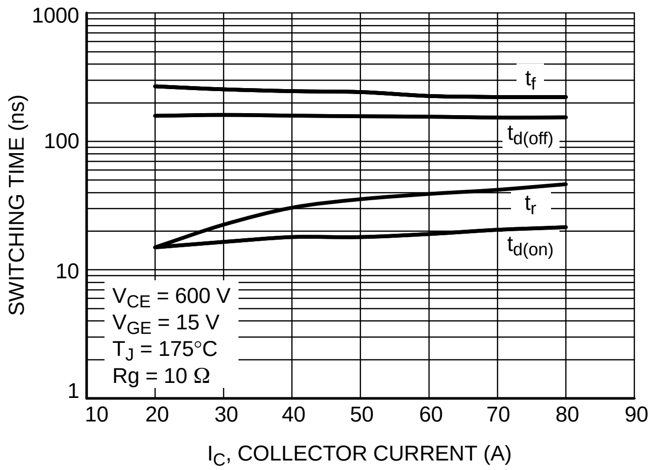


Figure 13. Switching Time vs. I_C

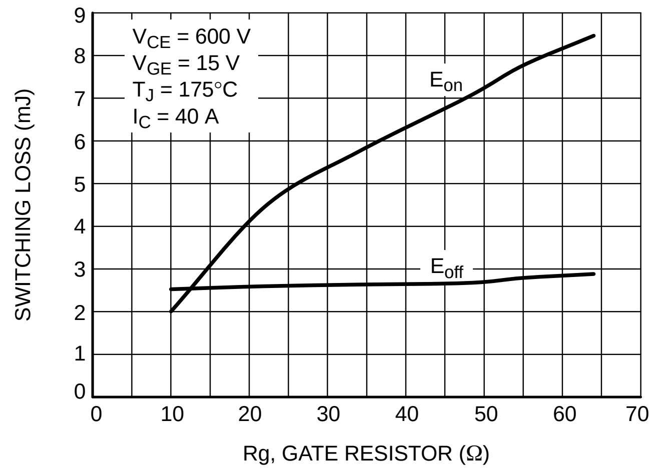


Figure 14. Switching Loss vs. R_G

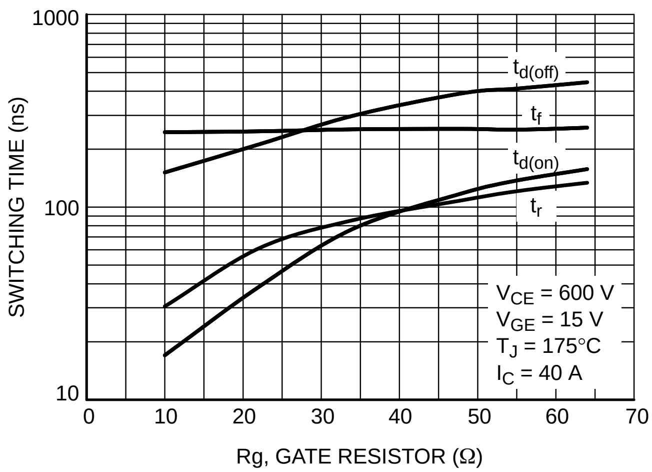


Figure 15. Switching Time vs. R_G

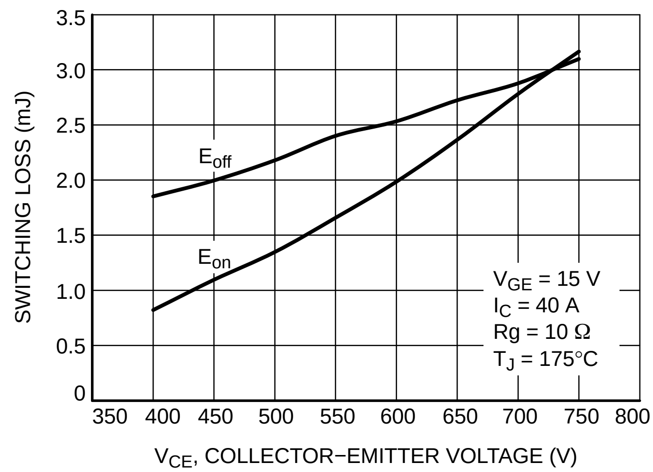


