



NS15T07Y1M7

650 V, 15 A Three-phase Full-bridge IGBT Power Module

Rev. 1 — 8 July 2026

Product data sheet

1. General Description

The NS15T07Y1M7 is an insulated-gate bipolar transistor (IGBT) power module. The module uses 7th-generation carrier stored trench-gate and field-stop (FS) technology. It is designed for high-voltage industrial applications, including power inverters and motor drives.

2. Features

- Three-phase full-bridge topology with an NTC temperature sensor
- Rated voltage and current: 650 V/15 A
- Maximum junction temperature: 175 °C
- Short-circuit withstand time: 5 µs
- Solderable auxiliary contacts
- Optimized design for low parasitic inductance
- Low collector-emitter saturation voltage
- Low switching losses
- Validated with enhanced 2,000-hour HTRB and HV-H3TRB qualification testing

3. Applications

- Motor drives
- Servo drives
- Air conditioning systems
- Renewable energy systems
- Uninterruptible power supply (UPS) inverters

4. Quick Reference Data

Table 1. Quick Reference Data

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CES}	collector-emitter voltage	$T_{vj} = 25\text{ °C}$	-	650	V
I_{CDC}	continuous DC collector current	$T_c = 90\text{ °C}$	-	29	A
		$T_c = 100\text{ °C}$	-	27	A
$T_{vj(op)}$	operating junction temperature		-40	175	°C



Fig. 1. Product Outline

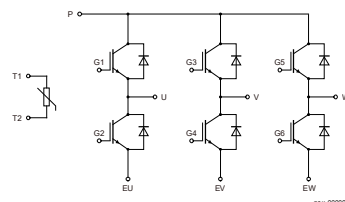


Fig. 2. Topology

5. Characteristic

5.1. IGBT

Table 2. Maximum Limiting Values

All values at $T_{vj} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified.

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CES}	collector-emitter voltage		-	650	V
I_{CDC}	continuous DC collector current[1]	$T_c = 90\text{ }^{\circ}\text{C}$	-	29	A
		$T_c = 100\text{ }^{\circ}\text{C}$	-	27	A
I_{CRM}	repetitive peak collector current[2]		-	30	A
V_{GE}	gate-emitter voltage		-20	20	V
$T_{vj(op)}$	operating junction temperature		-40	175	$^{\circ}\text{C}$

[1] Value is given at chip level, and is limited by $T_{vj(max)}$.

[2] Time duration is limited by $T_{vj(max)}$.

Table 3. Electrical Characteristics

All values at $T_{vj} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static Characteristics						
$V_{CE(sat)}$	collector-emitter saturation voltage[1]	$V_{GE} = 15\text{ V}; I_C = 15\text{ A}$	-	1.22	1.54	V
		$V_{GE} = 15\text{ V}; I_C = 15\text{ A}; T_{vj} = 125\text{ }^{\circ}\text{C}$	-	1.29	-	V
		$V_{GE} = 15\text{ V}; I_C = 15\text{ A}; T_{vj} = 175\text{ }^{\circ}\text{C}$	-	1.32	-	V
$V_{GE(th)}$	gate-emitter threshold voltage	$I_C = 0.15\text{ mA}; V_{CE} = V_{GE}$	4.35	5.0	5.65	V
I_{CES}	zero gate voltage collector current	$V_{CE} = 650\text{ V}; V_{GE} = 0\text{ V}$	-	-	100	μA
I_{GES}	gate-emitter leakage current	$V_{CE} = 0\text{ V}; V_{GE} = 20\text{ V}$	-	-	100	nA
r_g	internal gate resistor		-	0	-	Ω
C_{ies}	input capacitance	$V_{CE} = 25\text{ V}; V_{GE} = 0\text{ V}; f = 100\text{ kHz}$	-	1.34	-	nF
C_{oes}	output capacitance		-	0.08	-	nF
C_{res}	reverse transfer capacitance		-	0.02	-	nF
Q_G	gate charge	$V_{CC} = 400\text{ V}; I_C = 15\text{ A}; V_{GE} = 15\text{ V}$	-	0.20	-	μC

[1] Value is given at chip level.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Switching Characteristics							
t _{d(on)}	turn-on delay time	V _{GE} = ± 15 V; V _{CC} = 400 V; I _C = 15 A; R _{G(on)} = 15 Ω R _{G(off)} = 36 Ω; di/dt = 530 A/μs (only at turn-on, T _{vj} = 175 °C) dv/dt = 4000 V/μs (only at turn-off, T _{vj} = 175 °C)	T _{vj} = 25 °C	-	27	-	ns
			T _{vj} = 125 °C	-	27	-	ns
			T _{vj} = 175 °C	-	27	-	ns
t _r	rise time		T _{vj} = 25 °C	-	22	-	ns
			T _{vj} = 125 °C	-	23	-	ns
			T _{vj} = 175 °C	-	24	-	ns
t _{d(off)}	turn-off delay time		T _{vj} = 25 °C	-	180	-	ns
			T _{vj} = 125 °C	-	215	-	ns
			T _{vj} = 175 °C	-	239	-	ns
t _f	fall time		T _{vj} = 25 °C	-	58	-	ns
			T _{vj} = 125 °C	-	58	-	ns
			T _{vj} = 175 °C	-	67	-	ns
E _{on}	turn-on switching energy loss		T _{vj} = 25 °C	-	386	-	μJ
			T _{vj} = 125 °C	-	464	-	μJ
			T _{vj} = 175 °C	-	520	-	μJ
E _{off}	turn-off switching energy loss		T _{vj} = 25 °C	-	203	-	μJ
			T _{vj} = 125 °C	-	277	-	μJ
			T _{vj} = 175 °C	-	319	-	μJ
I _{C(sc)}	short-circuit current[1]	V _{GE} = ±15 V; V _{CEmax} = V _{CES} - L _{sCE} * di/dt	V _{CC} = 330 V; t _p ≤ 5 μs; T _{vj} = 100 °C	-	106	-	A
			V _{CC} = 400 V; t _p ≤ 3 μs; T _{vj} = 150 °C	-	100	-	A
Thermal Resistance							
R _{th(j-c)}	thermal resistance from junction to case	per IGBT switch		-	-	1.248	K/W
R _{th(c-h)}	thermal resistance from case to heatsink	per IGBT switch; λ _{grease} = 3 W/(m·K)		-	0.777	-	K/W

[1] Short-circuit cycles ≤ 1000 . Time between tests $\geq 10 \text{ s}$.

