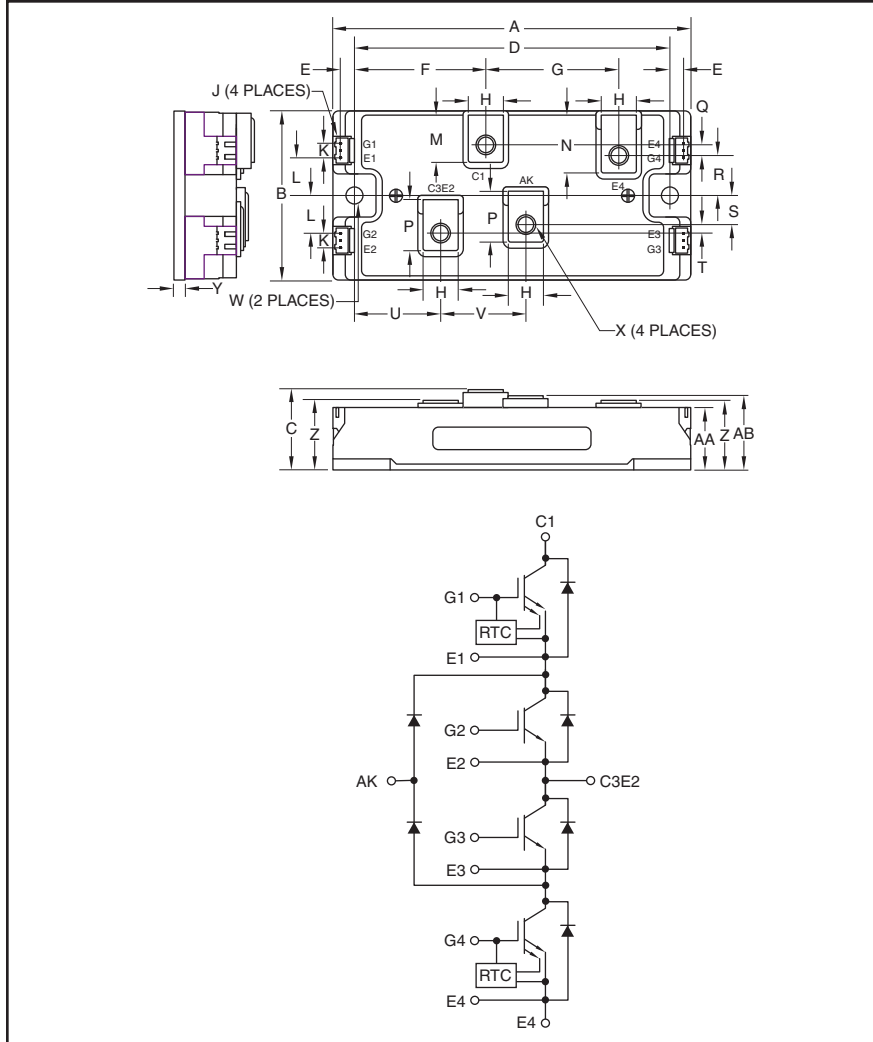


### TLI-Series (Three Level Inverter) IGBT 165 Amperes/600 Volts



Outline Drawing and Circuit Diagram

Dim.	Inches	Millimeters	Dim.	Inches	Millimeters
A	4.92	125.0	P	0.67	17.0
B	2.32	59.0	Q	0.16±0.02	4.0±0.5
C	1.08+0.04/-0.02	27.5+1.0/-0.5	R	0.55	14.0
D	4.33±0.01	110.0±0.25	S	0.39	10.0
E	0.20	5.15	T	0.12±0.2	3.0±0.5
F	1.80	45.75	U	1.20	30.5
G	1.83	46.5	V	1.16	29.5
H	0.47	12.0	W	0.22 Dia.	5.5 Dia.
J	0.14 Min.	3.6 Min.	X	M5 Metric	M5
K	0.2	5.0	Y	0.16	4.0
L	0.51	12.95	Z	0.93+0.04/-0.02	23.5+1.0/-0.5
M	0.61	15.5	AA	0.85+0.04/-0.02	21.5+1.0/-0.5
N	0.77	19.5	AB	1.00+0.04/-0.02	25.5+1.0/-0.5



#### Description:

The TLI-Series has been designed for three level (neutral point clamped) topologies in applications requiring high efficiency operation and improved output waveform quality. They also provide significant benefits in applications where low output noise using small filter components is required or where long motor leads create Standing Wave Ratio (SWR) voltage surge issues.