Figure 16. Switching Loss vs. V_{CE}

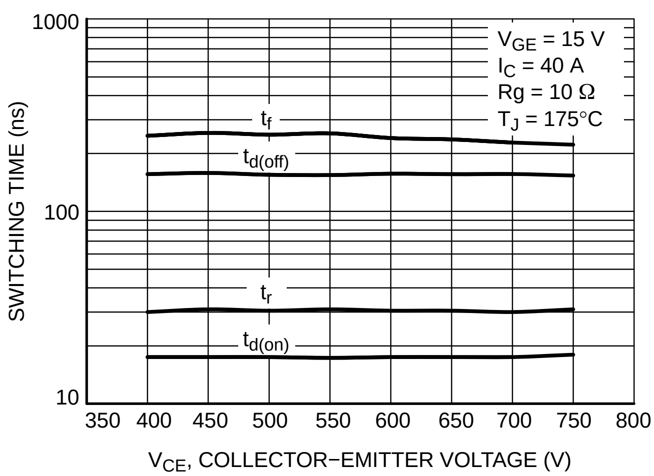


Figure 17. Switching Time vs. V_{CE}

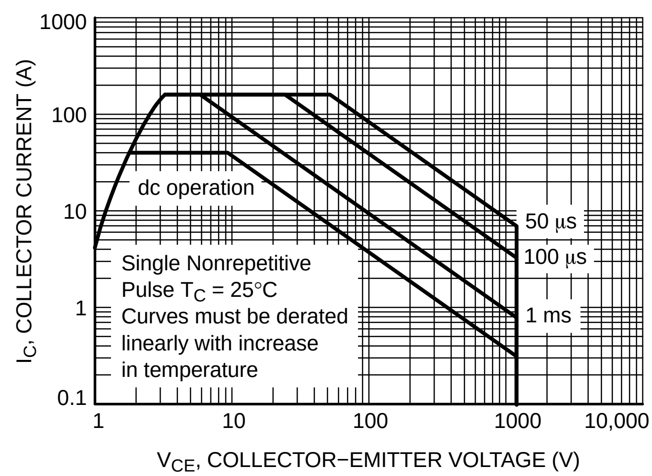


Figure 18. Safe Operating Area

TYPICAL CHARACTERISTICS

