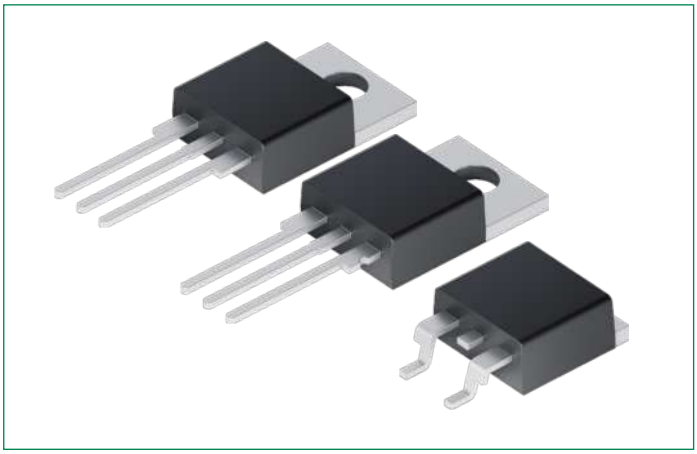
QVxx16xHx Series

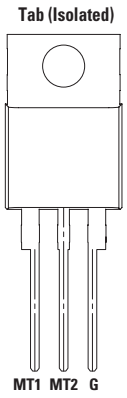
16 A High-Temperature Alternistor TRIACs

HF RoHS

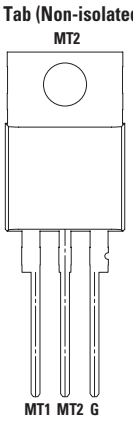


Pinout Diagram

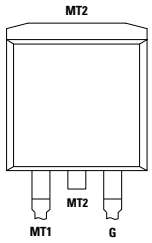
TO-220 (L-Package)

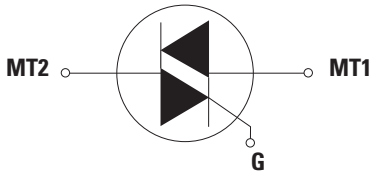


TO-220 (R-Package)



TO-263





MT1: Main Terminal 1; **MT2**: Main Terminal 2; **G**: Gate

Description

This 16 A high temperature Alternistor TRIAC, offered in TO-220AB, TO-220 isolated, and TO-263 packages, has rated 150 °C maximum junction temperature, $T_{vj(max)}$ and 200 A non-repetitive surge peak on-state current, I_{TSM} (60 Hz).

This series enables easier thermal management and increases surge handling capability in AC power control applications such as heater control, motor speed control, lighting controls, and static switching relays.

This QV series TRIAC operates in quadrants I, II, and III, and offers high performance in applications requiring high commutation capability without a snubber circuit.

Features

- Voltage capability of up to 800 V
- Surge current capability of 200 A at 60 Hz half cycle
- Mechanically and thermally robust TO-220 clip-attach assembly
- Maximum virtual junction temperature, $T_{vj(max)}$ of 150 °C
- Internally-isolated TO-220 package
- Halogen-free and RoHS-compliant
- UL 1557 recognized as an Electrically Isolated Semiconductor Device (L package: file number E71639)

Benefits

- High dv/dt up to 1500 V/µs for improved noise immunity
- 3Q technology for high commutation capability, resulting in smoother switching transitions and reduced EMI
- Internally isolated TRIAC packages offer improved thermal management and high electrical isolation, simplifying mounting and enhancing safety.

Applications

TRIAC is an excellent AC switch in heating, lighting, and motor speed control applications.

Typical applications are:

- Heater control such as coffee brewer, tankless water heater, and infrared heater
- AC solid-state relays
- Light dimmers including incandescent and LED lighting
- Motor speed control in kitchen appliances, white goods, home electronics, power tools, and light industrial applications such as compressor motor control

Product Summary

Characteristic	Value	Unit
$I_{T(RMS)}$	16	A
V_{DRM}/V_{RRM}	600 or 800	V
$I_{GT(Q1)}$	10 or 20 or 35 or 50	mA

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Maximum Ratings - Alternistor TRIAC (3 Quadrants)