#### Features:

- Smaller Output Voltage Steps Reducing Surge Voltage
- Low Output Ripple Current
- Lower Modulation Frequency With Same Quality Output Waveform

#### Applications:

- Three Level Inverter Topologies
- Solar Power Inverters
- High Efficiency UPS
- Long Motor Lead Applications

#### Ordering Information:

Example: Select the complete module number you desire from the table - i.e. CM165YE4-12F is a 600V ( $V_{CES}$ ), 165 Ampere TLI-Series IGBT Power Module.

Type	Current Rating Amperes	$V_{CES}$ Volts (x 50)
CM	165	12



Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272 www.pwr.com

**CM165YE4-12F**

**TLI-Series (Three Level Inverter) IGBT**

165 Amperes/600 Volts

**Absolute Maximum Ratings,  $T_j = 25^\circ\text{C}$  unless otherwise specified**

Ratings	Symbol	CM165YE4-12F	Units
Junction Temperature	$T_j$	-40 to 150	$^\circ\text{C}$
Storage Temperature	$T_{\text{stg}}$	-40 to 125	$^\circ\text{C}$
Mounting Torque, Main Terminals, M5 Screw (Max.)	–	30	in-lb
Mounting Torque, Mounting Holes, M5 Screw (Max.)	–	30	in-lb
Weight (Typical)	–	430	Grams
Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)	$V_{\text{iso}}$	2500	$V_{\text{rms}}$

**Inverter Part**

Collector-Emitter Voltage (G-E Short)	$V_{\text{CES}}$	600	Volts
Gate-Emitter Voltage (C-E Short)	$V_{\text{GES}}$	$\pm 20$	Volts
Collector Current DC ( $T_C = 25^\circ\text{C}$ )	$I_C$	165	Amperes
Peak Collector Current (Pulse) <sup>*2</sup>	$I_{\text{CM}}$	330	Amperes
Emitter Current ( $T_C = 25^\circ\text{C}$ )	$I_E^{*1}$	165	Amperes
Peak Emitter Current (Pulse) <sup>*2</sup>	$I_{\text{EM}}^{*1}$	330	Amperes
Maximum Collector Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_C^{*3}$	540	Watts

**Clamp Diode Part**

Repetitive Peak Reverse Voltage	$V_{\text{RRM}}$	600	Volts
Forward Current ( $T_C = 25^\circ\text{C}$ )	$I_{\text{FM}}$	165	Amperes

\*1  $I_E$ ,  $I_{\text{EM}}$ ,  $V_{\text{EC}}$ ,  $t_{\text{rr}}$ , and  $Q_{\text{rr}}$  represent characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).

\*2 Pulse width and repetition rate should be such that device junction temperature ( $T_j$ ) does not exceed  $T_{j(\text{max})}$  rating.

\*3 Junction temperature ( $T_j$ ) should not increase beyond  $150^\circ\text{C}$ .

