



General Description

OST140N120H7EM2F-E uses advanced Oriental-Semi's patented Trident-Gate Bipolar Transistor (TGBT™) technology to provide extremely low $V_{CE(sat)}$, low gate charge, and excellent switching performance. This device is suitable for mid to high range switching frequency converters.

Features

- Advanced TGBT™ technology
- Excellent conduction and switching loss
- Excellent stability and uniformity
- Fast and soft antiparallel diode



Applications

- Induction converters
- Uninterruptible power supplies

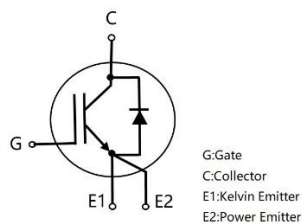
Key Performance Parameters

Parameter	Value	Unit
$V_{CES, min} @ 25\text{ }^{\circ}\text{C}$	1200	V
Maximum junction temperature	175	$^{\circ}\text{C}$
$I_C, pulse$	560	A
$V_{CE(sat), typ} @ V_{GE}=15\text{ V}$	1.68	V
Q_g	478	nC

Marking Information

Product Name	Package	Marking
OST140N120H7EM2F-E	TO247-plus-4L	OST140N120H7EM2

Package & Pin Information




Absolute Maximum Ratings at $T_{vj}=25\text{ }^{\circ}\text{C}$ unless otherwise noted

Parameter	Symbol	Value	Unit
Collector emitter voltage	V_{CES}	1200	V
Gate emitter voltage	V_{GES}	± 20	V
Transient gate emitter voltage, $T_P \leq 10\text{ }\mu\text{s}$, $D < 0.01$		± 30	V
Continuous collector current ¹⁾ , $T_C = 25\text{ }^{\circ}\text{C}$	I_C	230	A
Continuous collector current ¹⁾ , $T_C = 100\text{ }^{\circ}\text{C}$		190	A
Pulsed collector current ²⁾ , $T_C = 25\text{ }^{\circ}\text{C}$	$I_{C, \text{ pulse}}$	560	A
Diode forward current ¹⁾ , $T_C = 25\text{ }^{\circ}\text{C}$	I_F	170	A
Diode forward current ¹⁾ , $T_C = 100\text{ }^{\circ}\text{C}$		140	A
Diode pulsed current ²⁾ , $T_C = 25\text{ }^{\circ}\text{C}$	$I_{F, \text{ pulse}}$	560	A
Power dissipation ³⁾ , $T_C = 25\text{ }^{\circ}\text{C}$	P_D	937	W
Power dissipation ³⁾ , $T_C = 100\text{ }^{\circ}\text{C}$		468	W
Operation and storage temperature	T_{stg}, T_{vj}	-55 to 175	$^{\circ}\text{C}$

Thermal Characteristics

Parameter	Symbol	Value	Unit
IGBT thermal resistance, junction-case	$R_{\theta JC}$	0.16	$^{\circ}\text{C/W}$
Diode thermal resistance, junction-case	$R_{\theta JC}$	0.45	$^{\circ}\text{C/W}$
Thermal resistance, junction-ambient	$R_{\theta JA}$	40	$^{\circ}\text{C/W}$

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Collector-emitter breakdown voltage	$V_{(BR)CES}$	1200			V	$V_{GE}=0\text{ V}$, $I_C=0.5\text{ mA}$
Collector-emitter saturation voltage	$V_{CE(sat)}$		1.68	2.0	V	$V_{GE}=15\text{ V}$, $I_C=140\text{ A}$, $T_{vj}=25\text{ }^{\circ}\text{C}$
			2.06		V	$V_{GE}=15\text{ V}$, $I_C=140\text{ A}$, $T_{vj}=125\text{ }^{\circ}\text{C}$
			2.39		V	$V_{GE}=15\text{ V}$, $I_C=140\text{ A}$, $T_{vj}=175\text{ }^{\circ}\text{C}$
Gate-emitter threshold voltage	$V_{GE(th)}$	4.2	5.2	6.2	V	$V_{CE}=V_{GE}$, $I_C=0.5\text{ mA}$
Diode forward voltage	V_F		3.48	3.7	V	$V_{GE}=0\text{ V}$, $I_F=140\text{ A}$, $T_{vj}=25\text{ }^{\circ}\text{C}$
			2.86		V	$V_{GE}=0\text{ V}$, $I_F=140\text{ A}$, $T_{vj}=125\text{ }^{\circ}\text{C}$
			2.58		V	$V_{GE}=0\text{ V}$, $I_F=140\text{ A}$, $T_{vj}=175\text{ }^{\circ}\text{C}$
Gate-emitter leakage current	I_{GES}			100	nA	$V_{CE}=0\text{ V}$, $V_{GE}=20\text{ V}$
Zero gate voltage collector current	I_{CES}			10	μA	$V_{CE}=1200\text{ V}$, $V_{GE}=0\text{ V}$

Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{ies}		24898		pF	$V_{GE}=0\text{ V}$, $V_{CE}=25\text{ V}$, $f=100\text{ kHz}$
Output capacitance	C_{oes}		382		pF	
Reverse transfer capacitance	C_{res}		19		pF	
Turn-on delay time	$t_{d(on)}$		85		ns	$V_{GE}=15\text{ V}$, $V_{CC}=600\text{ V}$, $R_G=5\ \Omega$, $I_C=140\text{ A}$
Rise time	t_r		34		ns	
Turn-off delay time	$t_{d(off)}$		252		ns	
Fall time	t_f		70		ns	
Turn-on energy	E_{on}		3.51		mJ	
Turn-off energy	E_{off}		4.56		mJ	
Turn-on delay time	$t_{d(on)}$		80		ns	$V_{GE}=15\text{ V}$, $V_{CC}=600\text{ V}$, $R_G=5\ \Omega$, $I_C=70\text{ A}$
Rise time	t_r		19		ns	
Turn-off delay time	$t_{d(off)}$		294		ns	
Fall time	t_f		48		ns	
Turn-on energy	E_{on}		1.87		mJ	
Turn-off energy	E_{off}		2.63		mJ	

Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		478		nC	$V_{GE}=15\text{ V}$, $V_{CC}=960\text{ V}$, $I_C=140\text{ A}$
Gate-emitter charge	Q_{ge}		186		nC	
Gate-collector charge	Q_{gc}		102		nC	

Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode reverse recovery time	t_{rr}		183		ns	$V_R=600\text{ V}$, $I_F=140\text{ A}$, $di_F/dt=1000\text{ A}/\mu\text{s}$, $T_{vj}=25\text{ }^\circ\text{C}$
Diode reverse recovery charge	Q_{rr}		3.35		μC	
Diode peak reverse recovery current	I_{rrm}		39		A	

Note

- 1) Calculated continuous current based on maximum allowable junction temperature.
- 2) Repetitive rating; pulse width limited by max. junction temperature.
- 3) P_d is based on max. junction temperature, using junction-case thermal resistance.

Electrical Characteristics Diagrams

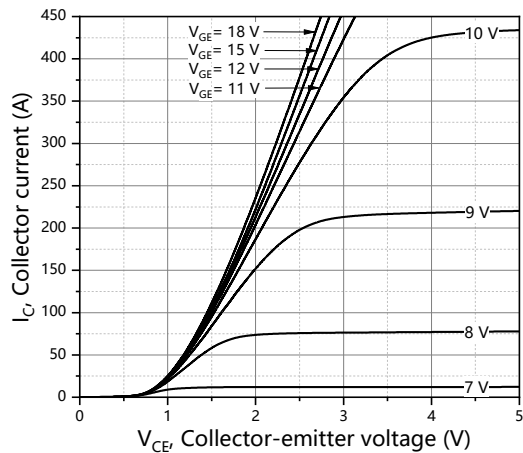


Figure 1. Typical output characteristics
($T_{vj}=25\text{ }^{\circ}\text{C}$)