5.2. Diode

Table 4. Maximum Limiting Values

All values at $T_{vj} = 25 \text{ }^\circ\text{C}$, unless otherwise specified.

Symbol	Parameter	Conditions	Min	Max	Unit
V_{RRM}	repetitive peak reverse voltage		-	650	V
I_F	continuous DC forward current[1]		-	15	A
I_{FRM}	repetitive peak forward current[2]		-	30	A
I^2t	I^2t value	$V_R = 0 \text{ V}; t_p = 10 \text{ ms}; T_{vj} = 175 \text{ }^\circ\text{C}$	-	21	A^2s
$T_{vj(op)}$	operating junction temperature		-40	175	$^\circ\text{C}$

[1] Value is given at chip level.

[2] Time duration is limited by $T_{vj(max)}$.

Table 5. Electrical CharacteristicsAll values at $T_{vj} = 25\text{ °C}$, unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V _F	diode forward voltage[1]	V _{GE} = 0 V; I _F = 15 A	T _{vj} = 25 °C	-	1.49	1.85	V
			T _{vj} = 125 °C	-	1.41	-	V
			T _{vj} = 175 °C	-	1.37	-	V
t _{rr}	reverse recovery time	V _R = 400 V; I _F = 15 A; V _{GE} = 0 V; di _F /dt = 530 A/μs (only at T _{vj} = 175 °C)	T _{vj} = 25 °C	-	74	-	ns
			T _{vj} = 125 °C	-	90	-	ns
			T _{vj} = 175 °C	-	98	-	ns
Q _{rr}	reverse recovery charge		T _{vj} = 25 °C	-	0.48	-	μC
			T _{vj} = 125 °C	-	0.79	-	μC
			T _{vj} = 175 °C	-	0.97	-	μC
I _{rrm}	peak reverse recovery current		T _{vj} = 25 °C	-	11	-	A
			T _{vj} = 125 °C	-	15	-	A
			T _{vj} = 175 °C	-	17	-	A
E _{rec}	reverse recovery energy loss		T _{vj} = 25 °C	-	85	-	μJ
			T _{vj} = 125 °C	-	152	-	μJ
			T _{vj} = 175 °C	-	205	-	μJ
R _{th(j-c)}	thermal resistance from junction to case	per diode switch		-	-	1.812	K/W
R _{th(c-h)}	thermal resistance from case to heatsink	per diode switch; λ _{grease} = 3 W/(m·K)		-	0.802	-	K/W

[1] Value is given at chip level.

5.3. NTC Thermistor

Table 6. NTC Thermistor

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
R_{25}	rated resistance	$T_{NTC} = 25\text{ °C}$	-	5	-	k Ω
$\Delta R/R$	deviation of R_{100}	$T_{NTC} = 100\text{ °C}$; $R_{100} = 491$	-5.5	-	5.5	%
P_{25}	power dissipation	$T_{NTC} = 25\text{ °C}$	-	-	20	mW
$B_{25/50}$	B-value		-	3375	-	K
$B_{25/80}$	B-value		-	3425	-	K
$B_{25/100}$	B-value		-	3443	-	K

5.4. Package

Table 7. Mechanical Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
RTI	relative thermal index (electrical)	housing only	-	130	-	$^{\circ}\text{C}$
L_{sCE}	internal stray inductance		-	24	-	nH
$R_{CC'+EE'}$	lead resistance, terminal to chip	$T_c = 25\text{ °C}$, per switch	-	7.5	-	m Ω
G	weight		-	22	-	g
T_{stg}	storage temperature		-40	-	125	$^{\circ}\text{C}$
F	mounting force per clamp		20	-	50	N

Table 8. Insulation

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{ISOL}	isolation test voltage	RMS; f = 50 Hz; t = 1 min	-	2.5	-	kV
	material of substrate isolation		-	Al ₂ O ₃	-	-
	creepage distance	terminal to heatsink	-	14	-	mm
		terminal to terminal	-	6.5	-	mm
	clearance distance	terminal to heatsink	-	10.0	-	mm
		terminal to terminal	-	5.2	-	mm
CTI	comparative tracking index		200	-	-	