**CM165YE4-12F**

**TLI-Series (Three Level Inverter) IGBT**

165 Amperes/600 Volts

**Electrical Characteristics,  $T_j = 25^\circ\text{C}$  unless otherwise specified**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
<b>Inverter Part</b>						
Collector-Cutoff Current	$I_{CES}$	$V_{CE} = V_{CES}, V_{GE} = 0V$	–	–	1	mA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 16.5mA, V_{CE} = 10V$	5	6	7	Volts
Gate Leakage Current	$I_{GES}$	$V_{GE} = V_{GES}, V_{CE} = 0V$	–	–	20	$\mu A$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 165A, V_{GE} = 15V, T_j = 25^\circ\text{C}$	–	1.6	2.2	Volts
		$I_C = 165A, V_{GE} = 15V, T_j = 125^\circ\text{C}$	–	1.6	–	Volts
Input Capacitance	$C_{ies}$		–	–	45	nF
Output Capacitance	$C_{oes}$	$V_{CE} = 10V, V_{GE} = 0V$	–	–	3	nF
Reverse Transfer Capacitance	$C_{res}$		–	–	1.7	nF
Total Gate Charge	$Q_G$	$V_{CC} = 300V, I_C = 165A, V_{GE} = 15V$	–	1000	–	nC
Turn-on Delay Time	$t_{d(on)}$	$V_{CC} = 300V, I_C = 165A,$	–	–	450	ns
Turn-on Rise Time	$t_r$	$V_{GE1} = V_{GE2} = 15V,$	–	–	200	ns
Turn-off Delay Time	$t_{d(off)}$	$R_G = 11\Omega,$	–	–	900	ns
Turn-off Fall Time	$t_f$	Inductive Load Switching Operation,	–	–	300	ns
Reverse Recovery Time	$t_{rr}^{*1}$	$I_E = 165A$	–	–	200	ns
Reverse Recovery Charge	$Q_{rr}^{*1}$		–	0.9	–	$\mu C$
Emitter-Collector Voltage	$V_{EC}^{*1}$	$I_E = 165A, V_{GE} = 0V$	–	–	3.2	Volts
External Gate Resistance	$R_G$		11	–	38	$\Omega$

**Clamp Diode Part**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Repetitive Reverse Current	$I_{RRM}$	$V_R = V_{RRM}$	–	–	1	mA
Forward Voltage Drop	$V_{FM}$	$I_F = 165A$	–	–	2.9	Volts
Reverse Recovery Time	$t_{rr}$	$I_F = 165A, V_{CC} = 300V,$	–	–	200	ns
Reverse Recovery Charge	$Q_{rr}$	$V_{GE1} = V_{GE2} = 15V, R_G = 11\Omega,$ Inductive Load Switching Operation	–	1.02	–	$\mu C$