Symbol	Characteristics	Conditions			Value	Units
$I_{T(RMS)}$	On-state RMS Current	QVxx16LHy	T_c = 115 °C	full sine wave	16	A
		QVxx16RHy / QVxx16NHy	T_c = 130 °C			
I_{TSM}	Non-repetitive Surge Peak On-state Current	f = 50 Hz, t = 20 ms	single half-cycle, T_{vj} initial = 25 °C		167	A
		f = 60 Hz, t = 16.7 ms			200	
I^2t	I^2t Value for Fusing	t_p = 8.3 ms			166	A^2s
di/dt	Critical Rate of Rise of On-state Current	f = 60 Hz, T_{vj} = 150 °C			100	A/µs
I_{GTM}	Peak Gate Trigger Current	$t_p \le 10$ µs, $I_{GT} \le I_{GTM}$, T_{vj} = 150 °C			4	A
$P_{G(AV)}$	Average Gate Power Dissipation	T_{vj} = 150 °C			0.5	W
T_{stg}	Storage Temperature Range	–			–40 to 150	°C
T_{vj}	Virtual Junction Temperature Range	–			–40 to 150	°C
V_{DSM}/V_{RSM}	Non-repetitive Surge Peak Off-state Voltage	V_{DRM} = 600 V, pulse width = 100 µs			V_{DRM}/V_{RRM} + 100	V
		V_{DRM} = 800 V, pulse width = 100 µs			V_{DRM}/V_{RRM} + 200	V

xx = voltage/10; y = sensitivity

Electrical Characteristics (T_{vj} = 25 °C, unless otherwise specified) — Alternistor TRIAC (3 Quadrants)

Symbol	Characteristics	Conditions		QVxx16xH2			QVxx16xH3			QVxx16xH4			QVxx16xH5			Units
				Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
I_{GT}	DC Gate Trigger Current	V_D = 12 V, R_L = 60 Ω	I – II – III	–	–	10	–	–	20	–	–	35	–	–	50	mA
V_{GT}	DC Gate Trigger Voltage		I – II – III	–	–	1.3	–	–	1.3	–	–	1.3	–	–	1.3	V
V_{GD}	Gate Non-trigger Voltage	$V_D = V_{DRM}$, R_L = 3.3 kΩ, T_{vj} = 150 °C	I – II – III	0.15	–	–	0.15	–	–	0.15	–	–	0.15	–	–	V
I_H	Holding Current	I_T = 100 mA		–	–	15	–	–	35	–	–	50	–	–	60	mA
$dv/dt_{(cr)}$	Critical Rate-of-riseof Off-state Voltage	$V_D = V_{DRM}$, Gate Open, T_{vj} = 150 °C		200	–	–	350	–	–	500	–	–	750	–	–	V/µs
		V_D = 2/3 V_{DRM}, Gate Open, T_{vj} = 150 °C		400	–	–	700	–	–	1000	–	–	1500	–	–	
$dv/dt_{(com)}$	Critical Rate-of-rise of Commutation Voltage	(di/dt)c = 8.6 A/ms, T_{vj} = 150 °C		10	–	–	30	–	–	50	–	–	–	–	–	V/µs
t_{gt}	Turn-on Time	$I_G = 2 \cdot I_{GT}$, t_p = 15 µs, I_T = 22.6 A_{pk}	I	–	3	–	–	3	–	–	3	–	–	3	–	µs
			II	–	4	–	–	5	–	–	6	–	–	6	–	
			III	–	8	–	–	14	–	–	15	–	–	17	–	
(di/dt)c	Without Snubber	T_{vj} = 150 °C		–	–	–	–	–	–	–	–	–	28	–	–	A/µs

xx = voltage/10; y = sensitivity

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Thermal Characteristics

Symbol	Characteristics		Value	Units
$R_{th(j-c)}$	Thermal Resistance, Junction to Case	QVxx16RHy/ QVxx16NHy	0.9	K/W
		QVxx16LHy	1.8	
$R_{th(j-a)}$	Thermal Resistance, Junction to Ambient	QVxx16RHy/ QVxx16NHy	45	K/W
		QVxx16LHy	50	