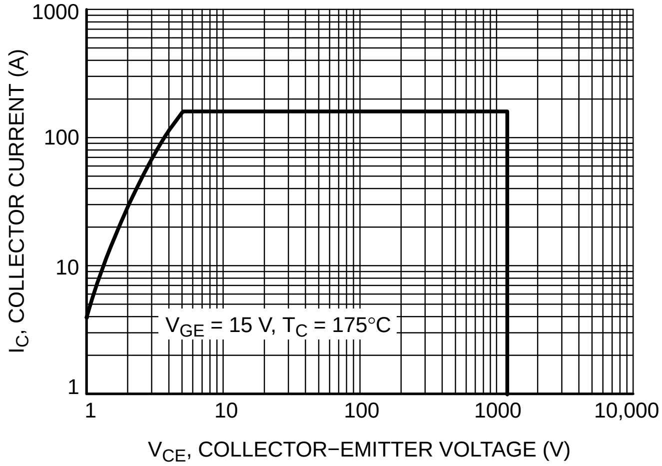


Figure 19. Reverse Bias Safe Operating Area

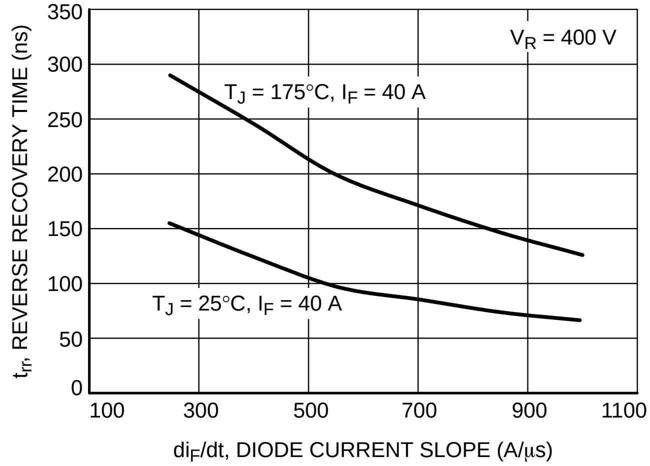


Figure 20. t_{rr} vs. di_F/dt

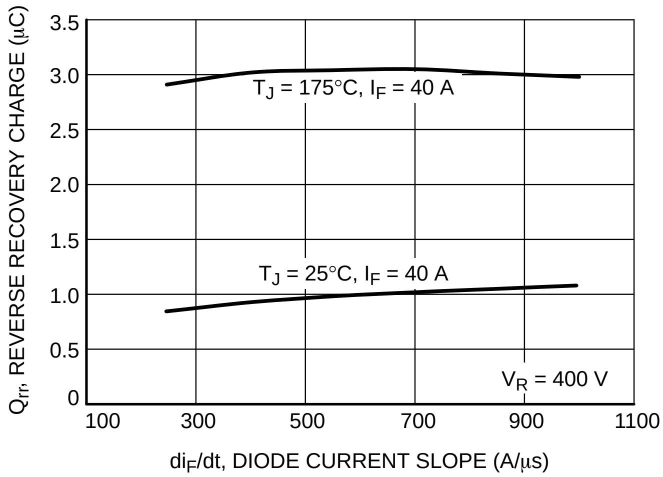


Figure 21. Q_{rr} vs. di_F/dt

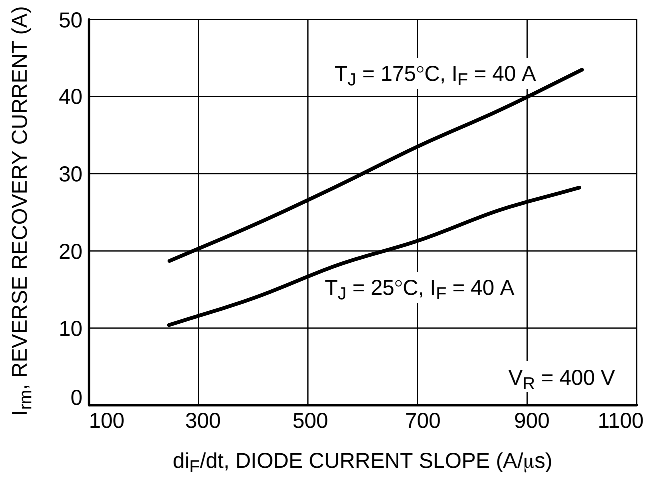


