onsemi

Three Level ANPC Q2Pack Module

NXH800A100L4Q2F2S1G/P1G, NXH800A100L4Q2F2S2G/P2G

This high-density, integrated power module combines high-performance IGBTs with rugged anti-parallel diodes.

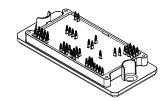
Features

- Extremely Efficient Trench with Field Stop Technology
- Low Switching Loss Reduces System Power Dissipation
- Module Design Offers High Power Density
- Low Inductive Layout
- Low Package Height
- This is a Pb–Free Device

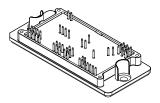
Typical Applications

- Solar Inverters
- Uninterruptable Power Supplies Systems

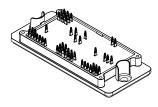
PACKAGE PICTURE



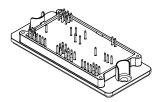
Q2PACK POSITIVE PRESS FIT PINS CASE 180HG



Q2PACK POSITIVE SOLDER PINS CASE 180HH



Q2PACK NEGATIVE PRESS FIT PINS CASE 180CQ



Q2PACK NEGATIVE SOLDER PINS CASE 180BM

MARKING DIAGRAMS

See detailed marking diagrams on page 2 of this data sheet.

PIN CONNECTIONS

See detailed pin connections on page 2 of this data sheet.

ORDERING INFORMATION

See detailed ordering and shipping information on page 8 of this data sheet.

SCHEMATICS

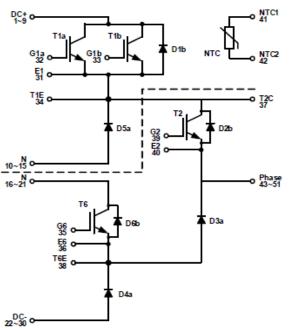


Figure 1. NXH800A100L4Q2F2X1G Schematic Diagram

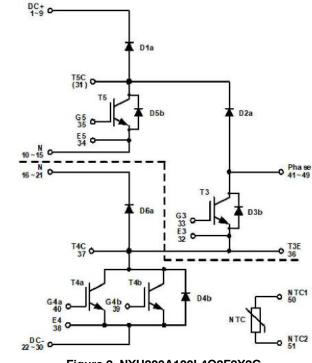


Figure 2. NXH800A100L4Q2F2X2G Schematic Diagram



	NXH800A100L4Q2F2X1G ATYYWW	
u		

NXH800A100L4Q2F2 X

G

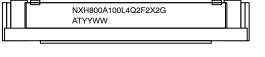
AT

YYWW

= Specific Device Code = P or S

= Pb-Free Package

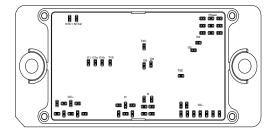
- = Assembly & Test Site Code
- = Year and Work Week Code
- Figure 3. NXH800A100L4Q2F2X1G Marking Diagram

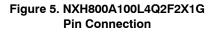


NXH800A100L4Q2F2 = X = G = AT = YYWW =

- = Specific Device Code
- = P or S
- = Pb-Free Package
- = Assembly & Test Site Code
- = Year and Work Week Code

Figure 4. NXH800A100L4Q2F2X2G Marking Diagram





PIN CONNECTIONS

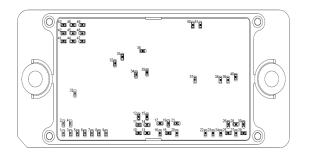


Figure 6. NXH800A100L4Q2F2X2G Pin Connection

:

Rating	Symbol	Value	Unit
OUTER IGBT (T1a, T1b, T4a, T4b)			
Collector-Emitter Voltage	V _{CES}	1000	V
Gate-Emitter Voltage Positive Transient Gate-Emitter Voltage (T _{pulse} = 5 μs, D < 0.10)	V _{GE}	±20 30	V
Continuous Collector Current @ T _C = 80°C	Ι _C	309	А
Pulsed Peak Collector Current @ $T_C = 80^{\circ}C (T_J = 175^{\circ}C)$	I _{C(Pulse)}	927	А
Maximum Power Dissipation (T _J = 175°C)	P _{tot}	714	W
Minimum Operating Junction Temperature	T _{JMIN}	-40	°C
Maximum Operating Junction Temperature (Note 1)	T _{JMAX}	175	°C
INNER IGBT (T2, T3)	• • • • •		
Collector-Emitter Voltage	V _{CES}	1000	V
Gate-Emitter Voltage Positive Transient Gate-Emitter Voltage (T _{pulse} = 5 μs, D < 0.10)	V _{GE}	±20 30	V
Continuous Collector Current @ T _C = 80°C	Ι _C	413	A
Pulsed Peak Collector Current @ $T_C = 80^{\circ}C (T_J = 175^{\circ}C)$	I _{C(Pulse)}	1239	А
Maximum Power Dissipation (T _J = 175°C)	P _{tot}	990	W
Minimum Operating Junction Temperature	T _{JMIN}	-40	°C
Maximum Operating Junction Temperature (Note 1)	T _{JMAX}	175	°C
NEUTRAL POINT IGBT (T5, T6)	I		
Collector-Emitter Voltage	V _{CES}	1000	V
Gate-Emitter Voltage Positive Transient Gate-Emitter Voltage (T _{pulse} = 5 μs, D < 0.10)	V _{GE}	±20 30	V
Continuous Collector Current @ $T_C = 80^{\circ}C$	Ι _C	224	A
Pulsed Peak Collector Current @ $T_C = 80^{\circ}C (T_J = 175^{\circ}C)$	I _{C(Pulse)}	672	A
Maximum Power Dissipation ($T_J = 175^{\circ}C$)	P _{tot}	543	W
Minimum Operating Junction Temperature	T _{JMIN}	-40	°C
Maximum Operating Junction Temperature (Note 1)	T _{JMAX}	175	°C
IGBT INVERSE DIODE (D1b, D2b, D3b, D4b, D5b, D6b)			
Peak Repetitive Reverse Voltage	V _{RRM}	1000	V
Continuous Forward Current @ $T_C = 80^{\circ}C$	١ _F	61	А
Repetitive Peak Forward Current (T _J = 175°C)	I _{FRM}	183	А
Maximum Power Dissipation (T _J = 175°C)	P _{tot}	151	W
Minimum Operating Junction Temperature	T _{JMIN}	-40	°C
Maximum Operating Junction Temperature	T _{JMAX}	175	°C
DIODES (D1a, D2a, D3a, D4a)			
Peak Repetitive Reverse Voltage	V _{RRM}	1000	V
Continuous Forward Current @ T _C = 80°C	۱ _F	177	А
Repetitive Peak Forward Current (T _J = 175°C)	I _{FRM}	531	А
Maximum Power Dissipation ($T_J = 175^{\circ}C$)	P _{tot}	446	W
Minimum Operating Junction Temperature	T _{JMIN}	-40	°C
Maximum Operating Junction Temperature	T _{JMAX}	175	°C

Table 1. ABSOLUTE MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Table 1. ABSOLUTE MAXIMUM RATINGS (T_J = 25° C unless otherwise noted) (continued)

Rating	Symbol	Value	Unit	
NEUTRAL POINT DIODES (D5a, D6a)				
Peak Repetitive Reverse Voltage	V _{RRM}	1000	V	
Continuous Forward Current @ T _C = 80°C	١ _F	238	А	
Repetitive Peak Forward Current ($T_J = 175^{\circ}C$)	I _{FRM}	714	А	
Maximum Power Dissipation ($T_J = 175^{\circ}C$)	P _{tot}	565	W	
Minimum Operating Junction Temperature	T _{JMIN}	-40	°C	
Maximum Operating Junction Temperature	T _{JMAX}	175	°C	

Table 2. THERMAL AND INSULATION PROPERTIES (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
THERMAL PROPERTIES			
Operating Temperature under Switching Condition	T _{VJOP}	-40 to +150	°C
Storage Temperature Range	T _{stg}	-40 to +125	°C
INSULATION PROPERTIES			
Isolation Test Voltage, t = 1 s, 50 Hz	V _{is}	4000	V _{RMS}
Creepage Distance		12.7	mm
Comparative Tracking Index	CTI	> 600	

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. 1. Refer to ELECTRICAL CHARACTERISTICS, RECOMMENDED OPERATING RANGES and/or APPLICATION INFORMATION for Safe

Operating parameters.