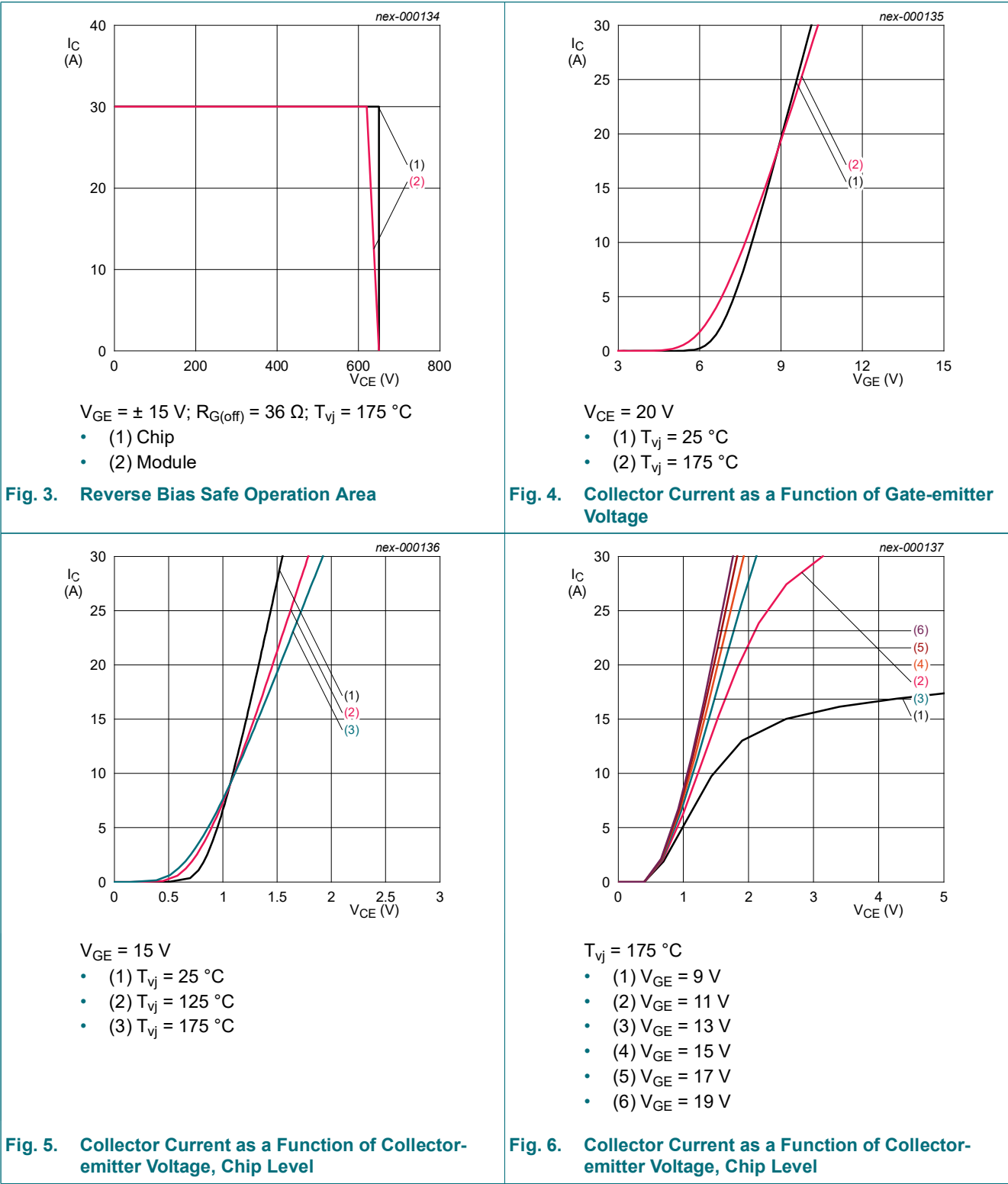
6. Ordering Information

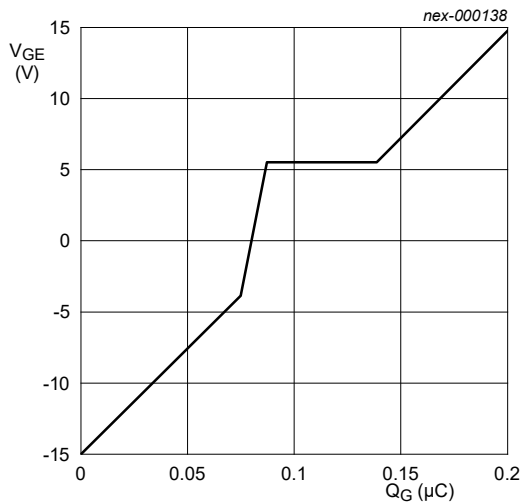
Table 9. Ordering information

Type number	Package		
	Name	Description	Version
NS15T07Y1M7	NY1	IGBT power module with three-phase full-bridge circuit topology; Solderable auxiliary contacts; Outline dimension 62.8 mm × 33.8 mm × 15.5 mm	SOT8130-2

7. Characteristic Diagram

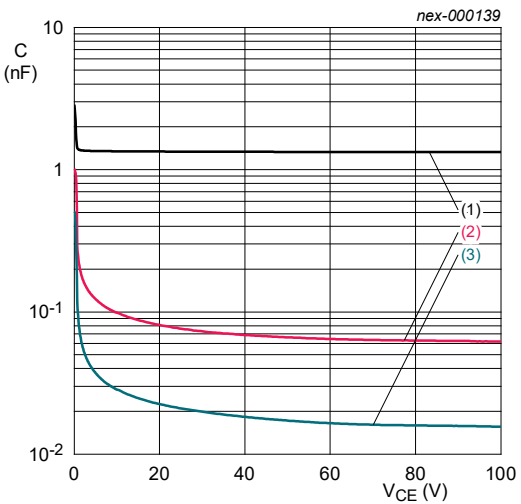
Table 10. Waveforms and Output Characteristics





$I_C = 15\text{ A}$; $V_{CE} = 400\text{ V}$

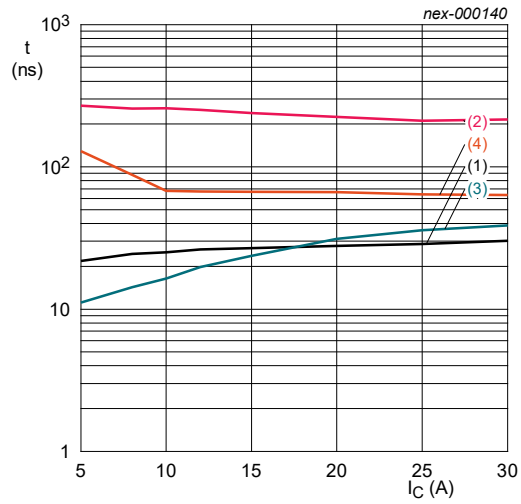
Fig. 7. Gate-emitter Voltage as a Function of Gate Charge



$V_{GE} = 0\text{ V}$; $f = 100\text{ kHz}$

- (1) C_{ies}
- (2) C_{oes}
- (3) C_{res}

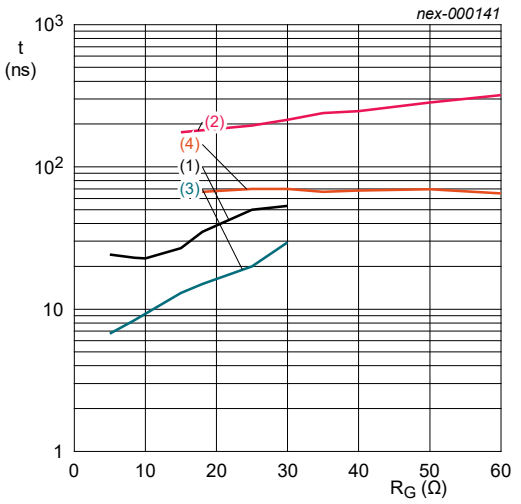
Fig. 8. Typical Capacitance as a Function of Collector-emitter Voltage