Figure 22. I_{rm} vs. di_F/dt

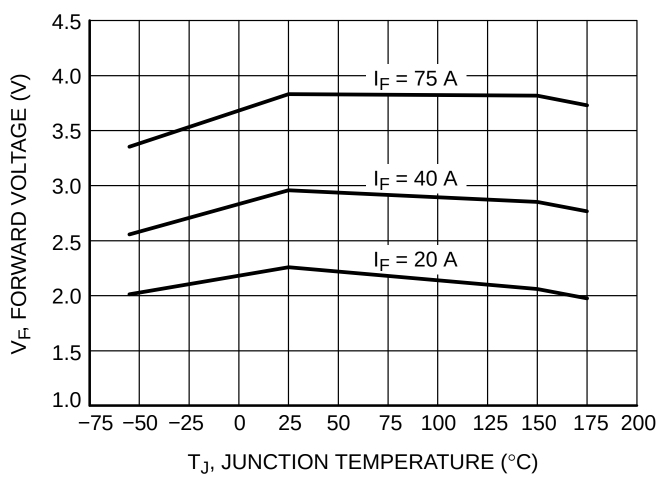


Figure 23. V_F vs. T_J

TYPICAL CHARACTERISTICS

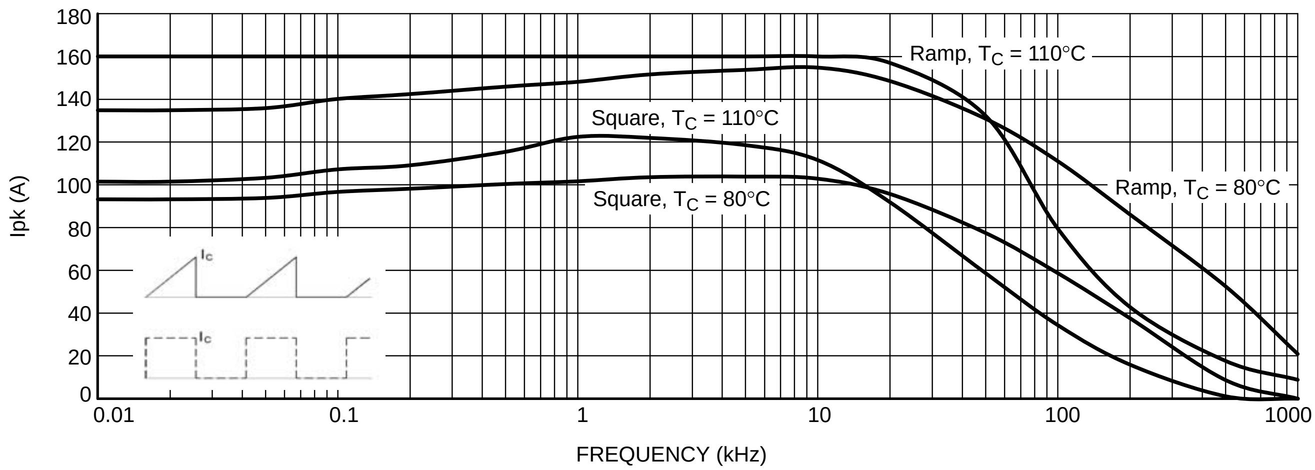
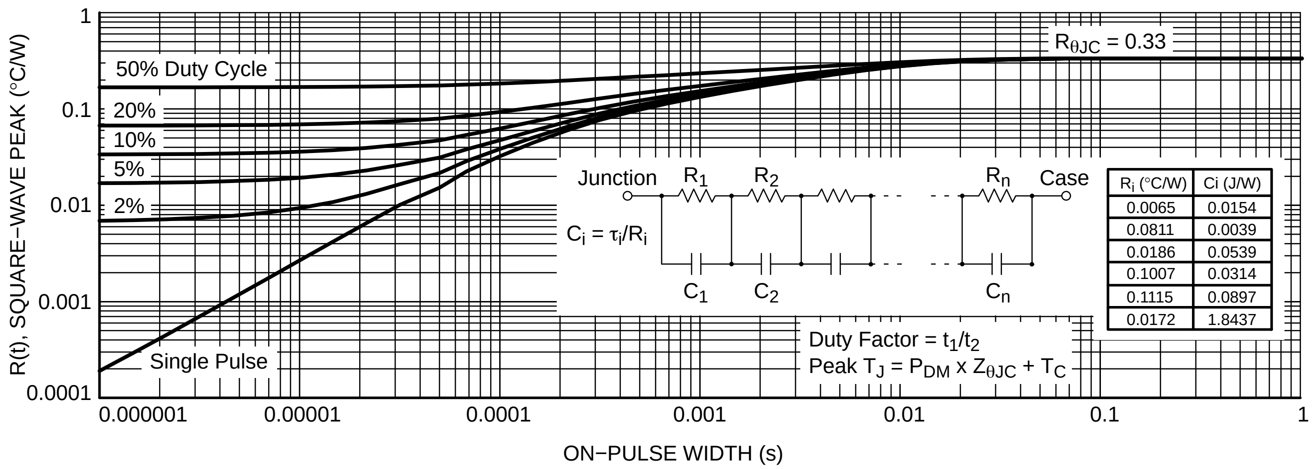
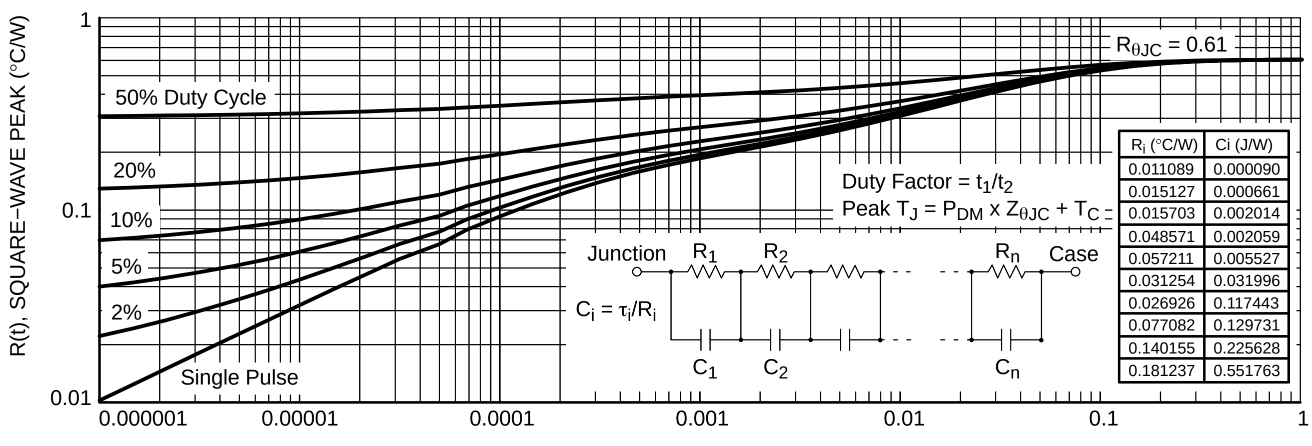