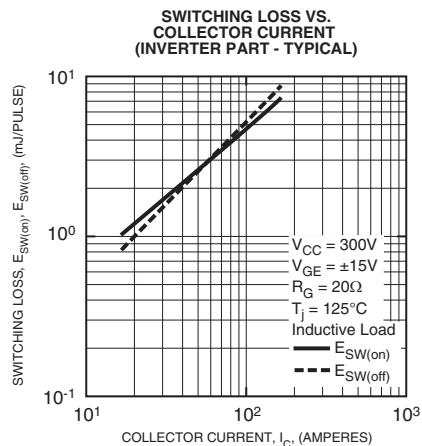
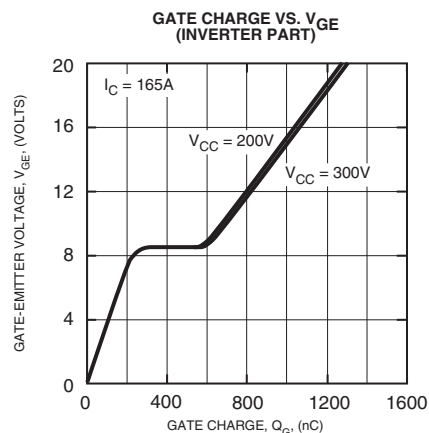
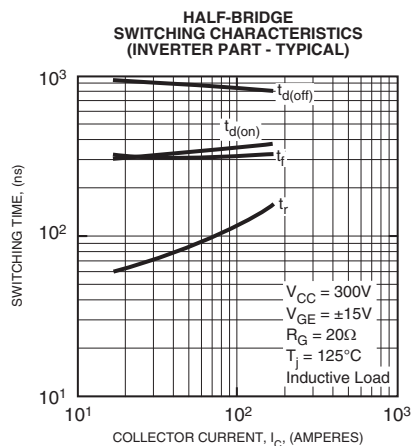
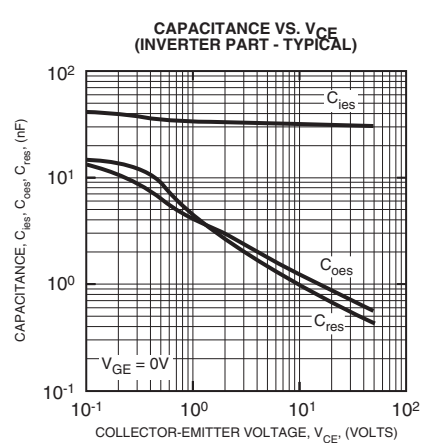
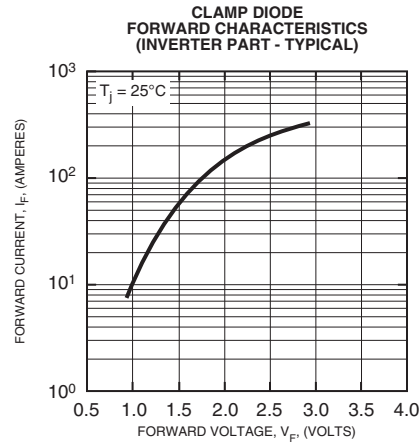
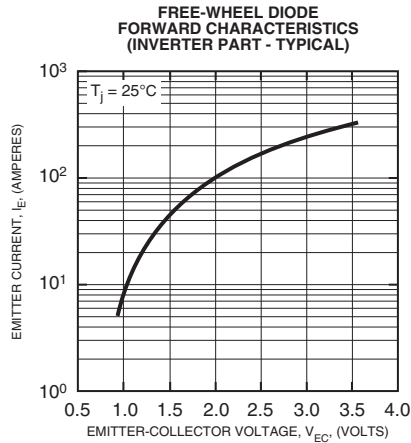
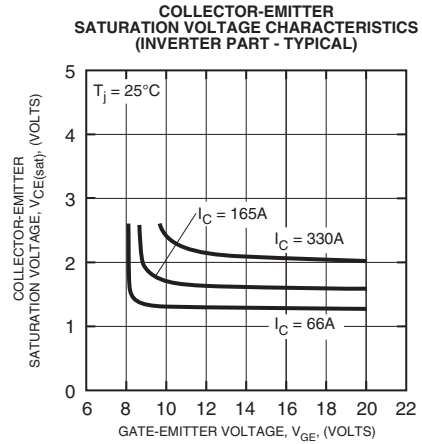
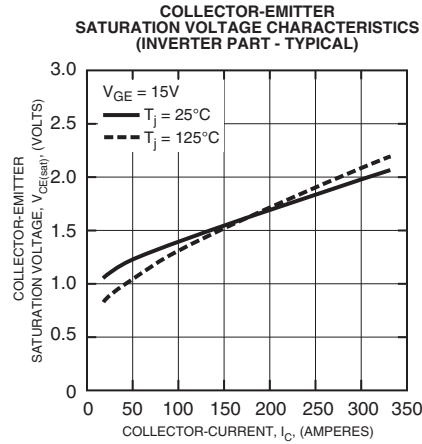
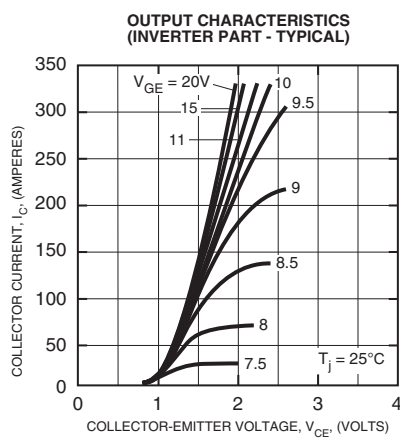
**Thermal and Mechanical Characteristics,  $T_j = 25^\circ\text{C}$  unless otherwise specified**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case <sup>*4</sup>	$R_{th(j-c)}Q$	Inverter IGBT	–	–	0.23	$^\circ\text{C}/W$
Thermal Resistance, Junction to Case <sup>*4</sup>	$R_{th(j-c)}D$	Inverter FWDi	–	–	0.52	$^\circ\text{C}/W$
Thermal Resistance, Junction to Case <sup>*4</sup>	$R_{th(c-f)}D$	Clamp Diode Part	–	–	0.38	$^\circ\text{C}/W$
Contact Thermal Resistance <sup>*4*5</sup>	$R_{th(c-f)}$	Thermal Grease Applied (per 1 Module)	–	0.087	–	$^\circ\text{C}/W$

<sup>\*4</sup>  $T_C$  measured point is just under the chips. If using this value,  $R_{th(f-a)}$  should be measured just under the chips.

<sup>\*5</sup> Typical value is measured by using thermally conductive grease of  $\lambda = 0.9 [W/(m \cdot K)]$ .

**CM165YE4-12F**  
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