xx = voltage/10; y = sensitivity

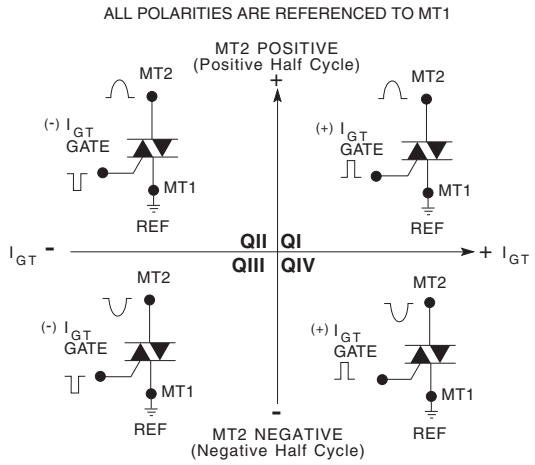
Static Characteristics

Symbol	Characteristics	Conditions	Value	Units
V_{TM}	Peak On-state Voltage	I_T = 22.6 A t_p = 380 µs	1.55	V
I_{DRM}/I_{RRM}	Peak Repetitive Off-state Current	$V_D = V_{DRM}/V_{RRM}$, T_{vj} = 25 °C	5	µA
		$V_D = V_{DRM}/V_{RRM}$, T_{vj} = 150 °C	4	mA
V_{TO}	Threshold Voltage	T_{vj} = 150 °C	0.85	V
R_D	Slope Resistance	T_{vj} = 150 °C	18.5	mΩ

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Characteristic Curves

Figure 1. Definition of Quadrants



Note: Alternistors will not operate in QIV

Fig. 2. Normalized DC Gate Trigger Current for all Quadrants vs. Junction Temperature

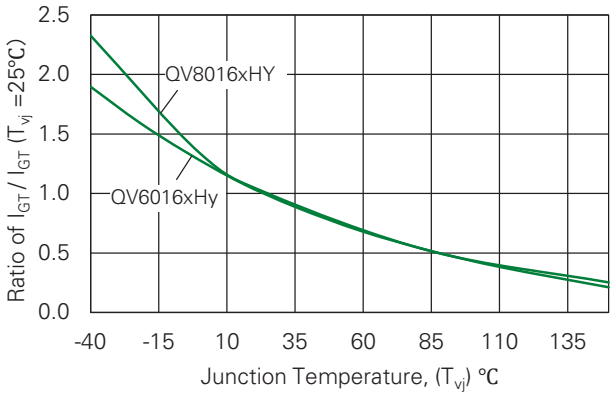


Fig. 3. Normalized DC Holding Current vs. Junction Temperature

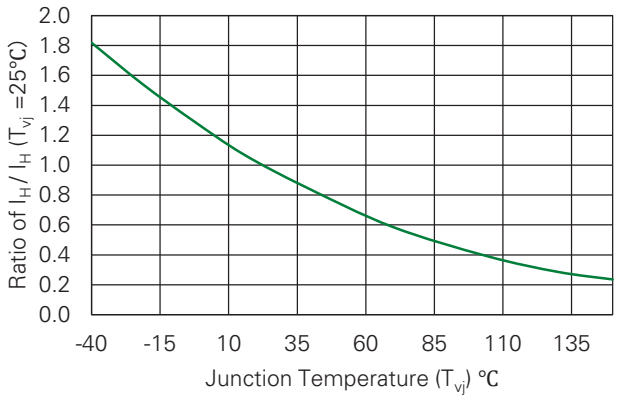


Fig. 4. Normalized DC Gate Trigger Voltage for all Quadrants vs. Junction Temperature