Figure 24. Collector Current vs. Switching Frequency



R_i (°C/W)	Ci (J/W)
0.0065	0.0154
0.0811	0.0039
0.0186	0.0539
0.1007	0.0314
0.1115	0.0897
0.0172	1.8437

Figure 25. IGBT Transient Thermal Impedance



R_i (°C/W)	Ci (J/W)
0.011089	0.000090
0.015127	0.000661
0.015703	0.002014
0.048571	0.002059
0.057211	0.005527
0.031254	0.031996
0.026926	0.117443
0.077082	0.129731
0.140155	0.225628
0.181237	0.551763

Figure 26. Diode Transient Thermal Impedance

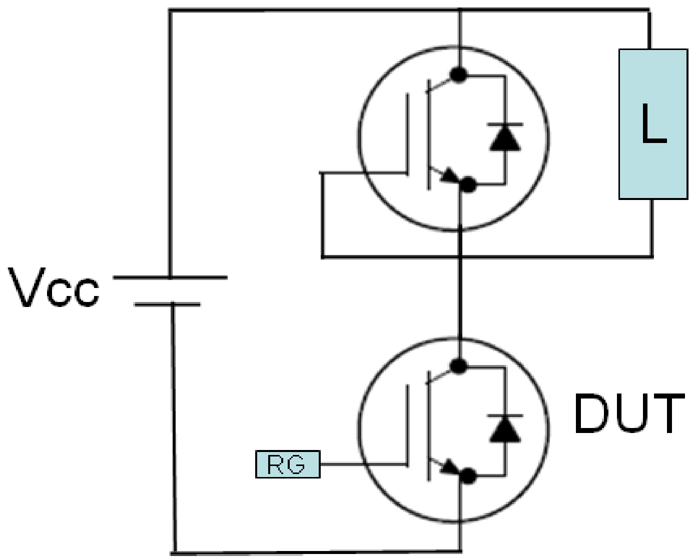


Figure 27. Test Circuit for Switching Characteristics

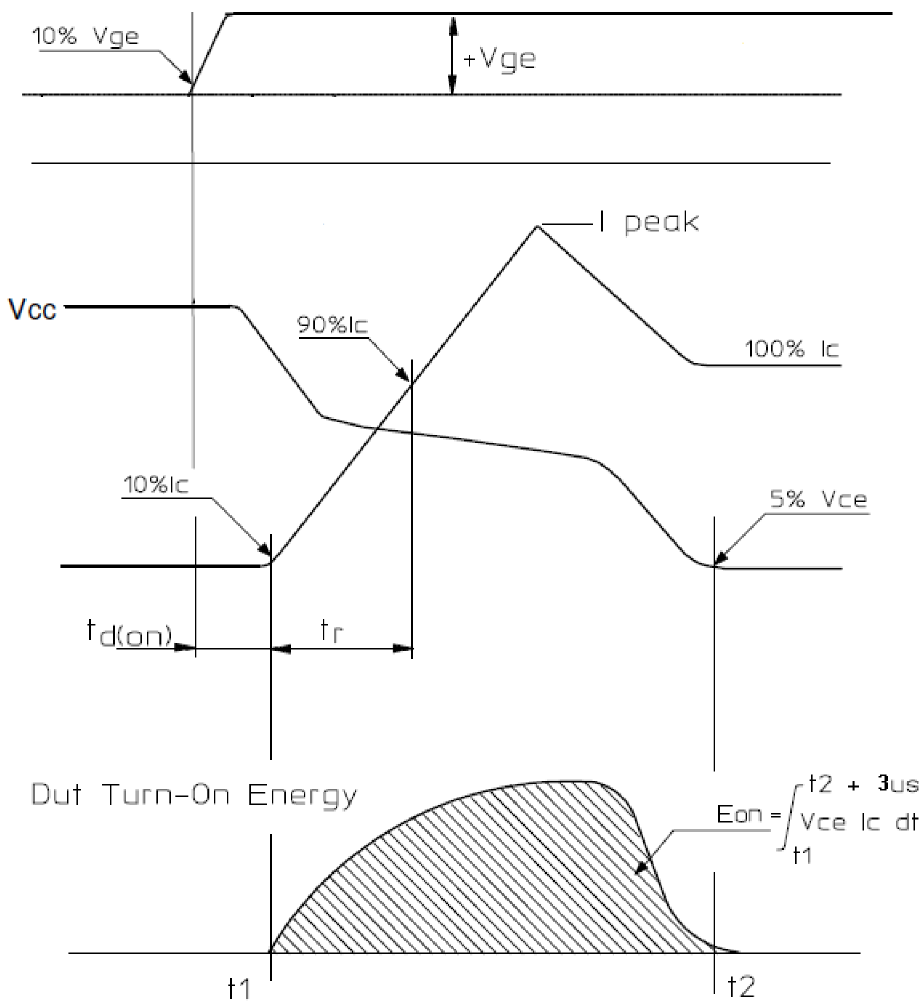


Figure 28. Definition of Turn On Waveform