Characteristic	Test Conditions	Symbol	Min	Тур	Max	Unit
IGBT (T1a, T1b, T4a, T4b) CHARAG	CTERISTICS					
Collector-Emitter Cutoff Current	V _{GE} = 0 V, V _{CE} = 1000 V	I _{CES}	_	-	20	μA
Collector-Emitter Saturation Voltage	V_{GE} = 15 V, I _C = 400 A, T _J = 25°C	V _{CE(sat)}	_	1.69	2.3	V
	V_{GE} = 15 V, I _C = 400 A, T _J = 175°C		-	1.95	—	1
Gate-Emitter Threshold Voltage	$V_{GE} = V_{CE}$, $I_C = 400 \text{ mA}$	V _{GE(TH)}	3.4	4.92	6.7	V
Gate Leakage Current	$V_{GE} = \pm 20 \text{ V}, V_{CE} = 0 \text{ V}$	I _{GES}	_	-	±2	μΑ
Turn-on Delay Time	$T_J = 25^{\circ}C$	t _{d(on)}	_	189.93	_	ns
Rise Time	V _{CE} = 600 V, I _C = 200 A V _{GE} = –9 V, 15 V	t _r	-	52.06	—	1
Turn-off Delay Time	$R_{Goff} = 23 \Omega$, $R_{Gon} = 15 \Omega$	t _{d(off)}	_	970.3	_	1
Fall Time	(T1a, T1b tested together)	t _f	-	22.56	_	1
Turn-on Switching Loss per Pulse		E _{on}	_	7.71	_	mJ
Turn-off Switching Loss per Pulse		E _{off}	_	8.12	—	1
Turn-on Delay Time	T _J = 125°C	t _{d(on)}	_	164.22	—	ns
Rise Time	V _{CE} = 600 V, I _C = 200 A V _{GE} = –9 V, 15 V	t _r	_	59.58	—	
Turn-off Delay Time	$R_{Goff} = 23 \Omega$, $R_{Gon} = 15 \Omega$ (T1a, T1b tested together)	t _{d(off)}	_	1088.34	_	1
Fall Time		t _f	_	33.6	_	1
Turn-on Switching Loss per Pulse		E _{on}	_	11.57	_	mJ
Turn-off Switching Loss per Pulse		E _{off}	_	10.77	—	1
Input Capacitance	V _{CE} = 20 V, V _{GE} = 0 V, f = 100 kHz	Cies	_	49700	_	pF
Output Capacitance	(T1a, T1b tested together)	C _{oes}	_	1530	_	1
Reverse Transfer Capacitance		C _{res}	_	308	—	1
Total Gate Charge	V _{CE} = 600 V, I _C = 300 A, V _{GE} = -15 V~15 V (T1a, T1b tested together)	Qg	_	3040	_	nC
Thermal Resistance – Chip-to-Heatsink	Thermal grease, Thickness = 2.1 Mil ±2%	R _{thJH}	_	0.225	-	K/W
Thermal Resistance – Chip-to-Case	λ = 2.9 W/mK	R _{thJC}	_	0.133	_	K/W
IGBT INVERSE DIODE (D1b, D2b, I	D3b, D4b, D5b, D6b) CHARACTERIST	ICS				
Diode Forward Voltage	I _F = 100 A, T _J = 25°C	V _F	_	2.73	3.7	V
	I _F = 100 A, T _J = 175°C	1	_	2.39	_	1
		-				

 $\mathsf{R}_{\mathsf{thJH}}$

R_{thJC}

K/W

K/W

_

_

0.770

0.63

_

_

Thermal grease, Thickness = 2.1 Mil $\pm 2\%$

 $\lambda = 2.9 \text{ W/mK}$

Thermal Resistance -

Thermal Resistance - Chip-to-Case

Chip-to-Heatsink

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

$\mathsf{NXH800A100L4Q2F2S1G/P1G}, \, \mathsf{NXH800A100L4Q2F2S2G/P2G}$

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

Characteristic	Test Conditions	Symbol	Min	Тур	Max	Unit
IGBT (T2, T3) CHARACTERISTICS	i					
Collector-Emitter Cutoff Current	V _{GE} = 0 V, V _{CE} = 1000 V	I _{CES}	—	-	20	μΑ
Collector-Emitter Saturation Voltage	V_{GE} = 15 V, I _C = 600 A, T _J = 25°C	V _{CE(sat)}	_	1.75	2.3	V
	V_{GE} = 15 V, I _C = 600 A, T _J = 175°C		_	2.15	-	
Gate-Emitter Threshold Voltage	$V_{GE} = V_{CE}$, $I_C = 600 \text{ mA}$	V _{GE(TH)}	3.4	4.83	6.7	V
Gate Leakage Current	V_{GE} = ±20 V, V_{CE} = 0 V	I _{GES}	_	-	±2	μΑ
Turn-on Delay Time	$T_J = 25^{\circ}C$	t _{d(on)}	_	233.73	_	ns
Rise Time	V _{CE} = 600 V, I _C = 200 A V _{GE} = -9 V, 15 V	t _r	_	68	-	
Turn-off Delay Time	$R_{Gon} = 11 \Omega, R_{Goff} = 23 \Omega$	t _{d(off)}	_	1364.18	_	
Fall Time		t _f	_	79.12	-	
Turn-on Switching Loss per Pulse		E _{on}	_	7.83	-	mJ
Turn-off Switching Loss per Pulse		E _{off}	_	16.73	-	
Turn-on Delay Time	T _J = 125°C	t _{d(on)}	_	213.78	-	ns
Rise Time	V _{CE} = 600 V, I _C = 200 A V _{GE} = –9 V, 15 V	t _r	_	75.99	_	
Turn-off Delay Time	$R_{Gon} = 11 \Omega, R_{Goff} = 23 \Omega$	t _{d(off)}	_	1514.94	-	
Fall Time		t _f	_	47.53	-	
Turn-on Switching Loss per Pulse		Eon	_	10.87	-	mJ
Turn-off Switching Loss per Pulse	-	E _{off}		17.39	-	
Input Capacitance	V _{CE} = 20 V, V _{GE} = 0 V, f = 100 kHz	C _{ies}	_	38100	_	pF
Output Capacitance	-	C _{oes}	_	1230	_	
Reverse Transfer Capacitance		C _{res}	_	226	-	
Total Gate Charge	V _{CE} = 600 V, I _C = 300 A, V _{GE} = 15 V	Qg	_	2230	-	nC
Thermal Resistance – Chip-to-Heatsink	Thermal grease, Thickness = 2.1 Mil ±2%	R _{thJH}	_	0.168	_	K/W
Thermal Resistance - Chip-to-Case	λ = 2.9 W/mK	R _{thJC}	_	0.096	-	K/W
DIODES (D1a, D2a, D3a, D4a) CHA	RACTERISTICS					-
Diode Forward Voltage	I _F = 300 A, T _J = 25°C	V _F	_	2.76	3.7	V
	I _F = 300 A, T _J = 175°C		_	2.43	-	
Reverse Recovery Time	$T_{\rm J} = 25^{\circ}C$	t _{rr}	_	105.26	_	ns
Reverse Recovery Charge	$V_{CE} = 600 \text{ V}, \text{ I}_{C} = 200 \text{ A}$ $V_{GE} = -9 \text{ V}, 15 \text{ V}, \text{ R}_{G} = 11 \Omega$	Q _{rr}	_	4.344	_	μC
Peak Reverse Recovery Current		I _{RRM}	_	106.04	-	А
Peak Rate of Fall of Recovery Current		di/dt	_	3.242	—	A/ns
Reverse Recovery Energy]	E _{rr}	I	1.304	_	mJ
Reverse Recovery Time	$T_{\rm J} = 125^{\circ}{\rm C}$	t _{rr}		176.9	—	ns
Reverse Recovery Charge	V _{CE} = 600 V, I _C = 200 A V _{GE} = -9 V, 15 V, R _G = 11 Ω	Q _{rr}	_	12.771	-	μC
Peak Reverse Recovery Current		I _{RRM}		154.24	—	А
Peak Rate of Fall of Recovery Current		di/dt		2.795	_	A/ns
Reverse Recovery Energy		E _{rr}	_	4.318	—	mJ
Thermal Resistance – Chip-to-Heatsink	Thermal grease, Thickness = 2.1 Mil ±2%	R _{thJH}	_	0.315	-	K/W
Thermal Resistance - Chip-to-Case	λ = 2.9 W/mK	R _{thJC}	_	0.213	_	K/W

$\mathsf{NXH800A100L4Q2F2S1G/P1G}, \, \mathsf{NXH800A100L4Q2F2S2G/P2G}$

ELECTRICAL CHARACTERISTICS (T_J = $25^{\circ}C$ unless otherwise specified) (continued)