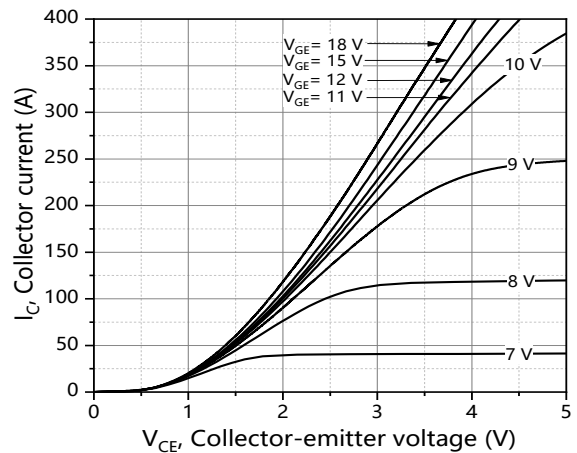


Figure 2. Typical output characteristics
($T_{vj}=150\text{ }^{\circ}\text{C}$)

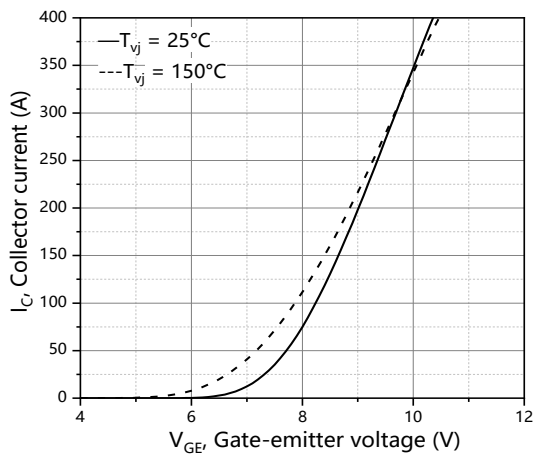


Figure 3. Typical transfer characteristics
($V_{CE}=20\text{ V}$)

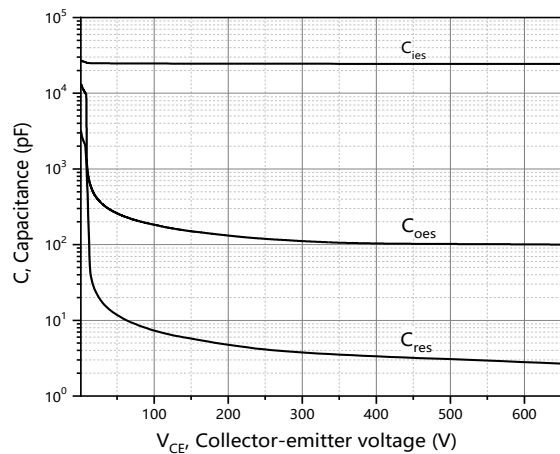


Figure 4. Typical capacitance
($V_{GE}=0\text{ V}$, $f=100\text{ kHz}$)