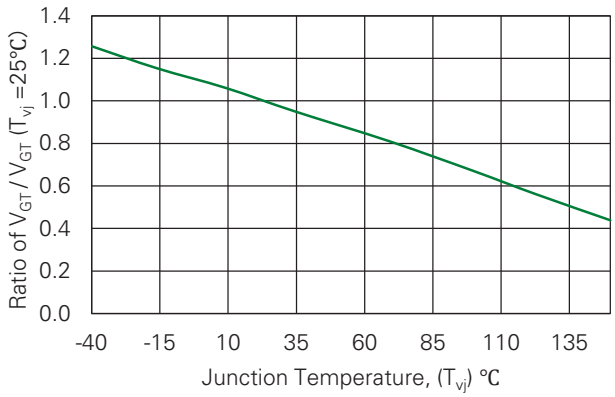


Fig. 5. Typical Power Dissipation vs. RMS On-state Current

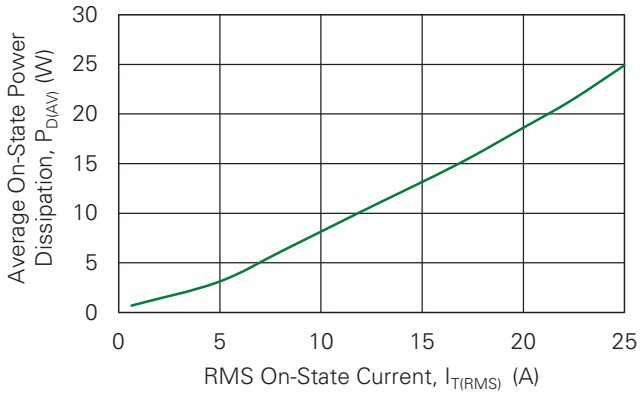
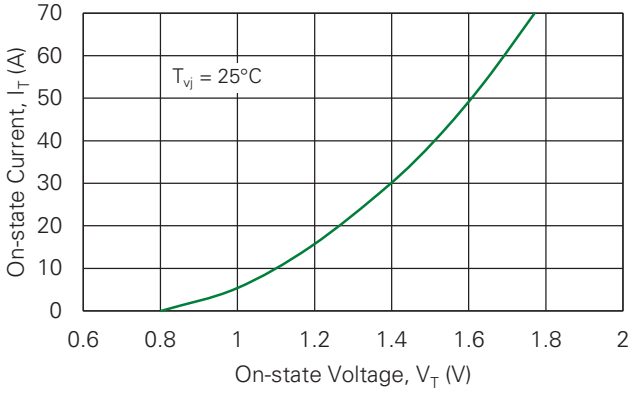


Fig. 6. Typical On-state Current vs. On-state Voltage



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Fig. 7. Maximum Allowable Case Temperature vs. RMS On-state Current

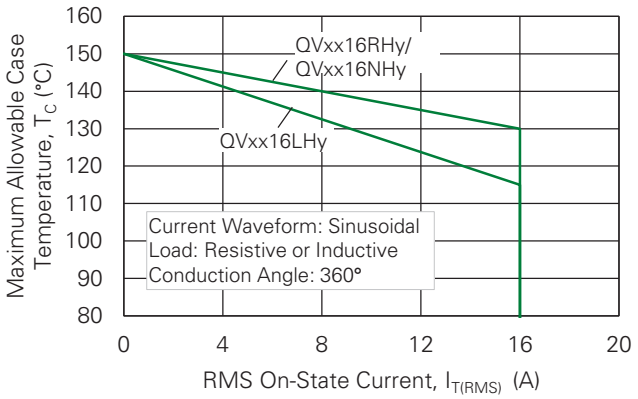
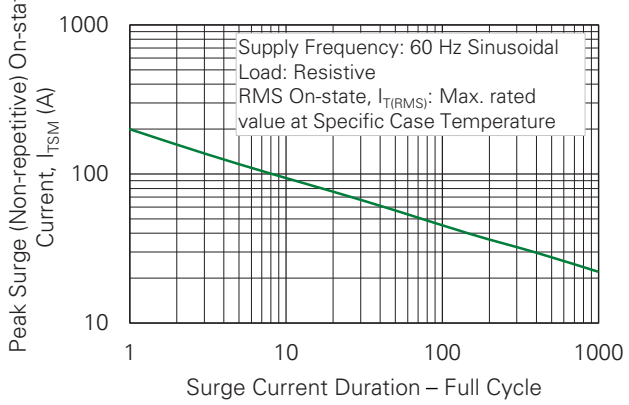


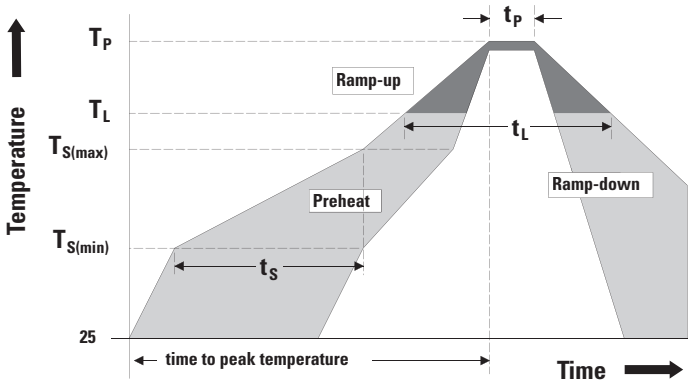
Fig. 8. Surge Peak On-state Current vs. Number of Cycles



Notes:
1. Gate control may be lost during and immediately following surge current interval.
2. Overload may not be repeated until junction temperature has returned to steady-state rated value.