Characteristic	Test Conditions	Symbol	Min	Тур	Max	Unit
IGBT (T5, T6) CHARACTERISTICS						
Collector-Emitter Cutoff Current	V _{GE} = 0 V, V _{CE} = 1000 V	I _{CES}	_	-	20	μΑ
Collector-Emitter Saturation Voltage	V_{GE} = 15 V, I _C = 300 A, T _J = 25°C	V _{CE(sat)}	-	1.70	2.3	V
	V_{GE} = 15 V, I _C = 300 A, T _J = 175°C		-	2.05	-	1
Gate-Emitter Threshold Voltage	$V_{GE} = V_{CE}$, $I_C = 300 \text{ mA}$	V _{GE(TH)}	4.1	5.03	6.0	V
Gate Leakage Current	V_{GE} = ±20 V, V_{CE} = 0 V	I _{GES}	-	-	±2	μΑ
Turn-on Delay Time	$T_J = 25^{\circ}C$	t _{d(on)}	-	120.19	-	ns
Rise Time	V _{CE} = 600 V, I _C = 200 A V _{GE} = -9 V, 15 V,	t _r	_	50.18	_	
Turn-off Delay Time	$R_{Gon} = 11 \Omega, R_{Goff} = 23 \Omega$	t _{d(off)}	_	682.65	_	
Fall Time		t _f	_	39.56	_	1
Turn-on Switching Loss per Pulse		E _{on}	_	8.58	_	mJ
Turn-off Switching Loss per Pulse		E _{off}	_	7.82		-
Turn-on Delay Time	T, = 125°C	t _{d(on)}				ns
Rise Time	$V_{CE} = 600 \text{ V}, \text{ I}_{C} = 200 \text{ A}$			112.48		
	V _{GE} = –9 V, 15 V, R _{Gon} = 11 Ω, R _{Goff} = 23 Ω	t _r		57.46		
Turn-off Delay Time		t _{d(off)}	_	747.87	_	
Fall Time		t _f	-	23.765	-	
Turn-on Switching Loss per Pulse		Eon	—	13.77	-	mJ
Turn-off Switching Loss per Pulse		E _{off}	-	10.41	-	
Input Capacitance	V _{CE} = 20 V, V _{GE} = 0 V, f = 100 kHz	C _{ies}	-	17400	-	pF
Output Capacitance		C _{oes}	-	654		
Reverse Transfer Capacitance		C _{res}	_	101	-	
Total Gate Charge	V_{CE} = 600 V, I_C = 300 A, V_{GE} = 15 V	Qg	_	1004	I	nC
Thermal Resistance – Chip-to-Heatsink	Thermal grease, Thickness = 2.1 Mil ±2%	R _{thJH}	-	0.264	-	K/W
Thermal Resistance – Chip-to-Case	λ = 2.9 W/mK	R _{thJC}	-	0.175	-	K/W
DIODES (D5a, D6a) CHARACTERIS	TICS					
Diode Forward Voltage	$I_F = 400 \text{ A}, \text{ T}_J = 25^{\circ}\text{C}$	V _F	-	2.83	3.7	V
	$I_F = 400 \text{ A}, \text{ T}_J = 175^{\circ}\text{C}$		_	2.42	-	
Reverse Recovery Time	$T_J = 25^{\circ}C$	t _{rr}	-	92.74	-	ns
Reverse Recovery Charge	V _{CE} = 600 V, I _C = 200 A V _{GE} = –9 V, 15 V, R _G = 15 Ω	Q _{rr}	-	5.66		μC
Peak Reverse Recovery Current		I _{RRM}	-	136.18	-	A
Peak Rate of Fall of Recovery Current		di/dt	_	3.14	_	A/ns
Reverse Recovery Energy		E _{rr}	_	2.03		mJ
Reverse Recovery Time	$T_{\rm J} = 125^{\circ}C$	t _{rr}	—	159.63	-	ns
Reverse Recovery Charge	V _{CE} = 600 V, I _C = 200 A V _{GE} = –9 V, 15 V, R _G = 15 Ω	Q _{rr}	_	17.00	_	μC
Peak Reverse Recovery Current		I _{RRM}	_	223.97	-	А
Peak Rate of Fall of Recovery Current		di/dt	—	2.71	_	A/ns
Reverse Recovery Energy		E _{rr}	-	6.80	-	mJ
Thermal Resistance – Chip-to-Heatsink	Thermal grease, Thickness = 2.1 Mil ±2%	R _{thJH}	_	0.244	_	K/W
Thermal Resistance – Chip-to-Case	λ = 2.9 W/mK	R _{thJC}	_	0.168	_	K/W

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

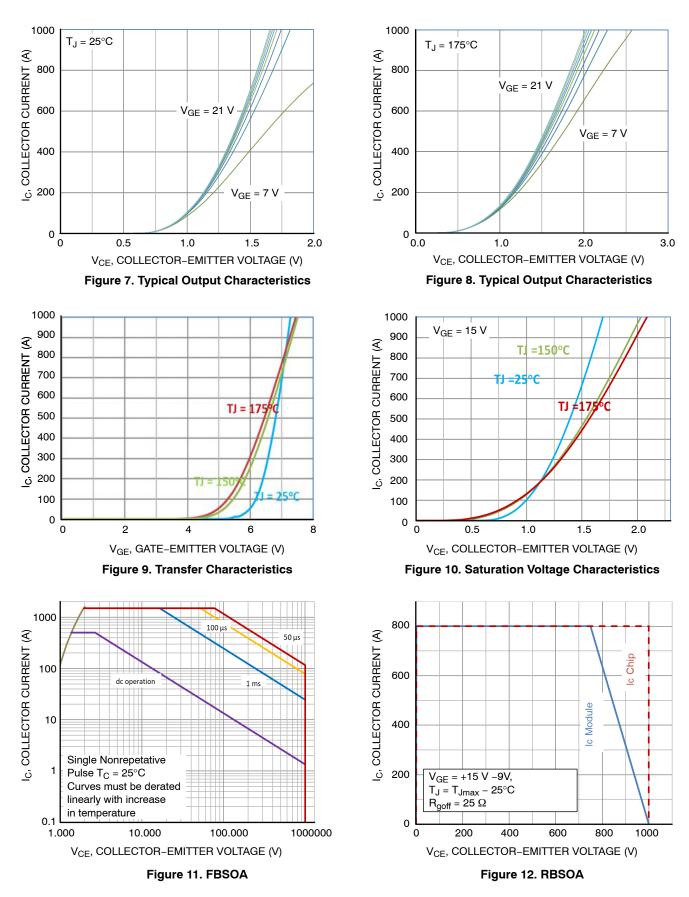
Characteristic	Test Conditions	Symbol	Min	Тур	Max	Unit
THERMISTOR CHARACTERISTICS						
Nominal Resistance	T = 25°C	R ₂₅	_	22	_	kΩ
Nominal Resistance	T = 100°C	R ₁₀₀	-	1504	-	Ω
Deviation of R25		$\Delta R/R$	-1	—	1	%
Power Dissipation		PD		187.5	1	mW
Power Dissipation Constant			_	1.5	_	mW/K
B-value	B(25/100), tolerance $\pm 3\%$		-	3980	-	К

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.

ORDERING INFORMATION

Part Number	Marking	Package	Shipping
NXH800A100L4Q2F2S1G	NXH800A100L4Q2F2S1G	Q2PACK – Case 180HH (Pb-Free/Halide-Free)	12 Units / Blister Tray
NXH800A100L4Q2F2P1G	NXH800A100L4Q2F2P1G	Q2PACK – Case 180HG (Pb-Free/Halide-Free)	12 Units / Blister Tray
NXH800A100L4Q2F2S2G	NXH800A100L4Q2F2S2G	Q2PACK – Case 180BM (Pb-Free/Halide-Free)	12 Units / Blister Tray
NXH800A100L4Q2F2P2G	NXH800A100L4Q2F2P2G	Q2PACK – Case 180CQ (Pb-Free/Halide-Free)	12 Units / Blister Tray

TYPICAL CHARACTERISTICS - IGBT T1/T4 AND D5A/D6A DIODE



TYPICAL CHARACTERISTICS - IGBT T1/T4 AND D5A/D6A DIODE (CONTINUED)