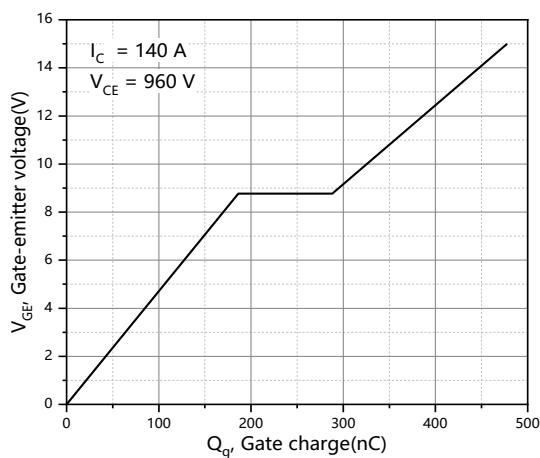


Figure 5. Typical gate charge

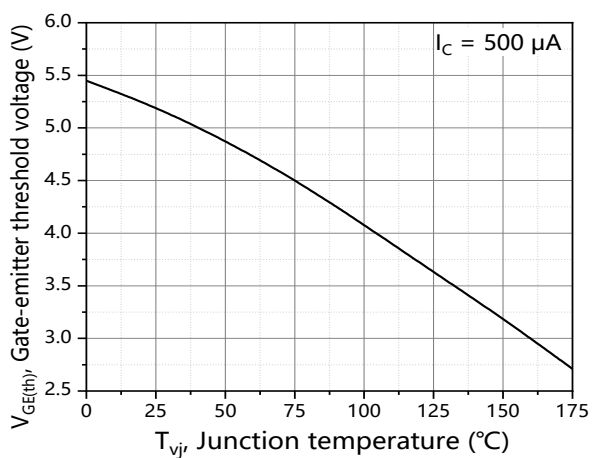


Figure 6. Gate-emitter threshold voltage

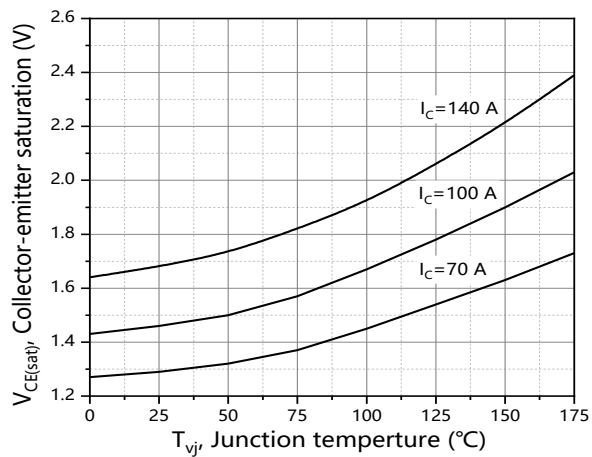


Figure 7. Typical collector-emitter voltage

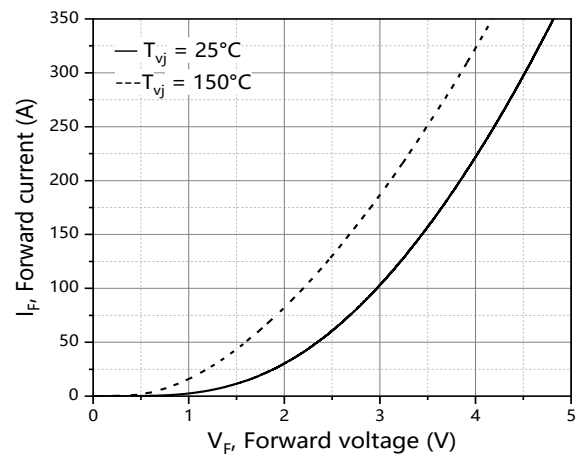


Figure 8. Forward characteristic of diode

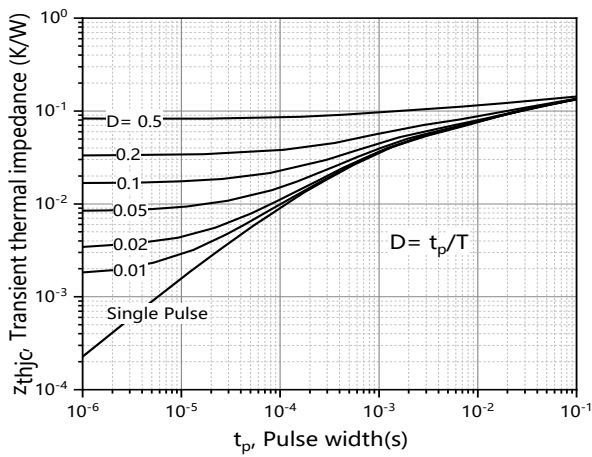


Figure 9. IGBT transient thermal impedance

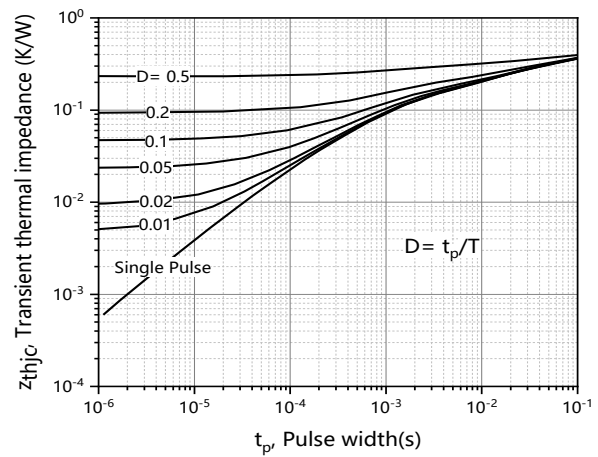


Figure 10. Diode transient thermal impedance

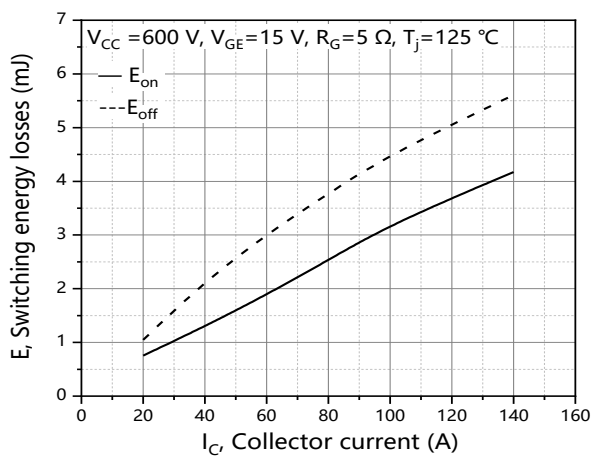
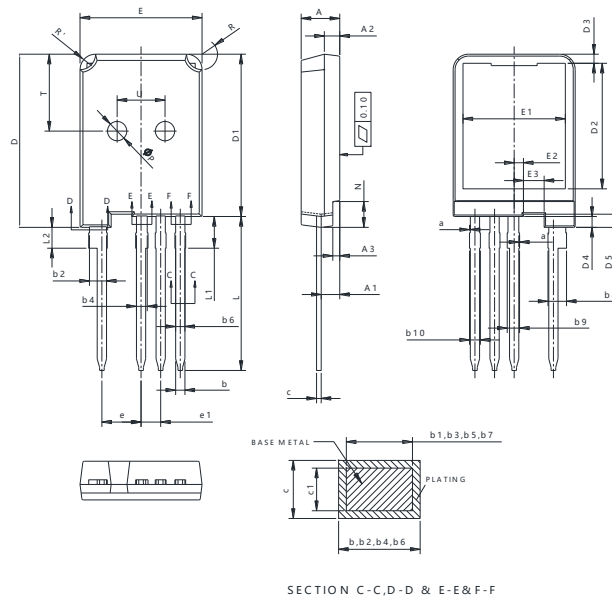


Figure 11. Switching energy vs. collector current

Package Information



Symbol	mm			Symbol	mm		
	Min	Nom	Max		Min	Nom	Max
A	4.90	5.00	5.10	D1	20.90	21.00	21.10
A1	2.31	2.41	2.51	D2	16.05	16.25	16.45
A2	1.90	2.00	2.10	D3	1.02	1.17	1.32
A3	0.80	0.90	1.00	D4	1.30	1.40	1.50
a	0.00	—	0.15	D5	1.60	1.70	1.80
