APPLICATIONS INFORMATION

A PRIMER ON ESSENTIALS OF OUTPUT VOLTAGE LIMITATIONS

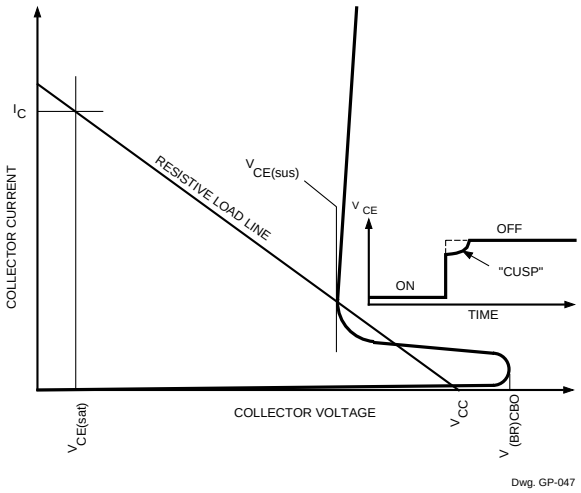

Figure 1 — Load Line with Resistive Load

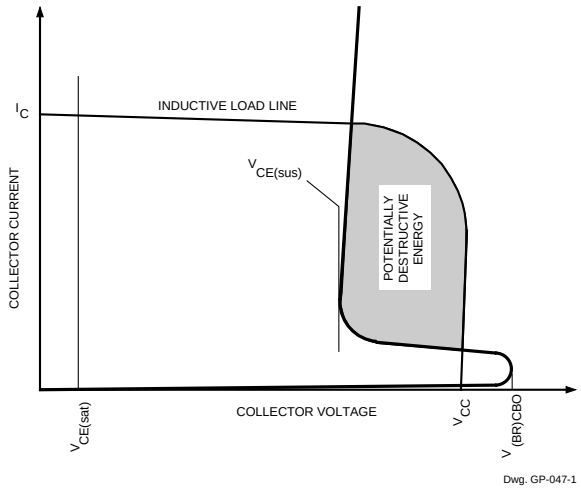

Figure 2 — Load Line with Inductive Load

Typically, overcoming the foremost roadblocks to successfully and reliably applying power and "smart-power" ICs involves an understanding of two critical specifications.

The first is the device's specified maximum allowable output voltage. Whether it is the maximum load supply voltage (V_{BB}), collector supply voltage (V_{CC}), or output voltage (V_{OUT}) the value approximates $V_{(BR)CBO}$. Typically, this absolute maximum rating is guaranteed by a leakage current measurement at the specified maximum voltage. This limit is satisfactory for resistive loads and some capacitive loads (see figure 1). Should the output load line cross the sustaining voltage curve, no "stored" energy is involved. Thus, device damage is unlikely although output voltage wave-shape aberrations (a "cusp") during turn-off often occur.

The second consideration relates to the specified minimum collector-emitter (or output) sustaining voltage for inductive loads. Many inductive load applications involve substantial stored energy. The output load line during turn-off resembles that of figure 2 and this stored energy can cause instantaneous, catastrophic failure of the device.

For safe, reliable operation with inductive loads, it is important (even imperative) that the circuit load line not intersect the sustaining voltage curve. Without proper output voltage limiting or clamping, the turn-off voltage across the output can (will usually) far exceed the device capability! Protection is easily accomplished by providing:

(a) a diode clamp (usually called a "flyback" or "recirculating diode") across the inductive load, or

(b) a Zener-diode clamp to supply or ground, or

(c) an RC snubber network.

For rapid current decay (fast turn-off speeds), using Zener diodes will raise the flyback voltage during turn-off and improve performance. However, the transient/momentary/peak/spike voltage must not exceed the specified minimum sustaining voltage.