Ciss

Coss

C_{rss}

100

10

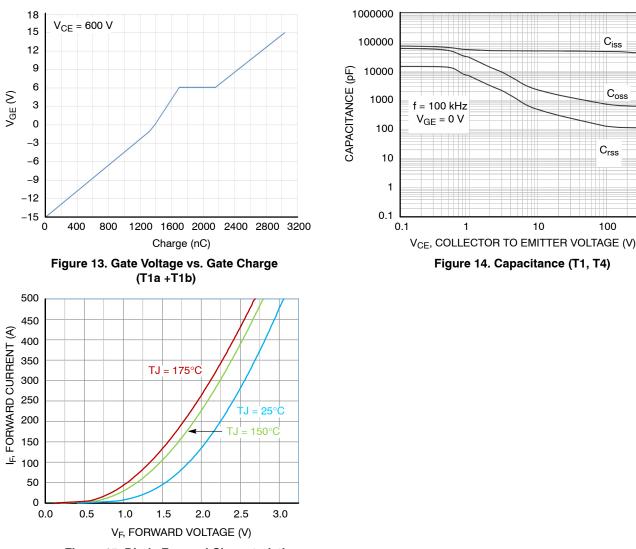
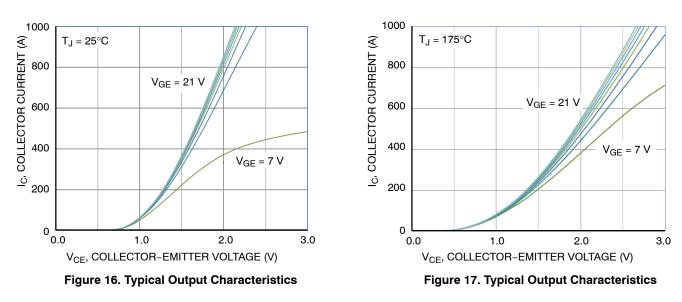
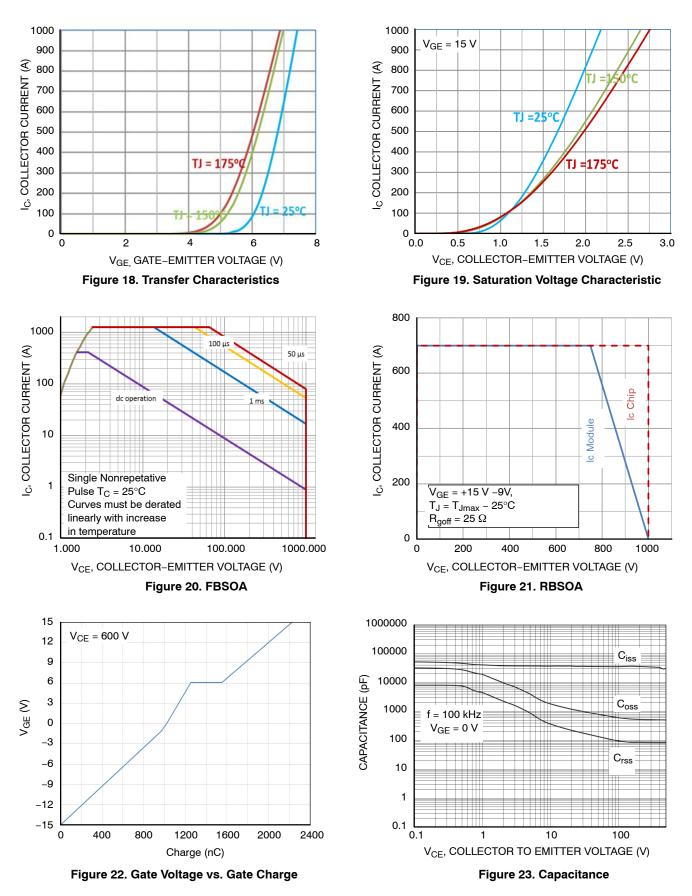


Figure 15. Diode Forward Characteristics



TYPICAL CHARACTERISTICS - IGBT T2/T3 AND D1A/D4A, D2A/D3A DIODE

TYPICAL CHARACTERISTICS - IGBT T2/T3 AND D1A/D4A, D2A/D3A DIODE (CONTINUED)



TYPICAL CHARACTERISTICS - IGBT T2/T3 AND D1A/D4A, D2A/D3A DIODE (CONTINUED)

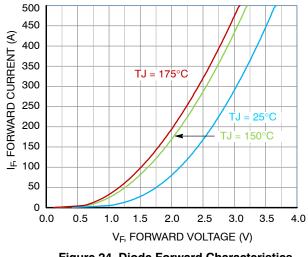
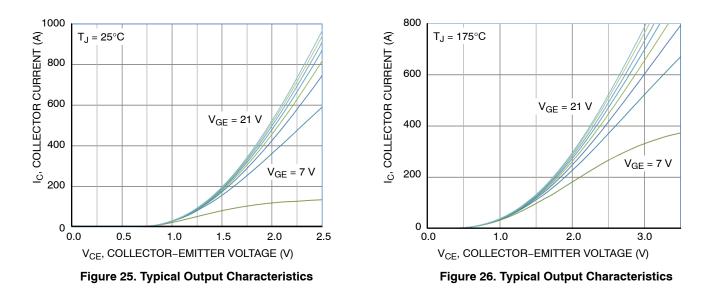
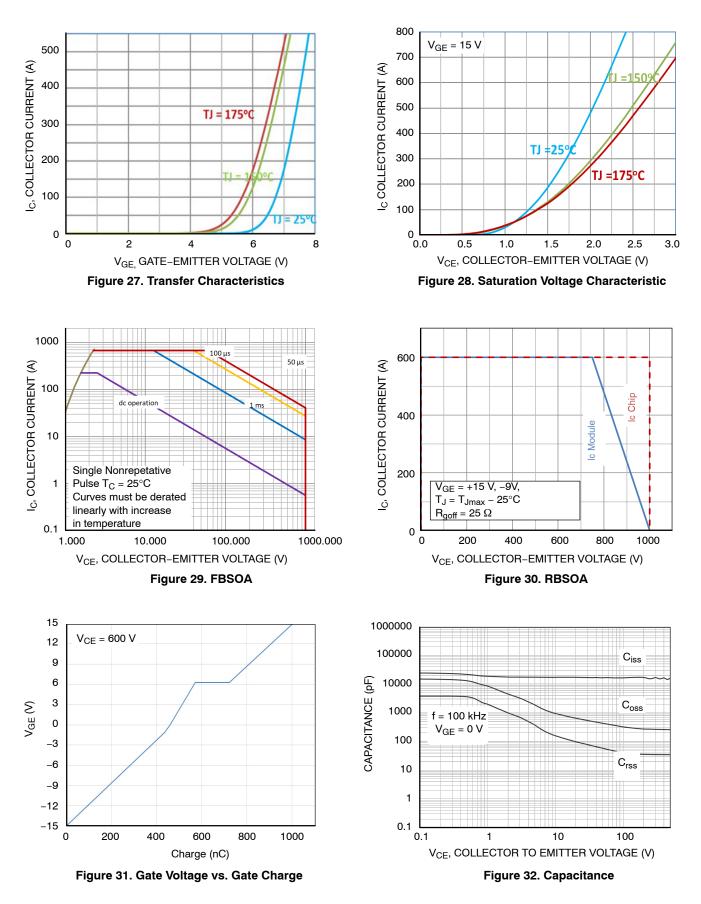


Figure 24. Diode Forward Characteristics

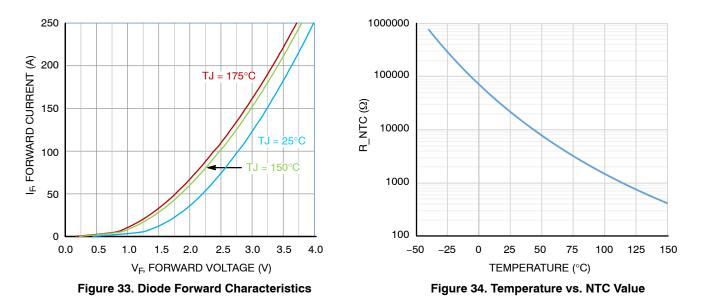
TYPICAL CHARACTERISTICS - IGBT T5/T6 AND D1B/D2B/D6B, D3B/D4B/D5B DIODE (CONTINUED)



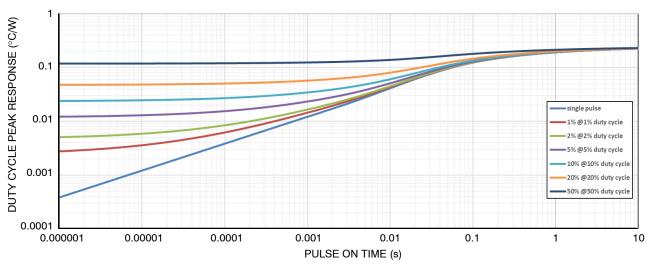
TYPICAL CHARACTERISTICS - IGBT T5/T6 AND D1B/D2B/D6B, D3B/D4B/D5B DIODE (CONTINUED)



TYPICAL CHARACTERISTICS - IGBT T5/T6 AND D1B/D2B/D6B, D3B/D4B/D5B DIODE (CONTINUED)