a'	0.00	—	0.15	E	15.70	15.80	15.90
b	1.16	—	1.26	E1	13.06	13.26	13.46
b1	1.15	1.20	1.22	E2	1.10	1.20	1.30
b2	2.16	—	2.26	E3	2.58	2.68	2.78
b3	2.15	2.20	2.22	e	5.080 BSC		
b4	1.36	—	1.46	e1	2.540 BSC		
b5	1.35	1.40	1.42	L	19.80	19.92	21.00
b6	1.16	—	1.26	L1	3.90	4.10	4.30
b7	1.15	1.20	1.22	L2	2.55	2.70	2.85
b8	—	—	2.40	P	2.40	2.50	2.60
b9	—	—	1.60	R	1.90	2.00	2.10
b10	—	—	1.40	R'	1.90	2.00	2.10
c	0.59	0.625	0.66	T	9.75	9.95	10.15
c1	0.59	0.60	0.66	U	6.00	6.20	6.40
D	22.30	22.40	22.50	N	3.24	3.34	3.44

Version 1: TO247-plus-4L-J package outline dimension

Ordering Information

Package Type	Units/ Tube	Tubes/ Inner Box	Units/ Inner Box	Inner Boxes/ Carton Box	Units/ Carton Box
TO247-plus-4L-J	30	20	600	4	2400

Product Information

Product	Package	Pb Free	RoHS	Halogen Free
OST140N120H7EM2F-E	TO247-plus-4L	yes	yes	yes

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