$V_{GE} = \pm 15\text{ V}$; $V_{CC} = 400\text{ V}$; $T_{vj} = 175\text{ }^\circ\text{C}$;
 $R_{G(on)} = 15\text{ }\Omega$; $R_{G(off)} = 36\text{ }\Omega$

- (1) $t_{d(on)}$
- (2) $t_{d(off)}$
- (3) t_r
- (4) t_f

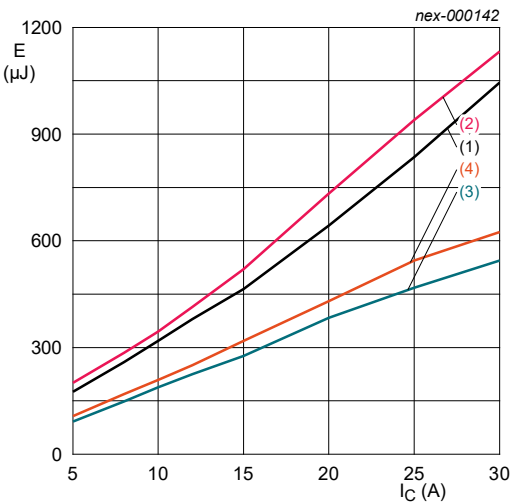
Fig. 9. Typical Switching Times as a Function of Collector Current



$V_{GE} = \pm 15\text{ V}$; $V_{CC} = 400\text{ V}$; $I_C = 15\text{ A}$; $T_{vj} = 175\text{ }^\circ\text{C}$

- (1) $t_{d(on)}$
- (2) $t_{d(off)}$
- (3) t_r
- (4) t_f

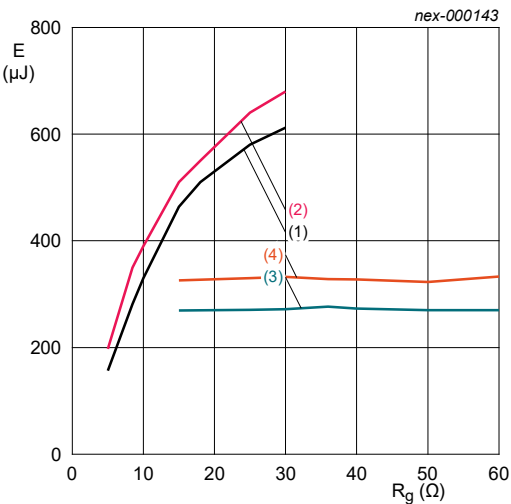
Fig. 10. Typical Switching Times as a Function of Gate Resistance



$V_{GE} = \pm 15\text{ V}; V_{CC} = 400\text{ V}$
 $R_{G(on)} = 15\ \Omega; R_{G(off)} = 36\ \Omega$

- (1) $E_{on}, T_{vj} = 125\text{ }^{\circ}\text{C}$
- (2) $E_{on}, T_{vj} = 175\text{ }^{\circ}\text{C}$
- (3) $E_{off}, T_{vj} = 125\text{ }^{\circ}\text{C}$
- (4) $E_{off}, T_{vj} = 175\text{ }^{\circ}\text{C}$

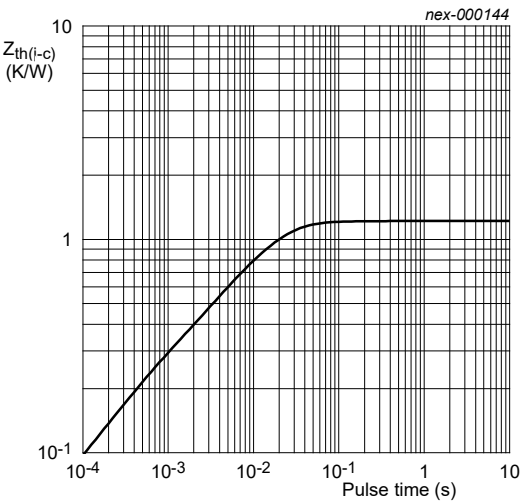
Fig. 11. Typical Switching Energy Losses as a Function of Collector Current



$V_{GE} = \pm 15\text{ V}; V_{CC} = 400\text{ V}; I_C = 15\text{ A}$

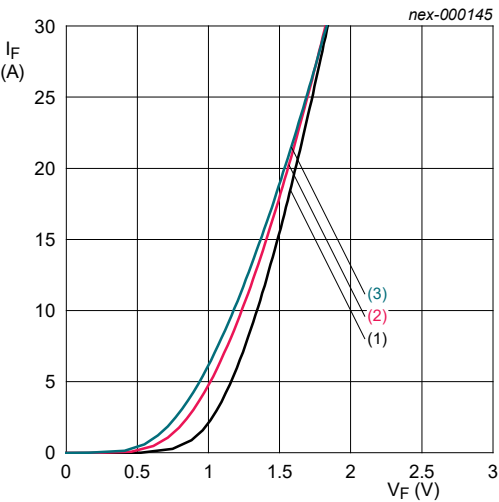
- (1) $E_{on}, T_{vj} = 125\text{ }^{\circ}\text{C}$
- (2) $E_{on}, T_{vj} = 175\text{ }^{\circ}\text{C}$
- (3) $E_{off}, T_{vj} = 125\text{ }^{\circ}\text{C}$
- (4) $E_{off}, T_{vj} = 175\text{ }^{\circ}\text{C}$

Fig. 12. Typical Switching Energy Losses as a Function of Gate Resistance



i	1	2	3	4
r_i [K/W]	0.03175	0.01288	0.21373	0.98944
τ_i [s]	0.000007	0.000058	0.000588	0.015464