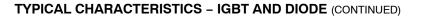




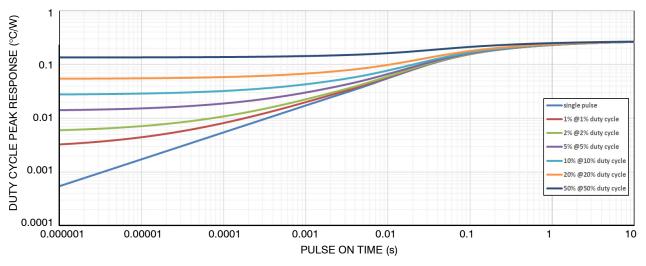




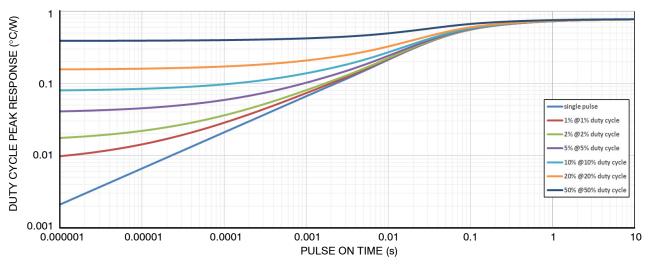
1 DUTY CYCLE PEAK RESPONSE (°C/M) 0.1 single pulse 0.01 1% @1% duty cycle 2% @2% duty cycle 5% @5% duty cycle 10% @10% duty cycl 0.001 20% @20% duty cycl 50% @50% duty cyc 0.0001 0.000001 0.00001 0.0001 0.001 0.01 0.1 1 10 PULSE ON TIME (s)



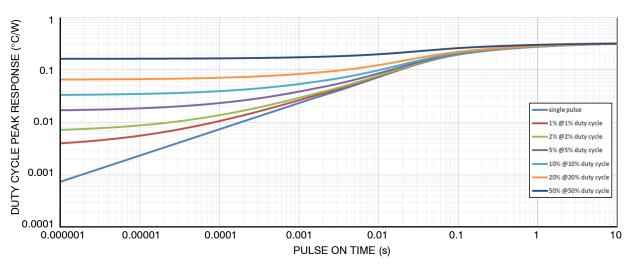






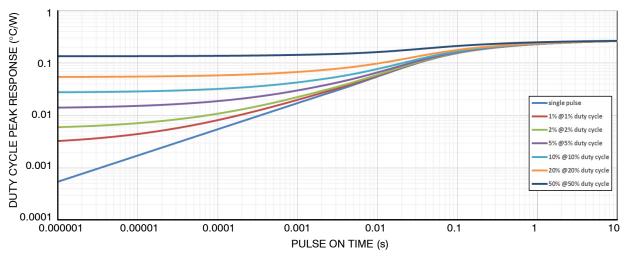




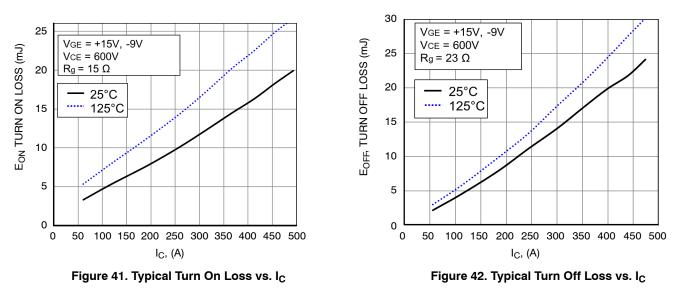


TYPICAL CHARACTERISTICS - IGBT AND DIODE (CONTINUED)



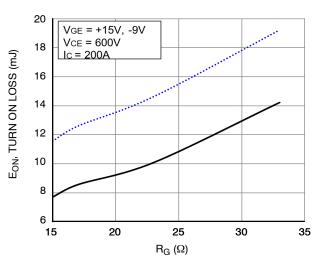






TYPICAL CHARACTERISTICS - T1, D5A OR T4, D6A

TYPICAL CHARACTERISTICS - T1, D5A OR T4, D6A (CONTINUED)





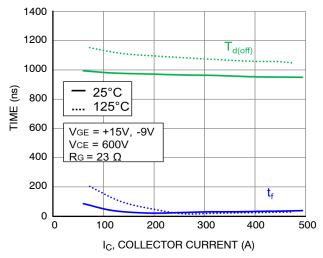
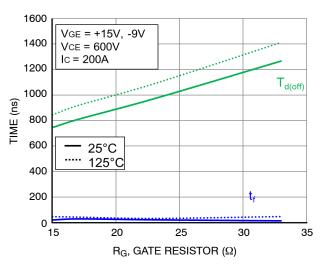


Figure 45. Typical Turn–Off Switching Time vs. I_C





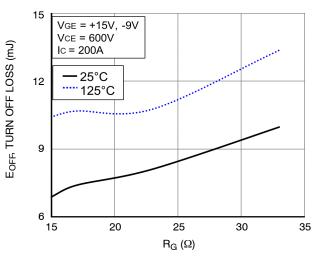


Figure 44. Typical Turn Off Loss vs. R_G

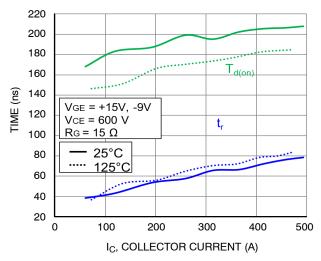


Figure 46. Typical Turn-On Switching Time vs. I_C

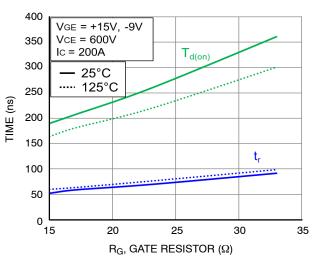
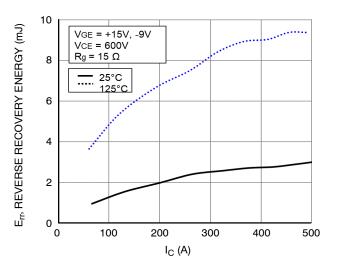


Figure 48. Typical Turn-On Switching Time vs. R_G

TYPICAL CHARACTERISTICS - T1, D5A OR T4, D6A (CONTINUED)





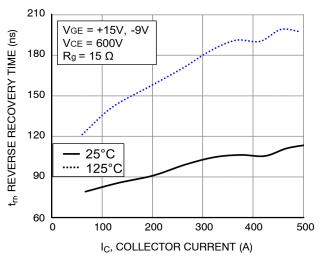


Figure 51. Typical Reverse Recovery Time vs. IC

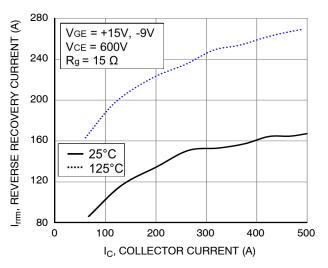


Figure 53. Typical Reverse Recovery Current vs. IC

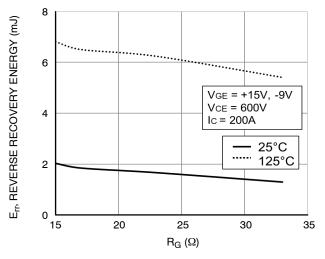


Figure 50. Typical Reverse Recovery Energy Loss vs. R_G

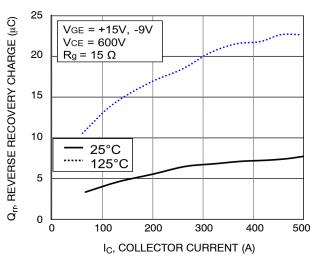


Figure 52. Typical Reverse Recovery Charge vs. IC

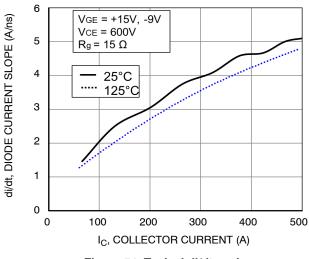
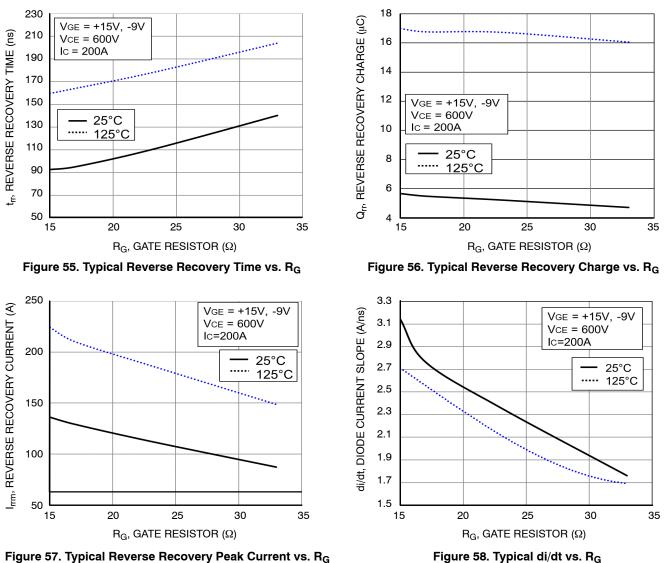
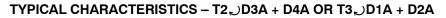
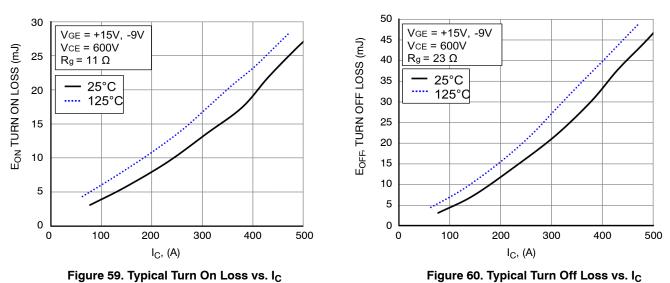