Soldering Parameters

Characteristic		Value
Reflow Condition		Pb – Free assembly
Pre-heat	Temperature Min ($T_{s(min)}$)	150 °C
	Temperature Max ($T_{s(max)}$)	200 °C
	Time (min to max) (t_s)	60 – 180 secs
Average ramp up rate (Liquidus Temp)(T_L) to peak		5 °C/second max
$T_{S(max)}$ to T_L - Ramp-up Rate		5 °C/second max
Reflow	Temperature (T_L) (Liquidus)	217 °C
	Time (t_L)	60 – 150 seconds
Peak Temperature (T_P)		$260^{+0/-5}$ °C
Time within 5 °C of actual peak Temperature (t_p)		20 – 40 seconds
Ramp-down Rate		5 °C/second max
Time 25 °C to peak Temperature (T_P)		8 minutes max



Environmental Specifications

Test	Specifications and Conditions
AC Blocking	MIL-STD-750, M-1040, Cond A Applied Peak AC voltage @ 150 °C for 1008 hours
Temperature/Humidity	EIA / JEDEC, JESD22-A101, 1008 hours; 160 V - DC: 85 °C; 85 % relative humidity
Temperature Cycling	MIL-STD-750, M-1051,1000 cycles; -55 °C to +150 °C; 15-min dwell-time
Resistance to Solder Heat	MIL-STD-750: Method 2031
Solderability	ANSI/J-STD-002: category 3, Test A
Lead Bend	MIL-STD-750, M-2036 Cond E
Moisture Sensitivity Level	Level 1, JEDEC-J-STD-020
UHAST	JESD22A-118, 96 hrs, 130 °C/ 85 % RH
IOL	MIL-STD-750 Method 1037

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Product Selector

Part Number	Voltage		Gate Sensitivity Quadrants	Type	Package
	600 V	800 V	I-II-III		
QVxx16LH2	X	–	10 mA	Alternistor TRIAC	TO-220AB (L package)
QVxx16RH2	X	–	10 mA	Alternistor TRIAC	TO-220AB (R package)
QVxx16NH2	X	–	10 mA	Alternistor TRIAC	TO-263 (D^2PAK)
QVxx16LH3	X	–	20 mA	Alternistor TRIAC	TO-220AB (L package)
QVxx16RH3	X	–	20 mA	Alternistor TRIAC	TO-220AB (R package)
QVxx16NH3	X	–	20 mA	Alternistor TRIAC	TO-263 (D^2PAK)
QVxx16LH4	X	X	35 mA	Alternistor TRIAC	TO-220AB (L package)
QVxx16RH4	X	X	35 mA	Alternistor TRIAC	TO-220AB (R package)
QVxx16NH4	X	X	35 mA	Alternistor TRIAC	TO-263 (D^2PAK)
QVxx16LH5	X	X	50 mA	Alternistor TRIAC	TO-220AB (L package)
QVxx16RH5	X	X	50 mA	Alternistor TRIAC	TO-220AB (R package)
QVxx16NH5	X	X	50 mA	Alternistor TRIAC	TO-263 (D^2PAK)

Packing Options

Part Number	Marking	Weight	Packing Mode	Base Quantity
QVxx16LHyTP	QVxx16LHy	2.2 g	Tube Pack	1000
QVxx16RHyTP	QVxx16RHy	2.2 g	Tube Pack	1000
QVxx16NHyTP	QVxx16NHy	1.6 g	Tube Pack	1000
QVxx16NHyRP	QVxx16NHy	1.6 g	Embossed Carrier	500

Part Numbering and Marking

QV 60 16 L H4 56

Component Type
QV: High dv/dt TRIAC or Alternistor

Voltage Rating
60: 600 V
80: 800 V

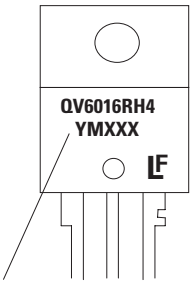
Current Rating
16: 16 A

Package Type
L: TO-220 Isolated
R: TO-220 Non-Isolated
N: TO-263 (D^2PAK)