Fig. 13. Transient Thermal Impedance of IGBT as a Function of Single Pulse



- (1) $T_{vj} = 25\text{ }^{\circ}\text{C}$
- (2) $T_{vj} = 125\text{ }^{\circ}\text{C}$
- (3) $T_{vj} = 175\text{ }^{\circ}\text{C}$

Fig. 14. Typical Diode Forward Current as a Function of Forward Voltage, Chip Level

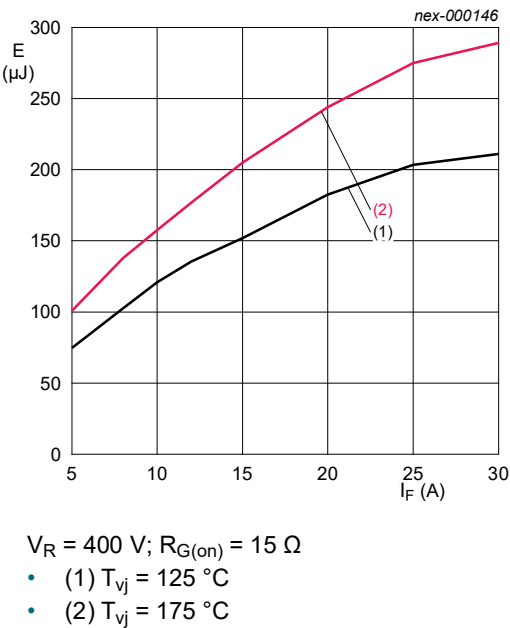


Fig. 15. Typical Reverse Recovery Energy Loss as a Function of Forward Current

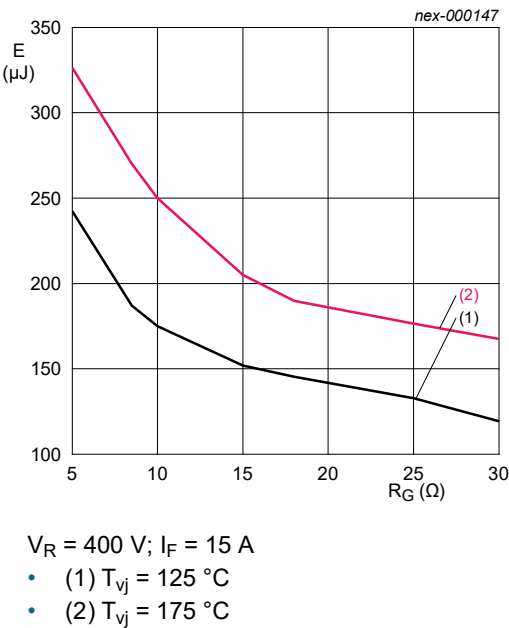
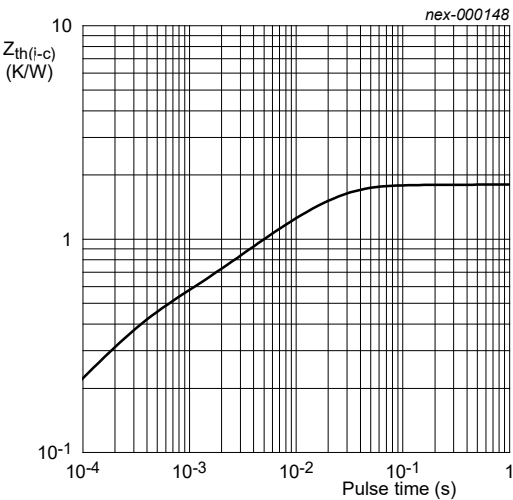


Fig. 16. Typical Reverse Recovery Energy Loss as a Function of Gate Resistance



i	1	2	3	4
r_i [K/W]	0.046475	0.013573	0.423231	1.328721
τ_i [s]	0.000003	0.000022	0.000297	0.014044