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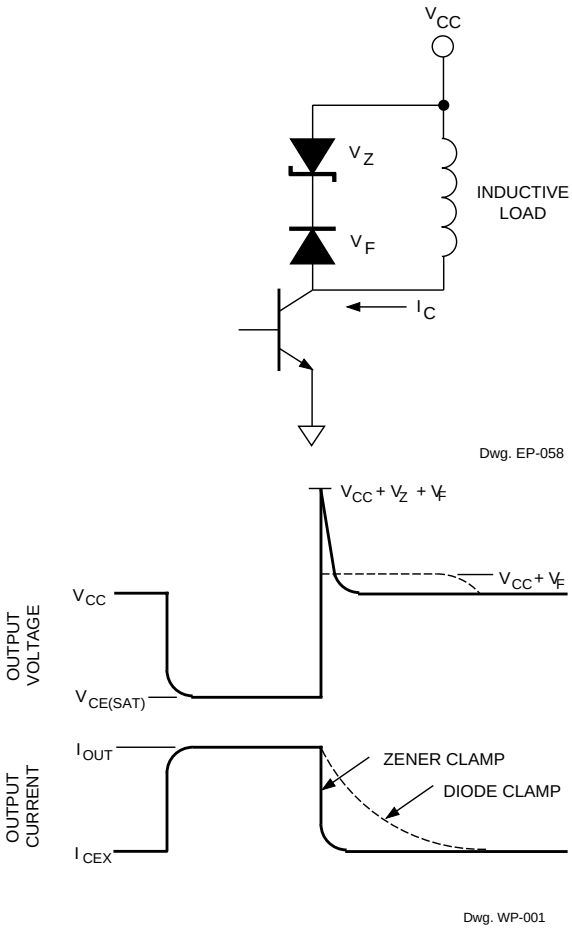

Figure 3 — "Protected" Inductive Load Driver

Power supply and circuit values are chosen such that V_{CC} (supply) + V_F (diode forward voltage) + V_Z (Zener voltage, if used) ≤ $V_{CE(sus)}$.

Further, for reliable operation, the peak current ratings of both the flyback and Zener diodes must be at least as high as the load current. Note – surge power ratings of Zener diodes are typically greater than 10 times the continuous rating in repetitive, low-duty cycle (5% to 10%) applications.

The output voltage ratings of popular Allegro power drivers follows. Some of these sustaining voltage ratings (bold faced) do not presently appear in Allegro data sheets. These specifications will be added at the next revisions. Additional assistance pertaining to sustaining voltage issues can be provided by Allegro Applications Engineering.

Part Number(s)	Max. V_{BB}, V_{CC}, V_{OUT}, or V_{CEX}	Min. $V_{OUT(SUS)}$, $V_{CE(SUS)}$, or $V_{CE(sus)}$	Internal clamp diodes
2003 and 2004	50	**35**	yes
2023 and 2024	95	**50**	yes
2065	80	50	yes
2068	50	35	yes
2069	80	50	yes
2540	50	50	yes
2543	25*	35	yes
2547	25*	40	no
2549 and 2559	25*	40	yes
2557	32	40	yes

— cont'd —

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Part Number	Max. V_{BB}, V_{CC}, V_{OUT}, or V_{CEX}	Min. $V_{OUT(SUS)}$, $V_{CE(SUS)}$, or $V_{CE(sus)}$	Internal clamp diodes
2580	50	35	yes
2585	25	15	yes
2588	80	50	yes
2596 and 2597	50	35	yes
2803 and 2804	50	**35**	yes
2823 and 2824	95	**50**	yes
2878	50	35	yes
2879 and 2879-2	80	50	yes
2916, 2917, 2918, and 2919	45	45	yes
2936-120	45	45	yes
2944	60	35	yes
2961	45	45	1 of 2 req'd
2962	45	45	yes
2981 and 2982	50	**35**	yes
2983 and 2984	80	**45**	yes
2985	30	15	yes
2987	35	35	yes
2998	50	50	yes
3951, 3952, and 3953	50	50	yes
3955 and 3957	50	50	yes
3964	33	33	yes
3966 and 3968	30	30	yes
5140 Hall	25*	25	yes
5800 and 5801	50	**~35**	yes
5804	50	35	yes
5821	50	**~35** (use 5841 for inductive loads)	no
5822	80	**~50** (use 5842 for inductive loads)	no
5841	50	35	yes
5842	80	50	yes
5890	80	50	yes
5891	50	35	yes
5895	50	35	yes
6219	45	45	yes
8902	14	14	yes

* Maximum allowable supply voltage is specified higher. Listed here is maximum useful operating voltage defined by an internal overvoltage shutdown or current limiting.

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