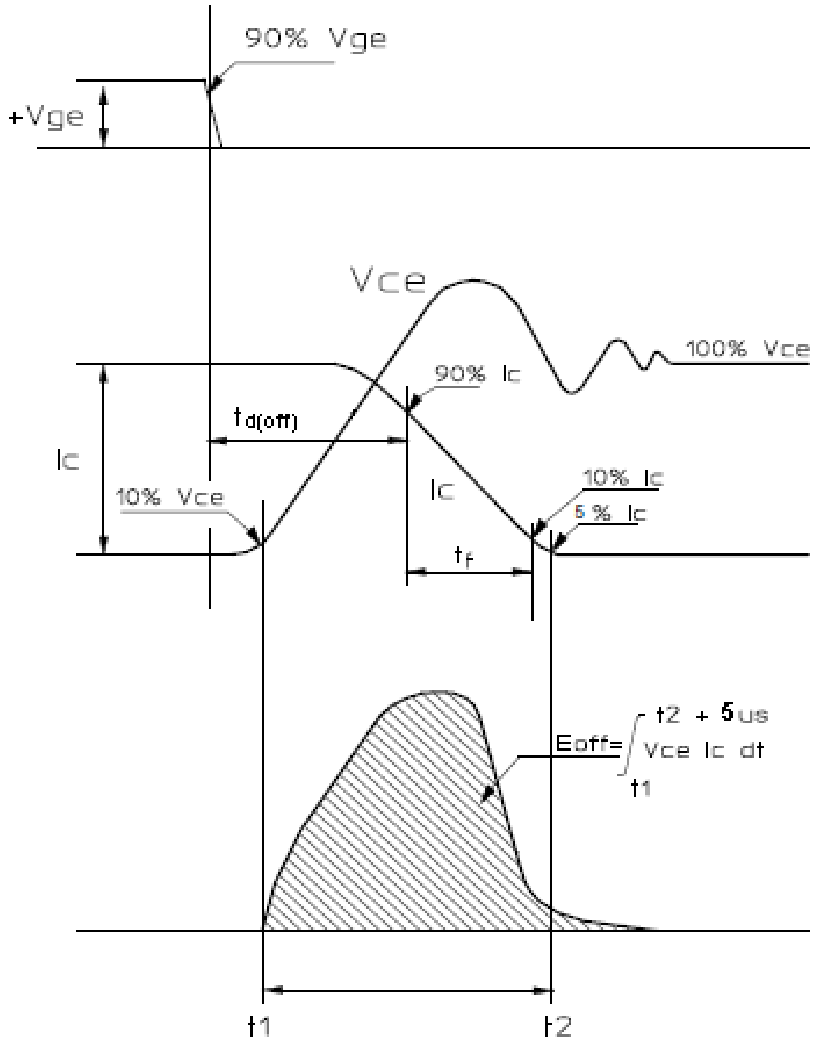
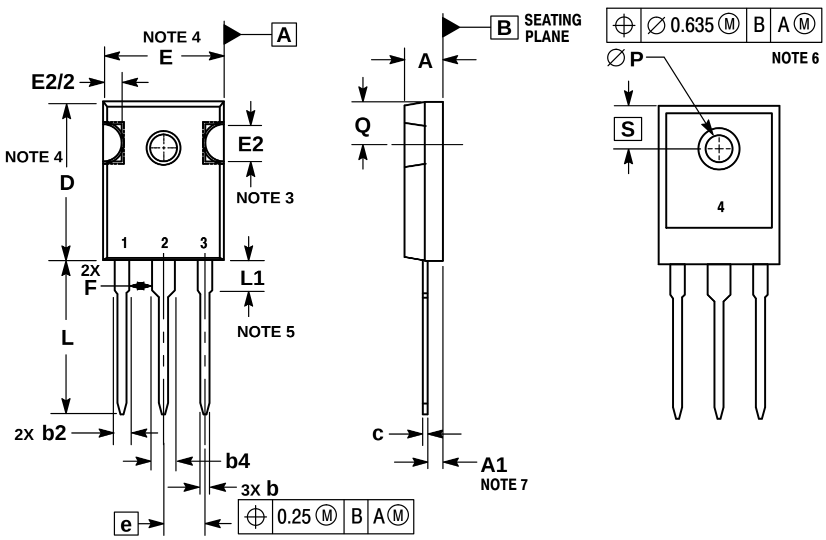


Figure 29. Definition of Turn Off Waveform

PACKAGE DIMENSIONS

TO−247
CASE 340AL
ISSUE D



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. SLOT REQUIRED, NOTCH MAY BE ROUNDED.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.13 PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREME OF THE PLASTIC BODY.
5. LEAD FINISH IS UNCONTROLLED IN THE REGION DEFINED BY L1.
6. ∅P SHALL HAVE A MAXIMUM DRAFT ANGLE OF 1.5° TO THE TOP OF THE PART WITH A MAXIMUM DIAMETER OF 3.91.
7. DIMENSION A1 TO BE MEASURED IN THE REGION DEFINED BY L1.

	MILLIMETERS	
DIM	MIN	MAX
A	4.70	5.30
A1	2.20	2.60
b	1.07	1.33
b2	1.65	2.35
b4	2.60	3.40
c	0.45	0.68
D	20.80	21.34
E	15.50	16.25
E2	4.32	5.49
e	5.45 BSC	
F	2.655	---
L	19.80	20.80
L1	3.81	4.32
P	3.55	3.65
Q	5.40	6.20
S	6.15 BSC	

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative

Общество с ограниченной ответственностью «МосЧип» ИНН 7719860671 / КПП 771901001
Адрес: 105318, г.Москва, ул.Щербаковская д.3, офис 1107

Данный компонент на территории Российской Федерации

Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

http://moschip.ru/get-element

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:
moschip.ru
moschip.ru_4
moschip.ru_6
moschip.ru_9