Figure 54. Typical di/dt vs. I_C







TYPICAL CHARACTERISTICS - T1, D5A OR T4, D6A (CONTINUED)

TYPICAL CHARACTERISTICS - T2, D3A + D4A OR T3, D1A + D2A (CONTINUED)

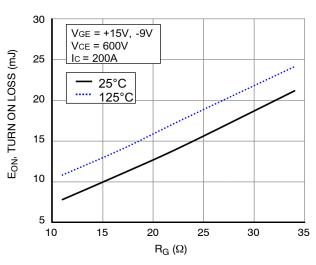
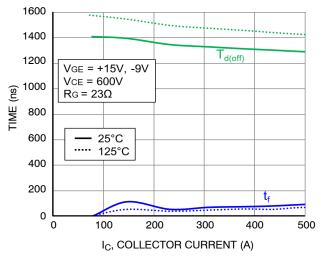
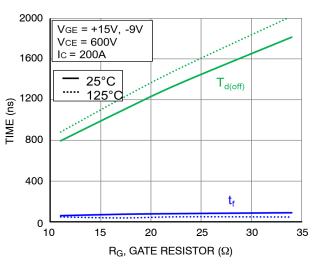


Figure 61. Typical Turn On Loss vs. R_G









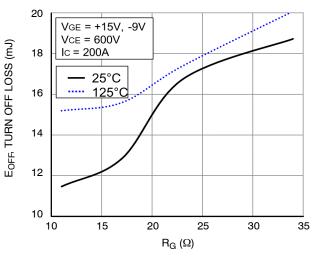


Figure 62. Typical Turn Off Loss vs. R_G

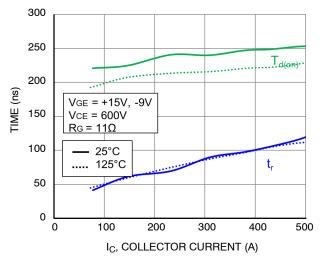


Figure 64. Typical Turn-On Switching Time vs. IC

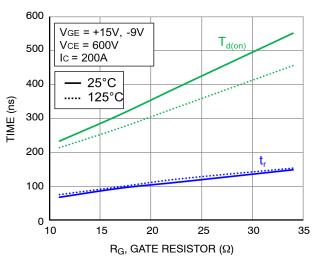
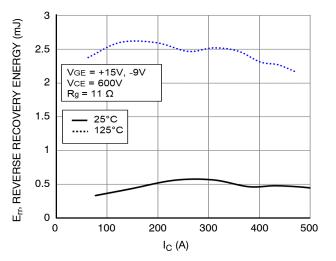


Figure 66. Typical Turn-On Switching Time vs. R_G

TYPICAL CHARACTERISTICS - T2, D3A + D4A OR T3, D1A + D2A (CONTINUED)





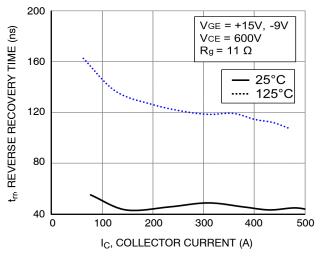


Figure 69. Typical Reverse Recovery Time vs. I_C

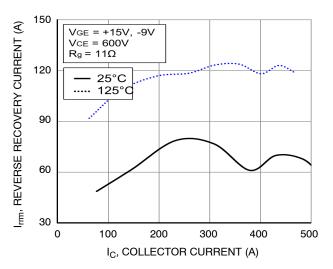


Figure 71. Typical Reverse Recovery Current vs. IC

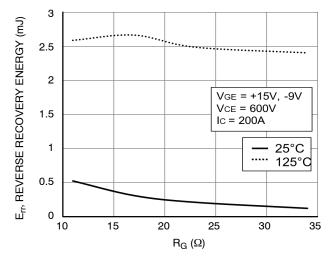


Figure 68. Typical Reverse Recovery Energy Loss vs. R_G

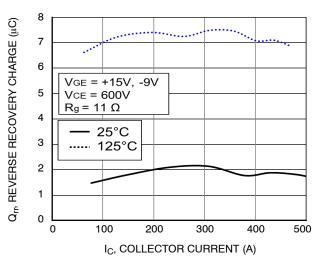


Figure 70. Typical Reverse Recovery Charge vs. IC

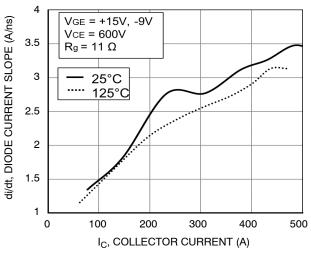


Figure 72. Typical di/dt vs. I_C

TYPICAL CHARACTERISTICS - T2, D3A + D4A OR T3, D1A + D2A (CONTINUED)

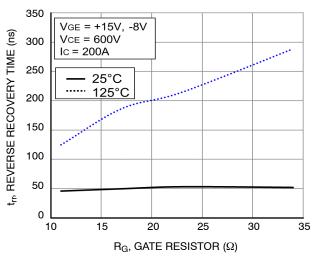


Figure 73. Typical Reverse Recovery Time vs. R_G

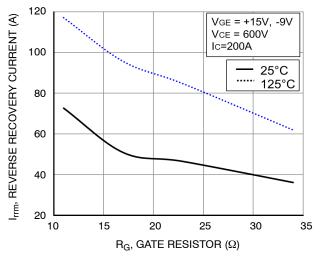


Figure 75. Typical Reverse Recovery Peak Current vs. R_G

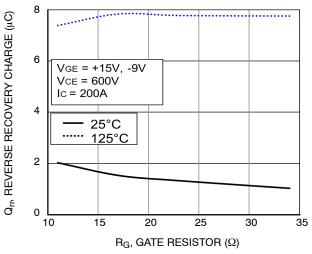


Figure 74. Typical Reverse Recovery Charge vs. R_G

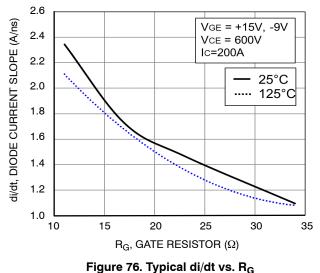
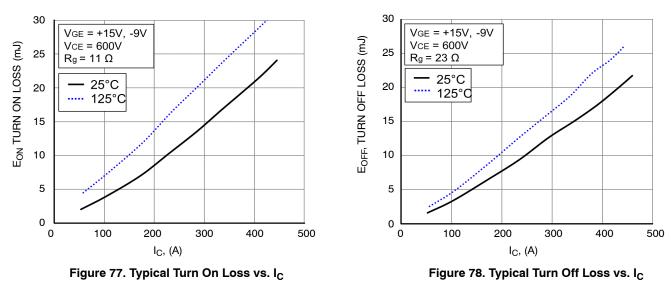
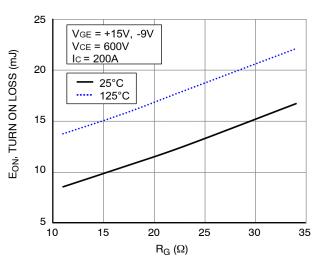


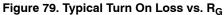
Figure 76. Typical di/dt vs. F

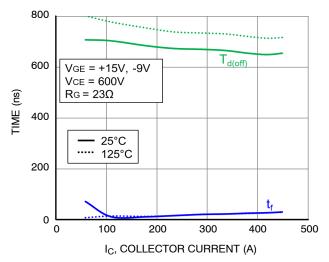


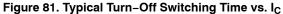
TYPICAL CHARACTERISTICS – T6, D4A OR T5, D1A

TYPICAL CHARACTERISTICS - T6, D4A OR T5, D1A (CONTINUED)