Sensitivity & Type
Alternistor TRIAC
H2: 10 mA (QI, II, III)
H3: 20 mA (QI, II, III)
H4: 35 mA (QI, II, III)
H5: 50 mA (QI, II, III)

Lead Form Dimensions
xx: Lead Form Option

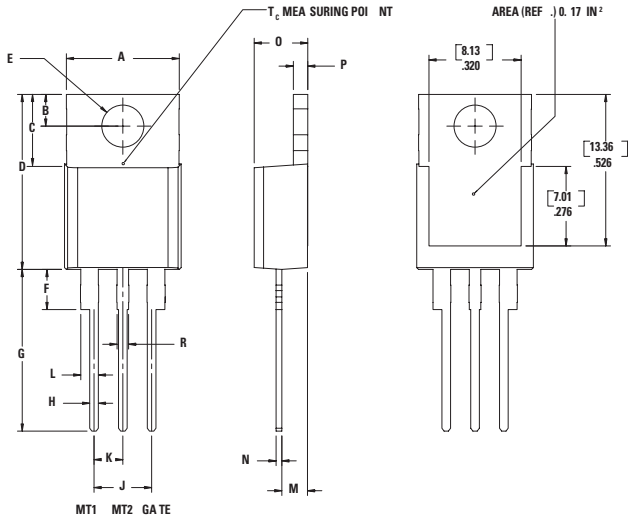
TO-220 AB - (L and R Package)
TO-263 AB - (N Package)



Date Code Marking
Y:Year Code
M: Month Code
XXX: Lot Trace Code

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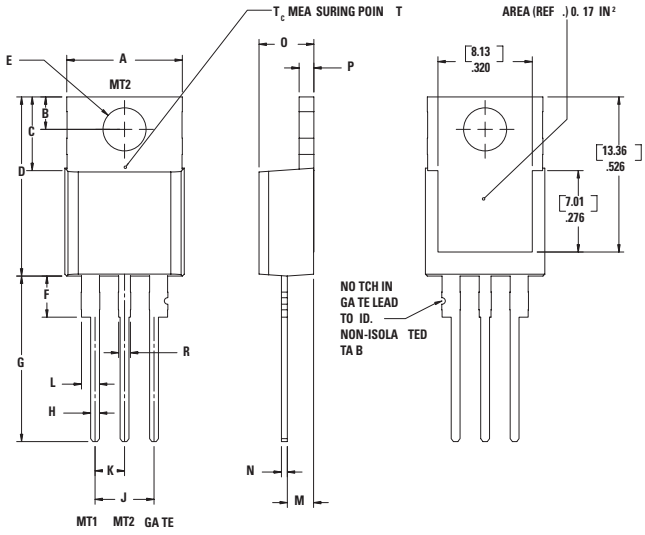
Package Dimensions TO-220AB (L-Package) -- Isolated Mounting Tab



Note: Maximum torque to be applied to mounting tab is 8 in-lbs. (0.904 Nm).

Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max
A	9.65	10.67	0.380	0.420
B	2.67	2.92	0.105	0.115
C	5.84	6.35	0.230	0.250
D	14.99	15.75	0.590	0.620
E	3.61	3.73	0.142	0.147
F	2.79	3.30	0.110	0.130
G	13.72	14.60	0.540	0.575
H	0.64	0.89	0.025	0.035
J	4.95	5.21	0.195	0.205
K	2.41	2.67	0.095	0.105
L	1.52	1.91	0.060	0.075
M	2.16	2.41	0.085	0.095
N	0.46	0.61	0.018	0.024
O	4.52	4.78	0.178	0.188
P	1.14	1.52	0.045	0.060
R	0.97	1.22	0.038	0.048

Package Dimensions TO-220AB (R Package) – Non-isolated Mounting Tab Common with Center Lead