Fig. 17. Transient Thermal Impedance of Diode as a Function of Single Pulse

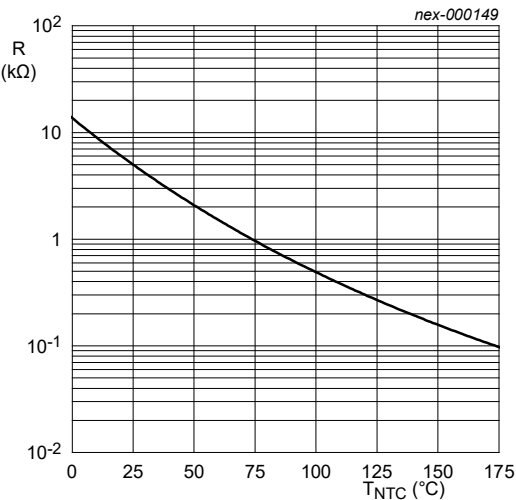


Fig. 18. NTC-thermistor Characteristics

8. Waveform Definition

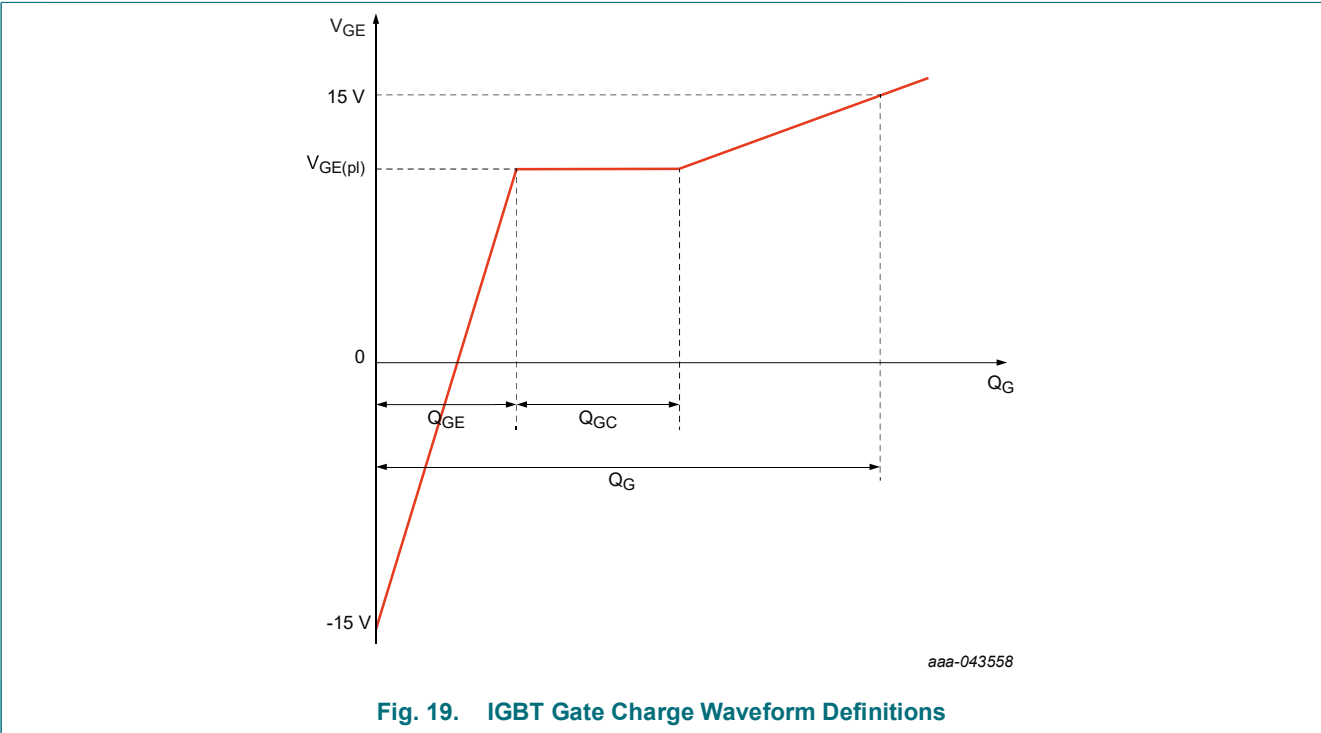


Fig. 19. IGBT Gate Charge Waveform Definitions