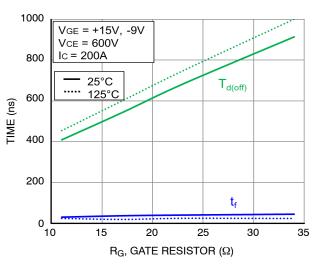


Figure 83. Typical Turn-Off Switching Time vs. R_G

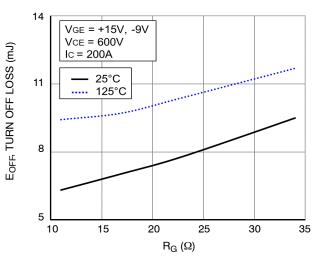


Figure 80. Typical Turn Off Loss vs. R_G

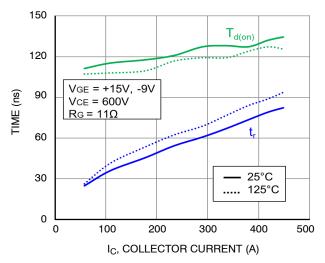


Figure 82. Typical Turn-On Switching Time vs. IC

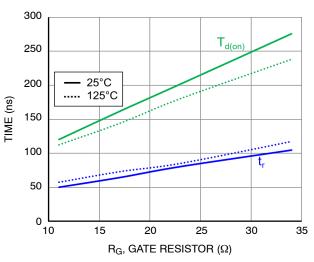
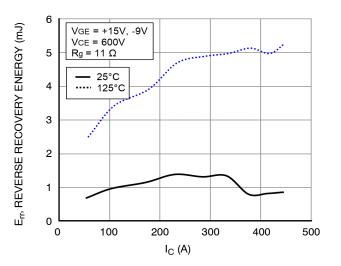


Figure 84. Typical Turn-On Switching Time vs. R_G

TYPICAL CHARACTERISTICS - T6, D4A OR T5, D1A (CONTINUED)



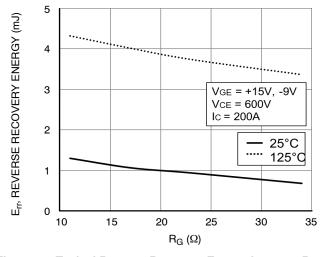


Figure 85. Typical Reverse Recovery Energy Loss vs. IC

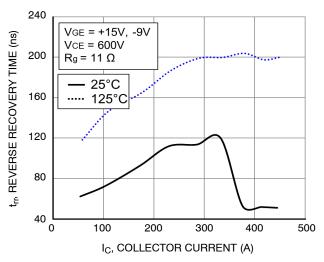


Figure 87. Typical Reverse Recovery Time vs. IC

210

180

150

120

90

60

0

VCE = 600V

25°C

100

125°C

 $R_g = 11\Omega$

.....

Irm, REVERSE RECOVERY CURRENT (A)



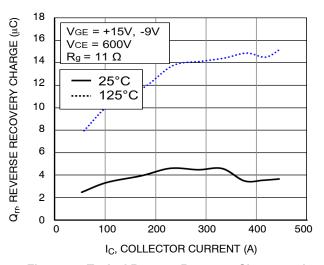


Figure 88. Typical Reverse Recovery Charge vs. I_C

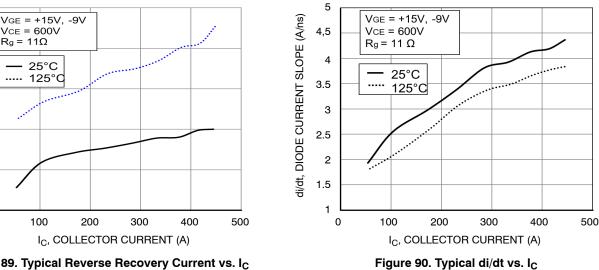


Figure 89. Typical Reverse Recovery Current vs. IC

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TYPICAL CHARACTERISTICS - T6, D4A OR T5, D1A (CONTINUED)

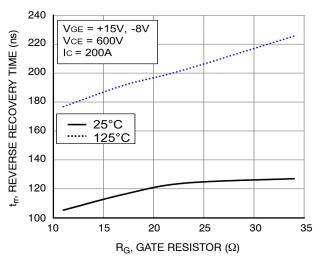


Figure 91. Typical Reverse Recovery Time vs. R_G

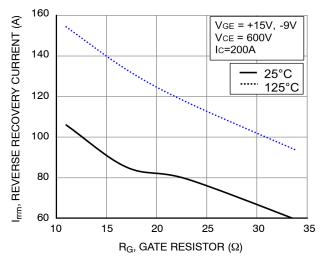


Figure 93. Typical Reverse Recovery Peak Current vs. R_G

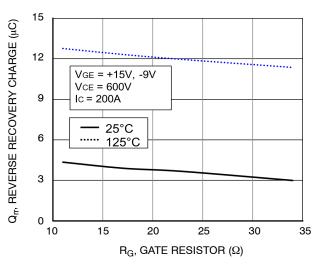


Figure 92. Typical Reverse Recovery Charge vs. R_G

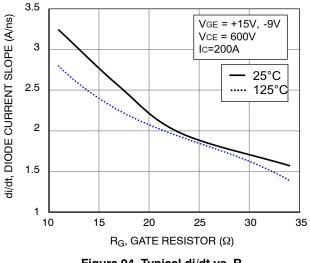
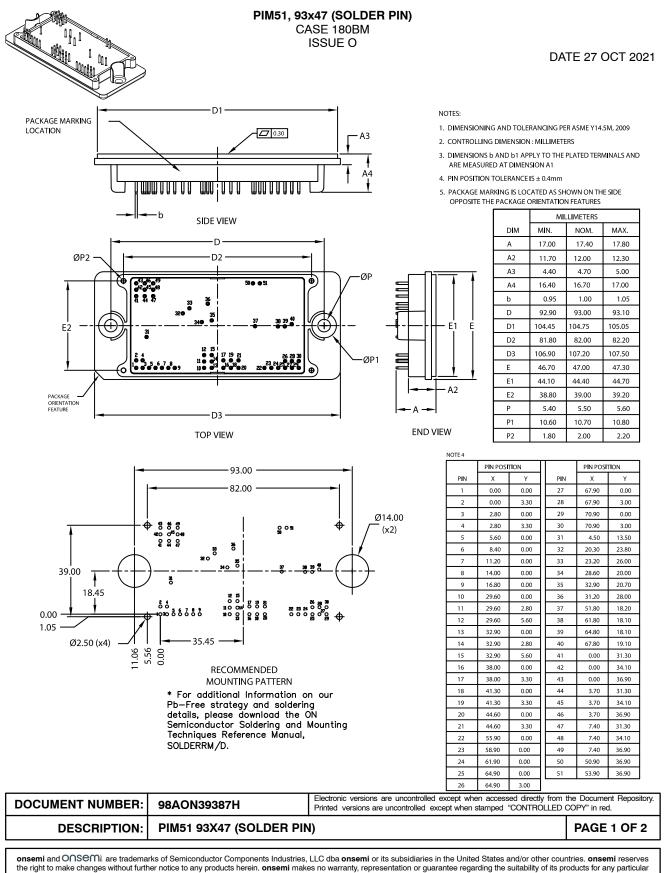


Figure 94. Typical di/dt vs. R_G

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

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PIM51, 93x47 (SOLDER PIN) CASE 180BM ISSUE O

DATE 27 OCT 2021

GENERIC MARKING DIAGRAM*	
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	
FRONTSIDE MARKING	
2D CODE	
BACKSIDE MARKING	
XXXXX - Specific Dovice Code	*

XXXXX = Specific Device Code AT = Assembly & Test Site Code YYWW = Year and Work Week Code *This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

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MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

ONSEM¹.

AL ALA	CA	3x47 (PRESS FI SE 180CQ ISSUE O	Т)				
		330E 0			DA	ATE 28	OCT 2
PACKAGE MARKING LOCATION ØP2 E2 PACKAGE CREMITION	D1 D1 D1 D1 D1 D1 D1 D1 D1 D1		NOTES: 1. DIMENSIONING 2. CONTROLLING 3. DIMENSIONS b ARE MEASURE 4. PIN POSITION 11 5. PACKAGE MAR OPPOSITE THE FILE FILE A2 A1	DIMENSION AND b1 APP D AT DIMENS OLERANCE I KING IS LOC/	HILLIMETER LY TO THE P ION A1 5 ± 0.4mm ATED AS SHO RIENTATION MILL MIN. 16.90 14.1 11.70 4.40 16.40 16.40 1.61 0.75 92.90 104.45 81.80	RS LATED TERM	IINALS AND
FEATURE	D3	_	END VIEW	E2 P	38.80 5.40	39.00 5.50	39.20 5.60
			NOTE 4	P1 P2	10.60 1.80	10.70 2.00 PIN POS	10.80 2.20
39.00	93.00 82	● ● ● ● ● ● ● ● ● ● ● ● ● ●	PIN X 1 0. 2 0. 3 2. 4 2. 5 5. 6 8. 7 11. 8 14. 9 16. 10 29. 11 29. 13 32. 14 32. 15 32. 16 38. 17 38. 17 38. 18 41. 19 41. 20 44. 21 44. 22 55. 23 58. 24 61. 25 64.	00 0.000 3.30 3.30 80 0.000 80 3.30 80 0.000 80 3.30 80 0.000 80 0.000 80 0.000 20 0.000 80 0.000 80 0.000 50 2.80 900 5.66 900 5.60 900 5.60 900 5.60 900 5.60 900 5.60 900 5.60 900 5.60 900 5.60 900 5.60 900 5.60 900 5.60 900 5.60 900 5.60 900 5.60 900 5.60 900 5.60 900 5.60 900 5.60 900 5.00	28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46	x x 67.90 67.90 70.90 70.90 23.20 23.20 23.20 32.90 31.20 51.80 61.80 64.80 67.80 0.00 0.00 0.00 3.70 3.70 3.70 7.40 7.40 50.90 53.90	Y 0.00 3.00 0.00 3.00 13.50 23.80 26.00 20.00 20.70 28.00 18.10 18.10 18.10 13.30 34.10 36.90 31.30 34.10 36.90 36.90 36.90 36.90 36.90 36.90
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PIM51, 93x47 (PRESS FIT) CASE 180CQ ISSUE O