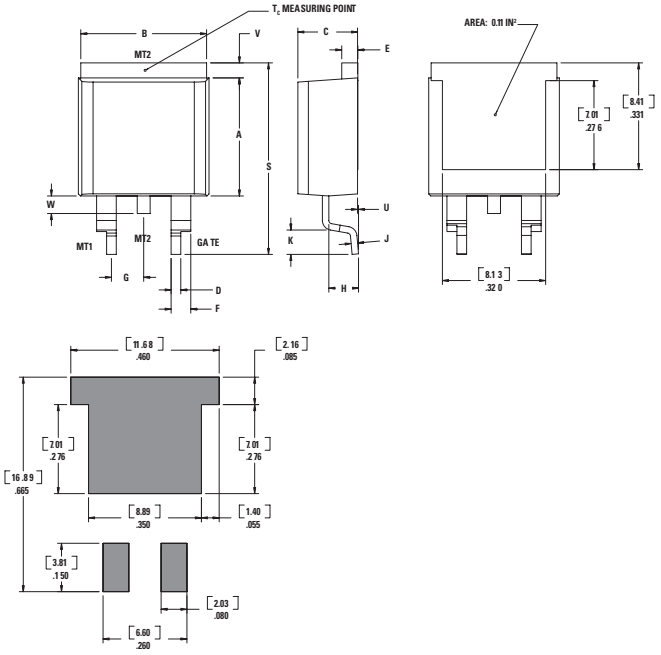


Note: Maximum torque to be applied to mounting tab is 8 in-lbs. (0.904 Nm).

Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max
A	9.65	10.67	0.380	0.420
B	2.67	2.92	0.105	0.115
C	5.84	6.35	0.230	0.250
D	14.99	15.75	0.590	0.620
E	3.61	3.73	0.142	0.147
F	2.79	3.30	0.110	0.130
G	13.72	14.60	0.540	0.575
H	0.64	0.89	0.025	0.035
J	4.95	5.21	0.195	0.205
K	2.41	2.67	0.095	0.105
L	1.52	1.91	0.060	0.075
M	2.16	2.41	0.085	0.095
N	0.46	0.61	0.018	0.024
O	4.52	4.78	0.178	0.188
P	1.14	1.52	0.045	0.060
R	0.97	1.22	0.038	0.048

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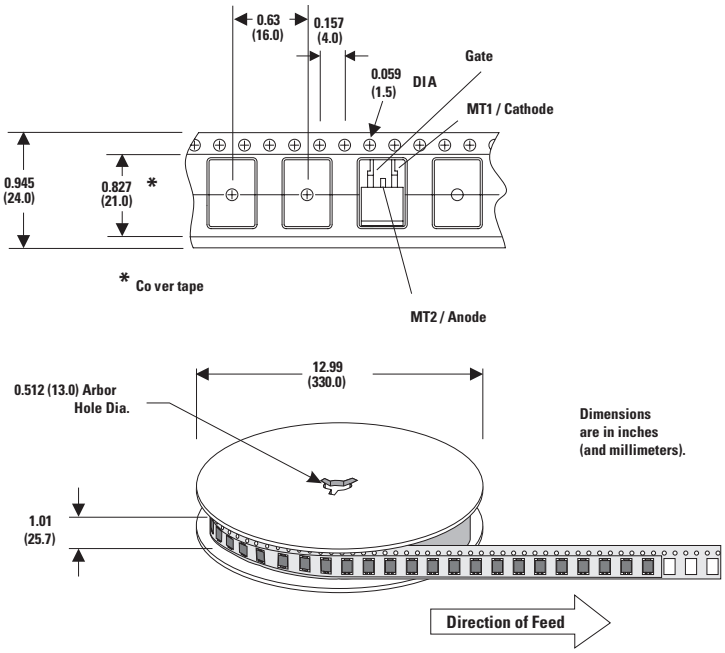
Package Dimensions TO-263 (N Package) – D²PAK Surface Mount



Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max
A	9.14	9.40	0.360	0.370
B	9.65	10.67	0.380	0.420
C	4.52	4.78	0.178	0.188
D	0.64	0.89	0.025	0.035
E	1.14	1.52	0.045	0.060
F	1.52	1.91	0.060	0.075
G	2.41	2.67	0.095	0.105
H	2.34	2.59	0.092	0.102
J	0.46	0.61	0.018	0.024
K	2.29	2.79	0.090	0.110
S	14.99	15.88	0.590	0.625
V	0.89	1.14	0.035	0.045
U	0.05	0.25	0.002	0.010
W	1.02	1.78	0.040	0.070

Reel Pack (RP) Specifications for TO-263 Embossed Carrier

Meets all EIA-481-2 Standards



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IXYS Part of: Littelfuse Expertise Applied | Answers Delivered

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