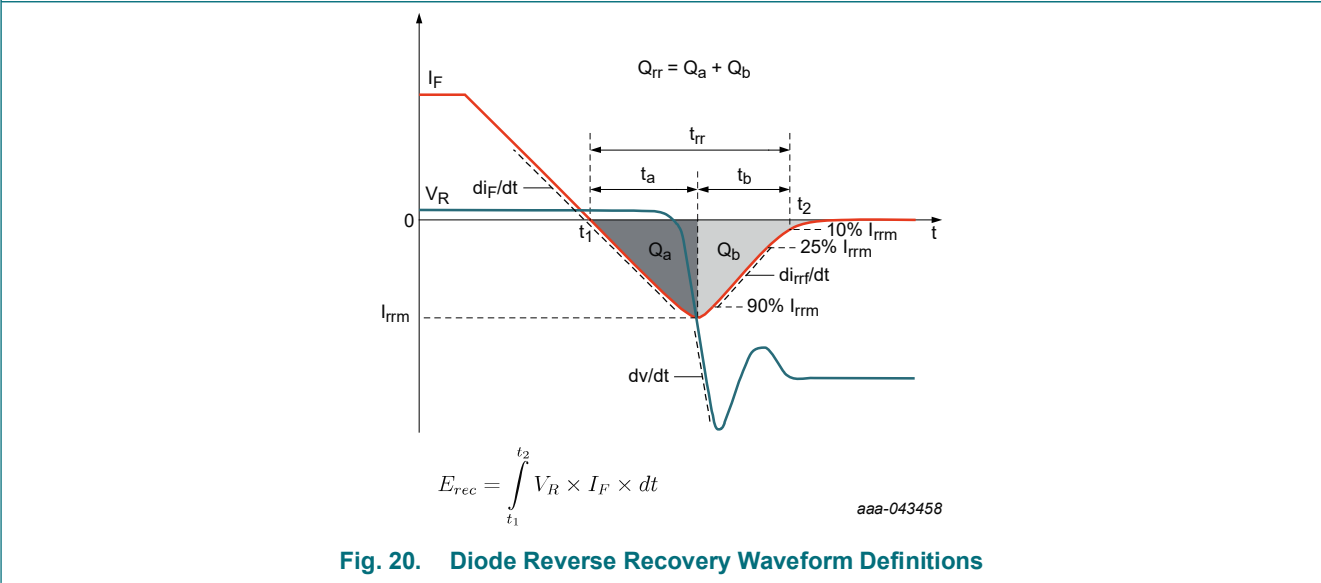


Fig. 20. Diode Reverse Recovery Waveform Definitions

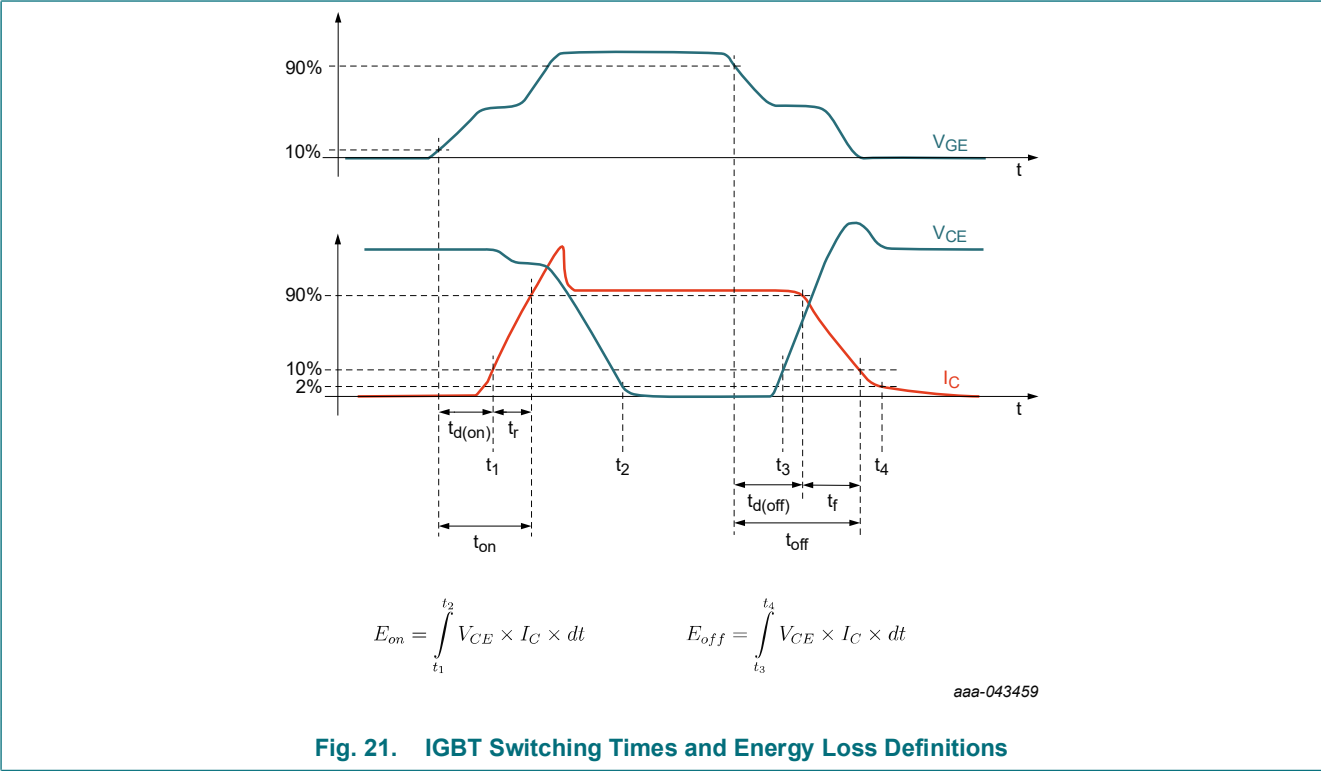


Fig. 21. IGBT Switching Times and Energy Loss Definitions

9. Circuit Diagram

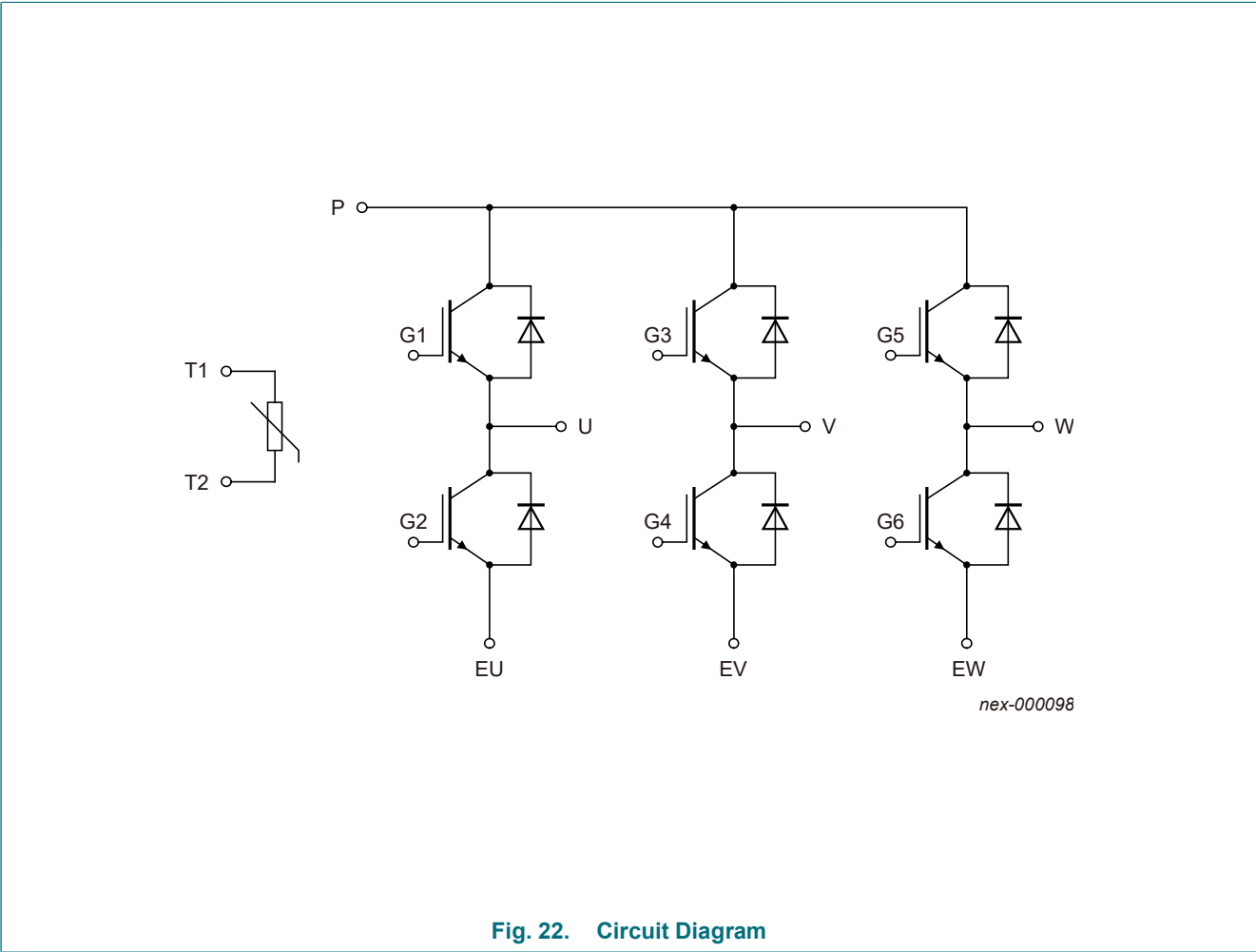
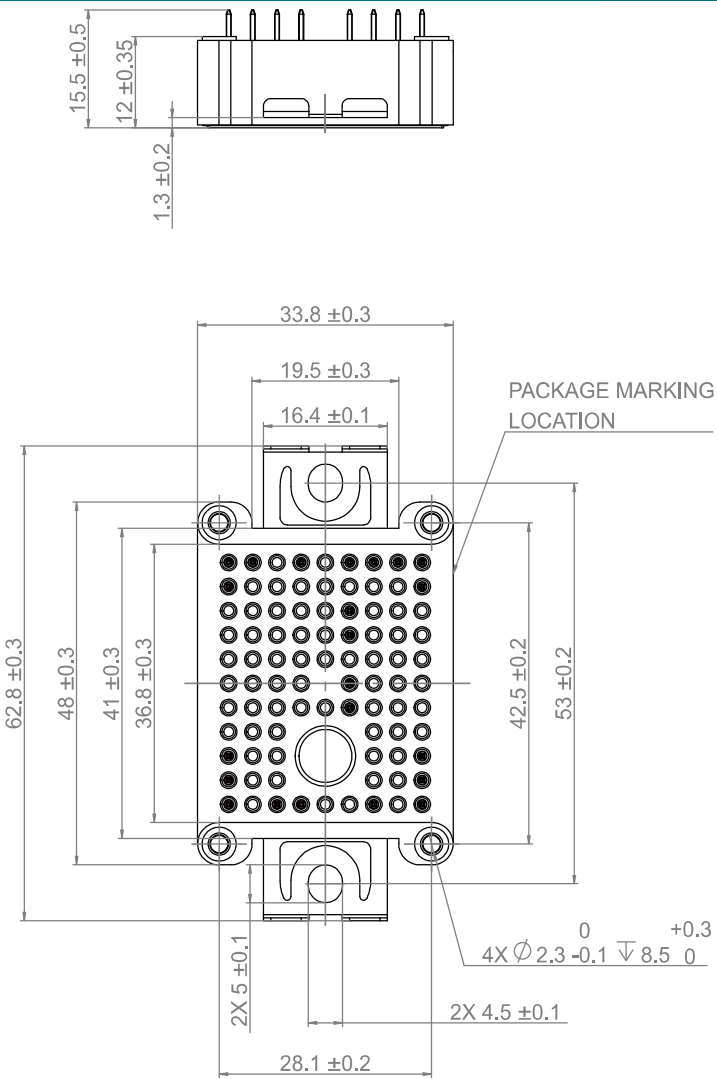