DATE 30 OCT 2021

GENERIC MARKING DIAGRAM*	
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	
FRONTSIDE MARKING	
2D CODE	
BACKSIDE MARKING	
VVVVV Specific Dovice Code	*

XXXXX = Specific Device Code AT = Assembly & Test Site Code YYWW = Year and Work Week Code *This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

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MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

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			 DIMENSIONIN CONTROLLING DIMENSIONS ARE MEASUR PIN POSITION PACKAGE MA OPPOSITE TH 	5 DIMENSION 6 AND 61 AF ED AT DIMEN TOLERANCE RKING IS LO	N : MILLIMETE PPLY TO THE ISION A1 IS ± 0.4mm CATED AS SH ORIENTATION	RS PLATED TER	MINALS AND	
	SIDE VIEW			DIM	MIN.	NOM.	MAX.	
	D	- 1		A	16.90	17.30	17.70	
ØP2 -	D			A1	14.	18(REF)		
OP2				A2	11.70	12.00	12.30	
		●)/_∞ 🚽		A3	4.40	4.70	5.00	
T)	37 43 46 49			A4 b	16.40 1.61	16.70 1.66	17.00 1.71	
				b1	0.75	0.80	0.85	
E2 ()				D	92.90	93.00	93.10	
				D1	104.45	104.75	105.05	
		S \ØP1 ■		D2	81.80	82.00	82.20	
	,,,,,_,_,_,,_,,,,,,,,,,			D3 E	106.90 46.70	107.20 47.00	107.50 47.30	
			A2 A1	E1	46.70	44.40	44.70	
ORIENTATION FEATURE	D3		A	E2	38.80	39.00	39.20	
	TOP VIEW		END VIEW	Р	5.40	5.50	5.60	
				P1	10.60	10.70	10.80	
	93.00	>	NOTE 4	P2	1.80	2.00	2.20	
	82.00		PIN POSIT	ION		PIN POS	TION	
	62.00	-	PIN X	Y	PIN	х	Y	
		Ø14.00	1 0.00	0.00	27	62.50	0.00	
4	+ 0 «00« 5	(x2)	2 0.00	4.00	28 29	65.30 68.10	0.00	
			4 3.00	4.00	30	70.90	0.00	
39.00 +		(+)	5 6.00	0.00	31	13.70	19.80	
		\cup	6 6.00	4.00	32	16.70	19.80	
18.45		I	7 9.00	0.00	33	19.70	19.80	
0.00		⁶⁰⁰⁰ 0	8 9.00 9 12.00	4.00 0.00	34 35	23.20 38.00	19.80 18.60	
1.05		\backslash	10 26.90	0.00	36	41.00	19.20	
Ø2.50 (x4) 🥣	A 35.45 9.55 00 11.55 00	∕Ø1.45~1.54 PLATED	11 26.90	3.30	37	38.00	26.00	
	ت نہ ۃ RECOMMENDED	THRU HOLE	12 29.90	0.00	38	54.10	14.70	
	MOUNTING PATTERN		13 29.90 14 32.90	3.30 0.00	39 40	59.60 61.70	24.60 27.50	
			14 32.90 15 32.90	3.30	40	5.50	36.90	
			16 38.00	0.00	42	8.50	36.90	
			17 38.00	2.80	43	63.50	31.30	
			18 38.00	5.60	44	63.50	34.10	
			19 41.30 20 41.30	0.00	45 46	63.50 67.20	36.90 31.30	
			21 41.30	5.60	40	67.20	34.10	
			22 54.10	0.00	48	67.20	36.90	
			23 54.10	3.30	49	70.90	31.30	
			24 56.90 25 56.60	0.00	50 51	70.90 70.90	34.10 36.90	
			26 59.70	0.00	L 31	70.90	20.90	
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DESCRIPTION:	PIM51 93X47 (PRESS FIT)						PAGE	1 OF 2
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PIM51, 93x47 (PRESS FIT) CASE 180HG ISSUE O

DATE 08 NOV 2021

GENERIC MARKING DIAGRAM*	
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	
FRONTSIDE MARKING	
2D CODE	
BACKSIDE MARKING	
VVVVV Specific Dovice Code	*

XXXXX = Specific Device Code AT = Assembly & Test Site Code YYWW = Year and Work Week Code *This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

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DESCRIPTION:	PIM51 93X47 (PRESS FIT)		PAGE 2 OF 2			

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MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

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	CA	x47 (SOLDER PII ASE 180HH ISSUE O	N)				DATE	16 NO	V 2021
PACKAGE MARKING			2. CC 3. DI AF 4. PI 5. PA	S: MENSIONING DNTROLLING MENSIONS & RE MEASURE N POSITION ¹ ACKAGE MAR PPOSITE THE	DIMENSION AND b1 AP D AT DIMEN TOLERANCE	N : MILLIMETE PLY TO THE ISION A1 IS ± 0.4mm CATED AS SH	ERS PLATED TERI	MINALS AND	
ØP2	► b SIDE VIEW D D2 				DIM A A2 A3 A4	MIN. 17.00 11.70 4.40 16.40	NOM. 17.40 12.00 4.70 16.70	MAX. 17.80 12.30 5.00 17.00	
			E [*]	1 E	b D D1 D2 D3 E	0.95 92.90 104.45 81.80 106.90	1.00 93.00 104.75 82.00 107.20	1.05 93.10 105.05 82.20 107.50	
PACKAGE ORENTATION FEATURE	D3 TOP VIEW		A	2	E E1 E2 P P1 P2	46.70 44.10 38.80 5.40 10.60 1.80	47.00 44.40 39.00 5.50 10.70 2.00	47.30 44.70 39.20 5.60 10.80 2.20	
	93.00	Ø14.00	NOTE 4	PIN POSITI X 0.00 0.00	ON Y 0.00 4.00	PIN 27 28	PIN POSI X 62.50 65.30	TION Y 0.00 0.00	
39.00			3 4 5 6 7 8	3.00 3.00 6.00 9.00 9.00	0.00 4.00 0.00 4.00 0.00 4.00	29 30 31 32 33 34	68.10 70.90 13.70 16.70 19.70 23.20	0.00 0.00 19.80 19.80 19.80 19.80	
0.00 1.05 Ø2.50 (x4)	پ ۲۵۵۵۵۵۵ ۲۵۵۵۵۵۵۵۵۵۵۵۵۵۵ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰	°°° \$	9 10 11 12 13	12.00 26.90 26.90 29.90 29.90	0.00 0.00 3.30 0.00 3.30	35 36 37 38 39	38.00 41.00 38.00 54.10 59.60	18.60 19.20 26.00 14.70 24.60	
	* For additional Information on ou Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mour Techniques Reference Manual, SOLDERRM/D.		14 15 16 17 18 19	32.90 32.90 38.00 38.00 38.00 41.30	0.00 3.30 0.00 2.80 5.60 0.00	40 41 42 43 44 45	61.70 5.50 8.50 63.50 63.50 63.50	27.50 36.90 31.30 34.10 36.90	
			20 21 22 23 24	41.30 41.30 54.10 54.10 56.90	2.80 5.60 0.00 3.30 0.00	46 47 48 49 50	67.20 67.20 67.20 70.90 70.90	31.30 34.10 36.90 31.30 34.10	
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PIM51, 93x47 (SOLDER PIN) CASE 180HH ISSUE O

DATE 16 NOV 2021

GENERIC MARKING DIAGRAM*	
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	
FRONTSIDE MARKING	
2D CODE	
BACKSIDE MARKING	
VVVVV Specific Dovice Code	*

XXXXX = Specific Device Code AT = Assembly & Test Site Code YYWW = Year and Work Week Code "This information is generic. Please refer to device data sheet for actual part marking. Pb–Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

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