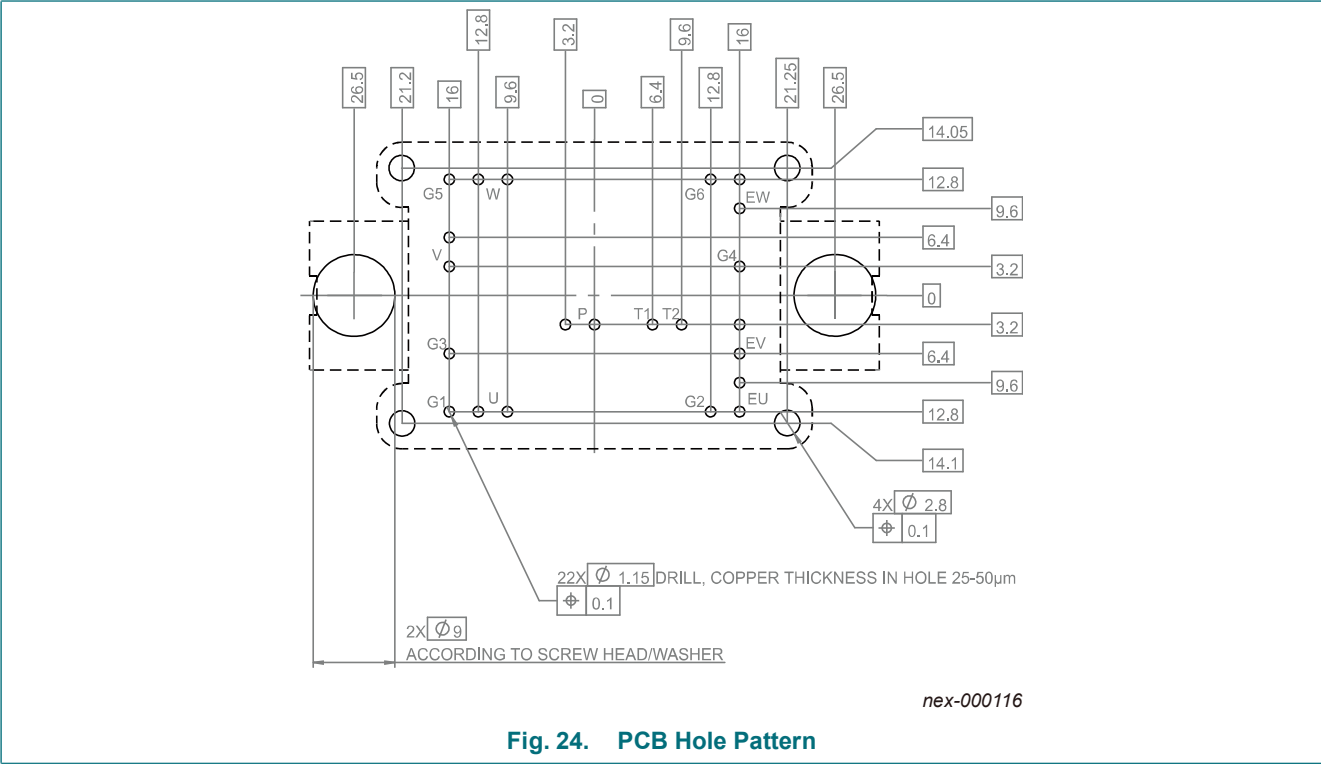
Fig. 22. Circuit Diagram

10. Package Outline



nex-000115

Fig. 23. Package Outline



11. Revision History

Table 11. Revision History

Document ID	Release Date	Data Sheet Status	Supersedes
NS15T07Y1M7 v.1	20260708	Product data sheet	-

12. Legal information

Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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